INTERACTIONS OF MONETARY POLICIES IN SOUTH EAST EUROPE COUNTRIES IN A EUROPEAN MONETARY UNION CONTEXT

A GLOBAL-VECTOR AUTOREGRESSIVE MODEL

Thesis submitted to the
Department of Economics of The University of Sheffield
in fulfilment of the requirements for the degree of
Doctor of Philosophy

Petros Golitsis
140241921

The University of Sheffield
Department of Economics
Sheffield, March 2018

Abstract

This thesis discusses the interactions of monetary policies in the South-eastern European Countries (SEEC) in a European Monetary Union (EMU) context, by modelling via a Global Vector Autoregressive Model (G-VAR) the interdependencies arising between the member states and the related financial institutions in the region. The EMU and its relation to monetary or economic policy interactions has been heavily and effectively researched by numerous researchers including, indicatively, the Nobel laureate Mundell (1961) who theoretically and empirically considered and examined the effects of monetary and fiscal policies coordination on real output, interest rates and exchange rates with the aim of increasing the benefits that could arise from an optimum currency area (OCA). A G-VAR model for South-Eastern Europe (SEE), however, has not been applied and foreign exchange reserves have not yet been considered within such a contextual framework. There is a gap to fill in on the theoretical and empirical relation of the aforementioned variables using econometrics and we will do so by using a multi-simultaneous equations system with weak exogeneity, i.e. a G-VAR. The incorporated variables are: the foreign exchange reserves, the real effective exchange rate (REER), the growth approximated by the industrial production index (IPI) and the monetary policy which is quantified through interest rates and specifically by the money and market rate. The variables that will be treated as weakly exogenous within the GVAR system are the Euribor and the EMU Real Effective Exchange Rate. The frequency of the data is monthly and covers the period from 2002 to 2016. The analysis is conducted with the use of secondary data which is acquired through publicly available published data and reports from Central Banks, the European Central Bank (ECB), Eurostat, OECD, BIS, IMF and the World Bank. The European Countries that are considered are Bulgaria, Croatia, FYROM, Greece, Romania and Slovenia. The European Monetary Union and its role are captured by the related interest rate, i.e. Euribor, and the Real Effective Exchange rates of EMU members as a whole. The main task of the project is to capture the transmission mechanism −from the monetary to real economy− by considering the role of foreign exchange reserves in the case of SEE countries. This adds to the understanding of the economic policy effect on nominal and real variables, suggests a better macroeconomic policy design and adds to the efficiency of the implementation of monetary policy that captures complexities that are related to an Optimum Currency Area (OCA). On top of the above the EMU REER helps us in understanding the existing and dynamically changing competitive related interlinkages that exist between the investigated variables.

Keywords: Foreign exchange reserves, real effective exchange rate (REER), industrial production index (IPI), monetary policy, interest rates, money and market rates, monetary transmission mechanism, SEE, EMU, G-VAR, Unit roots, Cointegration, Weight Trade Matrix, Generalized forecast error variance decompositions (GFEVDs) and Generalized impulse response functions (GIRFs).

Table of Contents

List of Figures

List of Tables

List of Abbreviations

AIC	Akaike Information Criterion
BIS	Bank of International Settlements
BOP	Balance of Payments
CB	Central Bank
CESEE	Central, Eastern and South-eastern Europe
DOTS	Direction of Trade Statistics
ECB	European Central Bank
ECT	Error Correction Term
EU	European Union
EMU	European Monetary Union
EUR	Euribor
FDI	Foreign Direct Investment
FS	Foreign Reserves
GDP	Gross Domestic Product
GFEVDs	Generalized forecast error variance decompositions
GIRFs	Generalized impulse response functions
GVAR	Global Autoregressive Model
FYROM	Former Yugoslav Republic of Macedonia
IBA	ICE Benchmark Administration Limited
IMF	International Monetary Fund
I	Interest Rate
IC	Information Criteria
IRP	Interest Rate Parity
IPI	Industrial production index
IRF	Impulse response functions
LEV	Bulgarian Lev
NBR	National Bank of Romania
NISR	National Institute of Statistics of Romania
NSIB	National Statistical Institute of Bulgaria
OCA	Optimum Currency Area
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
PP	Persistent Profile
PPP	Purchasing Power Parity
REER	Real Effective Exchange Rate
SBC	Schwartz Bayesian Criterion
SEE	South East Europe
VDC	Variance Decomposition
VECM	Vector Error Correction Model
WB	World Bank

Acknowledgements

I am particularly grateful to Dr. Konstantinos Mouratidis and Dr. Pavlos Gkasis for providing me with expert and timely personal supervision along the development of the current research.

I am grateful also to all team of the Economics Department at the University of Sheffield for the support and guidance concerning this thesis.

Many thanks are due to my family for the patience and the unconditional support along this challenging three-year long PhD studies.

Last but not least, I would like to take the opportunity to thank my current employer for the support, while balancing between working and student-researcher life.

"It is characteristic of economics that valuable and interesting work may be performed and steady progress made for many years, and yet that the results will be almost useless for practical purposes until a certain degree of exactness and perfection has been reached. Half-baked theory is not of much value in practice, though it may be half-way towards final perfection."

J. M. Keynes, *A Treatise on Money*, vol. II, 1930, p. 406.

“These thinkers seem to push their inquiries some way into the problem, but not so far as they might. It is what we are all inclined to do, to direct our inquiry not by the matter itself, but by the views of our opponents: and even when interrogating oneself one pushes the inquiry only to the point at which one can no longer offer any opposition. Hence a good inquirer will be one who is ready in bringing forward the objections proper to the genus, and that he will be when he has gained an understanding of all the differences.”

Aristotle, *On the Heavens*, II 13, 294b6-13; translated by J. L. Stocks.

“Noli turbare circulos meos.”
Archimedes

Chapter 1 - Introduction

1.1 A brief literature review, research objectives and justification

Monetary unions in general, and their relation to monetary or economic policy interactions have been heavily, and effectively researched by numerous researchers including, indicatively, the Nobel laureate Mundell (1961). Mundell theoretically and empirically considered, and examined, the effects of monetary and fiscal policies' coordination on real output, interest rates, and exchange rates, with the aim of increasing the benefits that could arise from an Optimum Currency Area (OCA).

An OCA, which European Monetary Union (EMU) could be in theory, is of high importance. Some South-eastern Europe countries, which are the focal ones on this research, are already part of EMU (e.g. Greece and Slovenia) and some (e.g. Bulgaria, Croatia, FYROM and Romania) are planning to become part of it. Thus it is important to address what happens and what will happen to a country, macro-economically speaking, once it joins EMU.

Still, before we formulate our research questions and objectives we have to briefly review the economic policy literature as it is related to our topic. Indicatively, starting with the paper of Cooper (1969) we gain access to the international framework within which a deeper economic integration occurs. While, Kydland and Prescott (1977), building on the work of Cooper, attempt to capture implications that include optimization sets, and rules, commitment to pre-chosen decisions, and discretion of economic policy. An important stream of this literature addresses the trade-off between 'rules vs discretion', by considering both single-country, and multi-country approaches. A detailed literature, and the evaluation of this stream is effectively provided by Kehoe (1987), and Curie and Levine (1985), but these are considered as rather early contributions, and thus, they are discussed indicatively only to a certain extent.

As expected, the vast literature on monetary and fiscal policy coordination considers, and captures complexities, and implications that vary according to the setting, and the preferences of the involved agents. For example, within the EMU or EU, different monetary, and/or fiscal authorities −in EMU's case the monetary authority being the European Central Bank, ECB− could have different incentives −explicit or not− to target different levels of inflation (in order for example to redistribute the burden of the sovereign debt). Alternatively, the monetary authority −the ECB or the European Stability Mechanism (ESM) in its path towards becoming a European Monetary Fund (EMF)− could have the preference to 'frame', and organize control (through the quantitative easing (QE) programme) of fiscal policies, especially in the case of countries that seem to act or have acted independently or discretionary due to moral hazard (Bordo et al. (2013); Dixit, and Lambertini (2003); Beetsma et al. (2001); Levine, and Brociner (1994); Beetsma, and Bovenberg (1988);). Historically we have experienced these cases in Greece, Cyprus, Spain, Portugal, and Ireland.

On top of the above one could argue, following Issing (2002), that ECB rejects the idea and practice of fiscal coordination, under the assumption that such an implementation could decrease the economic welfare of the member states, but most importantly it could threaten its independence. Still, before advancing onto the investigation of fiscal policy interlinkages, it is important initially −for the given status of the EMU− to focus on the monetary policies. For the time being it is safe to say that the current policy coordination seems to be a function of the EU institutional settings, and the political preferences of EMU, and EU member states.

Within this context, the possible, and up to a degree applied enforcement of a 'common set of rules' across not only the EMU, but also the EU, and non-EU members −an 'enforcement' that varies in terms of different degrees and whether it is direct or indirect– could alter the economic performance of the countries involved in the European integration project.

The macroeconomic consequences of economic policy discretion are studied by many researchers such as Hebous (2011) and Fatas, and Mihov (2003), that justify the aforementioned restrictions in the name of policy coordination, and the broader coherence of Europe. While Buiter (2003) focuses on the importance of the 'Stability, and Growth Pact', suggesting a 're-designing' of the financial-fiscal-monetary framework. McKay (2005), on the other hand, is in favour of policy discretion by considering both political, and economic implications, and tensions. Fitoussi and Saraceno (2013) criticize the inflexible treaty-based European framework which imposes a lot of constraints on economic policy discretion. The mitigation of asymmetric shocks is being studied by Daianu et al. (2014) who suggest policy alternatives including changes in unemployment insurances, and pensions systems to a further political integration or at least a form of centralization.

Bordo et al. (2013) by focusing on the historical experience of federalizing attempts, conclude that an efficient approach would be one that embeds a direct, and explicit transfer mechanism, which must be accompanied with a degree of policy discretion that could capture different policy preferences, but we are historically away from that. Such a transformation of course could be applicable if the differences of the members of the 'Union' are not too extreme, something which is not the case, given that the countries of the EMU include for example Bulgaria, Romania, Germany, the Netherlands, and Finland. These 'macroeconomic consequences of economic policy discretion related' literature could grow further in the future, and on this direction, the present thesis attempts to fill a gap in the area by studying the different SEE economies in terms of their policy discretion in an EMU context.

Thus, this research attempts to use and model macroeconomic and financial variables in the case of the SEE region, on its relation to European Monetary Union

(EMU), by using a Global Vector Autoregressive Model (G-VAR). A Global Vector Autoregressive (G-VAR) model −that can capture these existing interlinkages− has not been applied for South-Eastern Europe (SEE) in terms of monetary policy interdependencies, and foreign exchange reserves have not yet been considered within such a contextual framework too. Therefore, the present thesis contributes to this research area by applying a methodology not yet applied in the study of the region, and by incorporating variables in the econometric model which have not been considered by the previous studies. Thus, this thesis offers two distinct contributions in the literature. The first one is a reconsideration of the variables used to study the transmission mechanisms of monetary policies, by adding the foreign exchange reserves, and the second one, is the application of a GVAR on the specific focal countries.

In capturing these interdependencies the monetary transmission channel must be investigated. The chosen variables, in doing so, are Euribor or Euribor-interbank related short term rates (used as trigger variables that approximates the monetary policy), the foreign exchange reserves (FS) and the real effective exchange rate (REER) as intermediate targets, and the industrial production index (IPI) as the final −real economy related− target. The focal countries, i.e. Bulgaria, Croatia, FYROM, Greece, Romania and Slovenia are chosen, for the given research focus of this thesis in SEE, because only for those within the region there are available data. Also, these four variables are available in a monthly frequency within the region only for the aforementioned countries and this is why these six countries are chosen. On top of that, the monthly frequency is the reason why IPI is chosen to be used instead of the GDP, which is available in a quarterly basis only. It is also interesting to add that these six countries could be disaggregated into three broader groups: EMU members, EU members, and non-EMU non-EU, which makes SEE region a rather unique place to be investigated.

Thus overall, within the context of our topic, the G-VAR framework will allow us to capture the interdependences of the economies, the importance of economic and financial flows, and the spillover effects that are generated by the co-movements of monetary policies across SEE, and EMU. It has to be added that a related approach was used by Dragomirescu-Gaina and Phillipas (2015), who still −instead of monetary policies, which are used in our case−, studied the effects and the interactions of fiscal policies in the E.U. context (by modelling additionally the interdependencies arising between the private, and the public sector, without paying significant attention to SEE, E.U., and non-E.U. countries).

There is also lack of literature that considers foreign reserves (FS) as an essential variable within this research area. For a country, e.g. Bulgaria, that aims to join the EMU, FS are of high importance given that through those the country could more smoothly join the Union. Once in, the FS that were needed to defend the fixed exchange rate regime (Lev is pegged to Euro) will become redundant. Thus, it has to be stressed for example, that countries such as Greece, and Slovenia, that has joined the EMU, do not need to sustain any more a buffer stock of foreign reserves (given that it is known that EMU members do not need to defend the Euro, which fluctuates freely on the global markets), and thus the FS are not only interesting as a variable to be investigated, but are crucial for the SEE countries that could be following the Greek and the Slovenian example.

Summing up, the aim of this study could be captured by the following research question:

What is the role of monetary policies −for the given economic interlinkages in the SEE− on sustaining economic, and financial stability, and promoting real growth within the region on an EMU context?

A main research question that could be disaggregated into secondary ones, such as:

1. What are the different transmission mechanisms by which 'the monetary effect', through money and market rate, foreign exchange reserves, and real effective exchange rates, contributes to nominal, and real economy?
2. To what extent does each transmission path affect the nominal, and the real performance of the economy?
3. What is the "ideal" level (if applicable) of foreign exchange reserves that SEE countries should hold?
4. Is it a proper economic decision for the SEE countries to eventually join the EMU or not?

The aforementioned research questions could be further disaggregated to the following research objectives, which are:

RO1: To identify, and analyse the monetary transmission mechanism, and its channels in the case of SEE in an EMU context.

RO2: To analyse the main concepts, tools, and developments in foreign exchange reserves practices in relation to financial stability, and monetary efficiency.

RO3: To show that the stability of foreign exchange reserves in the long run is a prerequisite towards an EMU entrance, and the broader co-integration of SEE with EMU, and EU.

RO4: To test, and relate foreign exchange reserves with the stability of the exchange rate regimes, and exchange rate related values over time in the case of SEE economies.

RO5: To identify, and analyse the factors that drive the real effective exchange rates in the Balkans (South-Eastern Europe). The theories of purchasing power parity (PPP), and interest rate parity (IRP) will be tested indirectly, and will be related to real economic performance, and if applicable to foreign exchange reserves as well.

RO6: In relation to RO3, to evaluate, and measure the stability of exchange rate regimes in SEE countries.

RO7: To draw macroeconomic policy design recommendations for SEE Central Banks, and governments.

This thesis will develop these questions using a relevant body of literature, advance a set of hypotheses, and mainly test them in the empirical context of SEE, and EMU. The results will be further incorporated into 'theory' building, by formulating future research, macroeconomic policy design, and institutional related operations. The answers to these questions will be drawn from the implementation of the methodology. The G-VAR and the use of the Generalized Impulse Response Functions (GIRFs) will allow us to capture the dynamics, and the responsiveness of the above variables to external shocks, Additionally, unit root tests –apart from being a G-VAR pre-requisite– will help us to determine the stability of foreign exchange reserves, and the respective foreign exchange rates, in terms of testing their stationarity· this is a condition that could be considered as a prerequisite for the financial, and economic integration of the focal countries that could lead to their entry in the EMU, and to a "smooth stay", once a country is in.

1.2 Organisation of the thesis

The rest of the thesis is structured as follows: Chapter 2 reviews the literature on which this research is based upon: monetary transmission mechanism, and foreign exchange reserves. The exchange rates will be addressed as a part of the foreign exchange reserves due to their nature, and their direct relation to this variable, and real effective exchange rate, and growth, approximated by Industrial Production will be treated as subparts too. Building on Chapter 2 in Chapter 3 we describe the data sets and in Chapter 4 we introduce the G-VAR models that are going to be estimated by presenting the methodology adopted, and by providing a detailed research design that will support, and act as a framework of our analytical method, analysis, and results of the next chapter. Thus, Chapter 5 develops the research hypotheses that are being tested, taking up the main empirical findings, and developing a more detailed theoretical model with specific application to economic policy design, and implementation, while Chapter 6 turns to conclusions proposes areas for future research, and addresses the limitations of the study. The thesis concludes with the bibliography, and the relevant appendices.

Chapter 2 - Literature Review

The primary interest of the literature review is to determine how the monetary transmission mechanism works and subsequently show how a nominal variable, like the short-term interest rates, alters the performance of the real economy. On the existing ‘transmission mechanisms’, that will be reviewed, the real effective exchange rate (REER) will be added and the foreign exchange reserves (FS) as well, in investigating −and contributing on− different transmission paths. REER could be seen as a key variable, which is not considered thoroughly so far, which absorbs a part of the monetary expansionary or contractionary ‘waves’, while at the same time acts as an indicator that quantifies the relation of the accumulated productivity of an economy to realized and demanded output in an Aggregate Demand-Aggregate Supply (AD-AS) context. Thus, it must be considered as a ‘bridge’ variable within the final simultaneous system of equations (G-VAR) that will allow us to determine the dynamics, the channels and the possible, up to a certain extent, ‘Granger causalities’[1] of the entire system. The above are related directly and indirectly to the respective exchange rate regimes, which acts as a framework, and specifically to the sustained foreign exchange reserves (FS) of the Central Banks (CBs), and thus these must be reviewed too.

The inclusion of the real effective exchange rate and of the foreign exchange reserves, are additions on the existing ‘channels of monetary transmission’. These channels, so far, include: the traditional interest rate channels, the exchange rate channel, channels operating through other asset prices and the so-called credit channels. The ultimate goal of the above is not only to understand these transmission mechanisms in their own right, but to capture the broader implications in the research

---

[1] For the drawbacks and the limitations related to the ‘Granger-Causality term see Section 4.2 and Appendix H.

area and subsequently propose to Central Banks how to best conduct monetary policy.

Overall, within the literature review part, we will initially present, elaborate and overview the theoretical postulations regarding the monetary policy channels, by focusing on money and market rate. Then we will proceed to foreign exchange reserves and regimes to establish the framework that will allow us to make a synthesis of the investigated variables, and subsequently enable us to capture effectively their effect to the nominal and real economy, as they are approximated both by the REER and the IPI. Then, we will proceed with a critical evaluation of the empirical work on the field, and we will also align the reviewed work with the applied methodology of this thesis, which is the way we conclude the chapter, i.e. by reviewing the literature of G-VAR methodology on monetary economics.

2.1 Monetary transmission mechanism

Within the aforementioned framework, our initial focus is to overview monetary policy and the monetary transmission mechanism in particular, by addressing the existing channels, and by insisting on the interest rate one. Before we do so though, it is important to briefly review the known existing channels.

The traditional Keynesian IS-LM view on the monetary transmission mechanism could be captured by the following schema, which shows the effects of a monetary expansion onto output:

$$M \uparrow \Rightarrow i_r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \qquad (1)$$

If prices are considered, then, with nominal interest rates at zero, an expansion in the money supply can raise the expected price level (P^e) and hence expected inflation (π^e), etc., will transform the schema onto:

$$M \uparrow \Rightarrow P^e \uparrow \Rightarrow \pi^e \uparrow \Rightarrow i_r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \qquad (2)$$

If we proceed to the 'exchange rate channel' then the schema becomes:

$$M \uparrow \Rightarrow i_r \downarrow \Rightarrow E \downarrow \Rightarrow NX \uparrow \Rightarrow Y \uparrow \qquad (3)$$

where 'E ↓' is a depreciation of the currency, and NX are Net Exports. The 'equity price channel' is:

$$M \uparrow \Rightarrow P_e \uparrow \Rightarrow q \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \qquad (4)$$

where q is −based on Tobin's q-Theory− the market value of firms divided by the replacement cost of capital (Tobin, 1969). Also note that the P_e on this 'channel' is equity prices. Another equity price channel is the 'wealth effects on consumption', which takes the following form:

$$M \uparrow \Rightarrow P_e \uparrow \Rightarrow W \uparrow \Rightarrow C \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \qquad (5)$$

where W is wealth and C is consumption. This channel was introduced by Modigliani (1971) and apart from being used at the Board of Governors of the Federal Reserve System, introduces the life-cycle model, where consumption spending is determined by the lifetime resources of consumers (made up of human capital, real capital and financial wealth).

To proceed, the 'Bank Lending Channel', that incorporates the 'asymmetric information' problems in credit markets, is:

$$M \uparrow \Rightarrow \text{bank deposits} \uparrow \Rightarrow \text{bank loans} \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \qquad (6)$$

This channel is extensively reviewed by key researchers such as Bernanke and Gertler (1995), Cehcchetti (1995) and Hubbard (1995). For a recent review both on the bank-lending channel and monetary policy during pre- and post-2007 crisis, see Salachas et al. (2017).

The 'Balance-Sheet channels', incorporating the concepts of adverse selection and moral hazard, take the form:

$$M \uparrow \Rightarrow P_e \uparrow \Rightarrow \text{adverse selection} \downarrow \text{ \& moral hazard} \downarrow \Rightarrow \text{lending} \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \tag{7}$$

which can be understood as such: expansionary monetary policy rises equity prices, leading to increased investment spending, and real output, due to decreased adverse selection and moral hazard problems.

On top of the above, the monetary policy expansion, does not only lower the interest rates, but improves the balance sheets of firms, due to increased cash flow, and thus it reduces adverse selection and moral hazard problems.

$$M \uparrow \Rightarrow i \downarrow \Rightarrow \text{cash flow} \uparrow \Rightarrow \text{adverse selection} \downarrow \text{ \& moral hazard} \downarrow \Rightarrow \text{lending} \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \tag{8}$$

Note that on the above sequence, it is the nominal interest rates, and not the real ones, that affect firms' cash flow. On the aforementioned channel, the 'interest rate' and 'cash flow' link, could also be replaced by 'unanticipated price changes', and thus become:

$$M \uparrow \Rightarrow \text{unanticipated } P \uparrow \Rightarrow \text{adverse selection} \downarrow \text{ \& moral hazard} \downarrow \Rightarrow \text{lending} \uparrow \Rightarrow I \uparrow \Rightarrow Y \uparrow \tag{9}$$

The last, commonly reviewed, channel is the 'Household Balance-Sheet Effects'. In practice it comes from another way of viewing how the balance-sheet channel operates through consumers, by focusing on the liquidity effects on consumer durable and housing expenditure (Mishkin, 1978):

$M \uparrow \Rightarrow P_e \uparrow \Rightarrow$ financial assets $\uparrow \Rightarrow$ likelihood of financial distress $\downarrow \Rightarrow$
consumer durable and housing expenditure $\uparrow \Rightarrow Y \uparrow$ (10)

For a more analytical presentation and review of the above see Mishkin (1996).

Before we proceed to a detailed literature review of the monetary policy and the monetary transmission channel, in aligning these topics with the approach and the applied G-VAR methodology of this thesis, it has to be repeated that the gap we attempt to fill in is related to the addition of the real effective exchange rate and foreign exchange reserves on the monetary transmission channel. Which means that the path to be investigated and empirically tested, blends the first three aforementioned channels (i.e. the $M \uparrow \Rightarrow i_r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$ (1); $M \uparrow \Rightarrow P^e \uparrow \Rightarrow \pi^e \uparrow \Rightarrow i_r \downarrow \Rightarrow I \uparrow \Rightarrow Y \uparrow$ (2); $M \uparrow \Rightarrow i_r \downarrow \Rightarrow E \downarrow \Rightarrow NX \uparrow \Rightarrow Y \uparrow$ (3)), onto an 'exchange rate, including foreign reserves, channel', that is expected to follow, probably, this schema:

$M \uparrow \Rightarrow i_r \downarrow \Rightarrow REER \downarrow$ and $FS \downarrow \Rightarrow NX \uparrow \Rightarrow Y \uparrow$ (11)

where REER going down means that the economy becomes more competitive. Thus, the above could be read as: an expansionary monetary policy drives down the real interest rates, which in their turn make the economy more competitive. Within a region like the SEE one, the increased competitive stance of the economy and the lower interest rates, can provide ground on the CB to decrease the foreign exchange reserves that are needed either to defend a fixed exchange rate regime or for credibility purposes. The aforementioned, increase the Net Exports, and thus the real output will increase as well. Note though that the 'Foreign Exchange Reserve effect' requires further investigation and will be empirically tested and reviewed analytically on the relevant chapter of the thesis. Also, if the expected inflation, which can go up (π^e ↑), is incorporated on the above, as a result of an initial monetary policy expansion (along with an increase in equity prices), then an offsetting increase in REER is expected to take place, in smoothing further the final result on real output (Y), increasing the complexity of the path. Last but not least, it has to be repeated that in our thesis the real output is approximated from IPI, and is chosen, as stated, instead of GDP, because it is available on a monthly frequency and not a quarterly one. This choice makes sense, for the used time frame of 2002 to 2016, to increase the number of available observations.

2.1.1 From nominal to real variables. A monetary policy overview

It is widely known that the 1970s and the 1980s have been considered by key researchers –varying from Gali and Gambetti (2009) and Mishkin (2008, 2007) to Boivin and Giannoni (2006) and Clarida et al. (2000)– as 'revolutionary' decades in 'monetary policy' because within the context of the 'theory of expectations' they addressed theoretically and quantified empirically, both the market and the public expectations to capture and forecast the trends of the economy as a whole.

Indicatively, Mishkin (2007) overviews the operations of the Fed during the 1950s and the 1960s –that focused on the targeting of the "money market conditions" and specifically on interest rates in a pro-cyclical pattern (i.e. a positive response of money supply growth to output growth and the inverse)– and supports that this pro-cyclicality in monetary policy terms ceases to work. Moreover, the observed and repeated 'imperfections' of the long-run trade-offs between inflation and unemployment (as it is described from the Phillips curve) and also any level of unemployment that was higher than the 'natural' one (the non-accelerating inflation rate of unemployment, known as NAIRU) during 1970s and 1980s, tended to result to an inflated economy, without causing any subsequent changes in the real GDP.

Analytically, researchers have focused on the impact of sudden changes in the monetary policy on real output and on the respective switching patterns and trends on the monetary transmission mechanism, arguing that the monetary policy shocks tend to reduce any positive effects on the economic performance activity, which seemed not to be the case in the past (Gali and Gambetti, 2009; Boivin and Giannoni, 2006). Some researchers though, including Primiceri (2005), support that some 'minor changes' can be captured in their effect, through the monetary transmission mechanisms, both to economic output and inflation.

Clarida et al. (2000) claim that monetary policy in the case of USA has significantly changed since 1980 and onwards, a fact that can be attributed, up to a degree at least, to the new Chairman of the period of the Board of Governors of the Federal Reserve (FED), Paul Volcker. Before the administration of Volcker, USA had been experiencing 'stagflation', i.e. high inflation coupled with stagnation (low or zero output growth or high unemployment), that was commonly attributed to the adverse supply shocks (oil price shocks in 1973-1974 and in late 1970s again) and the subsequent volatility of aggregate supply. To proceed, Clarida et al. (2002) support that the 'Volcker-Greenspan doctrine' of the expected inflation, could halt inflation by following a proactive monetary policy that passes the respective signal to the firms and consumers, and thus, subsequently alters their utilized expectations and buffers both aggregate demand and aggregate supply shocks.

The changing role of monetary policy conduct and the diminishing role of monetary policy shocks to real output was further related to consumer behaviour and the perception and strategies of the companies. On top of that it was also attributed to the technological evolution and other financial and material-related innovations (Boivin and Giannoni, 2006). These authors claim that the monetary policy was more efficient recently because the monetary authorities have increased their responsiveness both to the expected inflation and to aggregate supply and aggregate demand shocks. Thus, monetary policy could stabilize the economy more effectively compared to the past, due to a better quantification of the ‘exogenous disturbances’ and due to more systematic, consistent and determined reactions to the changing economic trends and ‘equilibria’. The above finding is contradicted by Caglayan et al. (2011) who investigate the effects of monetary shocks −through imposing sign restrictions on the Impulse Responses Functions of macroeconomic variables such as IPI and exchange rates− in the cases of Japan and UK. Not only these researchers show that the effect of a ‘contractionary’ (i.e. adverse) monetary policy shock on IP is ambiguous, but they claim that there is a delayed over-shooting ‘process’ for Japan and the exchange rate of both UK and USA. In all cases, this is an area that requires further investigation and this thesis will contribute to this direction.

On top of the above, the economic and social cost of persistent high inflation drove monetary policy economists to change the ‘paradigm’ and focus on ‘monetary targeting’ by setting a strong ‘monetary anchor’ on the main monetary aggregates. Such a change of course requires a statistically significant and lasting empirical relationship between the ‘goal variables’ (inflation or output) and the ‘targeted’ ones (Mishkin, 2008), which tends to wear out in periods of economic shocks or crisis.

Other monetary economists did not agree with the ‘monetary targeting’ practices, thus, the focus remained on looking for a more effective ‘nominal anchor’, something that led in its turn to the development of the ‘inflation targeting’ that occurred in 1990s. Mishkin (2007) states for example that ‘inflation targeting’ is based on the commitment of monetary authorities to price stability, transparency and availability of the objectives of monetary policy conduct, and also on the consistency and the willingness and/or responsibility of the related institutions to achieve the target.

Recently, on top of the ‘targeted inflation’, monetary economists use exchange rate pegs as an intermediate ‘nominal anchor’ by means of another way to promote price stability. More specifically, ‘inflation targets’ could be sustained by pre-deciding the exchange rate peg and by making it clear to all involved agents. Exchange rate peg is commonly used to emerging and developing economies, but also in some advanced countries as will be discussed in Section 2.2 (a framework which is considered in our approach). According to Mishkin (2007) by following such a practice we can realize its irreplaceable role in a proper monetary policy conduct, which further supports our choice to consider the real effective exchange rate and the foreign exchange reserves as part of the Monetary Transmission Mechanism, especially in the case of SEE, where the non-EMU countries are aiming towards a Eurozone entry.

2.1.2 Defining the mechanism: the monetary transmission

According to Taylor (1995) the monetary transmission mechanism is the “*process through which monetary policy decisions are transmitted into changes in real GDP and inflation*” (p. 11). Broadly speaking we could define the mechanism as the process that incorporates the effect of nominal to real variables and vice versa. Researchers in order to explain and capture the tendencies of the monetary mechanism impose emphasis on variables like interest rates, money supply (on its relation to the monetary base), exchange rates and asset prices. Also within this context, the role of financial institutions and banks is taken under consideration. Specifically, researchers −aiming to capture and quantify the relationship between monetary policy shocks and real output− focus on variables like the exchange rates, the short-term interest rates and the long-term interest rates.

Boivin et al. (2010) have provided a literature review on the ways that monetary policy is conducted and focus on how the monetary transmission mechanism works. Analytically, central banks (CBs) purchase specific assets that vary over time and space and they do so partially by expecting the 'markets' to buy the greater proportion (by doing so the CBs aim to influence the consumption through wealth effects). A recent change of monetary policy conduct by CBs, involves the purchase of different types of assets that are related, apart from the corporate bonds, to real estate assets (mortgages), a practice which is done by focusing on the prices of the assets instead of their valuation (Issing, 2011).

Devereux and Engel (2007) focus on exchange rate fluctuations within the context of the monetary transmission mechanism. These researchers stress that even though domestic goods and services are price sticky, in domestic currency terms, the nominal exchange rate changes alter the value of the real exchange rate. These changes are incapable of capturing the comparative prices of identical or similar products internationally and thus, they could vary significantly. This could be attributed to the fact that the 'pass-through' of the exchange rates to retail prices is rather limited, and thus, the fluctuations tend to be in the region of the real exchange rate. However, it would be good to note that the 'pass-through' to the prices of some intermediate goods could be statistically significant and thus it could cause an effect on expenditure patterns. Overall, Devereux and Engel (2007) capture the 'trade-off' that seems to be evident between the exchange rate volatility –which could increase the expenditure significantly– and, on the other hand, the inefficiency of it, when it is around the real exchange rate (within the Purchasing Power Parity context). This in its turn signals towards the implementation of fixed exchange rate regime or the membership to a currency union like the Eurozone, which is of special interest and aligned with our approach.

It has to be added that in developing countries, or countries that are under international aid or bailout programs, the monetary transmission mechanism seems to be rather unstable and consequently less effective, something which is attributed to underdeveloped or undercapitalized financial intermediaries, which could be the case for some of the SEE economies. For example, Fetai (2013) focuses on the macroeconomic effects of economic policies, both the monetary and the fiscal one, and their supplementary role in stabilizing the economy in the case of a small open economy, like FYROM. But we should proceed and focus now directly on the 'Interest rate channel'.

2.1.3 The Interest rate channel

Nominal and real interest rates tend to vary based on the changes of 'rational expectations' and the stickiness of goods and wages (Taylor, 1995). The theory supports that at least in the short-run, an increase both in the nominal interest and the exchange rate could lead to a subsequent rise of the real interest and real exchange rate, respectively. On the other hand, in the long-run, real interest and real exchange rates reach their 'equilibrium' along the adjustment of prices and expectations. Within the short-run versus long-run and the 'expectations' perspective, the prices tend to be sticky –mainly downwards– and subsequently inflation tends to persist in remaining unaltered, at least when the change of interest rates is not that persistent or unexpected.

Researchers, including Calvo et al. (1995), support that monetary stability can be sustained in the case of an open economy by setting a nominal anchor that could be either the nominal exchange rate or the money supply. Such a neoclassical claim is counter-argued by researchers which support that institutions –at least in the short-run– target real variables like the real exchange and the real interest rate.

"Interest-rate smoothing", i.e. the frequent and relatively small change of the interest rate could be inefficient due to the fact that the macroeconomic policy tends to work with an inertia and to a great extent (Sack and Wieland, 2000). However, minor adjustments of the short-run interest rate are commonly being used by CBs. The aforementioned scholars support that the interest rate 'smoothing' could be efficient or even better close to an optimum if three criteria are being met: first, the 'forward looking' behaviour of all market participants, second, if the measurement of the ‘error’ is related and reset according to some of the main macroeconomic variables takes place, and third, if the involved uncertainty that concerns the main structural parameters is also implemented. On top of that, CBs consider the forward-looking expectations, uncertainty related to data, and last but not least, involved uncertainty in the parameters.

Overall, the key optimization question that CBs must answer is: how often and to what degree the interest rate should be altered for its given relation to the main macroeconomic variables? Taylor (1995) claims that the solution is an ‘interest rate rule’ that is based on changes of two key variables that are the result of the used differences of four variables, i.e. the difference between the realized and the targeted inflation, and the difference between the nominal and the potential or trend output. It is good to note here though that the trend or potential output is not an actual variable but a proxy that is the result of the average growth. Furthermore, the variation of the real exchange rate suggests inverse changes in net exports (deflated one) and thus altering the real output too. Differently stated, aggregate consumption and fixed capital formation, i.e. investment, as being a part of the real output, are negatively related to the real interest rate.

2.2 Foreign exchange rates: the international reserves, the exchange rate regimes and the exchange rate value

Literature on foreign exchange reserves, foreign exchange regimes and foreign exchange rate values shows that there is no “ideal”, i.e. “correct”, exchange rate regime for all countries at all times (Frankel, 1999). Also the concept of “ideal” or optimal foreign exchange rate reserves is revealed, apart from a multi-factorial and a dynamic one, as a variable of a primary importance, only if other key exchange rate related macroeconomic variables are co-integrated between the member states that could form a monetary union.

Exchange rate stability is considered to be a prerequisite for economic and financial integration, but also it could be used, in its relation to international or foreign exchange reserves, as a framework that can capture the condition and the dynamic properties of an economy within the broader context and the evolution of the European Monetary Union as a whole. Key economic variables like foreign exchange reserves, inflation, expected inflation, growth rates, output gaps and interest rates, just to name a few, and key theories like Purchasing Power Parity (PPP), Interest Rate Parity (IRP) and Balance of Payments (BOP), are interrelated and should be used in order to understand the stability of exchange rate regimes. The related econometric concept of stationarity and the respective properties of the exchange rates, or even possible co-movements of the investigated variable with other key macroeconomic variables, could lead in the medium term or in the long-term to a functional and sustainable economic and financial integration of Southeast European (SEE) countries with the European Union (EU) and eventually with the European Monetary Union (EMU).

At this stage, the Optimum Currency Area (OCA) literature should be reviewed to build a framework that will help us to absorb and understand the complexity of foreign exchange rates and foreign exchange reserves. Foreign exchange reserves will be addressed in five subsections, i.e. in their relation to: (1) exchange rate volatility, currency crises and international liquidity, (2) optimal level, (3) Balance of Payments (BOP) and interest rates, (4) the current financial and economic crisis, and (5) their over–accumulation (to focus further on emerging economies). Following the above we will consider the ‘foreign exchange rate regimes’, and the existing literature will be explored, within the context of our research, in order to align further the research questions and objectives with the empirical chapters of this thesis.

2.2.1 Optimum Currency Area (OCA)

One of the key points of the thesis is to increase our understanding on the following: Should the non-Eurozone members of SEE (e.g. Bulgaria, Croatia and Romania) eventually join EMU? Or differently stated, what is the current economic condition −in terms of sustainability and growth potential− of the existing EMU members, i.e. of Greece and Slovenia?

In order to answer these questions the concept of the Optimum Currency Area (OCA) that was introduced by Robert Mundell (1961) has to be reviewed. An OCA is any geographical region that would be better off economically (i.e. economic efficiency would be maximized) if the region as a whole ended up sharing a single common currency. It focuses on the optimal characteristics that would allow the merger of currencies to occur –under the pre-requisites of increased labour mobility, capital mobility and price and wage flexibility, similar business cycles, and a currency risk-sharing system across countries– and thus the creation of a new currency could be realized. This theoretical concept of OCA is commonly used to argue if a region could become a currency union or not, something that could be seen as one of the final stages in economic integration and not as a step towards it, as it seems to be the case in the EMU. No need to state that OCA is expected to be larger than a single country.

According to Baldwin and Wyplosz (2012), Euro was created based on the argument that individual European countries do not form an Optimal Currency Area on their own, but Europe as a whole does. The OCA theory has been used extensively in recent years in the case of EMU and EU and it is commonly argued (indicatively see Krugman (2015) and Ricci (2008)), that the region did not meet the criteria for an OCA to occur and that happened not only at the time the Euro was introduced but also in the coming years. The economic "difficulties" that the area is constantly and repeatedly experiences could be attributed to the above and to the failure of EMU and EU to move towards an actual OCA. It would be interesting to provide here, in supporting further the above, a statement of the famous economist Milton Friedman, that opposed the idea before its implementation. Friedman stated:

"Europe exemplifies a situation unfavourable to a common currency. It is composed of separate nations, speaking different languages, with different customs, and having citizens feeling far greater loyalty and attachment to their own country than to a common market or to the idea of Europe." (*Times,* November 19, 1997*)*

Friedman and other scholars by stressing the aforementioned, help us in clarifying further that these differences impose a real constraint on one 'key factor' of the procedure towards an OCA, which is labour mobility within Europe (on top of the limited wage flexibility that is evident throughout the continent when the continent is treated as a whole). Thus, even if EU meets some measures that characterize an OCA, the low labour mobility –an enormously low one compared to USA– combined with the fact that the region seems not to be willing to move towards a 'fiscal federalism', that could mitigate the regional economic differences and the different ability of each part of the zone to absorb internal and external shocks, make matters more demanding and complex. Some authors though, argue that the EU and EMU crisis pushed towards more federalization in a fiscal policy context (Caporaso et al., 2014). Note though that within the context of this thesis, the labour factor is captured indirectly by using the REER, a variable, as known, which is responsible for the comparison of the competitive stance of the investigated economies.

2.2.2 Foreign exchange reserves

2.2.2.1 Foreign exchange reserves in their relation to Exchange Rate Volatility, Currency Crises and International Liquidity

Within our scope, and the context presented above, we aim to investigate the level of foreign exchange reserves that are sustained by the Central Banks in general and by South Eastern Europe (SEE) countries specifically (even though the respective literature is rather limited, if not non-existent, for this region). Thus, special attention will be given on the factors that determine their level, during monetary and economic crisis, by considering the exchange rate regime and the volatility of the exchange rates and the international liquidity as well. Even though the exchange rate regimes were considered as a 'ghost-framework' briefly in the introductory parts above (see Subsections 2.2 and 2.2.1) we will now proceed in depth and directly relate the exchange rate regimes to the foreign exchange reserves and to the currency crisis by considering the international liquidity conditions.

It has to be noted in advance that foreign exchange reserves seem to be of greater than expected importance in the case of relatively small, weak and historically unstable economies and countries, like the ones we investigate in SEE, including Greece, apart from Bulgaria, Croatia, FYROM, Romania and Slovenia.

In this part, after an introduction on the respective literature review of the international reserves (this is another name for the foreign exchange reserves) that will align further the research questions and objectives to the coming theoretical and empirical sections of this thesis, we will proceed with the relation of reserves to their optimal level and their relation to Balance of Payments. Then, we will relate them to the current economic and financial crisis by paying special attention to emerging economies, including Eastern Asian economies, like China and India (for the given lack of studies for SEE).

The first systematic attempt in explaining the level of international reserves could be considered as an 'non-economical" one, and was delivered by Machlup (1966) that proposed the "Wardrobe theory". Particularly, this author claimed that the demand of international reserves is not an optimal behaviour-related decision that takes place at Central Banks, but the outcome of the enduring willingness of the Central Bankers to keep on increasing their reserves. This 'explanation' that can be perceived as a purely psychological one, fails to explain in a quantitative way the demand for foreign exchange reserves. Thus, within a quantitative and economic theory related context, we can support that this approach transfers the problem onto research areas that introduce the random, non-economic behaviour related factor, as the main reason behind the sustained level of reserves, which is not within our interest and scope.

The first important tackle of the Reserves issue, following the optimizing approach, was introduced by Heller (1966). Heller supported that CBs act rationally and determine the level of international reserves by balancing the marginal costs to marginal benefits. Three decades later, Gandolfo (1995) underlined that the demand of international reserves and the international liquidity problem are academic questions that are not answered yet. Specifically, Gandolfo states: "*moot questions, far from being solved, notwithstanding innumerable studies*" (p. 564). It has to be noted that the majority of these 'innumerable' empirical studies do not coincide with the contemporary econometric theory, even though a lot of those were the state-of-the-art at their times (Badinger, 2004). The analysis of demand of international reserves, when the domestic money market is isolated, ignores the crucial monetary approach of the Balance of Payments (BOP), where the 'disequilibrium' of the domestic money market changes the level of reserves in the short-run. Note that within the chosen variables of this thesis, apart from the real effective exchange rate the BOP is captured, as a common unobserved factor, through the Trade weight matrix of the G-VAR model. On top of that, a lot of studies estimate the demand reserve functions by using the method of Ordinary Least Squares (for a panel data application of 122 countries, see for example Aizenman and Marion, 2002) a method which is exposed to particular critique and cannot capture the complexity of the existing interlinkages between the investigated variables (see Pesaran, 2015; and for an analytical discussion the theoretical part of this thesis, Section 4).[2]

---

[2] As stated, the variables under investigation include the foreign exchange reserves, the industrial production as a growth proxy, the interest rates and the real effective exchange rates and all of these variables are expected to be non-stationary. Thus, given that the foreign reserves

The scientific contribution of Granger (1981), Engle and Granger (1987) and Johansen (1988) paved the way for a detailed and sufficient analysis of the cointegrating relationships that exist between the non-stationary variables (Karfakis, 1997). During the 90's only few reserve demand related studies had managed to overcome the aforementioned weaknesses, and did so by using "Error Correction Models" (ECMs) and had managed to include, in the applied models, the dis-equilibrium in the domestic money markets concept (see indicatively Huang και Shen 1999; Huang 1995; Ford and Huang 1994; Elbadawi 1990).

One limiting characteristic of these relatively earlier studies is that they focused only on country-specific cases, and thus it was hard to generalize and capture the existing macroeconomic international interlinkages. These studies (including, Huang and Shen 1999; Huang 1995; Ford and Huang 1994; Elbadawi 1990) use Vector Error Correction Models (VECMs) and investigate the cases of China, Taiwan, Sudan and Austria, and East Asian countries such as Singapore, Hong-Kong, South Korea, and Malaysia.

Within this context, the first question that rises, for every country or a group of countries (for example within the EMU, the member countries have one Central Bank in practice) is if the Central Bank chooses the international reserves rationally or if Machlup (1966) was right in proposing the "wardrobe theory" as a rather 'simplistic' explanation of the Reserves level. If the "Wardrobe theory" or any "non-economical" theory is being rejected, then the demand of international reserves of the investigated Central Bank should be addressed within the framework of contemporary economic and econometric science.

Depending on the country under investigation, the fixed exchange rate (former or current one) or the flexible exchange rate regime, the existence of monetary crisis or not, the international liquidity could be used in understanding the reserve level that is chosen to be sustained by the Central Banks. Economically

---

related variables are expected to be non-stationary as well, the econometric Least Squares related modelling will lead to insufficient or even, more probably, to spurious results.

speaking, in such an economic theory related context, it could be determined if the 'monetary approach on the BOP of each country' holds, and if this is the case, if it could lead to a money demand surplus (or supply) which subsequently is related to an outflow (or an inflow respectively) of international reserves in the short-run. In the long-run, the disequilibrium of the money market should 'disappear' and the same should happen also to the long-run demand of reserves.[3]

Most of the developing economies borrow from the international financial markets on a frequent basis, bringing international currencies within their countries, either via governments or the private sector, including the interbank markets (Winjholds and Kapteyn, 2001). The theoretical supporters of sustaining large quantities of international reserves claim that the cost of the policy to do so is low compared to the economic consequences that could rise after a sudden devaluation or depreciation of the currency.[4] In the developing Southeastern Asian countries for example there is a growing tendency of sustaining more international reserves (as it is captured through the increased ratio of international reserves to GDP). An outcome that occurs as expected due to Central Bank interventions. A first probable explanation of this economic phenomenon is the self-insurance of these countries against the output costs that occur after sudden stops of international capital inflows. This economic 'choice', the increase of international reserves, is observed in these countries mainly after the Asian Economic crisis that occurred and peaked in 1997 and 1998. Since then the monetary authorities of East Asian countries,

---

[3] It should be stressed here that the Greek and the Slovenian Central Banks are, in our times, special cases, given that they have sacrificed their monetary policy independence –and their exchange rate– after their Eurozone entrance. The same applies also, up to a degree, to the Central Bank of Bulgaria, in the curved path of this country towards EMU, through a pegged regime that will lead more smoothly to EMU. Thus, within such a context, it has to be added, that this thesis contributes not only to the history of this type of exchange rate regime related transitions, but also helps us to investigate further the pre- and post- entry effects of these types of memberships. It is also important to understand why we will review and empirically test the Greek and the Slovenian experience into joining EMU, two rather different cases, which could act as a model, at least for the small open transition economies of Balkans and Southeast Europe, especially given that some of these economies have already pegged their currencies to the Euro.

[4] Devaluations are frequently caused after financial crises like the one in Southeast Asia in 1997 and the Lehman Brothers collapse in 2008.

have doubled their stockpiles of international exchange reserves in the coming years[5].

The increasing tendency of Central Banks to maintain more international reserves, as this is experienced in Eastern Asia, could be explained by various factors. Aizenman (2005), for example, shows the inadequacy and the contradictions that arise on the 'buffer stock model', in explaining the demand of international reserves. This particular model predicts that the 'mean of reserves' is dependent negatively on the adjustment costs, the opportunity cost of reserves and the volatility of exchange rates, and positively on GDP and on the instability of the reserve volatility (see also Flood and Marion, 2001; Edwards, 1983; Frenkel and Jovanovic, 1981, on the reasons behind the choice of these specific variables). Aizenman (2005) supports that the buffer stock model exhibits limited ability in explaining the relatively recent developments on the demand of international reserves, and based on his research it is the increased volatility of exchange rates, which is observed in the last decades, that drives into decreasing sustained reserves in some countries, contradicting the buffer stock model.

Based on Aizenman (2005), and Aizeman and Marion (2003), the factors that explain the increased demand for international reserves –considering the 'false' estimations of the buffer stock model– include, first, the size of the country-specific international financial transactions (where particularly the sustained reserves are probably increasing, when the population of the country and the standards of living increase), second, the volatility of international receipts and payments (on the degree that the reserves are contributing to the cushion of the economy, meaning that the sustained reserves tend to increase on the increased instability of the export

---

[5] For example, at the end of May of 2002, the Central Banks held 845 billions of US dollars, or differently stated the 38% of Exchange Reserves globally. China, Taiwan, Hong-Kong, South Korea and Singapore came after Japan in being the largest holders of international reserves (holding at that stage US$700 billions). See also part 2.2.2.5 for this matter.

receipts of the country) and, third, the vulnerability of external shocks[6]. The fourth factor added is the flexibility of the exchange rates of the country that decreases the demand of reserves, which is happening because the Central Bank does need to reserve a stockpile in managing its fixed exchange rate regime. Consequently, international reserves are likely fewer when the volatility of the exchange rate is increased.

In regards to the aforementioned literature, it is useful to add two political factors that could potentially decrease the demand of international reserves, i.e. the 'political instability and the political corruption', and 'the lack of credibility', that act like 'taxes' on the returns of reserves. A proxy being used for this political turbulence is 'the probability that a government could be succeeded with democratic means' (Aizeman and Marion, 2003a). As far as the political corruption is concerned, a corruption index is constructed by Tanzi and Davoodi (1997), which acts also as an efficiency proxy. This proxy, used by Aizenman and Marion (2002), provides evidence that an increase of the corruption index decreases significantly the sustained reserves. An outcome that holds for the increased political instability too, and goes along in the context, as stated, of an increased probability that the government would be 'succeeded' through democratic means.

Aizenman and Marion (2002), on top of the above, investigate if their model under different specifications, was successful in forecasting the sustained reserves, before and after the Asian Financial crisis (that lasted from 1997 to 1999). Their results show that the monetary authorities of the investigated countries changed the level of the sustained international reserves. In the case of South Korea, for example, their model overestimates the sustained reserves of 1997, the year that the crisis occurred, but essentially underestimates the sustained level between 1998 and 1999. These results indicate that during and after the crisis, South Korea had limited access to the

---

[6] The maintained reserves tend to increase after the average propensity to import increases. Mainly, it is reported, that when economies are open and vulnerable, the external shocks are more evident and persistent.

international money markets, and thus it could not adjust its foreign reserves at the higher level that had chosen to maintain in 1998 and in 1999. A special case is the one of Malaysia also, where the model overestimates the sustained reserves for the three years under investigation. The explanation of this outcome underlines the dilemma of balancing between the will of a country to introduce capital controls and its will in sustaining international reserves.[7] Malaysia chose to impose capital controls during the financial crisis, and thus it 'managed' to reduce further its effective integration with the rest of the global capital markets and subsequently their demand of international reserves was driven down as well.

Overall, the central question is why the economies of Eastern Asia had chosen to increase the demand of international reserves, and under this light, we will investigate, for the given differences of these two regions, the SEE economies. The aforementioned factors seem to be inadequate in explaining the increased reserves demand. Thus, even though researchers are considering theoretical factors, like precautionary holdings (that could be held when the government wants to "smooth consumption", i.e. to "distribute" in time the cost of the disturbance that might occur after a sudden capital outflow)[8], we will focus on the monetary transmission channel. Within this channel, foreign exchange reserves, as stated, are considered as a key variable. A variable that is expected to 'act' between the Monetary policy variable (i.e. Euribor) and the 'targeted' ones, i.e. the real effective exchange rate, and the industrial production. In this framework, by changing the 'target' and by using reserves as a variable (that is in fact the medium of the monetary transmission mechanism) it will become clearer that developing economies choose to sustain –or not– international reserves for precautionary purposes. On top of the above, the

---

[7] A case which makes the 'Greek post-EMU-entry imposed capital controls' further interesting and unique (considering the different case of Cyprus), given that the country 'faced' the capital controls without paying any attention on the level of the reserves, given that the country remained an EMU member and thus there was no fixed exchange rate regime to defend by their level and their probable use.

[8] In the case of an economy that struggles to collect funds either from the international capital and money markets or from tax collection.

political turbulence and the existing instability of SEE countries, could force the Central Banks to hold even more reserves in terms of a smooth EMU entry.

The above could explain why the foreign reserves are showing an increasing tendency over time in the SEE region (excluding the existing members of the Eurozone, i.e. Greece and Slovenia). We can also support that their maintenance, do not follow the patterns of demand conditions, but rather add on the credibility of each country, and thus increase not only the chances of sustaining a credible exchange rate regime (that meets the Maastricht exchange rate criterion of not devaluating the currency in the last three years prior to succession) but diminish the requested risk premium (as it is measured by the interest rates). A risk premium that tends to be higher than expected, or in accordance to other economic and financial indicators, and thus acts as a signal of a non-integrating path of the country with the existing EMU members.

Thus, in the EMU framework we can split the region into two broader groups: first, the existing members of the Eurozone (Greece and Slovenia) and second, the countries that are still not members (Bulgaria, Croatia, FYROM and Romania). A categorization that brings us to the next step: the need of a CB to hold additional foreign reserves, in a system of pegged rates, because they typically help to 'ward off' potential attacks by speculators[9].

At this point, we have to underline that the foreign reserves could be "responsible" not only for a smooth entry of a country to the Eurozone, but within an adjustment context as well. Within this context, the foreign reserves could be used for macroeconomic policy stability purposes in the future (note that the foreign reserves become abundant once a country joints the EMU). This is an area which is heavily

---

[9] it is useful to stress why Central Banks, in the first place, maintain foreign reserves. Conceptually we could distinguish between the reserves that are being held in facilitating trade, and the ones that are needed for other reasons. The 'facilitating trade' reason, as known, is related to the accommodation of expected and non-expected (i.e. 'systematic' and 'random') fluctuations in 'current account' receipts and payments, while the 'other reasons', apart from the temporal non-speculative changes in 'capital account' related items, include the 'buying of time' when a country is under fundamental disequilibria, and also the required time for the domestic economic policies to be utilized and maximize their effectiveness into the chosen directions.

under-researched and this thesis contributes by designing a novel framework of analysis.

2.2.2.2 Foreign Exchange Reserves and their optimal level

We will now focus on international reserves in relation to their 'optimal' level. As expected, this part of research includes both critical and empirical approaches. A critical review of the respective economic literature on the demand for international reserves was provided by Grubel (1971), while the work of Bahmani-Oskooee and Brown (2002) was a review on the demand for international reserves at that time. The Bahmani-Oskooee earlier (1985), delivered a survey on the demand for international reserves from an empirical perspective by conducting an overview of the empirical studies of his time, but econometrics have exhibited significant progress since then. Lane and Burke (2001) also focused on the "empirics" of foreign reserves, but still it is rather outdated for the purposes of our study.

Early literature also includes research papers like the one of Kenen and Yudin (1965) and Kelly (1970) that worked on the demand for international reserves, while later ones, like the one of Kahn (1978), explore the demand for international reserves by considering additionally the distinction between a fixed and a floating exchange rate regime. Claassen (1975) blended the 'demand for international reserves' with the 'optimum mix' and 'speed of adjustment policies', while Landel-Mills (1989) has incorporated on foreign reserves and on their relation to 'opportunity cost'.

As far as 'optimality' of the foreign reserves is concerned we may start historically, skipping the literature of the fifties, by reporting Heller (1966) who discussed the optimal level of 'international reserves'. Cohen (1979), on his turn, related the need for international reserves to credit facilities, while Ben-Bassat and Gottlieb (1992), related the optimal international reserves to sovereign risk. Flood and Marion (2001) analysed the holding of international reserves in an era of high capital mobility.

The optimal level of international reserves must be considered more analytically, given that they enhance not only to the economic but to the broader stability, especially in the cases of comparatively small countries that we will address more directly later on (see Subsection 2.2.2.4). Also note that special attention will be given to the applied methodologies of the reviewed papers. Moreover, many researchers, including Jeanne and Ranciere (2011), address the optimality issue of international reserves for emerging market economies.

The primary focus of these scholars, i.e. Jeanne and Ranciere (2011), is to determine the optimal level of international reserves for a small open economy that seeks insurance against sudden declines in capital flows. This is a fact that further interests the countries under study, given that the perceived as the strongest economically country of SEE, i.e. Greece, experienced a capital flight and a financial meltdown during the period 2012-2015, which reached a peak at June 2015, when the country was hovering in terms of its EMU presence. The sudden stop of capital flow in the case of Greece led to capital controls and other forms of financial and capital limitations. A similar incident has also occurred in the broader region and specifically in Cyprus in 2013. Note that the aforementioned authors, Jeanne and Ranciere (2011), propose a formula that could determine that 'ideal level'. While, capital controls in terms of their usefulness and in building walls instead of bridges –for the given possible contagion effects that occur due to the current form of institutions and the interlinkages between the economies– are reviewed on the research papers of Forbes et al. (2013); Klein, M (2012) and Chinn and Ito (2006).

Prabheesha et al. (2009) addressed the optimality matter by incorporating a further theoretical perspective. Specifically, they considered the precautionary versus the mercantilist approaches to foreign reserves. By testing those in an Indian context, they provide some empirical evidence on the reasons behind the increasing tendency of foreign reserves and mainly they manage to explain, partly at least, their volatility. More precisely by using an Autoregressive Distributed Lag (ARDL) model they investigate the cointegrating relations of foreign reserves to other macroeconomic fundamentals and they conclude that both perspectives, the precautionary and mercantilist ones, are related to the foreign reserves level in India and they are both responsible in capturing part of their volatility.

To continue, the financial crisis and the depletion of sizable international reserves, from 'fear of floating' to the 'fear of losing international reserves', is elaborated in a coherent way by Aizenman and Sun (2012). The size of international reserve depletion during the global 2008–2009 crisis −where only about half of the emerging markets drew down their reserves as part of the adjustment mechanism− is discussed and explained. While, the exchange market pressure and absorption by international reserves, the related emerging markets and the fear of reserve loss during the 2008–2009 crisis is also discussed by Aizenman and Hutchison (2012). These researchers evaluate how the global financial crisis emanating from the US was transmitted eventually to emerging markets.

International reserves and the roll-over risk are analysed additionally by Bianchi et al. (2012) that choose to focus on the theoretical framework, in order to quantitatively investigate the optimal accumulation of international reserves as a hedge against roll-over risk. While the optimal precautionary reserves for low-income countries through a cost-benefit analysis, are also studied by Kim et al. (2011). This paper develops a cost-benefit approach that allows a quantification of the optimal level of international reserves in low-income countries.

Before we proceed to the next part we have to shed some more light on the applied methodologies that are being used in addressing the level and the relation of foreign reserves to other key macroeconomic variables. Bussière et al. (2015) for example, using a dataset for 112 emerging economies, have tested if the accumulation of foreign reserves has any statistically significant impact in helping the CBs and the respective economies to endure more effectively the 2008-2009 global financial shock. By focusing on the relation of foreign reserves and the capital controls these researches provide empirical evidence, via Instrumental Variables and Two Stage Least Squares (2SLS), that the countries with more reserves and simultaneously less short-term debt are better off and thus they suffered less especially if they accommodated the above with a less open capital account.

Ford and Huang (1994 investigated the demand for international reserves in the case of China by using an Error Correction Model (ECM). While Ahmad and Pentecost (2009) through a cointegrating analysis, and specifically by applying a threshold cointegration approach, they focus on the relation of the exchange rates and international reserves. A cointegration approach on the demand for international liquidity was delivered also by Karfakis (1997), while Kasman and Ayhan (2008) searched for the existence of possible structural breaks and used Unit root and Cointegration tests for foreign exchange reserves and exchange rates in the case of Turkey. Even earlier, Iyoha (1976) through a distributed lag specification focused on the demand for international reserves in less developed countries.

In all cases foreign reserves could be viewed as a 'gunpowder' that could be used during periods of 'crisis' to settle down the imports or to compensate 'foreign creditors', especially if there is no access to any finance furthermore. On top of the above CBs could use foreign reserves in order to intervene in foreign exchange markets in defending the domestic currency or even to drive it to a 'favourable' direction and level.[10] Within the context analysed above it is important to note that a CB, acting like the 'monetary authority', must ensure that their foreign reserves are visible and thus without even actually depleting them, they could manage to remain credible during periods of crisis. Particularly, as analysed in Krugman (1999), an unfavourable (i.e. a downward) expectation about the foreign exchange rate of an economy, will 'normally' lead to a deterioration of banks and/or firms' balance

---

[10] Foreign reserves could be viewed as a "nuclear power" that acts in a preventive manner. I.e. the existence of what could be perceived as 'sufficient reserves' persuades the confidence of investors not only on the expected exchange rate of the economy but on the capacity to repay foreign liabilities as well.

sheets, obviously due to a currency mismatch, a mismatch that subsequently leads to a lower ‘aggregate investment’.

On top of that, Cheng (2014), by incorporating the aforementioned ‘theoretical model of Krugman’, provides evidence that the above will not occur if the monetary authority (CB) manages to maintain adequate reserves and if it remains committed in rescuing the private sector. Thus, in this context, foreign reserves act as a ‘contingent insurance’ that depends on the ‘expected value’ of the domestic currency and thus subsequently they do not have to necessarily be piled over.

2.2.2.3 Foreign Exchange Reserves, the Balance of Payments (BOP) and the Interest rates

The aforementioned optimal value of international reserves both in emerging and industrialized countries is not only directly linked to exchange rates, but to the concept of Balance of Payments (BOP), which is affected by the interest rates. Thus, the importance of other factors like BOP and interest rates, being related to the stability of exchange rates, must be stressed and reviewed. We will be doing so by focusing indicatively on some influential articles of this area.

The ‘BOP constrained growth and convergence’ is elaborated, both from a theoretical and from an empirical perspective by Garcimartin et al. (2014). These authors challenge the BOP constraint hypothesis that was developed by Thirwall (1979). This commonly “accepted” –i.e. “not rejected”– hypothesis has been empirically supported ever since. The challengers support that this hypothesis fails to interpret correctly the necessary conditions in order for convergence to occur. Their aim is to construct a model that is able to reconcile the ‘BOP-constraint hypothesis’ with the respective convergence, by working with Organization for Economic Cooperation and Development (OECD) countries.

The ‘BOP-constraint hypothesis’, is important within the framework of our research because it attempts to explain the international growth rate differences. The aforementioned researcher, Thirwall, on an influential paper had been supporting and showing since then, that if the long-run BOP equilibrium on a current account is a requirement, then a country's long run growth rate can be approximated by the ratio of the growth of exports to the income elasticity of demand for imports. Even though this ratio is not going to be used directly in our research −but via interest rates, inflation rate (as approximated in such a context from the real effective exchange rate and the Weight Trade matrix that captures the common unobserved factor within the G-VAR) and IPI differential between the tested countries− the shocks and possible disequilibrium will be addressed quantitatively within the G-VAR and specifically by using Global Impulse Response Functions (GIRFs) and especially by capturing the interdependencies that exist between the investigated countries.

It has to be underlined here that the G-VAR methodology is not only able to capture the responsiveness of the investigated variables under specific external shocks, but also it helps us to address the co-movements of the variables within the system, in investigating the “patterns” that exist between SEE economies and the EMU and thus subsequently quantify and measure in magnitude and in time profile terms, how sudden changes of the money and market rate of EMU countries can alter the performance of nominal and real variables of the SEE countries.

2.2.2.4 Foreign Exchange Reserves and the current financial and economic crisis. Focusing on the emerging economies

Now, having presented the above, it would be useful to briefly overview the part of the literature that focuses on the developing and less developed countries, given that these are closer to the exact research context of this thesis, and also given that the vast majority, if not all, of Southeast European countries could be considered as such.

Apart from Romero (2005) who delivered a comparative study between China and India by focusing on the factors that affect foreign currency reserves in China and India, Sula (2011) proceeded with a quantile regression approach for the demand for international reserves in developing nations, while Abdul and Sheharyar (2008) investigated the optimal demand for foreign exchange reserves in the case of Pakistan, following Khan and Ahmed (2005) that addressed earlier the demand for international reserves for this country.

With respect to less developed or developing economies foreign reserves related literature, Elbadawi (1990) studies demand for international reserves in the case of Sudan, by focusing on this labour exporting country. While Ibrahim (2011) elaborated on the external reserve holdings in the case of Nigeria by addressing their implications for investment, inflation and exchange rate. The aforementioned authors Aizenman and Marion (2003) focused on the over-accumulated international reserves in the Far East, while Aizenman again, in another research paper, addressed international reserves' management and their relation to capital mobility, in the current comparatively highly volatile world (Aizenman et al., 2007). These papers tend to provide evidence on the increased accumulation of foreign reserves which is mainly attributed to precautionary demand, as it is opposed to the mercantilist one, contradicting earlier findings and claims of Aizenman and Marion (2003a, 2003b, 2002).

Tariq et al. (2014) by extending the determinants and the optimality of foreign exchange reserves held in the case of Pakistan –in a buffer stock model– analyse the interactions between the real effective exchange rate and the foreign exchange reserves (from 1973 to 2008), which is a path that we take as well. They conduct their analysis from a mercantilist perspective and according to their approach this relation seems to hold in the investigated country. Specifically, their empirical findings suggest that foreign reserves changes in Pakistan is the result of export-led growth strategies followed in the country via a rigorous real exchange rate depreciation. It is interesting to add here that the floating regime 'switching policies' as they are applied from the CB of the country, increases the foreign reserves.

On the same mercantilist framework, Cruz (2015) investigates the reasons for the over-accumulation of foreign reserves in emerging economies. This mercantilist motive, as stated, can be perceived as an intervening 'industrial policy' where the existing reserves help CBs to sustain a stable and "undervalued" real exchange rate. The authorities by doing so manage to boost economic growth mainly, as expected, through tradable goods. The data used in this research paper covers the period 1996-2011 for ten Latin American countries. Opposed to existing literature on this area, the researcher uses the foreign reserves as a determinant of the real exchange rate, which is rather unique and we follow in our thesis as well. The empirical findings of this research provide some evidence that foreign reserves in Latin America have the tendency to appreciate the real exchange rate. Thus, the strategy of over-hoarding of foreign reserves in this region does promote neither economic growth nor economic development.

2.2.2.5 The over accumulation of Foreign Exchange Reserves

Foreign reserves in the context of the global financial crisis are presented indicatively by Dominguez et al. (2012). These researchers by comparing the pre-crisis to post-crisis international reserve accumulations, explain the cross-country differences in post-crisis economic performance, act as a bridge that helps us understand the above in the context of the final part of the literature review. This final part reviews the over-accumulation of foreign reserves, especially given that foreign reserves have reached a new level mainly since 2000, not only in absolute numbers but in ratios too.

Indicatively Cheung et al. (2009) focused on the exaggeration of the extensive accumulation of foreign reserves, by choosing not only to use the term 'hoarding' of international reserves, but by bringing 'back' the "Mrs Machlup's wardrobe theory" and the "Joneses" (Clower and Lipsey, 1968). Cruz (2015) again, in researching the reasons of foreign reserves hoarding in emerging economies, as we have seen, finds that this strategy does not increase the economic growth in the specific region. His empirical findings, provide evidence –and this is what we are really interested in– that foreign reserves in Latin America appreciate the real exchange rate which is an outcome that is related and should be compared to our own results, as we will see. Also, the above article provides ground in adding the foreign reserves as part of the monetary policy transmission channel.

Another research paper, written by Cheung and Sengupta (2011), follows the accumulation of foreign reserves and the "keeping up with the Joneses" in the case of Latin American economies. A topic that was also addressed earlier by Edison (2003) who was 'wondering' in the very first years of over-accumulation if foreign exchange reserves in Asia are too high, while Pineau and Dorrucci (2006) elaborated and overviewed the accumulation of foreign reserves in a rather general way.

2.2.3 Foreign exchange rate regimes

In defending a fixed exchange rate regime and its relation to the economic policy intervention, Allsopp and Vines (2000) provide a useful description of the steps that could be commonly followed. They say: '*But, under the Bretton Woods arrangements, there was a strong commitment also to the maintenance of the exchange rate […] A shock, such as a sterling crisis, tended to trigger a complex set of reactions which might be characterised as follows. First, use the reserves. If that was not sufficient, use interest rates. As that policy failed or became 'too expensive' add in fiscal policy and perhaps incomes policies as well. And, if all that failed, devalue the exchange rate […]*" (p. 8).

A quote which is further interesting from the perspective of this thesis, because it is under the 'interest rate reaction functions', stabilization and nominal anchors, that we address the Generalized Impulse Response Functions (GIRFs) within the G-VAR framework. This issue though will be considered in the next subsection of this literature.

At this stage we have to briefly review Aizenman et al. (2013) that measure the “trilemma aspects”, i.e. the exchange rate flexibility, monetary independence and capital account openness. These researchers manage to do so by outlining new metrics related to the unprecedented increase of the international reserves that occurred since 2000s (as discussed above, see Section 2.2.2). These researchers show that since the early 90s in emerging economies, the trilemma variables have converged towards intermediate levels that are characterized by managed flexibility that goes along with ‘sizable’ foreign reserves acting as a buffer, and at the same time they manage to retain some degree of monetary independence. The above, in the context of our research, is related to the fact that out of the six investigated countries, the no “fixed regime” status is evident in the cases of Croatia, Romania, and FYROM, while Greece, Slovenia and Bulgaria could be perceived as “fixed” regimes.

Aizenman et al. (2013), to proceed, has directly tested the linearity of the ‘trilemma’, and have shown that the weighted sum of the three variables is equal to a constant, which means that any rise in one ‘trilemma’ variable means that the weighted sum of the other two should be offset by a proportional drop.

2.2.4 Interest Rate Parity (IRP) and Purchasing Power Parity (PPP) in explaining the exchange rate value

Even though EMU was expected to lead to a further integration between its member states, at the current historical phase we could say that the opposite seems to have happened, at least up to a degree, or based on a given perspective The reasons for this vary from inflation and interest rate differences, to dissimilar budget and trade deficits that ended up being unsustainable. The existing differences of the accumulated public debts of the Eurozone members and the willingness of the investors to keep on refinancing those, eventually drove the EMU ‘experiment’ close to its limits or to a new phase that did not eventually happen in 2015, even though a

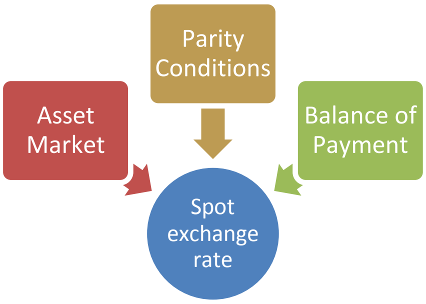
Greek exit, i.e. 'Grexit' was formally offered from the European Commission (EC) as an option. According to Ghosh et al. (2012) monetary unions might lead to destabilization for the countries that are under asymmetric shocks (though, theoretically at least, this could be absorbed if the EMU could develop and rely upon some efficient adjustment tools).

Since the entrance of Greece to the EMU the country seems to have lost any comparative competitiveness that historically had. Gibson et al. (2013) base this loss on comparative inflation between Greece and the other euro zone members, a difference that tended to be 1% higher on average from 2002 to 2009 according to Eurostat. The higher inflation, as expected, accumulates overtime, and changes the 'purchasing power', and thus subsequently it affects the real exchange rate. On top of that, the lower nominal and real interest rates that followed the Euro membership and the over-increased borrowing of that time increased imports in a higher rate compared to exports. Thus, the capital and money inflow in the country overall boosted aggregate demand and thus, without any offsetting increase in the productivity and the aggregate supply of the economy, prices were increased.

Subsequently, inflation resulted in less competitive Greek products internationally and thus the decreased exports made the Current Account (CA) of the Balance of Payments (BOP) even worse. Also, the excess government spending increased wages (especially the ones of the civil servants) and thus the CA was further affected. As it is known and expected from economic theory the wage increase makes industries less competitive in an international context (Malliaropoulos, 2010). Existing empirical research clearly supports that the free floating exchange rates are a prerequisite that facilitates the trade between countries in the case where the nominal prices do not adjust easily to the real internal shocks (Obstfeld and Rogoff, 2000).

Eventually, by considering the above, the PPP in the case of Greece within the context of comparing domestic to foreign prices could not be reached and sustained. Taylor (2003) indicatively, in explaining PPP, supports that if the condition does hold, then any unit of a currency must have similar purchasing power both within the country and out of it. Differently stated the prices of identical goods must be the same across countries (Case et al., 2012). The PPP allows us to determine the exchange rate by comparing the prices of identical or similar household baskets of goods and services (Moffett et al., 2009) and if we add on that the Interest rate parity condition (i.e. the interest rate differential between the countries that tend to drive the exchange rates in the short run), the aforementioned CA and BOP and the asset markets we can end up with a better picture of the exchange rate determinants (see Figure 2-1 below).

Figure 2-1: The determinant of Foreign Exchange Rates



Source: Moffett, Stonehill and Eiteman (2009)

Analytically, the concept of PPP was addressed analytically by Balassa (1964) and Samuelson (1964) who quantified the relation of asset prices and the transmission mechanism between countries that are at various developmental stages. Balassa and Samuelson separately reached the same conclusion and contributed to the foundations of what was named the 'Balassa-Samuelson effect' which states that the differences in PPP in different countries affect the real exchange rate. Specifically, the relationship between PPP and exchange rates allows economists to compare the economic conditions and differences of various countries. Additionally, according to this theory, the prices and the volume of non-traded goods is expected to rise along the increased productivity, real wages and real income without determining in advance the direction of a 'Granger-causality'. Based on Halpern and Wyplosz

(2001) decreased productivity is what leads to inflated non-tradable goods, thus, to a subsequent increase of the value of the real exchange rate. Overall, the different productivities of various countries could be used in explaining both the real exchange rates and the required period of time which is needed to meet the PPP equilibrium condition which ideally is of ‘a one to one ratio’, in terms of foreign to domestic prices (Lothian and Taylor, 2004). The above is blended, in a coherent way, in our approach, by choosing to work with the variable of the real effective exchange rate.

To proceed, the Uncovered interest rate parity theory (UIP) suggests that the change in the exchange rate between two countries is dependent upon the interest rate difference between the domestic and the foreign interest rate. It tends to hold in the short run and thus the respective interest rates should be short run rates as well. The main reason behind the tendency of UIP to hold is related to the arbitrage opportunities that rise when the higher interest rates cause capital inflows to the respective country, resulting in subsequent changes in exchange rates (Omer, et al. 2013). It has to be noted that the UIP tends to hold if certain conditions are met. Conditions such as a small open economy, free capital mobility, interest bearing assets that can be substituted, and of course, rational economic agents. The above are supported by numerous researchers, including indicatively Backé and Wójcik (2008), Basso, et al. (2007), Ferreira and Ledesma (2007), Chinn and Meredith (2004), Orlowski (2003), Lothian (2002), Flood and Rose (2001). Still, there is a relatively large proportion of literature that rejects this Parity Condition. Indicatively, Hameed and Rose (2016), Fama (1984), and a growing literature of our times (Sirichand et. al (2015), Güney and Hasanov (2014)) focuses on Real Interest Parity condition that deflates the interest rates and thus insists on how persistent nominal interest rate differentials are related to inflation.

In all cases, it is important to add, that within our context, a part of literature adds a premium to the domestic interest rates to quantify the additional compensation which is required for the extra risk taken. Thus the commonly used formula of Interest Rate Parity (IRP), for the uncovered case, as opposed to the covered one where forward contracts are being used instead, is:

$$i^D = i^F - (E^e_{t+1} - E_t)/E_t \qquad (2.1)$$

where, i^D is the domestic interest rate, i^F is the foreign one, E^e_{t+1} is the expected exchange rate in the following period, and E_t is the spot rate at period t. Once the risk premium is added to the formula, this becomes:

$$i^D = i^F - (E^e_{t+1} - E_t)/E_t + \rho \qquad (2.2)$$

where ρ denotes the requested additional risk premium.

In all cases, the above is useful in understanding the framework within which the investigated variables operate. Also the UIP is important for the present study, given that the interest rate, in the form of Euribor, is going to be used as a main global –i.e. shock– variable that will quantify the effect of the European monetary policy to SEE economies, in capturing the transmission channels in the region.

The level of domestic interest rates is also important given that it helps us to understand the economic growth of a country, and also influences the level of savings, investment, consumption and capital inflows. On top of that there is a particular interest for the emerging economies of SEE, given that capital inflows are needed to sustain and boost growth. A growth that should be coupled with proper economic policy interventions, which in their turn could be related to an efficient use of the foreign exchange reserves, once a further integration of the region to EMU and EU occurs. Thus, as stated, there would be no need to maintain any foreign exchange reserves, which is the case we have seen historically both in Greece and Slovenia (the only EMU members of the region that we study).

Market interest rates −including the money market rates, government bond yields, and the return on other financial instruments− affect the respective economies via different channels. Channels that vary from the banking sector and asset prices to the non-banking financial sector (see for example Bondt (2005), Sander and Kleimeier (2004) and Ho and Saunders (1981)). These channels are evident to EMU members, new EU members, and candidate countries also (Horváth and Podpiera, 2012; Karagiannis, et al., 2011; Ronald and MacDonald, 2009); and Égert, et al., 2007). As expected, there is no consensus in the literature on what drives the interest rates in emerging economies (though reported factors include: economic development, credibility, degree of openness, global risk appetite, liquidity conditions, international crises, etc.) and thus within this context it is important to address them within the newly proposed monetary transmission channel applied in this thesis. Especially, given that the aforementioned researchers argue that the spread of interest rates is dependent mainly on domestic variables, we are further interested in examining this claim, and to capture the channels and the interlinkages amongst the investigated variables, by applying a G-VAR model for the six investigated countries of the SEE region.

In combining the above, i.e. by bringing together the two conditions PPP and IRP, and by considering both inflation and interest rate differences between counties in explaining the exchange rate variation −as it is suggested by the Fisher Condition− Güney and Hasanov (2014) investigated the real interest parity hypothesis for ten post-Soviet transition countries. By employing linear unit root tests and non-linear unit root tests, as developed by Kapetanios et al. (2003), they examine the stationarity properties of 'real interest rate differentials' of the transition economies vis-à-vis Russia, USA and Germany, concluding that real interest rate parity tends to hold, especially when non-linearities are taken into account. Additionally, as examined by Sirichand et Al. (2015) −who focused on which component of "real interest parity" (RIP) drives the convergence path into the parity− it is the "reversion of inflation" rather than the nominal interest rates what drives the convergence for the parity to hold. Still, the above are open to further investigation.

To return to the case of Greece, the bailout funding that was offered by the ECB, the EC and the IMF (the so-called 'Troika'), in exchange of structural and other reforms, drove the country to a deeper and longer recession than the expected one (Baltas, 2013). Some economists argue that a floating exchange rate regime would help the country to cope better by reclaiming its monetary independence. However, it must be stressed that such an attempt requires an international collaboration about how such a step could be made in terms that include and vary from geopolitics to European regulations and law related issues (as someone could also tell within the current phase of the so called 'Brexit'). Furthermore, in the cases of relatively small and peripheral countries like Greece a floating exchange rate regime could lead to a further loss of credibility and thus a new peg or a band would be required to stabilize the economy again. The free float regimes are not as efficient as the fixed ones (dollarization, currency boards or monetary unions) to correspond to shocks in the case of small countries, and subsequently the flexible regime could lead to less effective economic policies −both monetary and fiscal− due to limited or no regulation at all (Ghosh et al., 2012).

Overall we can support, based on the reviewed literature, that the accession of Greece to the EMU refrained the country from using its monetary policy and devaluating its currency to counterbalance the negative effects of the required adjustment. The adjustment problems of the country eventually affected EMU and drove, according to Kouretas and Vlamis (2010), international agents to doubt the viability of EMU and the future of the Euro. An outcome, that might occur in the cases of Bulgaria and Romania also, and probably for the cases of Slovenia and Croatia, and thus, before we empirically test these SEE countries within an EMU framework, it is important to review further the respective literature.

Analytically, in reviewing the interest rates, mainly as a ‘receptor’ that could drive to sustainable cointegrating relations between the probable members of EMU, we have to focus on the importance of the country specific macroeconomic variables. The domestic interest rates, as literature suggests, are determined by country-specific factors and the economic conditions of the country (Neumeyer and Perri, 2005; Cline and Barnes, 1997; Edwards, 1996; Cline, 1995) and by the measurable creditworthiness of the country as well (Kaminsky and Schmukler, 2002; Eichengreen and Mody, 1998; Min, 1998). Also, interest rate related literature attempts to explain the interest rate differences of the emerging developing economies to the developed world (in our research, the SEE countries in relation to non-SEE EMU countries, i.e. excluding Greece which was not part of Euribor for the half of the investigated period and Slovenia that has comparatively limited presence in our model for the given trade weights that it has within the investigated region) through currency pegs. Pegs, as we have seen, are highly dependent on the credibility and rigidness of the peg, as it can be measured by and related to the sufficiency of reserves and the corresponding importance of macroeconomic fundamentals (see Ciarlone, et al., 2009; Rosenberg and Tirpák, 2008, González-Rozada and Yeyati, 2008; Schmukler and Serven, 2002). The ‘pegs’ are additionally important in the current state of the SEE region, and elsewhere, as a pre-stage towards an EMU entry.

Within this context, Baele et al. (2004) found, in the very early years of EMU −after the adoption of the Euro in 1999 and the subsequent circulation of the currency in 2002− statistical evidence of a financial integration. This research paper and the outcome of it calls for further investigation regarding the current status of financial integrations of the EMU and non-EMU members, where countries like Greece (existing members of EMU) are not financially integrated, while others, like Bulgaria (a non-member of EMU) seems to be, at least in terms of the cointegrating Euribor to Sofibor, i.e. the domestic interbank interest rate of this country.

Thus, specifically, in the case of Bulgaria, the interest rates, in their relation to the European ones (based on Petrevski and Bogoev, 2012; Minea and Rault, 2011; Vizek and Condic-Jurkic, 2010; Holtemöller, 2005) are co-integrated, i.e. are moving together in the long run. It is interesting to add here that at the same time these researchers fail to detect other factors that could be responsible in explaining the variation of the Bulgarian interest rates, showing towards the importance and the direct relation of the respective financial markets.

It is also important to add some earlier studies, including Hartmann et al. (2003), Adam et al. (2002), Hartmann et al. (2001) and Gaspar et al. (2001), that have used overnight unsecured rates and/or longer term money market 'benchmarks', to conclude on the importance of an interest rate convergence of EMU countries, as a prerequisite for a sustainable Union. A fact which is further useful given that Europe as a whole, and of course SEE, are non-OCAs.

The regression findings of Adam et al. (2002) must be reported also, given that the absolute value of the slope coefficient within the investigated cointegrating equations for the aforementioned variables, increased over time, meaning that after the advent of the EMU, the speed of convergence was accelerated. This acceleration though historically did not last and led to the Greek problem and to the official statements on behalf of the European Commission for a multi-speed and a multi-layered EMU and EU. This area of course requires further investigation, and we will do so on the empirical part.

In the same context, Vizek and Condic-Jurkic (2010) investigated if the money market rates of five Central and Eastern European (CEE) economies are integrated with the EMU rates. By incorporating Johansen cointegration techniques and Pairwise Granger Causality tests, they attempt to capture the channels through which the European interest rates affect the CEE money market rates, by considering the lending and the deposit rates as well. They find that Bulgarian money market rates and bank loan and deposit rates are integrated with the Eurozone ones. But what is really important, within the context of our research, is that they base this specific outcome on the existence of the Bulgarian currency board (along with the intensive European ownership of the banking sector of the country). Other authors, such as Petrevski and Bogoev (2012) end up with similar results, using Engle-Granger cointegration methods for time series data and VECMs. These methods will be applied in this thesis, and are expected to lead to cointegrating equations. Thus, the long-run co-movements between the Euribor and the Bulgarian money market interest rates, and among the other five SEE economies as well, will be addressed.

In relating further the interest rates under review to the "fixed exchange rate regimes" (see Subsection 2.2), which is the case of Bulgaria (and indirectly of Greece and Slovenia, given that these countries are under a fixed regime in practice, by being EMU members), it has to be added that the 'currency boards' limit or sacrifice the monetary policy independence of the countries, but on the other hand they "force", initially through an assumption and later on through an active practice, the integration of the respective financial markets.

Specifically, the domestic interest rate, as seminal papers support, is directly linked to the interest rate of the currency if this is pegged to some other currency (Calvo and Mishkin, 2003; Frankel, 1999). This finding was evident at a point in time when the Bulgarian currency (lev) was not pegged to the Euro, but to the Deutsche mark (see Nenovsky and Rizopoulos, 2003; Miller, 1999; Dobrev, 1999). The above argument is further supported by Shambaugh (2004), who provides statistically significant evidence that economies with fixed exchange rate regimes follow the interest rates of the base country more closely, which apart from expected is quite interesting, and should be tested empirically.

While Rivera-Batiz and Sy (2013) elaborate on the 'implied' interest rate difference of the foreign exchange forward contracts under fixed exchange rate regime in developing countries. These researchers provide evidence that, in periods of crisis, the interest rate difference exhibits upward tendency, something that could be attributed to the increased probability of a non-sustainable peg and thus a subsequent collapse of the currency board could lead to the devaluation of the domestic currency. This finding will be also investigated in our empirical part.

The relation of the interest rate differences of the countries with fixed exchange rate regimes, to the base currencies and the respective credibility of the currency boards is discussed in other research papers (including Cook and Yetman, 2014; Blagov and Funke, 2014; Blagov and Funke, 2013). A fixed exchange rate regime, it has to be stressed, that is evident in the three out of the six investigated countries in this thesis (given that two of those six countries, have given up officially their exchange rate flexibility by entering the EMU (Greece and Slovenia) and one has an official currency board (Bulgaria)). The rest of the investigated SEE countries, i.e. Croatia, Romania and FYROM, have flexible exchange rate regimes, at least *de jure*.

Backé and Wójcik (2008) have reviewed the “credit growth” of the new member states of European Union, and support that within the integration path of a new EU member and the subsequent expectation of an EMU entrance, the interest rates converge further to the European average ones. A conclusion that was evident even earlier in the findings and arguments provided indicatively from Lothian (2002). This author supported that in order for the economies to be really integrated, the real returns of assets (physical and financial ones, including interest rates) should converge. A fact that might not hold for SEE countries, no matter if one treats them as a group or independently. Still, this statement is aligned with our research questions and it will be tested empirically on the empirical chapters.

Holtemöller (2005) by investigating the spread between the domestic money market rates of Central and Eastern Europe (CEE), new EU member states and EU candidates, and the Euribor −and by incorporating a pre-EU and post-EU approach−, paved the way in testing similar relations in terms of an EMU pre and post period. This path is also followed in this thesis, given that GIRFs are incorporated, in helping us to capture the responsiveness of the investigated SEE variables to specific EMU related shocks.

Orlowski (2003) in line with the aforementioned context, by employing an ARCH model for Hungary, the Czech Republic and Poland, supports that the country-specific requested premium can be explained by the inflation and the exchange rate differences that exists between the investigated countries and the EMU. It has to be noted here that the specific choice of these two variables by Orlowski (2003) are being blended into one in our research and thus, we use REER instead.

Minea and Rault (2011) also focus on the Bulgarian money market rates responsiveness to interest rates shocks in the Eurozone (as they are approximated by the 3 month Euribor) using data from 1999 to 2010, and find that the Bulgarian economy absorbs the sudden movements/shocks of Euribor in the Eurozone relatively fast. In accordance with our expected cointegrating results, as we will see, the cointegration is lost when Sofibor (the Bulgarian interbank interest rate) is tested with the US interest rates. It is interesting to add that the above authors do not use the existing premium between the interest rates in Bulgaria and the EMU, but instead, they focus on GDP growth, as we also do in our approach (approximated through industrial production) and other macroeconomic fundamentals such as the asset prices and the money supply as well.

Mihailov (2010) in line with our expected cointegrating findings shows the current “currency board arrangement” of Bulgaria coupled with financial reforms in the market infrastructure of the economy have led to the higher integration of the Bulgarian economy with the Eurozone. A currency board that sacrifices, as it is expected, the monetary independence of the country, and thus help in understanding why the interest rate shocks are by definition and in practice fully ‘exogenous’.

Concluding, Uribe and Yue (2006) investigate how the country interest rate spreads are negatively correlated to macroeconomic variables, such as the real GDP growth, and investments and trade balance. Cline and Barnes (1997) and Cline (1995) reach to the same conclusions. While Neumeyer and Perri (2005), who apart from showing that it is not only the nominal but also the real interest rates in emerging economies that are more volatile compared to the rates of the developed ones, also provide statistical evidence of the strong counter-cyclicality and interest rate lead of the cycle. The above findings are paving the way for the present analysis and are expected to be consistent with our G-VAR and GIRFs results, while they also lead in reviewing the growth proxy of industrial production and the aforementioned real effective exchange rate on the last subsection of the literature review.

The above findings are further supported by Uribe and Yue (2006) and Neumeyer and Perri (2005), who provide statistical evidence both on the inverse relation between interest rates and growth and on the instability of the respective interest rate time series that increases the volatility of the business cycle. On top of that, following Longstaff et al. (2011), we choose to put more weight on global-exogenous factors of the respective country under study. Through this approach we support that G-VAR modelling can achieve and test the above much more effectively and will help us to clarify the complexity and the dynamic properties of the investigated variables in the region as a whole within an EMU context.

But we should first review the G-VAR literature in monetary economics, once we briefly address the IP and REER on the following section. The review of these two variables is a brief one, because they were already considered in the literature along other variables (see especially 2.2.2.4), and also special attention will be given in the final G-VAR part review(see 2.4).

2.3 Industrial Production (IP) and Real Effective Exchange Rate (REER)

The monetary transmission mechanism, which is the key topic of this thesis, as stated, attempts to explain how policy-induced changes in the nominal money stock or the short-term nominal interest rate impact real variables, such as aggregate output and employment. In this thesis, given that the growth proxy is the industrial production index, due to data limitations, we have to provide a brief literature review of this variable as well. This will be done by blending inflation to the exchange rate, i.e. through real effective exchange rate (REER), which captures the competitive stance of an economy.

It has to repeated here, that the choice of IPI instead of the nominal or the real gross domestic product (GDP) is based on the fact the IPI data are available monthly, opposed to GDP which are available quarterly or even semi-annually for some of the SEE countries.

Focusing on the real effective exchange rate related literature, directly on this subsection, we have to briefly review Ahmed et al. (2017). These researchers in the context of the Generalized Impulse Response Functions (GIRFs) investigate the role of macro-economic fundamentals in the 'transmission of international shocks' to financial markets in various emerging market economies (EMEs). By doing so they manage to provide evidence, as expected from the economic theory, that the emerging economies with better macroeconomic fundamentals suffered less, while the ones that had experienced earlier larger private capital inflows and greater exchange rate appreciation were worse off. This is an important outcome that will be tested within our thesis. Also it has to be stressed, that the interdependence between the macroeconomic variables, drove us to review these two variables, IPI and REER, in relation to the rest of the variables in the previous and to the coming subsection. Thus, there is no reason to insist at this stage furthermore.

Still, we have to add that Aron et al. (1997) focused on the determinants of the real exchange rate in South Africa, while Faruqee (1995) worked on the long run determinants of the real exchange rate from a stock flow perspective. Hsieh (1982), earlier, also addressed the key determinants of the real exchange rate. Last but not least, It is important to repeat that Cruz (2015) uses the foreign reserves as a determinant of the real exchange rate to explain the ‘hoarding’ of foreign reserves in emerging economies, an approach that we follow in this thesis, providing us ground to support our choice.

IPI and the REER will be now analysed further on the next subsection (2.4), by reviewing these variables in the context of the specific literature review of applied G-VARs in the broader area of monetary economics. Also, as stated, these variables were reviewed in relation to the aforementioned variables (of foreign reserves and interest rates) on the previous parts (see 2.2.2.4).

2.4 A brief literature review of applied G-VARs in monetary economics

This last section of literature review focuses on the applied VECMs and G-VARs in the area of monetary economics. The G-VAR related macroeconomic applications, as expected, include broader categories such as: the global inflation, global imbalances and exchange rate misalignments, role of the United States as a dominant economy, business cycle synchronization and the rising role of China in the world economy, impact of EMY membership, commodity price models, housing, effects of fiscal and monetary policy, labour market, and the role of credit and macroeconomic effects of weather shocks. For a review of the above categories, see Pesaran (2015), and Chudik and Pesaran (2014), where sectoral and other applications are provided.

Special attention will be now given to the variables that are used in the present analysis, i.e. the money and market rate, the real effective exchange rate (or the exchange rate and inflation, if the variable is split in two), the industrial production index and the foreign exchange reserves. Thus, from the aforementioned categories we will briefly review the ones that are related to global inflation and imbalances, exchange rate misalignments, the role of the United States as a dominant economy[11], business cycle synchronization and the rising role of China, focusing on synchronization of business cycles for the given differences of the EMU, EU and SEE economies. Moreover, we take into consideration the impact of EMU membership, and the effects of fiscal and monetary policy, focusing especially on the monetary policy and the role of credit, for the given scope of this thesis.

Anderton et al. (2010) developed a G-VAR in examining the oil price shocks on global inflation. These researchers have calculated the impact of increased imports from low cost economies on manufacturing import prices and through Phillips Curves they attempt to capture the inflationary pressure in OECD countries. By doing so, they manage to provide statistical evidence of various pressures on international trade prices (and labour markets) by associating them to structural factors and by also attributing them to 'globalization' which lags compared to monetary policy conduct.

Galesi and Lombardi (2009) have also studied the oil price shocks on inflation. Apart from the oil price shock these researchers use a food price shock as an exogenous, global shock variable, within the G-VAR structure. They manage, through a stable G-VAR model, to provide statistically significant evidence that the inflationary effects have greater weights in the case of developed countries as opposed to less developed ones.

To continue with Global imbalances and exchange rate misalignments, which could be the case in SEE, it is important to report Bussiere et al. (2012) that study the effects of demand shocks and shocks to relative prices on 'Global imbalances'. By modelling the international trade flows via a G-VAR they manage to indicate that the changes of demand −both domestic and foreign− are more important, in statistical significance terms, compared to relative trade prices impact on trade flows.

It is also important to report, for the given misalignment of SEE with the core countries of EMU, the work of Marcal et al. (2014) that examines the exchange rate

---

[11] Given that Germany seems or could play this role within EU and especially within EMU.

misalignments –through a real effective exchange rate in terms of whether it is overvalued or undervalued in the long-run– by using a G-VAR. By contrasting G-VAR measures of misalignment with other time series related methodologies that do not group countries, they manage to show that substantial differences exist on the results of the compared methodologies, especially in the cases of small and developing countries. These findings also support our choice to use a G-VAR. Also, it has to be noted here, in the context of the aforementioned comparison of methodologies, that we apply apart from the G-VARs, country specific VECMs.

We will now briefly address the role of the United States as a dominant economy, given that, within the context of our thesis, Germany –from a given perspective at least– have started playing a similar role within Europe, where EMU could be viewed as a vehicle that increases the ability of this country to do so. Thus, Chudik and Smith (2013) compare a model that uses USA as the dominant country, opposed to one that does not, and through a standard G-VAR that does not distinguish the impact of US variables from the respective cross section averages of the rest of the economies, they provide evidence that the US acts like a dominant economy. A similar result is also evident up to a point on the paper of Dees and Saint-Guilhem (2011) who again through G-VARs find a dominance that diminishes over time.

Business cycle synchronization and the rising role of China in the world economy will be reviewed also, within the G-VAR context, because the synchronization of cycles with EMU, EU and especially within SEE countries in the context of EMU and EU framework requires further investigation. This is important given that Germany shows signs of a rising role and dominance within Europe. Thus, Dreger and Zhang (2013) test the interdependence of the 'business cycles' in China and other industrial countries in quantifying the shocks to the economy of China. Similarly, Cesa-Bianchi et. al (2012) follow the same approach with the addition of Latin America, apart from China, in their relation to the global economy. These research papers use time-varying trade weights in constructing the respective matrix within their G-VAR, providing evidence of the synchronization of the 'cycles', a finding that is further supported by the work of Feldkircher and Korhonen (2012).

Focusing now on the synchronization of business cycles in emerging European countries to the rest of Europe and to the world –in investigating the differences of the EMU, EU and SEE economies, which is our special research interest– we should stress the research output of Feldkircher (2013) that structured a G-VAR for 43 economies. It is interesting to stress the main empirical findings of this work that show that emerging European economies respond to US GDP shocks as much as to EU GDP ones. This finding underlines further the probable impact of EU and EMU membership to these emerging economies, keeping in mind especially the examples of Greece and Cyprus, that once they joined EMU they collapsed, and subsequently were in need of bail-out programmes and experienced capital controls. Before we proceed further to this literature, we have to underline the research paper of Sun et al. (2013) who, through the use of two different 'weight trade matrices', one for trade and another for finance, and by combining those, they provide statistical evidence that shows the cross country interlinkages in Europe. Specifically, they have shown that the co-movements of GDP growth and interest rates are really strong, while the co-movements of inflation and real credit growth are weaker ones.

The research papers of Pesaran et al. (2007) and Dubois et al. (2009) where the first ones to capture and test the impact of EMU membership on the countries of this continent. These researches managed to use the G-VARs to investigate the 'counterfactual scenarios' of an experimental monetary union. This union was put in place before the advent of an Optimum Currency Area (OCA) and thus before a real economic integration. Within this historical context Pesaran et al. (2007) wondered "what if the UK had joined the EMU in 1999?" They managed to provide evidence that the GDP would be higher and inflation would be lower not only in the UK but to the EMU as well. While Dubois et al. (2009) found that the EMU boosted GDP in most of its members and also drove the interest rates down. It is useful to stress that these researchers managed to compare the above to a case where national monetary policies would have followed a German type monetary policy conduct. This result seems to be the second best outcome, compared to national monetary policy set ups that would constitute the UK monetary preference after the events of September 1992.

Moving on to the effects of fiscal and monetary policy we now focus on the monetary policy and on the role of credit. Apart from the studies of Favero et al. (2011), Hebous and Zimmermann (2013) focus on fiscal policy and show the heterogeneous fiscal policy multipliers that exist across countries and the spillover effects of fiscal shocks from every EMU country to the rest. These findings suggest that a coordination of fiscal policies could be more effective and also could act as step towards an OCA, where countries would be better off if they had joined a monetary union.

Georgiadis (2014a and 2014b) has investigated the cross country effects of monetary policy shocks. By using a G-VAR approach this researcher measures the spillover effects of the monetary shocks to the EMU and to the US. His results show that these shocks on GDP are heterogeneous across countries. Also "substantial" heterogeneity is detected in the EMU area, where the monetary shocks are impacting GDP more in the cases of the economies that have 'more wage and fewer unemployment rigidities'. It has to be noted also that these G-VAR applications incorporated sign restrictions in identifying the monetary policy shocks.

Last but not least, before we address the role of credit, within this brief literature of G-VAR methodology, Feldkircher and Huber (2016) report, among other interesting results, that the monetary policy of the United States, as it is quantified through these G-VAR related shocks, generates strong and lasting effects on real output internationally.

Indicatively, credit supply shocks, instead of the monetary ones, are used through G-VARs by numerous researchers, such as Fadajeva et al. (2017), Konstantakis and Michailides (2014), Xu (2012) and Eickmeier and Nu (2012). Fadajeva et al. (2017) investigate the international spillovers from EMU and US credit and demand shocks on emerging European economies. They provide statistical evidence that the international effects on total credit are larger than those on output, the spillovers from US shocks have a more extended 'global coverage' than euro area shocks and especially, further related to our research, the economies from emerging Europe are most vulnerable to the considered shocks.

Before we proceed to the presentation and the analysis of the G-VAR methodology (see Chapter 4) it is useful to briefly review some non-G-VAR papers on the area of the research focus of this thesis, paying special attention to VARX*[12], VECX*, VECM, cointegration, etc. Given especially that we have to stress the set up of the finally used methodologies applied, which are the structured Vector Autoregressive Model i.e. a VECM, and the G-VARs.

Thus, Chan (2011) provides a structural modelling of exchange rate, prices and interest rates between Malaysia and China in the liberalization era. Advanced econometric procedures including the structural VARX*, VECX*, over-identifying restrictions, bootstrapping, persistent profiles and Generalized variance decomposition are utilized in these analyses and the key findings of the research uphold support for both PPP and IRP, especially when exchange rate regime and structural breaks of Asia crisis and subprime crisis are taken into account.

Aristei and Gallo (2012) investigate the relationship between bank and interbank interest rates in the period of crisis using Vector Autoregressive Models, unit root tests, cointegration and mainly a final Markov Regime Switching-Vector Error

---

[12] Briefly, a VARX(1,1), where every country is modeled as a country-specific VAR augmented with the star (foreign) variables (VARX*), takes the following format: $x_{it} = \Phi_i x_{i,t-1} + \Lambda_{i0} x_{it}^* + \Lambda_{i1} x_{i}^*{}_{,t-1} + u_{it}$, where x_{it} is a k_i x 1 vector of domestic variables and x_{it}^* is a k_i^* x 1 vector of foreign variables. The $x_{it}^* = \sum W_{ij} x_{jt}$, $W_{ii}=0$, are the star (foreign) variables and are responsible for the interlinkages that exist between the investigated countries and rest of the world and also could be considered as an approximation of the unobserved global factors. The x_{it}^* also, as it can be seen above, can be computed as cross-sectional averages with weights W_{ij}.

Correction Model (MS-VECM). These researchers demonstrate that in Europe the financial crisis triggered a reduction of the degree of pass-through from the interbank rate. Mohanty (2012), on top of the above, investigated the interest rate channel of monetary policy transmission in India by means of Structural Vector Autoregression (SVAR) analysis and provided evidence that increases in policy interest rate have a negative impact on output growth

Kose et al. (2012) analyse the interest rate-inflation relationship, by employing unit root tests, cointegration, exogeneity tests, Vector Autoregressive and VECM, and they manage to conclude a long-term co-integrating relationship between short-term interest rate and expected inflation rate. While Shaari et al. (2012) examine the effects of oil price shock on inflation in Malaysia, using monthly data from 2005 to 2011, and through a VECM they manage to examine the effects of gold shocks – whenever applicable– on international reserves. The oil price shocks are also addressed through G-VARs by Mohaddes and Pesaran (2016). These influential researchers investigate the global macroeconomic consequences of country-specific oil-supply shocks and provide useful evidence that the Saudi Arabian oil supply shocks are more important than the Iranian oil output ones.

Mumtaz and Sunder-Plassmann (2010) apply Vector Autoregressive analysis to investigate the time-varying output growth, inflation and real exchange rate for the UK, euro countries, Japan, and Canada and Kohler (2010) analyse the exchange rates during the period of the financial crisis, emphasizing the significance of the short-term rate differentials in periods of depreciations (and the inverse), suggesting that they increase over time.

Arnone and Romelli (2013), in their study, focus on the dynamic central bank independence indices and inflation rates by employing unit root tests and a panel data analysis, providing evidence that the dynamics of inflation rates are significantly affected by legislative reforms which are used to modify the degree of independence of a Central Bank.

An empirical study for the USA, UK and Japan, was conducted on the basis of Markov regime-switching Vector Autoregressive model (MS-VECM) by Caglayan et al. (2011). These researchers provide evidence on the impact of interest rates and also they reveal that these affect only 20% of the changes of output and exchange rates in the researched countries.

The reported proportion of such an impact, e.g. of Caglayan et al., 2011, is of a unique interest and underlines that VECMs and GVARs are of a special importance, because they are capable in capturing not only the existing complexities and interlinkages between the investigated macroeconomic variables, but the spillover effects as well. These spillovers can and will be captured and measured specifically through GIRFs. This is the road that we take to investigate the monetary policy interlinkages and their respective impact on the chosen and reviewed variables, that will be now tested within the SEE in an EMU context.

Chapter 3 - Data

3.1 Data availability

The dataset employed in the present thesis is compiled from publicly available secondary data in order to answer empirically the research questions and objectives we have set. All sources are reliable and include the European Central Bank, the Federal Reserve Bank of the United States, South East Europe's Central Banks, Eurostat, International Monetary Fund, Bank for International Settlements, World Bank, National Statistical Services and Institutions of the countries under study, and finally, Public Debt Management Agencies.

Specifically, the Central Banks of Bulgaria, Croatia, FYROM, Greece, Romania, and Slovenia are used to collect data on Foreign Exchange Reserves (FS), while the Bank for International Settlements (BIS) and the World Bank (WB) were used to export the Real Effective Exchange Rate (REER). National Statistical Services of the countries under study were used to get the Industrial Production Indexes (IPI) and more specifically the National Institute of Bulgaria, the Croatian Bureau of Statistics, the Hellenic Statistical Authority, the 'Institutul National de Statistica' (the National Statistical Institute) of Romania, the Statistical Office of the Republic of Slovenia and the BIS for FYROM. Last but not least, in terms of the fourth variable, i.e. the interest rate we have used the Bulgarian National Bank, the Croatian National Bank, the National Bank of the Republic of FYROM, the Public Debt Management Agency (PDMA) of Greece, the National Statistical Institute of Romania, and the Ministry of Finance of the Republic of Slovenia.

Trade statistics in terms of the direction of trade, known as Direction of Trade Statistics (DOTS), that are needed for the generation of the trade weight matrix for the G-VAR analysis are obtained from the International Monetary Fund (IMF). Gross Domestic Product and Purchasing Power Parity, which are also needed for the construction of the trade weight matrix and the final G-VAR for the 2002-2016 period, are in constant 2011 international dollars, and originate from the World Development Indicators database. The ICE Benchmark Administration Limited (IBA) via the Fred −i.e. the Saint Louis Branch of the Federal Reserve Bank of United States− was used for the Euribor. Last but not least, the Real Effective Exchange Rate (REER) of the EMU −also needed for the final G-VAR− is obtained from the Bank of International Settlements (BIS) and the World Bank (WB), while the European Central Bank (ECB) and Eurostat were used for the Euribor.

The required data for all four variables is presented in this section for all countries under study i.e. Bulgaria, Croatia, FYROM, Greece, Romania, and Slovenia. It has to be noted that these focal countries are chosen, for the given research interest in SEE, because only for those within the region there are available data. The variables, as stated, are the Industrial Production Index (IPI), the Real Effective Exchange Rate (REER), the Foreign Exchange Reserves (FS) and the short-term Interest rates (I). Note that some limited access to the interbank rate of Slovenia in terms of the start date is present. More specifically, the starting date of this variable is the 1st of January of 2003 instead of 2002, and thus a backward linear interpolation through the econometric software EViews has taken place to add one year of observations. The same applies for the starting date of Foreign Exchange Reserves in the case of Greece given that the available starting date of this variable, provided by the Central Bank of Greece, is also 2003 instead of 2002.

Before we move onto the data description part, it is useful to provide a brief review of the economic background of the focal countries. The group of South-Eastern European Countries (SEEC), the European Monetary Union (EMU), and the European Union (EU), are all facing challenges that seem to be unprecedented in the areas of finance, sovereign debt crises, and policy coordination, and even geopolitical changes, and possible threats. The global financial crisis that occurred in 2007-2008 in USA was transformed through a credit crunch, a liquidity squeeze, and massive changes of capital flows to a debt crisis in the EU, and specifically in the EMU. The structure of EMU, coupled with the chosen policies for a non-integrated economic union, led to an instability that stressed further the differences of the agents that we are interested in, i.e. the SEE countries, the EMU, and the European Union (EU). It is important to stress that the countries of Greece, Romania, Bulgaria, Slovenia, Croatia, and FYROM could be disaggregated into three broader groups: EMU members, EU members, and non-EMU non-EU. This simple disaggregation underlines also the complexity of the topic, and of the region under study.

Thus, in terms of the economic background of these countries it has to be noted that Greece joint EMU on 1st of January of 2002, i.e. from the official start date of circulation of the Eurocurrency, while Slovenia did so at a later stage, i.e. on 1st of January of 2007. The remaining three countries are EU members, while FYROM struggles to join the Union and the NATO.

In overviewing the historical monetary and economic system experience of a SEE country, we will focus indicatively on Greece, which is the older nation-state of the region. The frequent problems of the twin deficit, i.e. the budget (fiscal) and the current account one, the increased public and foreign debt, the hyperinflation and the devaluations of drachma −the national currency of the country from 1831-2001− led the country historically to various exchange rate regime changes (varying from pegs, bands to managed float) that worked either as a mechanism that could lead to economic and financial stability or as a way to partially absorb the ‘waves’ of shocks or financial meltdowns.

Eventually, during the second half of 1990s, a hard drachma was introduced for some years in Greece, for the country to prepare for the adoption of the Euro. That would happen through the European Exchange Rate Mechanism (ERM) and if the Maastricht criteria were met. Out of the five criteria, Greece met the three (i.e. the stability of a low inflation, interest rates and a stable exchange rate) and failed to meet the targets of the public debt to GDP ratio and the budget deficit. An exemption though took place, not only for Greece but for Italy and Portugal too, and the countries joined EMU on the 1st of January of 2002. Overall, since 2002 we could state according to Mundell (1997), that the country has adopted again a fixed exchange rate regime, given that it is just an additional country being a part of a monetary union. This EMU period led to the financial meltdown of the Greek economy, to a 100 billion Euros controlled public debt default (2012-2013), capital controls (2015) and opened the discussion of an EMU exit, which further underlines the aforementioned perspective of Mundell.[13]

We will now proceed by focusing indicatively on a key macroeconomic indicator, i.e. Gross Domestic Product (GDP), for all six focal SEE countries. Thus, it should be reported that the GDP in Slovenia in was worth 48.77 billion US dollars in 2017. The GDP value of Slovenia represents 0.08 percent of the world economy and it averaged 32.75 USD Billion from 1990 until 2017, reaching an all time high of 55.59 USD Billion in 2008 and a record low of 12.52 USD Billion in 1992 (for the 1990-2017 period). GDP in Greece was worth 200.29 billion US dollars in 2017. The GDP value of Greece represents 0.32 percent of the world economy and it averaged 111.89 USD Billion from 1960 until 2017, reaching an all time high of 354.46 USD Billion in 2008 and a record low of 4.45 USD Billion in 1960. GDP in Bulgaria was worth 56.83 billion US dollars in 2017. The GDP value of Bulgaria represents 0.09 percent of the world economy and it averaged 28.10 USD Billion from 1980 until 2017, reaching an all time high of 57.42 USD Billion in 2011 and a record low of 9.70 USD Billion in 1994. GDP in Romania was worth 211.80 billion US dollars in 2017. The GDP value of Romania represents 0.34 percent of the world economy and it averaged 96.67 USD Billion from 1987 until 2017, reaching an all

---

[13] Mundell since 1997 has been stressing, if not questioning, if Greece was capable of joining EMU. Before doing so, the national public debt over GDP was 110%, the short-term interest rates were high and the economy had been running a twin deficit, i.e. both a budget and a current account one. There was a European consensus that by adopting the Euro the country would improve its macroeconomic imbalances, while the geostrategic position of the country was expected to counterbalance the 'costs' of the entrance (Mundell, 1997). Therefore, it is evident that the country was not fully prepared for such an accession. It is also important to stress that once the county joined the Eurozone it was not monitored effectively and it was not effectively guided to meet the Maastricht criteria until the 2008 crisis. The country failed to respond to this crisis and the question that remains open is how the economy would have reacted if it was monetarily independent (see also 2.2.3 for further analysis of the case of Greece).

time high of 213.61 USD Billion in 2008 and a record low of 25.12 USD Billion in 1992. GDP in Croatia was worth 54.85 billion US dollars in 2017. The GDP value of Croatia represents 0.09 percent of the world economy and it averaged 38.74 USD Billion from 1990 until 2017, reaching an all time high of 70.48 USD Billion in 2008 and a record low of 10.28 USD Billion in 1992. Last but not least, GDP in FYROM was worth 11.34 billion US dollars in 2017. The GDP value of FYROM represents 0.02 percent of the world economy and it averaged 6.58 USD Billion from 1990 until 2017, reaching an all time high of 11.36 USD Billion in 2014 and a record low of 2.32 USD Billion in 1992.

3.2 Data Description

In this section thel four variables for the six countries under study will be presented graphically and described briefly on an individual basis. The data range (starting and ending date), frequencies, units of measurement and sources will be stated.

3.2.1 Data Description for the Industrial production index (IPI)

The first variable, industrial production index (IPI), is commonly used as a proxy for production growth. This is preferred instead of Gross Domestic Product (GDP) because the frequency of the IPI is available on a monthly basis, instead of a quarterly one, which is the case with GDP. This choice is made because it enables us to expand the available sample, and also balances more effectively the different frequencies (varying from daily to monthly) of the investigated variables. More specifically, interest rates that are available on a daily basis are transformed into monthly rates, instead of quarterly which would have been the case if we had selected to utilise GDP.

The data for the Bulgarian IPI is obtained from the National Statistical Institute of Bulgaria from 1st of January 2002 (available since the 1/1/2001) until 31st of December 2016. The frequency of data, as stated above is monthly and the units of the index are transformed into percentage changes from the previous year. It has to be noted that 2010 is used as the base year i.e. 2010=100.

Data for the Croatian IPI is obtained from the Statistical Office of the Republic of Croatia (Croatian Bureau of Statistics) from 1st of January 2002 until 31st of December 2016, even though the available start date is 1st of January 2000. The frequency of the data, as stated above is monthly and the units of the index are transformed into percentage changes from the previous year.

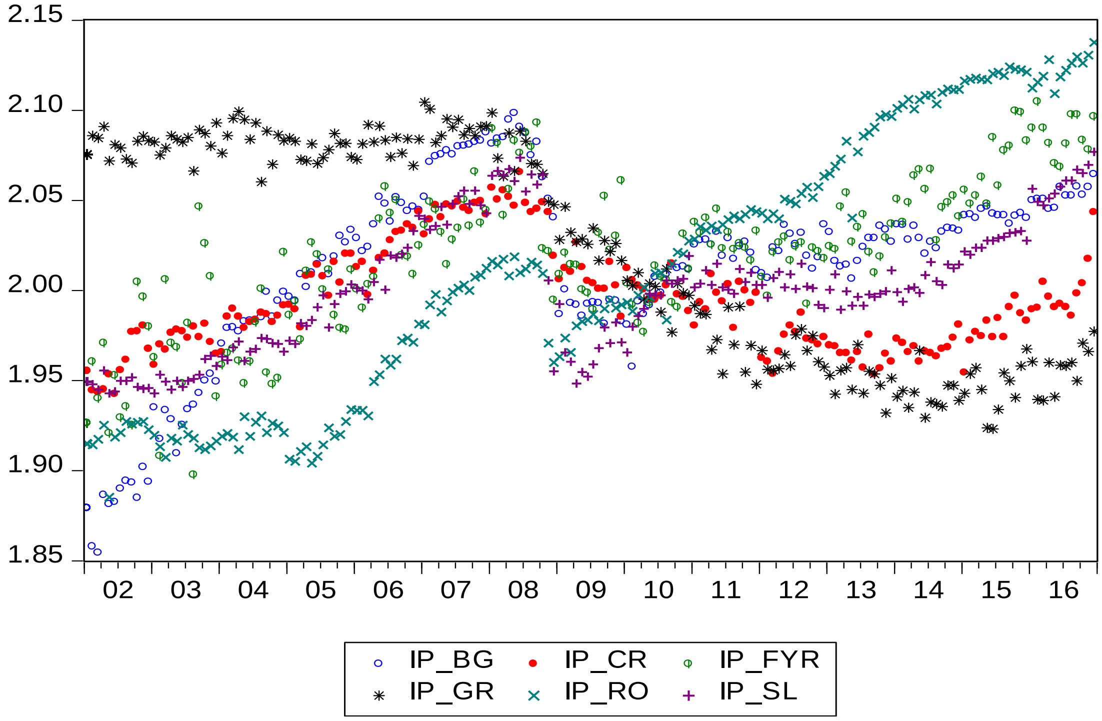
Data for the IPI of FYROM is obtained from the Bank for International Settlements (BIS) from 1st January of 2002 until 31st of December 2016. The frequency of data is monthly and the units are in percentage changes from the previous year.

Data for the Greek IPI is provided by the Hellenic Statistical Authority from 1st of January 2002 (the variable is available since 1/1/2000) until 31st of December of 2016. The frequency of the data is monthly and the units of the index are transformed into percentage changes from the previous year. It has to be noted that 2010 is used as the base year i.e. 2010=100.

Data for the Romanian IPI is obtained from the National Statistical Institute of Romania from 1st of January 2002 (available since 1/1/2001) until 31st of December 2016. The frequency of the data, as stated above is monthly and the units of the index are transformed into percentage changes from the previous year.

Data for the Slovenian IPI is obtained from the Statistical Office of the Republic of Slovenia from 1st of January 2002 until 31st of December 2016. The frequency of the data is monthly and the units of the index are transformed into percentage changes from the previous year.

Figure 3-1: Industrial production index (IPI): Bulgaria, Croatia, FYROM, Greece, Romania, Slovenia



Source: National Statistical Institute of Bulgaria; Croatian Bureau of Statistics; Bank for International Settlements (BIS); Hellenic Statistical Authority; National Statistical Institute of Romania; Statistical Office of Slovenia.

As expected, and similarly to the provided brief economic review above, the peak of the IPI, i.e of the used proxy for the GDP growth of the economies, is in 2008, just before the collapse of the Lehman Brothers. Since then there is a sudden drop and a slowdown for the next three years and afterwards, excluding Greece –that was under a continuous bailout program- and partly Croatia, the economies grow at different rates.

3.2.2 Data Description for the Real Effective Exchange rate (REER)

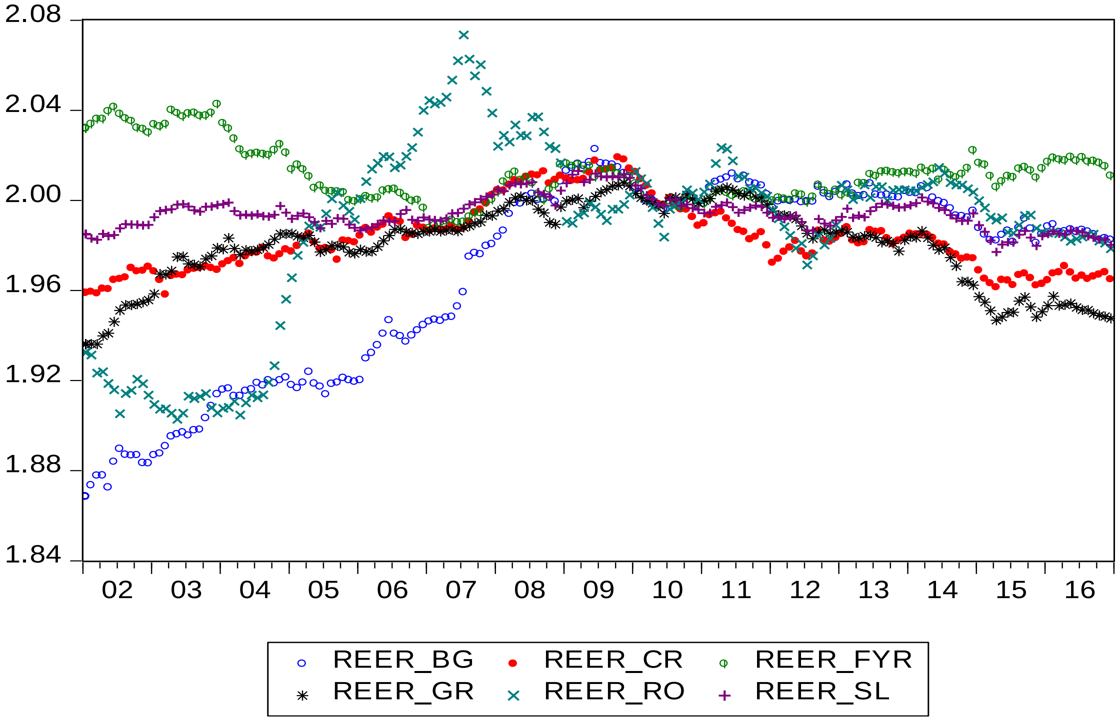
The second variable is the Real Effective Exchange Rate (REER). The chosen variable blends the exchange rate to the purchasing power parity by incorporating inflation, which means that the variable is a proxy for the competitive stance of the investigated country. More precisely, the REER is the nominal effective exchange rate

–a measure of the value of a currency against a weighted average of several foreign currencies– divided either by a price deflator or the index of production costs.

Data for the Bulgarian economy is collected by the Bank for International Settlements (BIS) from 1st of January 2002 to 31st of December 2016 and is in the form of percentages. The variable is also available through the World Bank. The frequency of observations is monthly. Availability for this data starts from the 1st of January 1992, but we collect data from 2002 onwards to have a common starting date with the rest three variables (and all six countries) in the final model.

Data for the Croatian economy is similar to the case of Bulgaria above and the same applies for the cases of FYROM, Greece, Romania and Slovenia. In the case of Greece the variable is also available from the World Bank starting from 1980 and using 2000 as the base year, while in the cases of Romania and Slovenia the variable is also available from the World Bank with a starting date of 1st of January 1991 and 1970, respectively. In all cases we start at 2002 in order to have a common starting date for all four variables (and all six countries) in the final model.

Figure 3-2: Real Effective Exchange Rate (REER): Bulgaria; Croatia; FYROM; Greece; Romania; Slovenia



Source: Bank for International Settlements (BIS)

Following the IPI pattern that was described before, with a lead or a lag, the peak of REER, i.e. the used proxy for the real growth of the economies in an international monetary context, is in 2007 for Romania and 2009 for the rest of the economies excluding FYROM that had been performing "better" in early 2000. It is important to stress though that there is a steady decline of REER since 2009 for the focal countries, which in terms of REER it means that these economies become more competitive comparatively speaking, given that REER is interpreted inversely, opposed to IPI.

3.2.3 Data Description for the Foreign exchange reserves (FS)

The third variable is the foreign exchange reserves of the Central Bank. Data for the Bulgarian economy is obtained from the National Bank of Bulgaria from 1st of January 2002 (available since 1/1/1996) until 31st of December 2016. The frequency of the data is monthly and the values are in millions of Lev. The units are transformed into percentage changes from the previous year, while the prices are current ones.

Data for the Croatian economy is obtained from the National Bank of Croatia from 1st of January 2002 until 31st of December 2016. The frequency of the data is on a monthly basis and the values are in millions of Euros. The units are transformed into percentage changes from the previous year. Prices are current ones. The available start year was 1993, but we have chosen 2002 to have a common starting date for the entire data set.

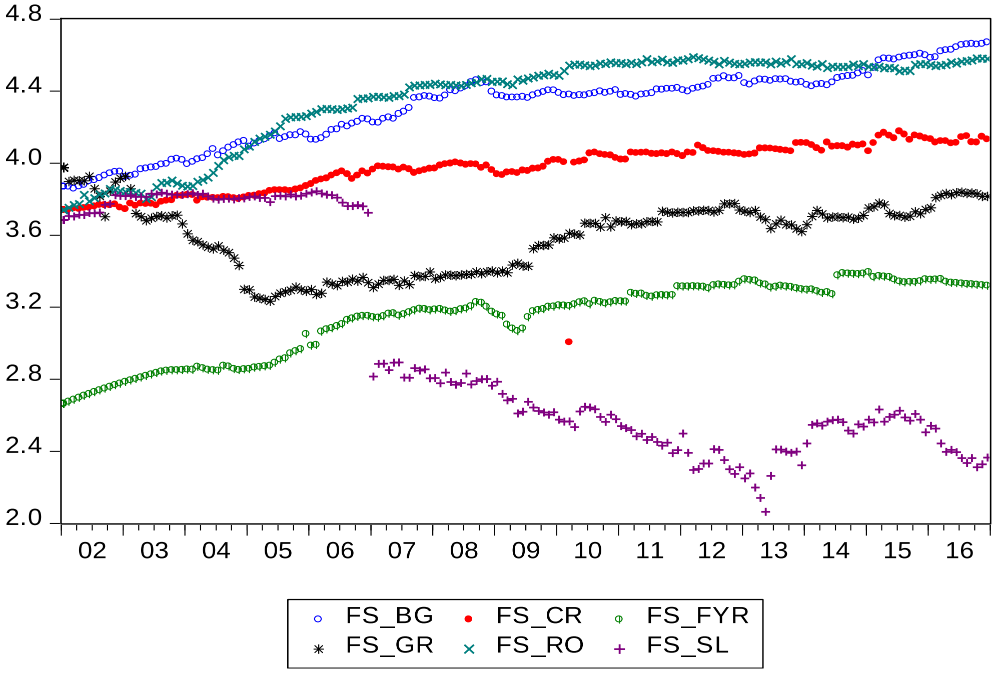
Data for the economy of FYROM is obtained from the National Bank of the country from 1st of January 2002 (available since 1/1/2000) until 31st of December 2016. The frequency of the data is on a monthly basis and the values are in millions US dollars. The units are transformed into percentage changes from the previous year. Prices are current ones, and the values for this county are not excluding gold, given that this variable is not reported by the Central Bank without it.

Data for the Greek economy is obtained from the Bank of Greece from 1st of January 2003 until 31st of December 2016. The frequency of the data is monthly and the values are in millions of Euros. The units are transformed into percentage changes from the previous year, while prices are current ones. According to the Bank of Greece (2015) Foreign Exchange Reserves are the foreign assets held or controlled by the central bank. It has to be noted that the reserves are either made of gold or a specific currency. Special drawing rights and marketable securities denominated in foreign currencies −like treasury bills, government bonds, corporate bonds and equities and foreign currency loans− are also included.

Data for the Romanian economy is obtained from the National Bank of Romania from 1st of January 2002 (available since 1/1/2000) until 31st of December 2016. The frequency of the data is monthly and the values are in millions of Euros. The units are transformed into percentage changes from the previous year, while prices are current ones.

Data for the Slovenian economy is obtained from the National Bank of Slovenia from 1st of January 2002 until 31st of December 2016. The frequency of the data is monthly and the values are in millions of Euros. The units are transformed into percentage changes from the previous year, prices are current ones, and the available starting year of this variable is 1st of January 1995. The 2007 entry of the county to the Eurozone is responsible for the observed structural break that takes place since the 1st of January of that year, given that the reserves are not needed anymore in defending a fixed exchange rate regime or the transition to the EMU based on Maastricht Criteria. The same applied for the case of Greece since the 1st of January of 2002.

Figure 3-3: Foreign exchange reserves: Bulgaria; Croatia; FYROM; Greece; Romania; Slovenia



Source: Bulgarian National Bank; National Bank of Croatia; National Bank of FYROM; Bank of Greece; Romanian National Bank; National Bank of Slovenia

As it can be observed on the figure above (3-3) Foreign Reserves are not following neither the IPI nor the REER trend, but they follow their own path. It is important to focus on the discontinuity of the data set of Slovenia in 2007, which is clearly attributed to the EMU entry of this country on the 1st of January of that year. Greece, as stated, joined EMU on 1st of January of 2002, and thus the sudden drop of Foreign Reserves is not evident on the figure above (historically though a similar sudden drop is evident compared to the 2001 data for Greece). The remaining FS of Greece throughout the observable 2002-2016 are rather stationary, econometrically speaking, and are related to the needs of FS for international trade purposes. The rest of the countries, i.e. the non-EMU ones, are steadily increasing their FS throughout the observable period.

3.2.4 Data Description for the Interest rate (the money market rate) (I)

The fourth variable is the interest rate (or the money and market rate). For the case of Bulgaria we use the 1-day interbank rate as a proxy for the interest rate. The data is obtained from 1st of January 2002 to 31st of December 2016, even though the available starting date is 1st of January 1992. The 1-day rate is chosen, instead of the 3-month rate, because the starting date of the latter is 1st of January of 2003. Values are available on a daily frequency and thus, we use an aggregation method (using the average) to transform values into monthly ones. The variable is in percentages, and the source is the Bulgarian National Bank.

For the case of Croatia we use the Croatian Central Bank rate, as an official proxy of the interest rate. The source is the National Bank of Croatia, with data obtained from the 1st of January of 2002 to the 31st of December of 2016. Values are available on a monthly basis, the variable is in percentages.[14]

For the case of FYROM the official interest rate as a proxy of the interest rate as stated by the National Bank of this republic is chosen. Data is obtained from the 1st of January of 2002 to 31st of December of 2016. Values are available with a daily frequency and thus, we use an aggregation method (using the average) to transform values into monthly ones. The variable is in percentages. The source is the National Bank of FYROM.

For the case of Greece the ideal would be to use the three month interbank rate as a proxy for the interest rate, but given that the Greek commercial banks were not part of the interbank offered rate, for the given collapse of the economy since 2010, it would be misleading to use this rate as an interest rate related variable. Thus, we choose not to use ECB rate, i.e. the equivalent of the Federal Funds rate, or the Euribor as stated, but the Greek 10-year bond, which acts as a benchmark for the monetary conditions of the economy. The reason we follow this approach is to capture more effectively the dynamics of these variables. Data is obtained from the

---

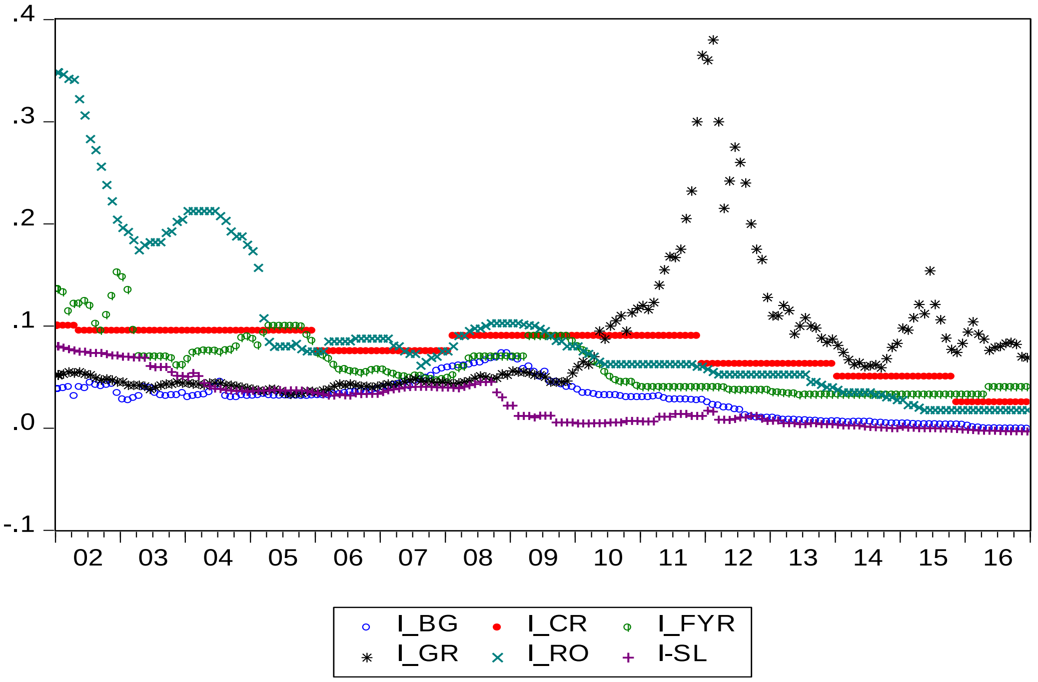
[14] The three month interbank rate, named as ZIBOR, was not available for the required dataset at the stage of the data collection of this thesis.

Public Debt Management Agency (PDMA) of Greece from 1st of January 2002 to 31st of December 2016, even though the available start date is 1st of January 1999. Values are available on a daily frequency and thus we use an aggregation method (using the average) to transform values into monthly ones. The variable is also available in percentages.

For the Romanian economy the three month interbank rate as a proxy of the interest rate is used. Data is obtained from the 1st of January of 2002 to 31st of December 2016. Values are available on a daily basis and thus, we use an aggregation method (using the average) to transform values into monthly ones. The variable is in percentages. The source is the National Statistical Institute of Romania.

Last but not least, for the case of Slovenia the three month interbank rate (SITIBOR) as a proxy for the interest rate is chosen. Data is obtained from the 1st of January of 2003 to 31st of December of 2016. Values are available on a daily basis and thus, we use an aggregation method (using the average) to transform values into monthly ones. The variable is in percentages. The source is the Ministry of Finance of the Republic of Slovenia.

Figure 3-4: Interest rate: Bulgaria; Croatia; FYROM; Greece; Romania; Slovenia



Source: Bulgarian National Bank; National Bank of Croatia; National Bank of FYROM; Bank of Greece; National Statistical Institute of Romania; Ministry of Finance of the Republic of Slovenia

Last but not least, as it can be observed on the figure above (3-4), the Interest rates are having, comparatively to the rest of the variables, considerable differences. Excluding the first three to four observable years, i.e. from 2002 to 2004, where the Romania Interest rate is moving downwards in meeting the tendency of the rest of the interest rates, the variables are showing clear signs of co-movement up to September of 2008, i.e. the month that Lehman Brothers collapsed. From that month and on, the Greek Interest rate increased exponentially showing towards the coming, at that time, market failure and the collapse of the entire economy. The bailout programs, that were introduced, drove the Interest rate of this country down, and since then −excluding the 2015 new, politically related, shock that drove the Interest rate up again−this focal variable is showing signs of an adjusting trend, that takes place though with a delay and keeps on being of a higher risk premium.

Chapter 4 - A G-VAR model for determining the impact of monetary policy on nominal and real variables of SEE countries in an EMU context

4.1 Introduction to the G-VAR Model

There is a growing body of research that uses, amongst other methodologies, G-VAR models to study the interactions between economies. The theory and practice of G-VAR modelling is broadly discussed by Pesaran (2015; 2014) who introduced the model back in 2000 and elaborated and applied it with various co-authors (Chudik and Pesaran, 2014; Dees, Di Mauro, Pesaran and Smith, 2007; Pesaran and Smith, 2006; Pesaran, Schueramann, Treutler and Weiner, 2006; Pesaran, Schueramann and Weiner, 2004, etc.). According to these key researchers the G-VAR has proven to be a very useful approach to analyse interactions in the global macroeconomic environment, where both the cross-section and the time dimensions are large. Their work surveys the latest developments in G-VAR modelling, examining both the theoretical foundations of the approach (Chudik and Pesaran, 2014) and its numerous empirical applications (Pesaran, 2015). Moreover, it has to be noted at this point that Pesaran (2014) provides a synthesis of existing literature and also highlights areas for future research.

G-VAR models apart from capturing the international co-movements and interlinkages of the investigated variables, they are also more flexible compared to VAR and VEC models[15], in addressing varying co-variations across variables and also

---

[15] See Appendix H for a theoretical and analytical presentation of VECM and their linkage to GVARs and the next footnote (16).

they analyse more efficiently the long-run dynamics and the cointegrating properties of the series. At this introductory stage of the methodological presentation of this thesis, we provide an example of a cointegrating G-VAR in a Vector Error Correction (VEC) format that could be written as such:

$$\Delta X_{it} = B_i dd_t - \Pi_i Z_{it-1} + B_i 0^* \Delta X^*_{it} + U_{it} \qquad (4.1)$$

where $Z_{it-1} = (X_{i't-1}, X^*_{it-1})$ and $\Pi_i = (I - B_i 1, - B_i^* 0 - Bi^* 1)$

This is a form that accommodates long-run solution and the existence of cointegration between X_{it} and $X^*_{it,}$ where X_{it} stands for the set of all domestic variables, and Δ for the first difference, while X^*_{it}, which is equal to $\Sigma W_{ij} x_{jt} = W_i x_{t,}$ are the foreign variables and are computed as cross-sectional averages with weights W_{ij}, allowing for interlinkages between each of the economies and the rest of the world and the proxy unobserved global factors as well, while, the Z_{it-1} is the domestic and the foreign variables with one lag. The U_{it} and the $B_i dd_t$ are the error terms and the vector of intercepts respectively.

On top of that, general impulse response analysis (see Section 4.2) is used to capture and analyse the effect of a typical shock (commonly equal to a one standard deviation) on the time path of all variables within the system of the equations. Furthermore in a G-VAR specification, Impulse response functions (IRFs and GIRFs) could be varying overtime, i.e. they are not constant, as they could depend on the time varying distance between monetary fundamentals across different countries (for the fiscal ones see indicatively Favero (2013)).

4.2 The G-VAR methodology

4.2.1 An introduction to G-VAR model

Macroeconomic policy analysis, design and application require taking under consideration interdependencies that exist across markets, union blocks (like EU and EMU), regions (like SEE), and economies. At the same time, national economies must be considered both from a global and a domestic perspective and transmission channels must be studied and understood. A Global Vector Autoregressive model (G-VAR) of the global economy is a model that allows us to do the above. Specifically, G-VARs allow us to analyse and capture the interdependencies within a macroeconomic context and furthermore to understand the transmission channels and the responsiveness of economies to both external and internal shocks that are related to the effects of changing macroeconomic conditions.

This research employs a monthly global model combining individual country vector error-correcting models in which the domestic variables are related to the country-specific foreign variables. The G-VAR is estimated for six SEE countries, namely Bulgaria, Croatia, FYROM, Greece, Romania and Slovenia over the period 2002-2016. The work undertaken contributes both to an academic and practical level in a number of directions including the broader field of G-VAR studies, the area of international economics and relations, monetary economics, economic and macroeconomic policy design and implementation, and real growth.

Particularly, one primary focus will be on the responsiveness of the domestic and foreign variables of SEE economies to shocks that are related to changes of the monetary policy to the Eurozone area, as quantified via Euribor, and to the policy related Real Effective Exchange Rate as well. All the above will allow this research to continue with economic policy suggestions and to identify the extent up to which the exchange rates and the exchange rate regimes are stable and sustainable. On top of that, such a fact, combined with proper economic policies, will allow us to further understand how SEE countries could be further integrated with and within EMU.

Chudik and Pesaran (2014) and Dees et al. (2007) provide a framework that will help us not only with the proper implementation of a robust G-VAR, but with the interpretations of the results as well. Apart from considering such a theoretical and empirical framework, and replicating it as well for the SEE region in an EMU context, we will manage to follow its rationale in order to blend these interpretations more effectively with our final conclusions.

The first key consideration before we proceed is related to the relatively large set of variables. This set must be endogenously determined within the G-VAR model, which is a factor-augmented high dimensional model. Such a model allows us to capture the general pattern of the existing interlinkages that are evident between the variables but cannot be estimated as such. This fact is directly attributed to the "curse" of dimensionality when the cross-section dimension of the data set is quite large.

Chudik and Pesaran (2014), apart from stressing the "theoretically coherent" and "statistically consistent" importance of the G-VAR models, and also given that they stress that G-VAR models were not the first large universal macroeconomic models of the global economy that were introduced (for an effective overview of the Global Models see Granger and Jeon, 2007), they clearly report that G-VAR models are one of the three commonly applied solutions to the "curse of dimensionality", next to factor-based models and Bayesian VARs.

The econometrical and theoretical solution of this "curse" is provided on their research paper (see Chudik and Pesaran, 2014) and there is no reason to replicate it here, for the given scope of this thesis. Thus, we make a reference to this important and critical paper not only in the context of the "curse of dimensionality" and the specific G-VAR solution, but also on the theoretical and structural G-VAR related issues of the "Large Scale VAR reduced form representation of data", the "introduction of 'common variables'", either as observed or unobserved common factors (defined also on Chudik and Pesaran, 2013) and the theoretical justification of the G-VAR approach overall. Not only in the context of approximating a global factor model (see Dees et al., 2007), but in approximating factor augmented stationary high dimensional VARs as well (see Chudik and Pesaran, 2011).

The conducting of the aforementioned and especially of the Impulse Response Functions (as Generalized ones, i.e. as GIRFs) and the respective analysis within a G-VAR context is going to be presented here briefly, but it is essential to remember that the practical application of it (see Section 5) will be merging theory with the specific results that are generated by the empirical part of this thesis.

Still, it is useful to repeat (see Section 4.2.7 on appendix H) that instead of the Orthogonalized approach that was introduced by Sims (1980) to identify and introduce the shocks to the model via Cholesky factor, the G-VAR model manages to skip the above related constraint of the importance of ordering of variables, by allowing us to use any ordering of variables, without raising any problems to the ability of the model to identify and quantify properly the time frame of the shocks, no matter if they are single shocks or subsets of shocks (see Dees et al., 2007). This solution will be analysed further on the Generalized Impulse response analysis within G-VARs (see Section 4.2.8).

4.2.2 Unit root tests

When testing the stationarity properties of the investigated variables, the standard ADF t-statistics are the ones that are commonly used on the G-VAR. Additionally, the Weighted Symmetric estimation of ADF type regressions (Park and Fuller, 1995) are denoted by WS. The WS statistic takes advantage of the time reversibility of 'stationary auto-regressive processes' and by doing so it manages to boost their power performance. Leybourne et al. (2005) and Pantula et al. (1995) support theoretically and show practically in a statistically significant manner, why the WS statistic should be preferred not only compared to the ADF one, but to the GLS-ADF one that was introduced by Elliot et al. (1996).

The lag length used by the two G-VAR unit root related statistics, the WS and the ADF one, are selected either through the Akaike Information Criterion (AIC) or the Schwartz-Bayesian Criterion (SBC) (see Section 4.2.4 for an analytical presentation of the lag selection criteria on appendix H). As expected, given that the integration of every variable is important for the stability of the finally used model, both statistics are provided for the level, first and second differences. Not only for the domestic variables, as it is common for a simple Vector Autoregressive model, but for the foreign (star) variables and global (shock related) variables too. Needless to add that the above hold and are provided not only for the country specific variables (as in our case) but for region-specific (if applicable) variables too. Last but not least, an 'intercept' is being added on the estimated ADF and/or WS regressions both for the first and second difference related results.

4.2.3 Specification and estimation of the Country-Specific Models

On this subsection we will briefly address the lag order selection of the individual VARX* models, the estimation of the individual VARX* models, considering the deterministic components of the VECMX*, and the residual serial correlation test.

4.2.3.1 The lag order selection of the individual VARX models*

As already stated, the two G-VAR unit root related statistics, the WS and the ADF, are selected either through the Akaike Information Criterion (AIC) or the Schwartz-Bayesian Criterion (SBC). The same two lag length criteria (see Section 4.2.4 for an analytical presentation of these criteria on appendix H) are not related only to the lag selection of the regressions being used for the stationarity properties testing, but on the lag structure of the VARX* model, which in practice is more important for the construction and the estimation of the final G-VAR model.

4.2.3.2 The estimation of the individual VARX* models

The respective equations that the two criteria use (AIC and SBC) are provided in their general form and structure before (see Section 4.2.4. on appendix H). Here, apart from repeating the two steps, i.e. the first one which is the estimation of the country-specific VARX, and the second which is the combination of country-specific VARX into a global model, we have to add that by abstracting the global observed variables, the country (or region) specific VARX* model is expressed in a general common form, where x is regressed on its own lagged values. The lag orders pi and qi of both domestic and star variables are selected by the aforestated criteria.

Thus the form of a VARX*, in a VECM* and specifically a VARX(1,1) model written as error correction form model looks like the following one, which is a country specific VECMX*:

$$x_{i,t} = \Phi_i x_{i,t-1} + \Lambda_{i0} x_{i,t}{}^* + \Lambda_{i1} x_{i,t-1}{}^* + u_{i,t}$$

$$x_{i,t} - x_{i,t-1} + x_{i,t-1} = \Phi_i x_{i,t-1} + \Lambda_{i0} x_{i,t}{}^* - \Lambda_{i0} x_{i,t-1}{}^* + \Lambda_{i0} x_{i,t-1}{}^* + \Lambda_{i1} x_{i,t-1}{}^* + u_{i,t}$$

$$\Delta x_{i,t} = -(I - \Phi_i) x_{i,t-1} + (\Lambda_{i0} + \Lambda_{i1}) x_{i,t-1}{}^* + \Lambda_{i0} \Delta x_{i,t}{}^*$$

$$\Delta x_{i,t} = a_i (\beta'_{ix} x_{i,t-1} + \beta'_{ix*} x_{i,t-1}{}^*) + \Lambda_{i0} \Delta x_{i,t}{}^*$$

$$\Delta x_{i,t} = a_i ECM_{i,t-1} + \Lambda_{i0} \Delta x_{i,t*} \qquad (4.2)$$

Where the Error Correction Model related term, i.e. the vector of long-run cointegrating relations, known as error correction terms (ECT) is:

$$ECM_{i,t-1} = \beta'_{ix} x_{i,t-1} + \beta'_{ix*} x_{i,t-1}{}^* \qquad (4.3)$$

Thus, in estimating the individual VARX* models we are in practice using a Vector Error Correction form (VECMX*) that allows for the possibility of cointegration both among the domestic variables and among the domestic and star variables as well (x_{it} and x_{it}*) and across $x_{i,t}$ and $x_{j,t}$ for i being different than j.[16]

The VARX* models, as stated, are country-specific, which means obviously that they are being estimated for every country separately conditional on star variables (x_{it}*), through reduced rank regressions and by quantifying the cointegrating relations that are already stated. By doing so, the number of cointegrating relations, let's say ri, the coefficients of the speed of adjustment, αi, and the vectors of cointegration, βi, are derived from every country specific model.

For the estimation of $\beta i = (\beta'_{ix}, \beta'_{ix*})'$ and of the other related parameters we need to take two steps. First, the rank of $\alpha\beta_i'$ is determined through the Johansen's Trace statistics and maximal eigenvalue statistics as they are set out in Pesaran et al. (2000) and β_i' is estimated by imposing suitable exact or possibly over-identifying restrictions on the elements of β_i'. The second step, conditional on a given estimate of β_i', the rest of the parameters of the VECMX* model are 'consistently' estimated by OLS regressions of the following form: $\Delta x_{it} = \alpha_i ECM_{i,t-1} + \Lambda_{i0}\Delta x_{it^*}$, where the EC term corresponds to the r_i cointegrating relations of the i^{th} country-specific model. For a more detailed description of the above see Chudik and Pesaran (2014), Smith and Galesi (2014), and Chudik and Pesaran (2013).

*4.2.3.3 The deterministic components of the VECMX**

The deterministic components of the VECMX* estimation of the country-specific models allow us to impose or not restrictions on the intercepts and/or on the trend coefficients (see Pesaran et al., 2000; MacKinnon et al. 1999). The commonly used cases are: restrict none, restrict intercept and not the trend coefficients and un-restrict intercepts and restrict trend coefficients. On the second and third case as just

---

[16] It has to be added that for estimation purposes of the model, star variables (xit*) has to be treated as integrated of order one (i.e. as I(1) and also as weakly exogenous with respect to the parameters of the VARX* model) or differently stated as "long-run forcing" variables.

stated the intercept and trend coefficients –if restricted– are restricted in order to lie within the cointegrating space.

In our case, as in most of the macroeconomic applications, where the investigated variables have deterministic trend related components, and given that the related long-run multiplied matrix is rank-deficient, the proper VECMX* is given by the third stated case, i.e. with unrestricted intercepts and restricted trend coefficients. It is also important to note that the absence of a deterministic trend in the model, for the second stated case, does not mean that the levels of the domestic variables will not be trended, given that they are due to the "drift coefficients".

4.2.3.4 Testing for residual serial correlation

As far as the residual serial correlation test is concerned, we must report that this test takes place through an F statistic of the known Lagrange Multiplier (LM) family of statistics (Godfrey 1978a; 1978b). This statistic tests for a possible presence of residual serial correlation and thus allows us to deal not only with the country-specific residual serial correlation, but with the cross-country correlation of the residuals as well.

This test can be done by 'conditioning' the domestic variables on weakly exogenous star variables (the foreign variables that are being used as 'proxies', i.e. approximations of the 'common unobserved global' factor or/and factors). By doing so we manage to reduce the degree of correlation of the residuals that exist across countries and/or regions and subsequently we avoid a "weak cross-sectional dependence". In practice we can say that we manage to "clean" the residuals from any effect that comes from the 'global factors', and thus we reach a position where we are allowed to interpret the related shocks in an international context.

In terms of dealing with the country-specific correlation of the residuals, if the residuals are cross-sectionally weakly correlated, a standard identification scheme can be applied to the country-specific VARX* model. For example the Cholesky factor of the covariance matrix of the residuals of a country could be used (see for example Cesa-Bianchi, 2013).

4.2.4 The weak exogeneity test

The key assumption that underlies the estimation of the country-specific VARX* models is that of the potential weak exogeneity. This means that the star variables, x_{it}^* (foreign variables) must be weakly exogenous with respect to the domestic ones, x_{it}. Thus we cannot afford to face long-run feedbacks running from x_{it} to x_{it}^*, without though 'ruling out' lagged short-run feedbacks between the two sets of variables (Granger and Lin, 1995; Johansen, 1992). Especially given that the star variables are generated by the domestic ones through the use of the trade weight matrix. This assumption and the respective test of it, ensures that the star variables are "long-run forcing" for the domestic variables, suggesting that the coefficients of the estimated Error Correction Terms (ECTs) of the individual country VECMX* are not included in the structure of x_{it}^*. Before we proceed with the format of this test, we need to stress that the assumption of weak exogeneity is consistent with a given degree of weak dependence across the error terms (see Pesaran et al., 2004).

The auxiliary regression that we use, based on Johansen (1992) and Harbo et al. (1998), includes the testing of the joint significance of the coefficients of the estimated ECTs for the individual country star variables. Thus, it takes the following form:

$$\Delta x_{it,l}^* = \mu_{il} + \sum \gamma_{ij,l} ECM_{i,t-1} + \sum \phi_{ik,l} \Delta x_{i,t-k} + \sum \vartheta_{im,l} \Delta \tilde{x}_{i,t-m}^* + \varepsilon_{it,l} \qquad (4.4)$$

for each l^{th} element of the foreign variables x_{it}^*. The joint significance of the coefficients of the ECT is tested by the following null hypothesis with the use of an F-statistic:

$$H_0: \gamma_{ij,l} = 0 \text{ for } j = 1,2,\dots,r_i$$

Note that the orders of the lagged changes of the domestic and star variables, p and q respectively −that do not have to be of the same order and can be selected either by the AIC or the SBC− are related to the end points of the summations that start from k being equal to one, and m being equal to one, respectively on the φ and θ related components, as it can be seen above. Still, the increase of q tends to reduce the number of statistically significant results of the investigated country. As expected, to continue, if the F-test allows us not to reject the above stated hypothesis, then the weak exogeneity assumption is being met.

Needless to add that the weak exogeneity test drives us to a proper specification of the individual country models and subsequently, overall, the non-violation of this assumption allows us to include the −weakly− exogenous star variables in the VARX* models.

4.2.5 The structural stability tests and the solution of the final G-VAR and the associated eigenvalues, persistent profiles and bootstraps

Structural breaks are possible and frequent, apart from acute, in the case of emerging economies. Economies like the SEE ones are exposed to further turbulence and face significant changes due to political and even social turnovers.

As expected the G-VAR modelling is not "immune" to this problem, and unfortunately according to Dees et al (2007) even though there is a substantial research on this area we do not actually know that much in testing efficiently the model breaks. The main problem and the constraint that arises from the above is related to our inability to quantify properly the possibility of future breaks, even though the "in-sample" breaks are captured via Bayesian and other procedures (Pesaran et al., 2006; Clements and Henry, 1999, 1998; and Stock and Watson, 1996). These breaks are of course important both for policy purposes and for forecasting purposes.

Dees et al. (2007) underline that given the individual country specific models (VARX*) within the G-VAR context are specified based on the conditionality of the star variables (i.e. the foreign variables) we can overcome the structural related problems. For example in the context of our research the short-term Interest rate and the Foreign Exchange Reserves equations are subject to structural breaks. The first ones due to their sensibility in various internal and external shocks and the second ones based on the fact that Foreign Reserves are not needed once a country joins the EMU (what has also happened in Greece and Slovenia). The above events, which constitute structural break in the sample, are roughly probable in occurring at the same timeframe in the other SEE countries. Thus, theoretically at least, given that in the country-specific models short-term interest rates equations could be specified conditional on the EMU Euribor, they do not have to be subjected to identical structural breaks, as long as these can be confined to an EMU model. The same could occur in the case of the Foreign Reserves also, under the condition that we would choose to add and use the FS in our econometric modelling also from an EMU perspective (i.e. had we chosen to add a third global variable, i.e the EMU FS).

Overall, the above treatment and phenomenon was introduced to macroeconometric modelling by Henry (1996) and was tested further by Hendry and Mizon (1998). To wrap up this part, the common break can be accommodated through the G-VAR structure given that the individual country specific models (VARX*), those underlying the G-VAR, "*might be more robust to the possibility of structural breaks as compared to reduced form single equation models considered, for example, by Stock and Watson (1996)*" (Dees et al., 2007, p. 14).

Stock and Watson (1996) consider a number of structural stability tests that are being used in a G-VAR context in testing and detecting a possible presence of structural breaks. Apart from the cumulative sum (CUSUM) statistic of maximal OLS (Ploberger and Kramer, 1992), Brown et al. (1975) had suggested in advance a statistic similar to the CUSUM , which was based on recursive instead of OLS residuals.

These statistics are used in G-VAR Matlab testing under a PK_{sup} notation. Other statistics being used include Wald type statistics, like the mean Wald statistic (MW) (see Hansen, 1992; Andrews and Ploberger, 1994), the exponential average one (APW) (see again Andrews and Ploberger, 1994) and likelihood ratio statistics (QLR) that focus in capturing a one-time structural change that could occur in any unknown change point of the series (Quand, 1960).

Also, tests for "parameter constancy against non-stationary alternatives", as proposed by Nyblom (1989) are available and used. In our G-VAR framework the heteroskedasticity robust version of Nyblom (1989) and the sequential Wald tests are also available. For a detailed mathematical and statistical consideration of the above see Smith and Galesi (2014), where we are informed that the above should be used, under the given theoretical considerations of this model, without any hesitation.

The null hypotheses follow the common structural stability test framework, where the stability of the parameters of the model is being stated there. The computation of the respective critical values of the aforementioned tests use bootstraps of samples that are obtained from the solution of the final G-VAR.

For an analytical solution and the theoretical considerations and the theoretical justification of the G-VAR framework, in their association to eigenvalues, see Chudik and Pesaran (2014), while for a mathematical and practical presentation of the above see Smith and Galesi (2014). Here we will briefly explain that the country specific VARX* models, as presented above, allow not only for cointegrating relations amongst domestic variables, but between domestic and star (foreign) variables (note that the star variables are country specific cross section averages).

Specifically, following Chudik and Pesaran (2014) we can state that the number of cointegrating vectors in the G-VAR is reflected in the eigenvalues of the companion representation of the same "stacked' model. These values –known as the eigenvalues– capture the dynamic properties of the model and consecutively can be used in examining the stability of the G-VAR model as a whole. In particular, as

Chudik and Pesaran state "*when the overall number of cointegrating relations is r = ∑ ri, then k-r eigenvalues of the G-VAR model fall on the unit circle, and the remaining eigenvalues fall within the unit circle for the model to be stable*" (p. 29).

Cheung and Lai (1993) indicatively provide statistical evidence for small size samples, which prove that the Trace Statistic performs better compared to the Maximum Eigenvalues. Still, both tests are subject to size-based distortions when the number of time series data is not long enough. Also these researchers, though Monte Carlo evidence, show that the Maximum Eigenvalue statistics are less robust "to departures from normal errors".

Overall, in the context of the stability of the G-VAR model, the selection of a proper number of cointegrating vectors is important, given that mis-specifications of the rank order of the cointegrating space can alter significantly the performance of the model as a whole. These alterations can cause a broader instability on the G-VAR model and subsequently persistence profiles (PPs) and Generalized impulse response functions (GIRFs) will jeopardize their credibility and could generate misleading results.

For the remaining stability related concepts, i.e. the persistent profiles (PPs) and bootstraps, Pesaran and Shin (1996) −that were the first to introduce and support the PPs in a G-VAR context− we have to add that the PPs refer to the time profiles of the effects of system or variable-specific shocks on the cointegrating relations in the G-VAR model. Differently stated, PPs are generating information on the adjustment speed of cointegrating relations in their path to dynamic "equilibrium points".[17]

---

[17] In terms of bootstrapping, it has to be stated that the G-VAR model is "bootstrapped", which means that the generated empirical distributions of the PPs and the GIRFs (see the next Section 4.4.8) come directly from the final and estimated format. Also, it has to be added that the bootstrapping is a statistical inferential approach that generates empirical distributions of the associated with the above error bands (both the lower and the upper one) and empirical distributions of the structural stability statistics as well.

4.2.6 The contemporaneous effects of foreign variables on their domestic counterparts

The contemporaneous effects of foreign variables (star variables) to domestic variables are useful in understanding the international interlinkages within the G-VAR model. The estimated coefficients can be interpreted as impact elasticities that capture the domestic and the corresponding star variables relation and are based on standard Newey-West (1987) and White (1980) adjusted variance matrices. High elasticities, as expected, suggest that the related variables are strongly co-moving variables.

The t-ratios make use of standard errors that are heteroskedasticity and autocorrelation consistent. Thus by using Newey-West and White heteroskedasticity and autocorrelation consistent standards errors, we add to the respective robustness of the results. The computation of the Newey-West and White adjusted variance matrices −and specifically the degrees of freedom corrected version of White's heteroskedasticity consistent variance estimator (θ) and the Newey-West variance estimator− allows for a small sample correction (see Smith and Galesi, 2014).

4.2.7 The average pairwise cross-section correlations

Another key assumption, apart from the 'weakly exogenous' star variables assumption, is that the "idiosyncratic" shocks of the specific country models should be cross-sectionally "weakly correlated". In such a way that the covariance of the star variable with the error term −Cov(x_{it}*, U_{it})− should tend to zero as the sample size goes to infinity. The above assumption, and the respective test of it, allow us to ensure that the star variables are weakly exogenous (Dees et al. 2007; Pesaran, 2004). As stated on Dees et al. (2007) "*by conditioning the country-specific models on weakly exogenous foreign variables, viewed as proxies for the 'common' global factors, it is reasonable to expect that the degree of correlation of the remaining shocks across* *countries/regions will be modest. These residual interdependencies [...] could reflect policy and trade spillover effects*” (p. 17).

Thus, in order to measure the extent to which the individual country star variables manage to reduce the cross-section correlations of the investigated variables in the model (G-VAR), the average pairwise cross-section correlations are computed both for the levels and the first differences of the dependent variables and the associated residuals. The computation is delivered not only for every country and for every variable, but for the “pairwise correlation” of each country to the rest of the countries and the average across countries too.

4.2.8 Impulse response analysis with G-VARs

On this last subsection of the theoretical discussion and presentation of the G-VAR model, we will focus on how Generalized Impulse Response Functions (GIRFs) and the related analysis are conducted within the G-VARs. Impulse Response Functions refer to the time-profile of the effects of variable specific shocks on the future condition of any dynamical system and thus, within such a context, to all the variables in a model. The usage of IRFs in a G-VAR framework was introduced by Koop et al. (1996) and was accomplished in a Global VAR context by Pesaran and Shin (1998):

$$y_t = \mu + \sum_{i=0}^{\infty} M_i \, w_{t-1} \tag{4.5}$$

where $E(w_t w'_t) = I_k$. The w_t components, as stated above, are uncorrelated and have a unit variance, meaning that a unit shock has a size equal to a one standard deviation. This helps us to capture the responses to an Orthogonalized shock through the implementation of the following format: $\frac{\partial y_{t+s}}{\partial w_t} = \Psi_s P$. Though, the P aforementioned matrix, forces a “causal“ relationship between variables to occur, and it does so due to an instantaneous representation of the relationships amongst the variables, which in its own turn clearly suggests that, as commonly observed and stated in a G-VAR context (for example see Pesaran, 2007 and appendix H). The ordering of variables –as they are about to be introduced to the G-VAR model– was playing an important role in the results of the Impulse responses (see indicatively Sims, 1980).

The concept of Generalized Impulse Response Functions was upgraded in Koop, Pesaran and Potter (1996), intending to resolve problems that rose in the context of Impulse Response Functions in nonlinear dynamic models, but instead it curved the way in using them to multi-variate time series models like Vector Autoregressive models. The Generalized Impulse Response Functions, as they were expanded by the abovementioned researchers, managed to deal with the three main issues that do rise in Impulse Response analysis, which according to Pesaran (2014, p. 589) are the following:

"*1. How was the dynamical system hit by shocks at time t? Was it hit by a variable specific shock or system wide shocks?*

2. What was the state of the system at time t-1, before the system was hit by shocks? Was the trajectory of the system in an upward or in a downward phase?

3. How would one expect the system to be shocked in the future, namely over the interim period from t+1, to t+n?"

Pesaran and Shin (1997), in order to continue, managed to solve this theoretical and practical problem of 'ordering the variables', by introducing the Generalized Impulse Response Functions (GIRFs) that are known to be "independent from the ordering of variables", and thus, as such, manage to yield more valid results. The General Impulse Response Functions (GIRFs), as stated on Pesaran and Shin (1997), are taking the following form:

$$GI(n, \delta, \Omega_{t-1}) = \mathrm{E}\left(\mathrm{x}_{\mathrm{t+n}} \middle| \varepsilon_{jt} = \delta_j, \Omega_{t-1}\right) - E(x_{t+n} | \Omega_{t-1}) \qquad (4.6)$$

where the Ω_{t-1} is known to be a "*particular historical realization of the process at time t-1*" (Pesaran (2014, p. 589) or differently stated a set of 'historical information' at time t-1, n is the 'horizon' and δ_j is the 'j-th element' of a shock", given always that $E(\cdot\,|\,\cdot)$ is the conditional mathematical expectation with respect to the Vector Autoregressive model.

To wrap up, and given that there is no practical reason within the context of this thesis to replicate the full theoretical framework of the discussion and analysis above, we will make a reference, apart from the aforementioned papers −concerning the diagonal elements of the used matrix, also known as 'persistent profiles'− to Lee and Pesaran (1993) and to Pesaran and Shin (1997). Note though, as stated that the 'persistent profiles' allow us to capture and analyse the speed of convergence towards a dynamic 'equilibrium' in systems that are co-integrated.

Overall, and to conclude, the Generalized Impulse Response Functions of a unit shock to the standard and initial Vector Autoregressive equation, as it was initially introduced by Sims (1980) (see appendix H), assume the ith equation, from a one standard deviation shock to the jth variable at horizon n, is given by the jth element of the provided $\delta_j = \sqrt{\sigma_j^2}$, which in its turn is just a 'unit shock', that could be captured by the following:

$$GI_j = \frac{1}{\sqrt{\sigma_j^2}}\Phi_i U_j \qquad (4.7)$$

Thus, instead of an 'Orthogonalized" Impulse Response functions, the Generalized one (GIRFs) are 'invariant' to the ordering of the variables, in the Vector autoregressive model. Presupposing a stable Vector Autoregressive model, which is a requirement which will be tested and met in building the model that we will be finally used. It is therefore, important to ensure that our model, the G-VAR, will be satisfying the stability condition.

Chapter 5 - Implementation of the methodology – Empirical findings and Analysis

This empirical section is composed of three broader parts. The first part will use and present how the VECM models are applied for each country separately. This analysis will help in the transition to the second and third part that will apply the G-VAR model simultaneously for all six countries, using two different global-shock variables.

More specifically, the first empirical part is using the cointegrating equations in capturing the long run properties of the series within a VECM structure. The second empirical part is using Euribor −plus the star (foreign)[18] variables within a G-VAR structure− while the third empirical part is using the Real Effective Exchange Rate of the Eurozone as the global variable that will be quantifying the external shock of this exchange rate and competition related variable, again with the addition of star variables within a G-VAR structure.

5.1 The VECM models for each country separately

As already stated in the previous chapter (see chapter 4, and Appendix H2.1 for an analytical presentation of the VECM) the form of a VARX*, in a VECM* and specifically a VARX(1,1) model can be written as an Error Correction form Model.

In this empirical chapter the focus is on the impact of monetary policy to the real economy, for each country separately. In order to do so, it is useful to investigate first the cointegrating properties of the variables and the interlinkages that rise between the VEC model.

---

[18] Star variables are the foreign variables that are generated within the GVAR through the trade weight matrices.

In choosing the cointegrating rank of the VEC model (see Appendix H) we will use the Akaike Information Criterion (AIC) for order selection, following indicatively Lütkepohl and Saikkonen (1999) who provide theoretical and empirical reasons in doing so especially for small sample studies. The same practice in terms of preferring AIC instead of the Schwarz-Bayesian Criterion (SBC) is also suggested by Pesaran (2015).

5.1.2 The case of Bulgaria with four variables - **Empirical tests and results**[19]

The empirical tests to be employed in this part are replicating the methodology that was initially introduced –in its very first form– by the research of Granger (1969) and developed further by Sims (1980) to reach indicatively the used Vector Autoregressive form by Quinn et al. (2011). It has to be noted that the criticism of the standard VAR (also known as a reduced-form VAR) as discussed and analysed in the previous theoretical sections (and on Appendix H) drives us not to incorporate concepts like "Granger-causality" and non-Generalized Impulse Response Functions. Instead once the cointegrating properties are addressed, we proceed with an Error Correction Model (ECM), given that the stationarity properties of the series are addressed in advance.

Thus, the applied tests at this part will start from the unit root tests (available in Appendix A, part C1 and C2, for the case of Bulgaria) and then they continue with the cointegration related tests, testing if cointegrating relations exist between the investigated variables, a stage that is a prerequisite for the development of a proper and stable Vector Error Correction Model (VECM).

Within this VECM framework Generalized Impulse Response Functions (GIRFs) are applied, given that the non-generalized IRFs are requesting a specific ordering of the variables, and thus cannot allow us to capture and analyse the dynamics of the

---

[19] A reduced form VAR for the case of Bulgaria is available upon request. See Appendix A for the VECM version of it. Note that the used variables on this version are five instead of four, given that CPI and Exchange rate were merged into REER in the process of this PhD research, and the end date is 2015 instead of 2016 as well.

investigated variables. On top of this, it has to be noted that even if we manage to support different ordering rationally, it would be almost impossible to support it to a proper degree with any financial or monetary theory.

The possible problems of autocorrelation and the normality related distribution of the error term will be tested within the VECM structure, and the results will be interpreted on the main body and be presented on the Appendix. Last but not least, the stability of the finally used VECM will be applied and presented too.

5.1.2.1 Testing for Cointegration

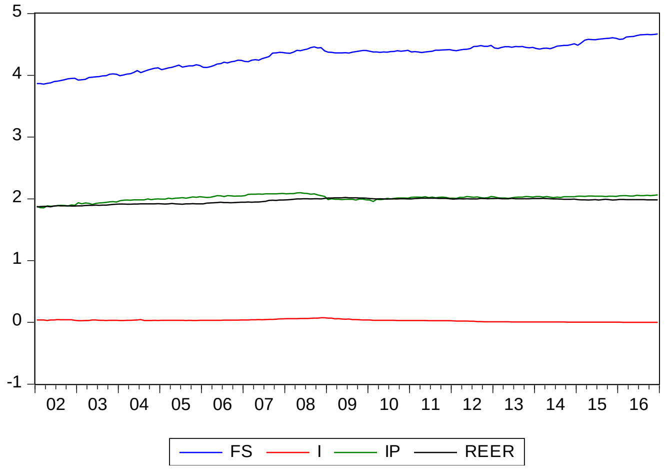
The test for cointegration as stated on the presentation of our applied methodology is conducted within the Johansen framework (see Johansen 1988; Johansen and Juselius, 1990)[20].

In the figure below all four variables are in level, as indicated by the respective literature. Interest rate is in a percentage form, while FS, IP and REER are in logarithms. The application of the Johansen Technique in testing the cointegrating equations (see also Pesaran, 2015, Smith and Galesi, 2014; Brooks, 2014) provide strong evidence that a co-integrating relation exists.

---

[20] This specific test is applied in level variables given that it is expected to exhibit and capture any long–run relationships that might exist between the variables and thus, it would be wrong to de-trend the data by using another level of integration apart from the order of zero. Specifically, it is maintained that "*as long as the two variables are I(1) and are linearly combined, in most cases we expect their combination to be also I(1)*", (Brooks, p. 335). It is further argued that cointegration of variables exists if their linear combination is stationary, which implies that two series are moving together in the long run, eventually establishing long-term or equilibrium related phenomena.

Figure 5-1: Four variables in level from 1/1/2002-31/12/2016. The case of Bulgaria



Lag intervals can change based on the lag length criteria related results that are provided within the proper lag selection of the VEC model. Thus, based on the AIC within the VECM (see Appendix A, part D3 and 5.1.2.2 below) the chosen number of lags is equal to 1 or 2.[21]

Table 5-1: Cointegration results using Trace statistics. The case of Bulgaria

Hypothesized No. of CE(s)	**Trace statistic**	**0.01 critical value**	**0.05 critical value**	**Probability**
None *	60.43141	54.68150	47.85613	0.0022
At most 1	35.44843	35.45817	29.79707	0.0100
At most 2	11.31986	19.93711	15.49471	0.1926
At most 3	0.461716	6.634897	3.841466	0.4968

Note: *Critical values based on MacKinnon-Haug-Michelis (1999)

On the Johansen cointegration table above Trace test indicates 1 cointegrating equation at the 0.01 level, while the same statistic, the Trace test, indicates 2 cointegrating equations at the 0.05 level of statistical significance. Specifically, the first column provides only the null hypotheses, which is the number of

---

[21] Once we assume, before testing, no deterministic trend in data –a choice that could be argued that meets the properties of some of our variables, if the test type includes an intercept but no trend (case 2)– we receive our first cointegrating results. Note that out of the five assumptions (see Appendix A, parts B4, B6 and B8) in terms of time trend and intercept, the first one of no deterministic trend with no intercept and no trend (case 1) is rarely being used and also the quadratic data trend (case 5) is also not used, given that quadratic data trend is not evident in the data sets. Thus, in testing the possible long run co-movements that might exist between the four investigated variables we use for the presentational part of the main body cases 2, 3 and 4. More analytically, these cases of cointegrating equations of Johansen are: case 2, if none of the time series have a time-trend, case 3, for the trending ones, which is being used if 'all trends' are stochastic, while if we have some evidence that some of the series are trend-stationary, then we should use case 4. Unit root results that are trend related are provided on their ADF equation forms on Appendix (see Appendix A, parts C1 and C2).

cointegrating equation or equations, and it would be 'not rejected' –for the chosen level of statistical significance– if the Trace statistic is lower than the respective critical value which is based on the MacKinnon-Haug-Michelis (1999). At 0.01 level of significance we observe that the Trace statistic which is equal to 35.44843 and in the case of the Null hypothesis of 'at most 1 cointegrating equation' (against the alternative of not at most 1 CE) is lower than the critical value of 35.45817, which means that there is not enough statistical evidence not to reject this hypothesis. Thus at 99% we can conclude that there is exactly one cointegrating equation. This presupposes that the first row, of the provided table above, clearly suggests, that at 0.01 level of significance in testing the Null hypothesis of 'none cointegrating equation', against the alternative hypothesis of 'not none cointegrating equation(s)', is rejected, given that the Trace statistic of 60.43141, which is greater than the 0.01 respective critical value of 54.68150.

Thus, from the above results we can state that two out of the four variables appear to be cointegrated, which can allow us to proceed –for the given established at 0.01 level of statistical significance cointegrating equation– with a VECM and the incorporation of the respective Error Correction Term (ECT). An ECT which is expected to be, as it is going to be quantified through the respective coefficient –for the entire cointegrating equation– statistically significant on the final VEC model and negative, as expected, as well. The negative sign shows and captures the return to an 'adjustment' and onto a cointegrating path.

Also, at this stage, it is useful to comment on the exact forms of the cointegrating equations, using one cointegrating vector as it is suggested from the Trace statistic[22] . Specifically, the normalized cointegrating coefficients (available on Appendix A, part B: B2 and B3) are bearing the expected from economic theory signs, amongst which the most interesting is the negative impact 'running' from Interest rate to the Growth proxy, i.e. the IP, suggesting that a drop in Interest rate (I)

---

[22] The equations are provided in the respective tables in Appendix A, part B: B2, B3,B7, both within the Johansen Cointegrating framework and the final VEC, augmented with the global variables, model

boosts IP. Industrial Production is also positively related to FS and to REER, as will be discussed below within the VECM structure. Still, note that the aforementioned are not statistically significant throughout.[23]

5.1.2.2 *The lag length criteria within the VECM structure*

We obtain results that apart from the AIC include the Schwarz-Bayesian Info Criterion (SBC), the Hannan-Quinn (HQ), the sequential modified Likelihood Ratio test statistic (LR), and the Final Prediction Error (FPE).[24]

Note, that all four variables in the VECM are considered to be in their first difference, given that the final model is a stable one in this case. The choice of first differenced variables is supported by the stationarity properties of the time series that applied on the 'unit root' related part (these results are available on the Appendix A, parts C1 and C2, and on the final G-VAR). Thus, overall, based on AIC the chosen number of lags is one, which means that the VEC model to be used is a VECM(1).

5.1.2.3 The Vector Error Correction Model (VECM)

For the given cointegration related results provided above (Section 5.1.2.1) we have grounds to proceed with a Vector Autoregressive Model that will be using an Error Correction Term (ECT), meaning that the final model, at this stage, is a Vector Error Correction Model (VECM).[25]

---

[23] Statistical significance changes in different orderings of variables (implying a possible mis-specification) and thus it is a sensitive matter that would be addressed more effectively within the VECM with the two Global variables (the global variables become the main 'drivers' of the investigated series) and within the final G-VARs.

[24] The lag length criterion that is used is the Akaike Information Criterion (AIC) (see the Appendix H for a thorough discussion of the selected and other criteria, and D3 for the respective table results).

[25] Prior to this, we also test whether the stability condition holds for the model, namely, whether the roots of the characteristic polynomial are within the Unit root circle (see Pesaran, 2015; Brooks, 2014). Also VEC Residual Serial Correlation LM Tests are applied under the null hypothesis of 'no serial correlation at lag order h', where the LM statistic of 30.94539 at one lag, for the respective critical value (a chi-square with 16 degrees of freedom, and the included observations being 178) or the calculated probability value of 0.0137, provide statistical evidence that there is no serial correlation at the 0.01 level of significance. The VEC Residual Normality tests are also applied under a Cholesky (Lütkepohl) Orthogonalization and under the null hypothesis that 'residuals are multivariate normal'. There is also some statistical evidence

For the given stability of our model, we can proceed to the interpretation of the results of the VECM, by considering the respective values of t-statistics that are provided within brackets. Note that the VECM will be using only the ECT as an exogenous variable. Also note that, apart from the VECM equations, the statistically significant results are reported within the table below (for the rest of the results see Appendix A, part E, Table E1b).

Table 5-2: VECM(1)

	dIP	**dREER**	**dFS**	**dI**
dIP	-0.293848* [3.85643]			
dREER		0.129681** [1.74825]		0.089068*** [1.64019]
dFS	0.1082982** [2.04971]			0.048343* [3.92865]
dI		0.186682*** [1.93644]		-0.12787** [-1.811183]
cointEq1	0.033119*** [1.67358]	0.014331** [2.16453]	0.079493* [2.70197]	0.018668* [3.85618]

Note: t-statistics are provided within brackets. One * denotes a statistically significant parameter at 0.01, ** at 0.05 and *** at 0.10. Also note that the Error Correction component is statistically significant.

VEC Model (1):
D(IP) = 0.0331191533827*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) - 0.293848006573*D(IP(-1)) - 0.0915153246972*D(REER(-1)) + 0.102981595983*D(FS(-1)) - 0.441852620012*D(I(-1)) + 0.000958352009648

D(REER) = 0.0143307677978*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) + 0.00322252323252*D(IP(-1)) + 0.12968127245*D(REER(-1)) - 0.0184159328771*D(FS(-1)) + 0.186681759152*D(I(-1)) + 0.000648331228565

D(FS) = 0.0794929520852*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) + 0.0282571783441*D(IP(-1)) + 0.0480328305538*D(REER(-1)) + 0.0788057985392*D(FS(-1)) - 0.229787735832*D(I(-1)) + 0.00404542832285

D(I) = 0.0186684370867*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) - 0.0222938966777*D(IP(-1)) + 0.0890680129971*D(REER(-1)) + 0.0483434132657*D(FS(-1)) - 0.127870168277*D(I(-1)) - 0.000501728398882

---

that the null hypothesis should not be rejected, indicating through the Jarque-Bera statistics and the respective Chi-square critical values that the 'residuals are multivariate normal' at 0.01 level of significance. The stability VECM test and the commented results are provided on the Appendix (A, parts D1, D2).

Before we proceed it has to be noted that the ECT estimated sign, at this model, is affected by the ordering of the variables. For example, when the ordering is IP, REER, FS, I the estimated coefficient is 0.014331 and when the ordering changes for example to FS, I, IP, REER (see Appendix A, Tables E1-E4), the sign of the ECT becomes borderline negative, and specifically -0.002478. In all cases this result requires a further investigation and seems to be sensitive not only to the ordering but to the cointegrating properties and lags of the series and of the VEC models as well.

As it can be seen on the first column of the VECM table provided above, there is a highly statistically significant impact 'running' mainly from IP past values to the current ones. It has to be noted also in advance that the above results, excluding the cointegrating equation, hold in the short-run given that we are within a VECM structure. The cointegrating equation, as it is captured by the respective coefficient, is also a statistically significant one only at the 0.10 level of significance.

The second finding, on the first column of table 5.2, shows that at the 0.05 level of significance, there is a statistically significant impact 'running' from the Foreign Reserves (FS) of Bulgaria to the Industrial Production of the country. A result that makes economic sense given that the FS are used in this country in promoting the exchange rate stability and thus, the country seems to be more stable and better growing when the FS are increasing and vice versa.

Real Effective Exchange Rate is also dependent on its own past values, as we can see on the second column, even though this is evident only at 0.10 level of significance. Also at the same level of significance REER is positively impacted by the Interest rate as expected. I.e. the sign is a correct one, in terms of economic theory, given that when Interest rate goes up, an increase in the REER means that the specific economy becomes less competitive in an international context.

Foreign Reserves of Bulgaria, in their turn, seem to be driven not by the chosen investigated variables in the short-run, but from the entire Cointegrating equation. This finding, even though it is expected, it requires further investigation, in terms of capturing the factors that affect FS in Bulgaria. This will be done in the coming chapters within the G-VAR structure.

Last but not least, the Bulgarian interest rate (I) is affected mainly by the Foreign reserves (FS) of this country. A highly statistically significant result as well (the t-value is 3.92, which is much greater than the t-critical of 2.60 that holds at the 0.01 level of significance) which is also positive. Suggesting that a decrease of FS drives down the Interest rates, as expected, providing evidence about the impact and the uses and the probable future use of FS of the country. Especially, after the EMU entry of Bulgaria, the country will not have to sustain such a level of FS to defend the pegged exchange rate regime, and thus it will be able to boost the economy, in a monetary policy context, by driving –up to a degree– the rate down or up, depending on which phase it is on the business cycle. The above result is also consistent with the Error Correction component which is statistically significant as well, even though it does not bear a negative sign[26].

5.1.2.4 Generalized Impulse Response Functions (GIRFs)

The Generalized Impulse Response Functions (GIRFs) will allow us at this stage to further determine the time profiles of the variables under investigation in terms of their responsiveness to the shocks of the other variables. Specifically, as we have already

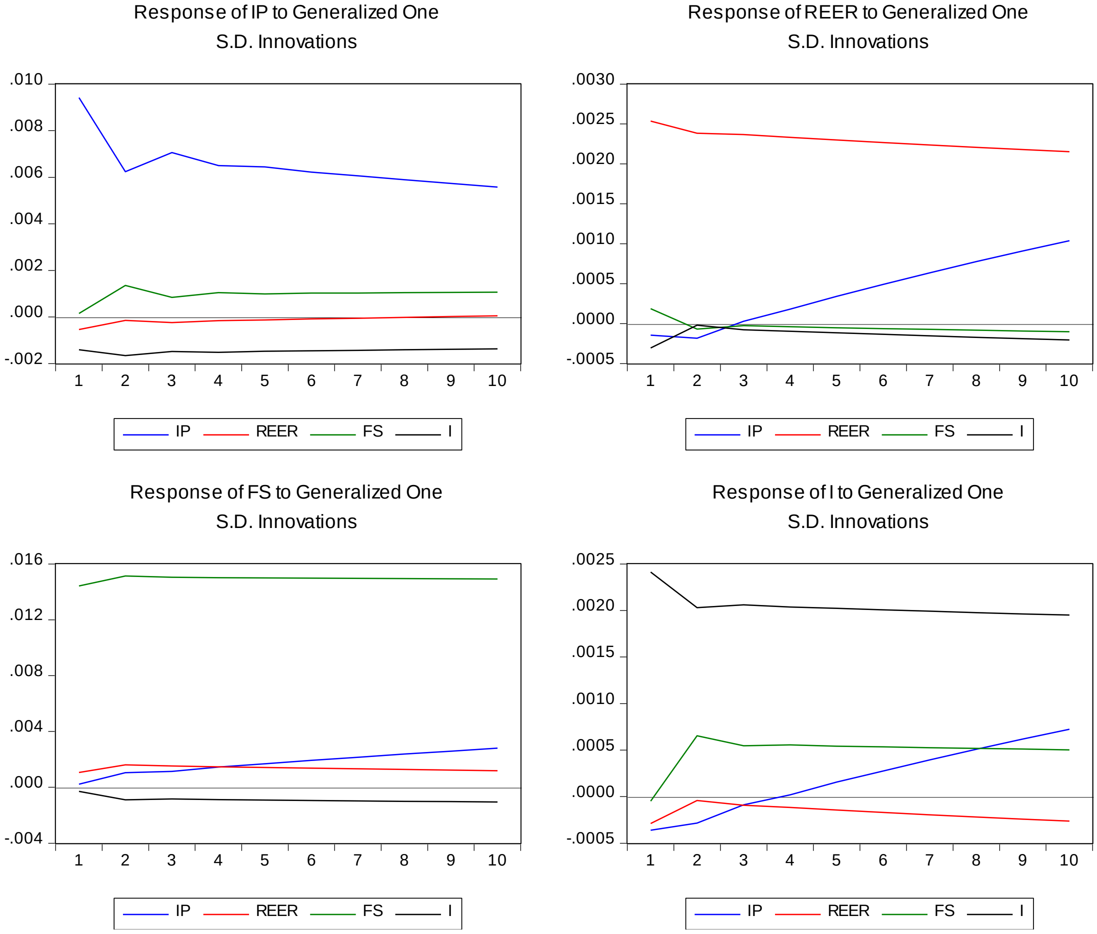
---

[26] Additionally it has to be noted, as the period examined contains the outburst of the global financial crisis (i.e. after September 2008), that it is useful to consider a structural break for means of capturing these effects and thus separate the pre- and the post crisis period. Thus, for this purpose a dummy variable is introduced, which starts from the ninth month of 2008, meaning that all dummy values are zero from the starting point of the sample to this date and then all values are equal to one, up to the ending point of the data set, given that the effects of this event are still present. Once the above dummy variable is introduced in the VECM for the case of Bulgaria, it is a statistically significant one and bears, as expected, a negative sign. The most statistically significant case is the one when IP is on the LHS of the system, given that the estimated coefficient is -0.007746 and the respective t-statistic is -3.14357 (see Appendix A, Table E3). A positive sign, as expected from economic theory, is evident also in the case when I is treated as an endogenous variable, i.e. when it is on the LHS of the system, which is also a statistically significant finding. Moreover, it has to be underlined that the introduction of the dummy variable does not change, neither the statistical significance nor the estimated signs of the coefficients of the VECM, providing further statistical evidence on the stability of the model. Nevertheless, the above call for further investigation through the final G-VAR, which will further capture the macroeconomic interlinkages and dependencies of the respective SEE country with the rest of the SEE countries, the EMU, and the EU.

discussed, the non-generalized Impulse Response Functions are measurements of the time-profile of the ‘effects’ of shocks that occur at a specific point in time (t_o) and then are distributed on the future values of the variables.

It has to be repeated here that the exact ordering of the variables (see Section 4.3) –I, REER, FS, and IP– even though it can be supported rationally, at least up to a point, it is not supported fully by any financial or economic theory and thus the robustness of the IR functions, which is partly ‘corrected’ with Cholesky Decomposed residuals, is limited and thus, it is only presented on the Appendix (see Appendix A, part E, Figures E3, E4). As opposed to the Impulse Response Functions, the Generalized Impulse Response Functions (GIRFs) correct the ‘ordering of variables’ related problem and thus are provided below. Thus even before the finally used G-VARs (see the following two empirical G-VAR chapters) the VECMs will help us to understand the dynamic behaviour of the variables under investigation.

Figure 5-2: Generalized Impulse Response Functions (GIRFs)


Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

The GIRFs above follow the VECM(1) results and allow us to investigate further the time-profile of every variable separately. The Industrial Production response to a shock (innovation) equal to one standard deviation of Foreign Reserves is a positive one and lasts for 10 periods (months) without wearing out. This finding is similar to the VECM results with one lag, and is an outcome that could be viewed partially as a statistically significant one, at least after the 2nd quarter Still, given that the upper and the lower bound are not provided here, we have to further investigate this matter at the GIRFs within the final G-VAR structure.

The IP responsiveness to Interest rate (I) it is also an interesting finding, given that it is a negative one, meaning –as expected from the economic theory– that the Growth proxy of the Bulgarian economy decreases to a positive shock of the country interest rate, and vice versa. A finding that also lasts for the entire provided time-profile, i.e. for ten consecutive months and also could be perceived, up to a point, as a statistically significant one.[27]

The Foreign Reserves (FS) response to a shock equal to one standard deviation of Interest rate (I) is a negative one and consistent with the economic theory expectations as well. It lasts also for 10 periods (quarters) without wearing out.

The responsiveness of the remaining two variables, REER and I in the case of the Bulgarian economy provide some mixed results that call for further investigation of the finally applied G-VARs. The REER responds to both FS and I shocks negatively after the 2nd quarter in the case of FS, and from the beginning in the case of I (note though that an increase on REER means that the Bulgarian economy is relatively worse off). Thus, the competitive stance of Bulgaria, for example a REER decrease –meaning that the economy is relatively more competitive– occurs on an increase of the domestic interest rates, a finding that calls for further investigation in terms of the transmission channels, economic and others as well. This result should be blended

---

[27] The bounds will be quantified effectively at the G-VAR later stage.

with a persistent statistically significant finding, at least after the 4th quarter approximately, which is the positive response of REER to the increasing IP. A finding that also suggests that even though the Bulgarian economy grows, the competitive comparative position of the economy generally –as it is quantified through REER, and as it is further investigated (see the G-VAR sections, 5.2 and 5.3)– is worse off. A result that could be blended also with another statistically significant finding, the response of Bulgarian Interest rates (I) to Generalized one standard deviation innovations (shocks) of IP, that again after approximately the 4th quarter seem to increase, suggesting probably that there is a premium which is being demanded by investors in order to trust the Bulgarian economy and/or there is some evidence that the Banking integration of EMU members compared to the SEE countries is not at the level that it 'should' be, in advancing the macro-economic coordination of the investigated countries and the real economic integration.

Last but not least, a clear and most probably a statistically significant and persistent result, is the responsiveness of the Bulgarian Interest rate (I) on a positive FS shock. As expected, the Interest rate goes up after an increase in the FS and goes down when the FS are driven down as well. This last provided interpretation of the GIRFs in a VECM context, indicates that the Bulgarian Central Bank, as reported on the VECM part (see section 5.1.2.3), could be using the 'unneeded' substantially large proportion of FS after an EMU entry in sustaining the interest rates of the economy at lower levels, showing a macroeconomic policy implication and effectiveness that rise once a country joins a monetary union (as we have already seen historically in the cases of Greece and Slovenia). Thus, we could support here, based on the above findings, that the aforementioned planed EMU entry of Bulgaria calls for no FS requirements, once in, in defending a fixed exchange rate regime, given that the EMU members –by any means– need no FS to defend the EMU flexible foreign exchange rate regime. Also, it has to be added here, as it is expected from the economic theory, the reported REER negative response to FS means that as the FS are increased the economy becomes more competitive.

Also, note that similar results are being reached if a different 'time profile' is being used, instead of the previously chosen one which consisted of ten periods. Thus, if a forty period time profile is being used (available in the Appendix A, Figure E2), the only slightly different outcomes are the FS response to REER that weakens after the third year; the REER that responds more to an IP shock compared to its own past values after the eighteenth month; and the 'I' that responds also more to an IP shock compared to its own one standard deviation after the second year.

In all cases the above will be further investigated in the G-VAR where the macroeconomic interlinkages of the SEE economies within an EMU framework will be better captured and understood.

5.1.3 The case of Croatia - **Empirical tests and results**

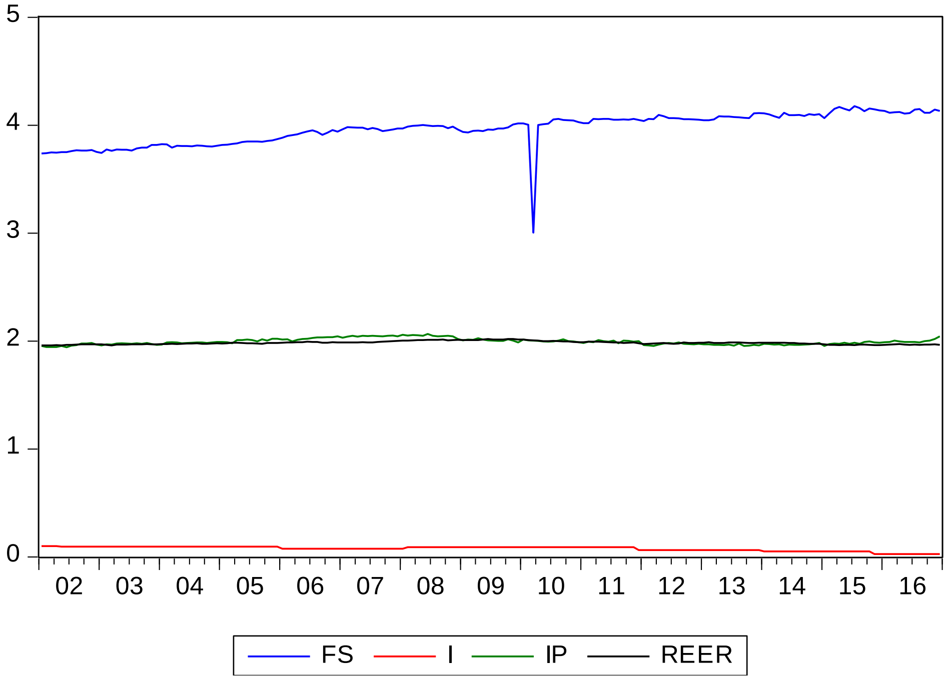
Given that the tests are already discussed and analysed in the previous section, both theoretically and empirically, from this point onwards the interpretation of the VECM related research output will be presented compactly.

The structure followed in this section consists of: tests for stationarity (see Appendix B, parts C1 and C2), tests for cointegration, the lag length criteria and the stability tests of the Vector Error Correction Model (VECM) and the Generalized Impulse Response Functions (GIRFs).

5.1.3.1 Testing for Cointegration

On the figure below all four variables are at level, in the case of Croatia. The Interest rate is in a percentage form, while FS, IP and REER are in logarithms, as is the case for all variables for all six investigated countries. It has to be stated here that the application of the Johansen Technique in testing the cointegrating equations provide evidence that a co-integrating relation exists also in the case of Croatia.

Figure 5-3: Four variables in level from 1/1/2002-31/12/2016. The case of Croatia.



Analytically, based on the AIC within the VECM (see Appendix B, part D, table D5, and 5.1.3.2 below) the chosen number of lags is equal to 1. More specifically, to test the possible long run co-movements that might exist between the four investigated variables we use again (see also 5.1.2.1) cases 2, 3 and 4, i.e. the following Johansen cointegrating equations: case 2, if none of the time series have a time-trend, case 3, for the trending ones, which is being used if 'all trends' are stochastic, while if we have some evidence that some of the series are trend-stationary, then we should use case 4. Below, for the given properties of our data set, we present case 3 (see Appendix B, part B, Table B6 and B7, for the presentation of the rest of the cases).

Table 5-3: Cointegration results using Trace statistics. The case of Croatia

Hypothesized No. of CE(s)	**Trace statistic**	**0.01 critical value**	**0.05 critical value**	**Probability**
None *	50.26614	54.68150	47.85613	0.0292
At most 1	22.97565	35.45817	29.79707	0.2473
At most 2	8.793115	19.93711	15.49471	0.3849
At most 3	0.337775	6.634897	3.841466	0.5611

Note: *Critical values based on MacKinnon-Haug-Michelis (1999)

In the Johansen table above we can observe that the Trace statistic indicates one cointegrating equation at the 0.05 level of significance. Specifically, for the stated null hypothesis on the first column, i.e. the exact number of cointegrating equation(s), which is none on the first row, we can 'reject' the null hypothesis –at the chosen 0.05 level of statistical significance– given that the Trace statistic of 50.26614 is greater than the respective critical value of 47.85613, which is based on the MacKinnon-Haug-Michelis (1999). At the 0.01 level of significance we observe that the Trace statistic which is equal to 50.26614 is lower than the respective critical value of 54.68150, which means that there is not enough statistical evidence to reject this hypothesis. Thus at 99% we can conclude that there are no cointegrating equation(s). This outcome though changes, if the initial lags are chosen to be one instead of two, thus, in this case one cointegrating equation exists also at the 0.01 level of significance (see Appendix B, part B, tables B6 and B7). In all cases (including cases 2 and 4) we can be confident that there is one cointegrating equation at the 0.05 level of significance.

Furthermore, we could focus on the specific estimated form of the cointegrating equations, with the one cointegrating vector based on the Trace statistic (provided in the respective Tables B2-B5, in Appendix B, both within the Johansen Cointegrating framework and the final VEC model). The normalized cointegrating coefficients have the 'correct' and expected from economic theory signs, amongst which, as it is the case of Bulgaria as well, it is the negative relation of the Interest rate to the growth proxy, i.e. the IP. A relation that is statistically significant given that the estimated coefficient in the VECM cointegrating equation part is 7.233738 and for the estimated standard error of 1.29357 the t-statistic is 5.59981. IP is also positively related to REER, a result that is highly statistically significant too and the same statistical significance applies for the negatively related IP to FS.

Overall, from the above results we can state that two out of the four variables appear to be cointegrated, and thus we can proceed –for the given cointegrating equation established at the 0.05 level of statistical significance – with a VEC model. The coefficient of the Error Correction component of this model is expected to be also statistically significant and negative too. A negative sign that captures the return to a cointegrating 'adjustment' and to a cointegrating path, provides statistical evidence that the shocks are absorbed and some of the investigated variables seem to move together in the long run.

5.1.3.2 The lag length criteria within the VECM structure

The lag length criterion used, as before (see subsection 5.1.2.2) is the Akaike Information Criterion (AIC). Note that all four variables in the VEC model are considered to be in their first difference in the case of Croatia as well, given that the final model is a stable one in this case. The choice of first differenced variables is supported by the stationarity properties of the time series that applied on the 'unit root' related part (see Appendix B, C1 and C2 and the final G-VAR). Thus, based on AIC the chosen number of lags is one, which means that the VEC model that is going to be applied to the case of Croatia is a VECM(1). (See Appendix B, D5 for the respective table).

5.1.3.3 The Vector Error Correction Model (VECM)

As discussed and analysed on the theoretical section and on the previous empirical subsection for the case of Bulgaria (5.1.2.3) and for the given cointegration related results provided above (see subsection 5.1.3.1) we have grounds to proceed with a structural Vector Autoregressive Model in the case of Croatia as well.[28]

---

[28] In terms of the stability condition of the VEC model, in the case of Croatia, the roots of the characteristic polynomial are within the unit root circle also (see also Pesaran, 2015; Brooks, 2014 and Appendix B, D1-D4), the VEC Residual Serial Correlation LM Tests, applied under the null hypothesis of 'no serial correlation at lag order h', where the LM statistic of 22.02680 at one lag, for the respective critical value (a Chi-square with 16 degrees of freedom, with the included observations being 178) or the calculated probability value of 0.1423, provide statistical evidence that there is no serial correlation at the 0.01 and 0.05 levels of significance. The VEC Residual Normality tests are also applied under a Cholesky (Lütkepohl) Orthogonalization and under the null hypothesis that 'residuals are multivariate normal'. There is also statistical evidence that the null hypothesis should not be rejected, indicating through the

For the given stability of our model, we can proceed with the interpretation of the VECM results. Note that on the table below we report the respective coefficients and the t-statistics (provided within brackets). Note that the VECM incorporates the Error Correction Term in the form of a cointegrating equation. Also note that only the statistically significant results are being reported and the VECM equations as well.

Table 5-4: VECM(1)

	dIP	**dREER**	**dFS**	**dI**
dIP	-0.318705 [-4.41]		-0.412493* [-5.75582]	
dREER				
dFS			-0.233278* [-3.11138]	
dI	0.545105* [2.62275]			
cointEq1			-0.383997* [-5.77929]	-0.007424* [-2.60536]

Note: t-statistics are provided within brackets. One * denotes a statistically significant parameter at 0.01, ** at 0.05 and *** at 0.10. Also note that the Error Correction component is statistically significant.

VEC Model (1):
D(IP) = - 0.0011933865461*(IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) + 3.91246963035) - 0.318705034491*D(IP(-1)) + 0.367864095663*D(REER(-1)) + 0.000297808275458*D(FS(-1)) + 0.54510492028*D(I(-1)) + 0.000876859190207

D(REER) = 0.00187180511496*(IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) + 3.91246963035) + 0.00736949229396*D(IP(-1)) + 0.0485926436524*D(REER(-1)) - 0.00161648778864*D(FS(-1)) + 0.0679551204342*D(I(-1)) + 5.84440361716e-05

D(FS) = - 0.412493074342*(IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) + 3.91246963035) + 0.607324817941*D(IP(-1)) - 1.63935494478*D(REER(-1)) - 0.233278195464*D(FS(-1)) + 1.00527107202*D(I(-1)) + 0.00302682726413

D(I) = - 0.00742390216533*(IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) + 3.91246963035) + 0.0237079161266*D(IP(-1)) - 0.013663502101*D(REER(-1)) + 0.00401282730306*D(FS(-1)) - 0.00481393357803*D(I(-1)) - 0.000440141586353

Note initially that in the first equation of the VEC system, when IP is on the Left Hand Side of the model, the Error Correction component, even though it bears the correct

---

Jarque-Bera statistics and the respective Chi-squared critical values that the ‘residuals are multivariate normal’ at the 0.01 level of significance. The stability VECM test and the commented results are provided on the Appendix (Appendix B, D1-D4).

negative sign, it is not statistically significant. Fortunately the negative sign is evident on the third and the fourth equation and is also highly statistically significant.

Another finding, on the first column, shows that at the 0.05 level of significance, there is a statistically significant impact 'running' from the domestic Interest rate (I) to the Industrial Production of the country. This finding shows that the increasing Interest rates in Croatia have a statistically significant positive impact on the IP, and vice versa, and thus, this could be interpreted as follows: either this means that the 'Keynesian assumption' on the negative relationship between the two variables does not hold, or the markets ask for a risk-premium when they invest in Croatia.

To continue, skipping REER which does not generate at this stage statistically significant results, Foreign Exchange Reserves of Croatia, in their turn, seem to be driven mainly by their past values and the cointegrating equation. The relatively high estimated coefficient of the cointegrating equation, which is equal to -0.41 and the high t-statistic as well, -5.76, show a highly statistically significant tendency to return to a 'stable FS path' where shocks are absorbed relatively quickly in time. This means that about 41% of the 'disequilibria' of a shock in the previous quarter adjust back to the long run 'equilibrium' path in the current month. This finding helps us understand also the negative sign of the estimated coefficient of the lagged FS (-0.23), which shows a highly statistically significant "correction" after any observed turbulence in the investigated variables.

Last but not least, the Croatian Interest rate (I) is affected only by the cointegrating equation. The CE is statistically significant (at the 0.01 level of significance) and it bears a negative sign, very close to zero though, providing some further evidence of the existing long run relationships of the investigated variables. To briefly comment the cointegrating equation here (see Appendix B: The VECM Table E3) the IP which is on the Left Hand Side (LHS) of the equation and is related positively to REER (the estimated coefficient is 5.62 and the t-statistic is -5.02) and negatively to

FS and to I (where the estimated coefficients are 1.19 and 6.68 and the t-statistics are -5.02 and 5.59, respectively). Note also that all parameters are statistically significant in this cointegrating equation which is being used within the VECM[29].

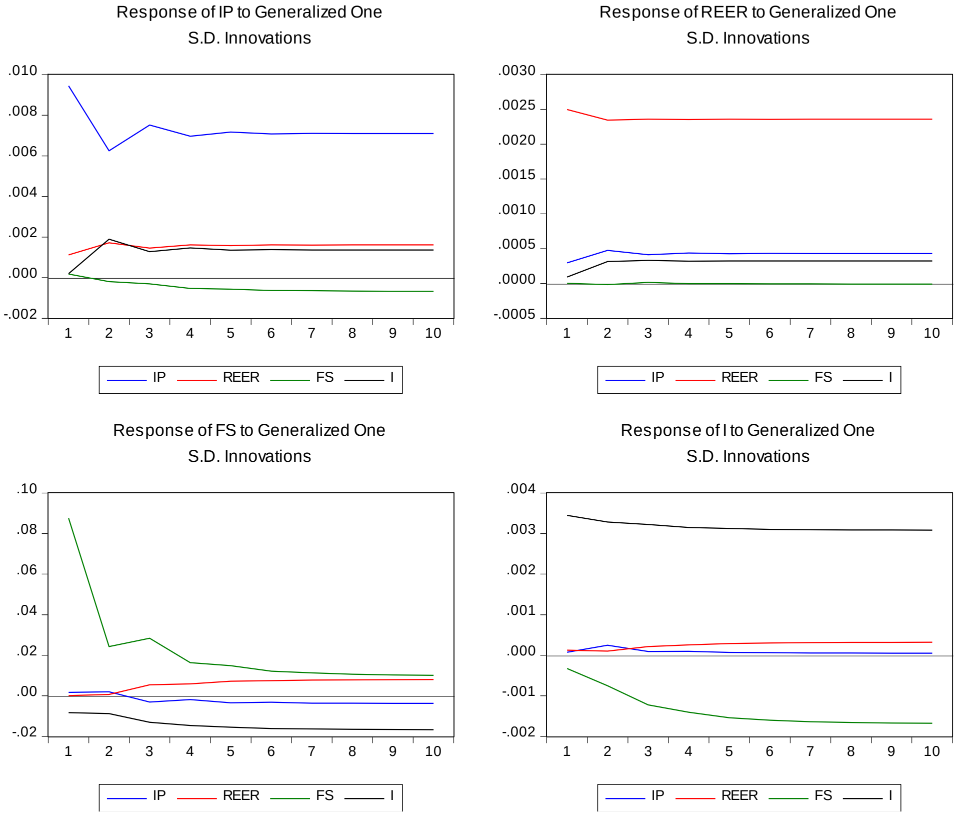
5.1.3.4 Generalized Impulse Response Functions (GIRFs)

The Generalized Impulse Response Functions (GIRFs) will help us at this stage to further understand the time profiles of the investigated variables in the case of Croatia as well. Given that the non-generalized Impulse Response Functions are measurements of the 'time profile' of the 'effect' of shocks that occur at a specific point in time (t_o) and then are distributed on the future values of the variables, we will apply only the Generalized Impulse Response Functions (GIRFs) to correct the 'ordering of variables' related problem. On the table below we provide the GIRFs without any bounds (the Cholesky decomposed residuals, 'exposed' to the specific 'ordering problem' are provided on the Appendix B, Figure E4).

---

[29] Additionally, we add a dummy variable in the case of Croatia (see Appendix B, Table E3), as we have done in the case of Bulgaria (see Subsection 5.1.3). The reason for this is that as long as the period examined includes the outburst of the global financial crisis (i.e. after the September 2008) it would be good to consider in our analysis this structural break. Thus, a dummy variable is introduced again starting from the ninth month of 2008, meaning that all dummy values are zero from the start to this date and then the rest of the values are one, up to the end of the data set, given that there are effects of this event still present. The structural break in the Croatian FS is also visible, even though visual inspection is not enough on the time series graph of the country. Thus, when a dummy variable is introduced in the case of Croatia the coefficient of it is statistically significant and bears the expected sign. Specifically, when the FS in on the LHS of the system of the equations, the estimated coefficient of the dummy is 0.096358 and the respective t-statistic is 4.99654, showing that the Croatian Central Bank has increased significantly the Reserves after the outbreak of the 2008 crisis. Also, apart from this finding, it has to be noted that the incorporation of the dummy variable does not change neither the statistical significance nor the estimated signs of the coefficients of the VECM, excluding only one coefficient of the cointegrating equation that loses its significance, a finding that is also evident in the Johansen cointegrating equation.

Figure 5-4: Generalized Impulse Response Functions (GIRFs)



The Industrial Production response of Croatia to a shock equal to one standard deviation of Croatian REER is a positive one seems to lasts for 10 periods (quarters) without wearing out. A finding that even though is similar to the VECM results with one lag, it cannot be reported at this stage to be a statistically significant one and has to be further tested within the G-VARs. Another outcome that could be viewed at least partially as a statistically significant one, mainly after the 2nd quarter, blended with the VECM result as well, is the responsiveness of the IP to the domestic Interest rate. A response that is estimated to be a positive one and does not wear out in time. Still given that the upper and the lower bound are not provided here, we have to further investigate this matter at the GIRFs within the G-VAR structure.

From the REER results it is interesting to comment on their positive responsiveness both to IP and to I, and on the no responsiveness to FS related shocks. Still, even though we cannot report the above as statistically significant results, we have some signs, that within this model, and for the given investigated variables, that a positive IP shock does not boost the REER of Croatia, the opposite seems to be the case, and also a positive shock of I boosts, as we have seen on the VECM(1), the IP as well.

The Foreign Reserves (FS) response to a shock equal to one standard deviation of Interest rate (I) is the only one, apart from the responsiveness of the variable to its past shocks, that is worthy for further interpretation. Thus, the FS responds negatively to an increase to ‘I’ and also this decrease tends to decrease further in time, showing some signs that the FS are not needed in the case of Croatia for a smooth entry towards EMU. A finding that could be linked also with the almost absolute zero responsiveness of REER to FS.

Last but not least, the responsiveness of ‘I’ in the case of Croatia to the REER seems to support the previous results and interpretations as well. An increase in REER (i.e. the worsening of the competitive position of Croatia) increases the ‘I’, which makes economic sense. Still, we need to proceed with our investigation within the G-VARs to ensure the statistical significance of the reported results.

Also note that similar results are reached if a different time profile is being used instead of the ten period one. If for example a forty period time profile is being used (available in the Appendix B, Figure E2), the only additional information that we do obtain in the case of Croatia is that the response of FS to the Generalized one standard deviation shock of ‘I’ after the first year is stabilized and remains stable and negative at -0.02%, for the rest of the period.

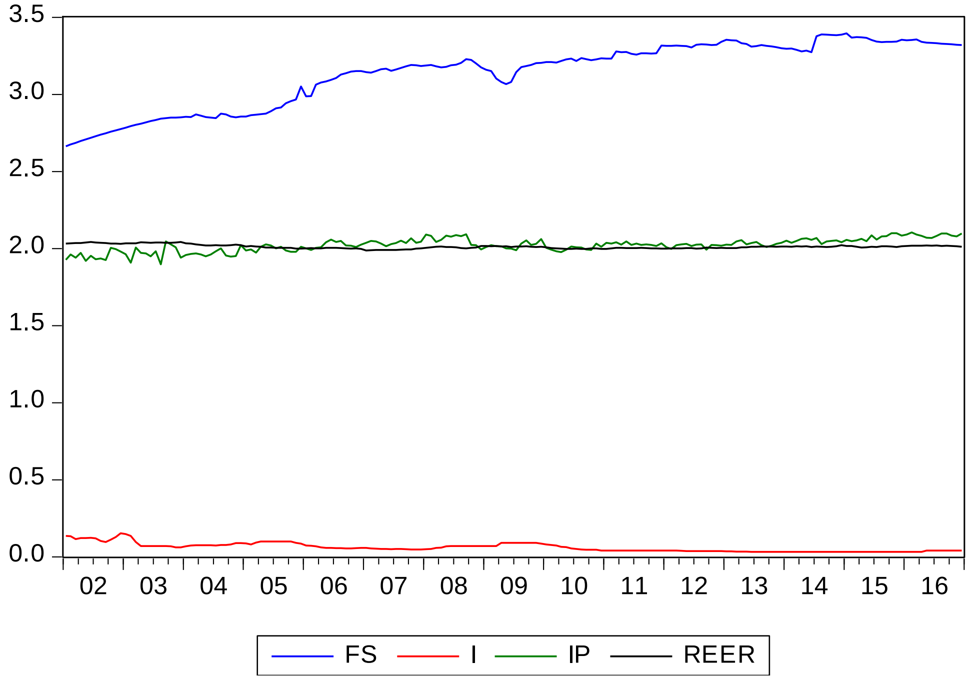
Still in all cases we have to further investigate the aforementioned outcomes in the final G-VARs. There the macroeconomic interlinkages of the SEE economies within an EMU framework will be captured more effectively and also we will consider within this econometric context the upper and lower bounds that will enrich our understanding further.

5.1.4 The case of FYROM - Empirical tests and results

5.1.4.1 Testing for Cointegration

On the first figure below all four variables are at level in the case of FYROM. Interest rate is in a percentage form, while FS, IP and REER are in logarithms. The application of the Johansen Technique in testing the cointegrating equations will provide evidence if a co-integrating relation exists between the investigated variables for the Case of FYROM.

Figure 5-5: Four variables in level from 1/1/2002-31/12/2016. The case of FYROM



Based on the AIC within the VECM (see Appendix C: table D3 and 5.1.4.2 below) the chosen number of lags is equal to 1. In order to test the probable long run ‘co-movements’ that might exist between the investigated variables we use again (see also 5.1.2.1 and 5.1.3.1) cases 2, 3 and 4[30], while if we have some evidence that some of the series are trend-stationary, then we should use case 4. Below, for the given properties of our data set, we present case 3 (see Appendix C for the presentation of the rest of the cases: B3 and B4).

---

[30] Which are the following Johansen cointegrating equations: case 2, if none of the time series have a time-trend, case 3, for the trending ones, which is being used if ‘all trends’ are stochastic.

Table 5-5: Cointegration results using Trace statistics. The case of FYROM

Hypothesized No. of CE(s)	**Trace statistic**	**0.01 critical value**	**0.05 critical value**	**Probability**
None *	53.00421	54.68150	47.85613	0.0152
At most 1	29.96044	35.45817	29.79707	0.0479
At most 2	13.56785	19.93711	15.49471	0.0956
At most 3	5.315972	6.634897	3.841466	0.0211

Note: *Critical values based on MacKinnon-Haug-Michelis (1999)

On the Johansen table above we can observe that the Trace statistic indicates one to two cointegrating equation(s) at the 0.05 level of significance. Specifically, for the stated null hypothesis on the first column, i.e. the number of cointegrating equation(s), which is none on the first row, we can 'reject' it –at the chosen 0.05 level of statistical significance– given that the Trace statistic of 53.00421 is greater than the respective critical value of 47.85613, which is based, as before, on the MacKinnon-Haug-Michelis (1999). At 0.01 level of significance we observe that the Trace statistic, which is equal as stated to 53.00421 is lower than the respective critical value of 54.68150, which means that there is not enough statistical evidence to reject this hypothesis. Thus at 99% we can conclude that there is no cointegrating equation in the case of FYROM, but still there are one to two cointegrating equations at the 0.05 level of significance (see also Appendix C, part B1-B5). In all cases (including cases 2 and 4) we are confident that there is at least one cointegrating equation at the 0.05 level of significance and most probably two. The "at most one CE" is borderline rejected at 0.05, given that the Trace statistic is 29.96044, while the respective critical value is 29.79707.

On the above we will add the exact estimated form of the cointegrating equations, with the two cointegrating vectors based on the Trace statistic (provided in the respective tables in Appendix C: B1-B3, both within the Johansen Cointegrating framework and the final VECMI). Specifically, the normalized cointegrating coefficients of both CEs, for the imposed restrictions of zero on the respective coefficients on REER and IP on the first and the second equation respectively, have the expected signs as well, amongst which, as is the case of Bulgaria and Croatia also, it is the negative relation of Interest rate to the growth proxy, i.e. the IP. A relation that is highly statistically significant also given that the estimated coefficient in the VECM cointegrating equation part is 3.524375 and for the estimated standard error of 0.911149 the t-statistic is 3.86663. IP is also negatively linked to FS but not in a statistically significant way. The REER, on the second CE is negatively related both to FS and I and these are also statistically significant findings.

Overall, from the above results we can report that two or even three out of the four variables appear to be cointegrated, and thus we are enabled to proceed –for the given established at the 0.05 level of statistical significance cointegrating equation– with a VEC model.

5.1.4.2 The lag length criteria within the VECM structure

The lag length criterion used, as before (see subsections 5.1.2.2 and 5.1.3.2) is the Akaike Information Criterion (AIC). Note that all four variables in the VEC model again are considered to be in their first difference in the case of FYROM also, given that the final model is a stable one in this case. The choice of first differenced variables is supported by the stationarity properties of the time series that applied in the 'unit root' related part (these results are available on the Appendix C, parts C1 and C2, and on the final G-VAR also). Thus, overall, based on AIC the chosen number of lags is one, which means that the VEC model that is going to be applied for the case of FYROM is a VECM(1).

5.1.4.3 The Vector Error Correction Model (VECM)

As already analysed on the theoretical section of this thesis and on the previous empirical subsections of the case of Bulgaria (5.1.2.3) and of Croatia (5.1.3.3) and for the given cointegration related results provided also above (see subsection 5.1.4.1) we have grounds to proceed with a structural Vector Autoregressive Model for the case of FYROM.[31]

Thus, for the given stability of our model, we can proceed with the interpretation of the VECM results for FYROM. Note that on the table below we report again only the respective coefficients and the t-statistics (provided within brackets). Note that the VECM incorporates, as it was the case before, the Error Correction Term. Note also, that only the statistically significant results are being reported (for the rest of the results see Appendix C, part E).

As opposed to the cases of Bulgaria and Croatia, the VECM is applied both with one and two cointegrating equations. These equations apart from delivering statistically significant results provide similar results in terms of the captured statistically significant parameters (the results are provided in full detail on Appendix C, table E3). Below we provide the VECM with one cointegrating equation and then the respective estimated equations of the model.

Table 5-6: VECM(1)

	dIP	**dREER**	**dFS**	**dI**
dIP	-0.281604* [-3.67443]			
dREER				
dFS				-0.044149** [-2.04437]
dI				0.44859* [6.942]
cointEq1	-0.200728* [-3.23958]			0.047528* [3.70932]

---

[31] In terms of the stability condition of the VEC model, in the case of FYROM, the roots of the characteristic polynomial are within the unit root circle (Pesaran, 2015; Brooks, 2014), the Vector Error Correction Residual Serial Correlation LM Test, applied under the null hypothesis of 'no serial correlation at lag order h', where the LM statistic of 23.78649 at one lag, for the respective critical value (a Chi-square with 16 degrees of freedom, with the included observations being 178) or the calculated prob. value of 0.0943, provide statistical evidence that there is no serial correlation both at the 0.01 and 0.05 level of significance. Also, the VEC Residual Normality tests are applied under a Cholesky (Lütkepohl) Orthogonalization and under the null hypothesis that 'residuals are multivariate normal'. There is also some statistical evidence that the null hypothesis should not be rejected, indicating through the Jarque-Bera statistics and the respective Chi-squared critical values that the 'residuals are multivariate normal' at the 0.01 level of significance. The stability VECM test and the commented results are provided in the Appendix (see Appendix C: Figure D1 and tables D1 and D2).

Note: t-statistics are provided within brackets. One * denotes a statistically significant parameter at the 0.01, ** at 0.05 and *** at 0.10. Also note that the Error Correction component is statistically significant.

VECM(1):

D(IP) = - 0.200727700381*(IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) -
1.13118037887*I(-1) + 0.131879290596) - 0.281604496176*D(IP(-1)) -
0.419669293202*D(REER(-1)) - 0.11506812231*D(FS(-1)) - 0.0841359689681*D(I(-1)) +
0.00134548856412

D(REER) = 0.00677520637859*(IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) -
1.13118037887*I(-1) + 0.131879290596) + 0.00436151231883*D(IP(-1)) +
0.0688945181134*D(REER(-1)) - 0.00607367580266*D(FS(-1)) - 0.0399905541668*D(I(-1)) -
0.000125531378158

D(FS) = 0.031594210468*(IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) -
1.13118037887*I(-1) + 0.131879290596) - 0.0478951840958*D(IP(-1)) -
0.751012400875*D(REER(-1)) + 0.0847950338967*D(FS(-1)) - 0.253829330975*D(I(-1)) +
0.00314084187224

D(I) = 0.0475283504616*(IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) -
1.13118037887*I(-1) + 0.131879290596) - 0.0235290320971*D(IP(-1)) +
0.210642022712*D(REER(-1)) - 0.0441488592378*D(FS(-1)) + 0.448590245605*D(I(-1)) -
7.69398908126e-05

What can be observed in the table above is that there is again a highly statistically significant impact running from the Cointegrating equation to the dependent variables of the system, and specifically to the first and the fourth equation where IP and I are treated as dependent variables respectively.

Also, on top of the above the Industrial Production (IP) of FYROM is affected also by its own past values mainly in the short run. Both Error Correction components are statistically significant at the 0.01 level, and while the first one is relatively highly negative (-0.2) suggesting a relatively quick adjustment to the cointegrating path, the second one is positive to a lower extent (0.047) showing some enforcement and dynamic adjustment towards the ‘equilibrium’. Again these results request some further investigation that will take place in the coming empirical chapters.

The Foreign Reserves (FS) and the Real Effective Exchange Rate (REER) of FYROM, seem to be driven neither by their past values, which is quite interesting, nor by the cointegrating equations that are statistically insignificant. There is one additional relatively interesting finding that has to be reported: The FS variable affects negatively and in a statistically significant way (at the 0.05 level of significance) the domestic interest rate (I). A finding that suggests that a decrease in FS increases the 'I', which could be interpreted in the context of a loss of confidence, a confidence that is sustained for the vulnerable and small economy when Foreign Exchange Reserves are perceived as 'adequate'. Thus, any loss of FS increases the 'I', because investors request, most probably, a greater risk premium.

Last but not least, returning to VECM with two cointegrating equations (see the respective Appendix, part E), the interest rate (I) is affected highly by its own past values. This is a finding that holds at a much lower to 0.01 level of significance and the estimated coefficient is also relatively too high, showing that the main 'driver' of the Interest rate of this economy is the rate at the previous month. This result must be coupled with the negative and statistically significant Error Correction (EC) component that shows the long-run impact of the second cointegrating equation as well. A cointegrating equation which is statistically significant (at the 0.01 level of significance) and bears a negative sign (see Appendix C: The VECM table (E5)). Analytically, on the second equation where the IP coefficient is restricted to be zero, and the REER coefficient is one, which is on the LHS of the equation, is related negatively to FS (the estimated coefficient is 0.372667 and the t-statistic is 2.53873) and negatively to 'I' (where the estimated coefficient is 4.882068 and the t-statistic is -3.475249). While on the first cointegrating equation where the IP coefficient is one, and the REER coefficient is restricted to be zero, IP is related negatively to FS (with the estimated coefficient is 0.115834 and the t-statistic of it a statistically insignificant one, 0.95271) and negatively to I (where the estimated coefficient is 3.524375 and the t-statistic is highly statistically significant, i.e. equal to 3.8663)[32].

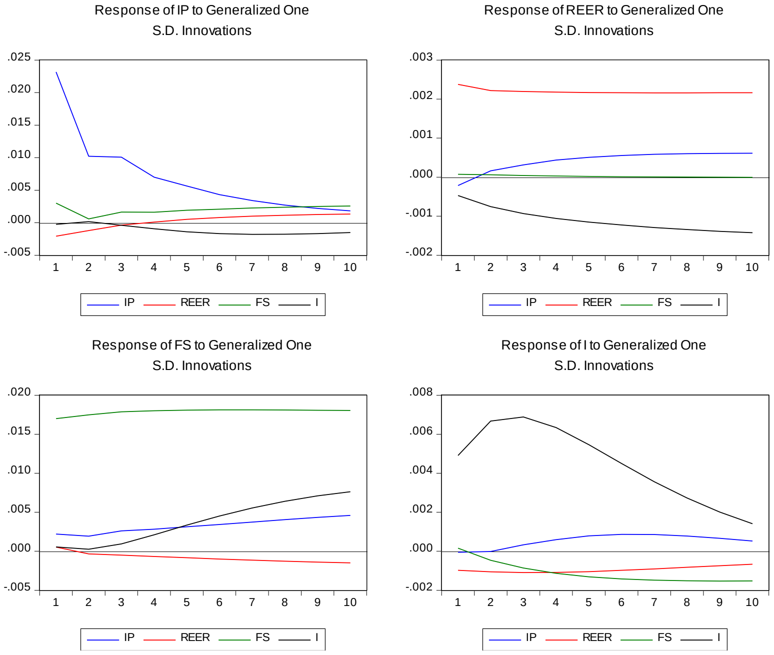
---

[32] Additionally, if a dummy variable is being added we will capture the effect of the outburst of the global financial crisis since September of 2008 in the case of FYROM as well (see Appendix C, table E3). Thus, when a dummy variable is introduced in the case of this economy the coefficients are statistically significant and bear the expected signs. When the IP is on the LHS of the system of equations, the estimated coefficient of the dummy is -0.030419 and the t-statistic is -4.99866, showing that the Growth proxy of FYROM responds negatively to the crisis, as expected, while when the REER is on the LHS the coefficient is a positive one, and equal to 0.002080 with a t-statistic of 3.25939, which even though is still low shows that the crisis of 2008,

5.1.4.4 Generalized Impulse Response Functions (GIRFs)

The Generalized Impulse Response Functions (GIRFs) will help us also to further understand the time profiles of the investigated variables in the case of FYROM as well. As we have already analysed the non-generalized Impulse Response Functions are measurements of the time profile of the 'effect' of shocks that occur at a specific point in time (t_o) and then are distributed on the future values of the variables, we will apply only the Generalized Impulse Response Functions (GIRFs) to correct the 'ordering of variables' related problem. On the table below we provide the GIRFs without any bounds (the Cholesky decomposed residuals, 'exposed' to the specific 'ordering problem' are provided on the Appendix C, Figure E5).

Figure 5-6: Generalized Impulse Response Functions (GIRFs)



The Industrial Production response of FYROM to a shock equal to one standard deviation of the domestic REER is a positive one after the third month and

---

as it is quantified through the specific dummy, makes the economy less competitive, something which is the economic translation of a REER increase. Also, when the interest rate is treated as an endogenous variable within the VEC model with the added dummy, the coefficient of the dummy is statistically significant, a weaker finding though, close to a 0.05 level, bearing the correct sign once again, and showing that the crisis affected positively the domestic interest rate of the investigated country. Also, apart from the above findings, it has to be underlined that the incorporation of this dummy variable has almost not changed neither the statistical significance nor the estimated signs of the coefficients of the VECM, excluding partly the coefficient of the cointegrating equation that raises its significance and becomes statistically significant at the 0.05 level when 'I' is on the LHS of the VEC system.

seems to last for at least 10 periods not only without wearing out but showing an increasing rate as well. This finding could be seen as a non-statistically significant one throughout and calls for further investigation. After the third month the responsiveness of IP to a positive interest rate (I) shock is the expected one in terms of economic theory, i.e. it responds negatively. The negative response that seems to last for the provided time profile subsides after the eighth quarter.

Another outcome that could be viewed at least partially as a statistically significant one, mainly after the second to the third month is the responsiveness of the FS to the domestic Interest rate. A response that is a positive one and does not wear out, but instead seems to insist at an increasing rate. An interesting finding, that at lower Interest rates the Central Bank chooses to sustain a lower quantity of Foreign reserves, as expected. Still given that the upper and the lower bound are not provided, we have to further investigate this relation at the GIRFs within the G-VAR structure.

From the REER results it is interesting to comment on their positive responsiveness to IP. Still, even though we cannot report this response as a statistically significant one, we have some signs, that within this model, and for the given investigated variables, that a positive IP shock does not boost the REER of FYROM (as is the case for example in Croatia). Instead, the opposite seems to hold, which means that a positive shock of the Growth proxy (the IP) increase the REER of FYROM, which means that IP is not ‘translated’ to a more competitive economy. The REER also responds negatively to an increasing interest rate related shock, which means that the economy of FYROM becomes more competitive even though the domestic ‘I’ is increased or inversely the economy is worse off in terms of its competitive stance, even though the Interest rates tend to go down and remain at relatively low levels, showing that the economy cannot ‘respond’ positively to low Interest rates, and at the same time these results point towards the more complex and dynamic interlinkages that exist between the domestic money and market rate to the EMU ones and to the real economies as well.

Last but not least, the responsiveness of 'I' in the case of FYROM shows that the investigated variable is not so self-related, compared to the rest of the outcomes, in each own past values, especially after the third quarter, showing that the variable has no 'persistent memory' as expected, a result that is supported not only by the small size of this economy, but by its vulnerability and volatility as well. Interest rate (I) responds positively to an increasing IP and negatively to an increasing FS and REER. These results given that they are borderline ones and not probably statistically significant as well, should be addressed within the G-VARs to ensure their statistical significance first before we proceed to their 'final' interpretation.

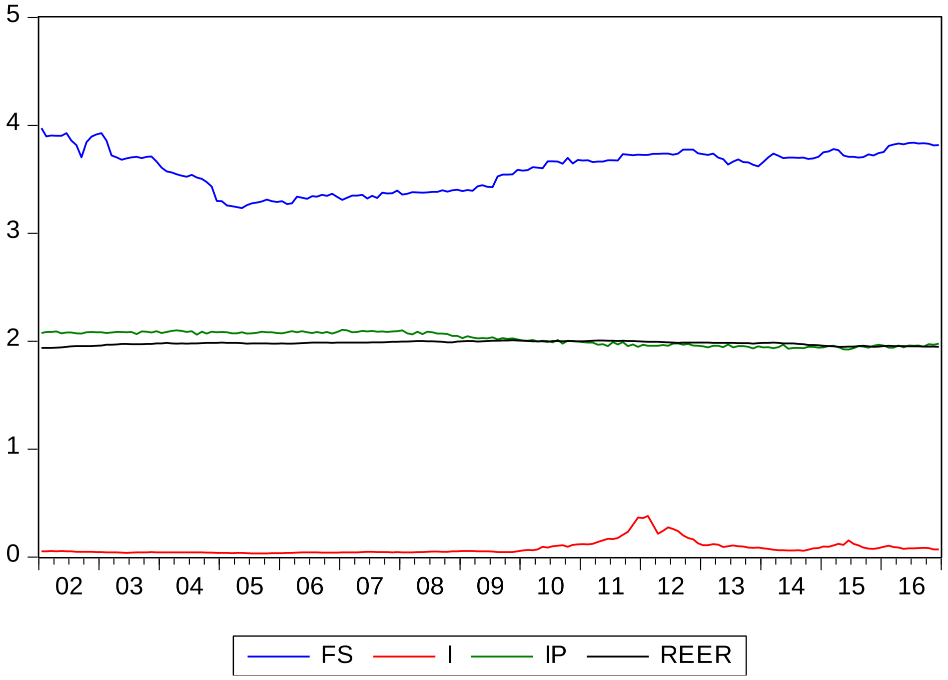
Also, note that similar results are being reached if a different time profile is being used instead of the ten period one. A forty period time profile is available in the Appendix (See Appendix C, Figure E2). The only slightly different outcome is the one that was partly evident in the IP case, where the response of this variable to 'I' eventually wears out and on the response of 'I' to REER and IP that both wear out as well. On FS response to 'I' we observe that after the first year the effect is stabilized.

5.1.5 The case of Greece - **Empirical tests and results**

5.1.5.1 Testing for Cointegration

On the figure below all four variables are now presented at level in the case of Greece. Interest rate is in a percentage form, while FS, IP and REER are in logarithms. It has to be stated once again that the application of the Johansen Technique in testing the cointegrating equations provide evidence if a co-integrating relation exists between the variables and thus we have to start with these tests for this country too.

Figure 5-7: Four variables in level from 1/1/2002-31/12/2016. The case of Greece



Based on the AIC within the VECM (see Appendix D, D3 and 5.1.5.2 below) the chosen number of lags is equal to one.

In order to test the probable long run 'co-movements' that might exist between the investigated variables we use again (see also 5.1.2.1, 5.1.3.1, 5.1.4.1) cases 2, 3 and 4, i.e. the following Johansen cointegrating equations: case 2, if none of the time series have a time-trend, case 3, for the trending ones, which is being used if 'all trends' are stochastic, while if we have some evidence that some of the series are trend-stationary, then we should use case 4. Below, for the given properties of our data set, we present case 3 (see Appendix D for the presentation of the rest of the cases and specifically part B and table B2).

Table 5-7: Cointegration results using Trace statistics. The case of Greece

Hypothesized No. of CE(s)	**Trace statistic**	**0.01 critical value**	**0.05 critical value**	**Probability**
None *	55.78110	54.68150	47.85613	0.0076
At most 1	23.60366	35.45817	29.79707	0.2177
At most 2	6.148052	19.93711	15.49471	0.6780
At most 3	2.456552	6.634897	3.841466	0.1170

Note: *Critical values based on MacKinnon-Haug-Michelis (1999)

On the Johansen table above we observe that the Trace statistic indicates exactly one cointegrating equation both at the 0.01 and the 0.05 level of significance. For the stated null hypothesis on the first column, i.e. the number of cointegrating equation(s), which is none on the first row, we can 'reject' the respective null hypothesis –at the chosen 0.05 and 0.01 level of statistical significance− given that the Trace statistic of 55.78110 which is greater than the respective critical value of 47.85613 and 54.68150, based on the MacKinnon-Haug-Michelis (1999). Thus, in both cases there is enough statistical evidence to reject the hypothesis of 'no cointegration'. Thus, even at 99% we can conclude that there is one cointegrating equation in the case of Greece.

On the above we could add the exact estimated form of the cointegrating equation, with the one cointegrating vector based on the Trace statistic (provided in the respective tables in Appendix D, Table B1, both within the Johansen Cointegrating framework and the final VECM). Specifically, the normalized cointegrating coefficients of the CE, for the imposed restriction of one on the respective coefficient of IP, are bearing if not the expected signs at least consistent signs with the rest of the results that will be discussed both in the VECM and the final G-VARs context. For example, IP is positively related to interest rate, the 10 year Greek bond which is used as a money and market proxy, for the given special condition that were valid for this country during the investigated period, a relationship that is a statistically significant one. The estimated coefficient in the VECM cointegrating equation part is 0.916251 and for the estimated standard error of 0.34156 the t-statistic is 2.68255. IP is also negatively related both to FS and REER in statistically significant ways. Note that an increase in REER means that the economy is worse off it terms of its relative competitive position, which means that the sign is the expected in the case of Greece. Specifically the increasing REER decreases IP as it is expected from economic theory. FS even though are not historically important −the country is a member of the Eurozone and thus their major portion which could be used in defending a fixed exchange rate regime is not needed anymore– are bearing, within the cointegrating equation of the specific VECM, a statistically significant population parameter. The sign is also negative given that their decrease "drives down" the IP.

Overall, from the above results we can report that two out of the four variables appear to be cointegrated, and thus we can proceed –for the given established at the 0.01 and 0.05 level of statistical significance cointegrating equation– with a VEC model.

5.1.5.2 The lag length criteria within the VECM structure

The lag length criterion being used is the Akaike Information Criterion (AIC). The respective table and results are provided in Appendix D, Table D3. Note that all four variables in the VEC model again are considered to be in their first difference in the case of Greece as well, given that the final model is a stable one in this case. The choice of first differenced variables, as stated repeatedly, is supported by the stationarity properties of the time series that applied on the 'unit root' related part (these results are available in the Appendix D and parts C1 and C2, and in the final G-VAR). Thus, overall, based on AIC the chosen number of lags is one, which means that the VEC model for the case of Greece is going to be a VECM(1).

5.1.5.3 The Vector Error Correction Model (VECM)

As already analysed on the theoretical section of this thesis and on the previous empirical subsections of the case of Bulgaria (5.1.2.3), Croatia (5.1.3.3) and FYROM (5.1.4.3) for the given cointegration related results provided also above (see subsection 5.1.5.1) we have grounds to continue with a structural Vector Autoregressive Model for the case of Greece.[33]

---

[33] In terms of the stability condition of the VEC model, in the case of Greece, the roots of the characteristic polynomial are within the unit root circle (Pesaran, 2015; Brooks, 2014), the Vector Error Correction Residual Serial Correlation LM Test, applied under the null hypothesis of 'no serial correlation at lag order h', where the LM statistic of 27.33856 at one lag, for the respective critical value (a Chi-square with 16 degrees of freedom, with the included

Thus, for the given stability of our model, we can proceed with the interpretation of the VECM results of Greece. Note that on the table below we report again only the respective coefficients and the t-statistics (provided within brackets). Note that the VECM incorporates again the Error Correction Term.

The VECM is applied with one cointegrating equation (see subsection 5.1.5.1). The results are provided in full detail on Appendix D, part E and Tables E). Below we provide the VECM with one cointegrating equation and the respective equations of the model.

Table 5-8: VECM(1)

	dIP	**dREER**	**dFS**	**dI**
dIP	-0.545999* [-8.49203]	-0.027029** [-2.02611]		
dREER		0.140853*** [1.92035]	-1.600825*** [-1.65435]	
dFS				
dI		-0.020447*** [-1.75823]		0.338379* [4.69105]
cointEq1		0.015368* [4.25049]	-0.100366** [-2.10423]	

Note: t-statistics are provided within brackets. One * denotes a statistically significant parameter at the 0.01, ** at 0.05 and *** at 0.10. Also note that the Error Correction component is statistically significant.

VECM(1):
D(IP) = - 0.000815996881302*(IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062) - 0.545998888562*D(IP(-1)) - 0.455288360679*D(REER(-1)) - 0.0216726830675*D(FS(-1)) - 0.0789659874634*D(I(-1)) - 0.000926423906999

D(REER) = 0.0153675286372*(IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062) - 0.0270290082488*D(IP(-1)) + 0.14085299776*D(REER(-1)) + 0.00237189717783*D(FS(-1)) - 0.0204467078975*D(I(-1)) + 4.18645184042e-05

D(FS) = - 0.100366398386*(IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062) - 0.0412588972321*D(IP(-1)) -

---

observations being 178) or the calculated probability value of 0.0379, provide statistical evidence that there is no serial correlation at the 0.01 level of significance. Also, the VEC Residual Normality tests are applied under a Cholesky (Lütkepohl) Orthogonalization and under the null hypothesis that 'residuals are multivariate normal'. There is also strong statistical evidence that the null hypothesis should not be rejected, indicating through the Jarque-Bera statistic and the respective Chi-squared critical values that the 'residuals are multivariate normal' at the 0.01 level of significance. The stability VECM test and the commented results are provided on the Appendix (see Appendix D and Figure D1 and Tables D1 and D2).

1.60082509277*D(REER(-1)) + 0.0587266516288*D(FS(-1)) + 0.113697668392*D(I(-1)) - 0.000333589918264

D(I) = - 0.00525510665477*(IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062) + 0.0224103635422*D(IP(-1)) + 0.0289462742508*D(REER(-1)) - 0.00167387995283*D(FS(-1)) + 0.338379343657*D(I(-1)) + 6.59414274503e-05

As can be observed on the provided VECM table above, there is again a highly statistically significant impact running from two out of four cointegrating equations to the respective dependent variables of REER and FS.

The Industrial Production (IP) of Greece is affected by its own past values mainly in the short run, which is the case of REER also, while in the long run the cointegrating equations shows no long run co-movements of the investigated variables in the case of IP. This result request some further investigation that will take place in the coming empirical chapters. The REER is also related negatively to the past values of Interest rate which is a finding that apart from being interesting requires some further investigation (that will take place in the GVAR chapters).

The Foreign Reserves (FS) of Greece are not of a special interest, given that they decreased sharply once the country joined the EMU. Still, within this context and coupled with the cointegrating findings in the Johansen framework (see 5.1.5.1) we could claim that the existing statistical significance –that seems to exist in the investigated interlinkages of the variables– is related to the broader stability that could be brought into an economy by an EMU entry. Meaning that once a country is a member of the Eurozone there is no need in the future to use FS to defend a fixed exchange rate regime or to 'gain' any additional credibility through their existence.

Last but not least, the Greek Interest rate (I) is affected highly and mainly by its own past values. This is a finding that holds at a much lower to the 0.01 level of significance (the t value is 4.69) and the estimated coefficient is also relatively high also (0.34), depicting that the main driver of the interest rate of this economy is the rate in the previous month. A result that makes further sense if we consider that the money and market rate proxy that we have used is the 10-year Greek bond[34].

5.1.5.4 Generalized Impulse Response Functions (GIRFs)

The Generalized Impulse Response Functions (GIRFs) will help us to further understand the time profiles of the investigated variables in the case of Greece as well. As we have seen before (on Section 4.2.7) we apply only the Generalized Impulse Response Functions (GIRFs) to correct the 'ordering of variables' related problem. Thus, on the table below we provide only the GIRFs, though, without any bounds (the Cholesky

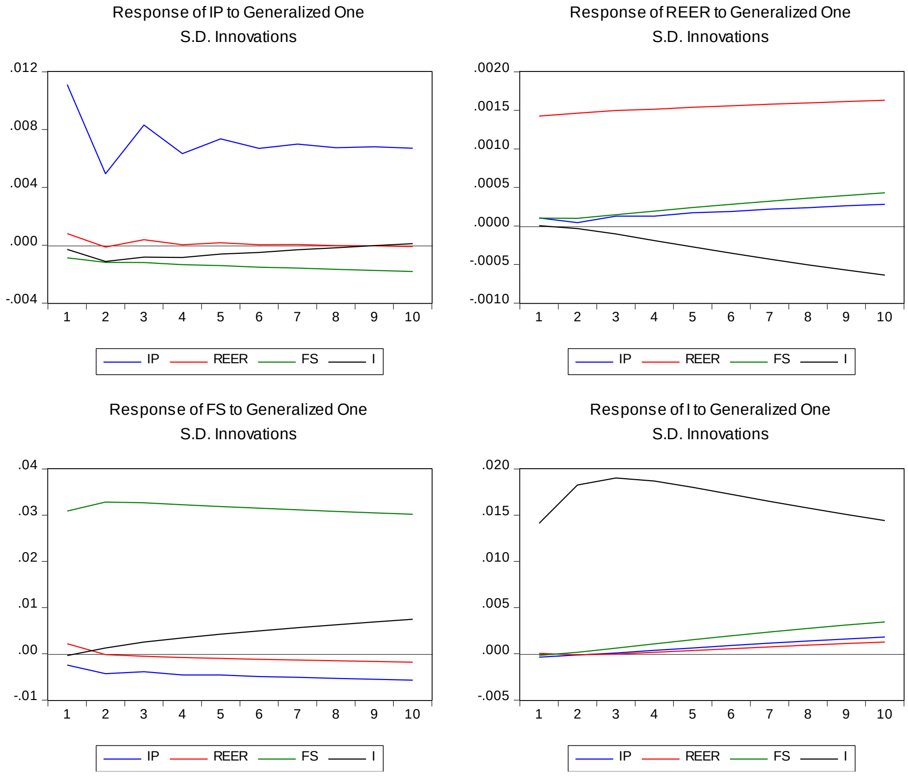
---

[34] Additionally, if a dummy variable is included in the VECM of Greece we will manage to capture a part of the complex effect of the outburst of the global financial crisis that started in September 2008 and subsequently hit the Greek economy (See Appendix D, Table E3). The crisis hit this Eurozone member in two waves, thus apart from the initial global one that will be quantified through a dummy starting at the eighth month of 2008 (named as dum08), there was a second 'wave' that drove indicatively the domestic 10-year bond interest rates to unsustainable levels that stayed above 7% from April 2010 to February 2014, reaching a peak of 38% in 2012 and staying above 30% from November 2011 to March 2012. Thus, within this context we have added a second dummy variable, Dum11, given that the crisis escalated mainly in 2011. Thus, when a dummy variable is introduced in the VECM of the Greek economy the coefficients remain as expected statistically significant and bear the correct signs. Analytically, when the IP is in the LHS of the system, the estimated coefficient of the dummy is -0.015642 and the t-statistic is -3.53657, showing that the Greek growth proxy responds negatively and in a statistically significant way to the 2008 crisis, as expected, while when FS is on the LHS the coefficient of the dummy is positive and equal to 0.0287307 with a t-statistic of 2.28897. A weaker finding at the 0.10 level of significance is that the dummy variable impacts the REER positively as well, providing evidence that the shock impacted negatively the economy's competitiveness. Apart from the above findings, it has to be underlined that the incorporation of this dummy variable has almost not changed neither the statistical significance nor the estimated signs of the coefficients of the VECM, excluding partly the coefficient of the cointegrating equation that raises its significance and becomes statistically significant even at the 0.01 level when IP is on the LHS of the VEC system, while on the contrary, the respective CE coefficient loses its impact on the Interest rate.

When both dummies are added to the Greek VEC model, the dum08 impacts negatively and in a statistically significant way the IP, as expected, and positively the FS as well, even though Greece was −and is− an EMU member. While the dum11 affects the REER negatively, even though close to zero −at the 0.01 level of significance− indicating that the second wave of the crisis, as the crisis was transformed into a Greek one within an EMU context, forced the economy to increase its competitiveness. This adjustment, given the nature of the REER, cannot come from the Euro exchange rate but from the CPI part of it. A weaker finding at the 0.10 level of significance can be identified in the dum11 impact on Interest rates which is a negative one and very close to zero. The incorporation of the two dummy variables has not changed the statistical significance and the estimated signs of the coefficients of the Greek VECM, excluding partly the coefficient of the cointegrating equation that raises its significance and becomes statistically significant even at the 0.01 level when I is in the LHS of the VEC system, returning the model to the non-dummy incorporated VEC results, while the respective CE coefficient in the case of IP becomes statistically significant at 0.10. The above results require further investigation which is what is presented within the coming GIRFs and mainly under the G-VAR structures.

decomposed residuals, 'exposed' to the specific 'ordering problem' are provided in the Appendix D, Figure E4).

Figure 5-8: Generalized Impulse Response Functions (GIRFs)



The Industrial Production response of Greece to a shock equal to one standard deviation of Greek REER is almost insignificant and weakens relatively quickly, while it responds negatively to a positive Interest rate (I) shock as it is expected from the economic theory. This response is negative throughout the time period and wears out after the eighth to ninth quarter.

From the REER results it is interesting to comment on their positive responsiveness to IP. Still, even though we cannot report this response as a statistically significant one, we have some signs, that within this model, and for the given investigated variables, that a positive IP shock does not boost the REER of Greece (as is the case in Croatia for example). Instead, the opposite seems to hold for this SEE country, which means that a positive shock of this growth proxy (the IP) increases its REER, which means that IP is not 'translated' to a more competitive economy. The REER also responds negatively to an increasing Interest rate related shock, which means that the country's economy becomes more competitive even though the domestic ‘I’ is increased. Or inversely, the economy is worse off in terms of its competitiveness, which is for example the case for FYROM, even though when the Interest rates tend to go down and remain at relatively low levels, showing that the economy cannot ‘respond’ positively to low Interest rates. At the same time, these results point towards a more complex and dynamic interlinkages that exist between the domestic money and market rate to the EMU ones and to the real economies too.

Last but not least, the responsiveness of ‘I’ in the case of Greece shows that the investigated variable is self-related to its own past values more compared to FYROM and less compared to Bulgaria and Croatia, showing that the variable has some ‘persistent memory’ as expected, for the given vulnerabilities and the volatility of the country that was released once it became a Eurozone member before the economy really met the related macroeconomic and financial ‘criteria’.

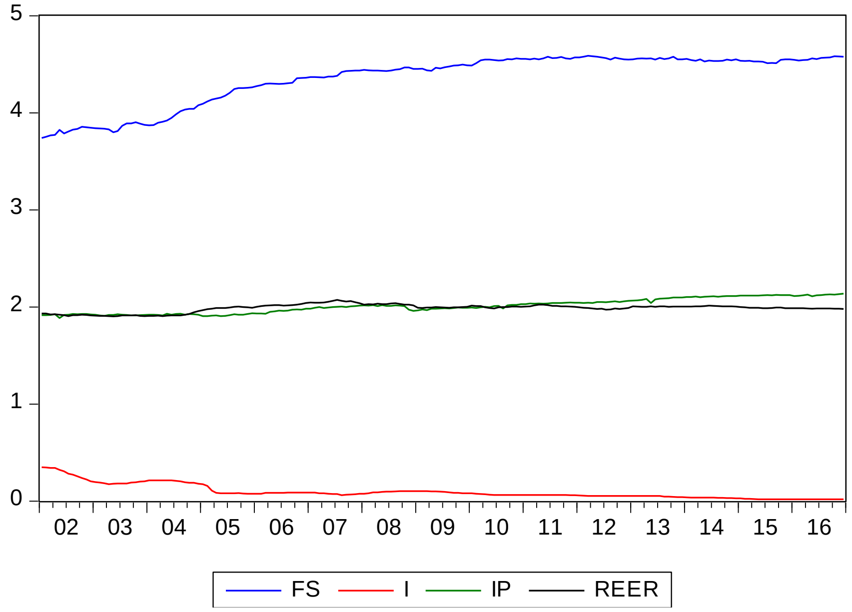
Note also that similar results are being reached if a different time period is used instead of the ten period one. A forty period time profile is available in the Appendix (See Appendix D, Figure E2). The only slightly different outcome is the one that was partly evident in the ‘I’ case, where the response of this variable to FS eventually wore out, as it is expected and suggested above. Still, the above results, especially given that there is no evidence if they are or not statistically significant, should be addressed within the G-VARs, before we proceed to their ‘final’ interpretation.

5.1.6 The case of Romania - **Empirical tests and results**

5.1.6.1 Testing for Cointegration

On the figure below the four variables are presented at level in the case of Romania. Interest rate (I) is in a percentage form, while FS, IP and REER are in logarithms. It has to be stated briefly once again that the implementation of the Johansen Technique in testing the cointegrating equations provide statistical evidence if a co-integrating relation between the variables does exist and thus it should be considered as a prerequisite in building a VEC model.

Figure 5-9: The four variables in level from 1/1/2002-31/12/2016. The case of Romania



Based on the AIC within the VECM (see Appendix E and 5.1.6.2 below) the chosen number of lags is equal to one. In order now to test the probable long run 'co-movements' that might exist between the investigated variables in the case of Romania, we use once again (see also 5.1.2.1, 5.1.3.1, 5.1.4.1, 5.1.5.1) cases 2, 3 and 4, i.e. the following Johansen cointegrating equations: case 2, if none of the time series have a time-trend, case 3, for the trending ones, which is being used if 'all trends' are stochastic, while if we have some evidence that some of the series are trend-stationary, then we should use case 4. Below, for the given properties of our data set, we present case 3 (see Appendix E for the presentation of the rest of the estimated cases and specifically part B, Table B2).

Table 5-9: Cointegration results using Trace statistics. The case of Romania

Hypothesized No. of CE(s)	**Trace statistic**	**0.01 critical value**	**0.05 critical value**	**Probability**
None *	52.95078	54.68150	47.85613	0.0154
At most 1	22.45453	35.45817	29.79707	0.2739
At most 2	6.642632	19.93711	15.49471	0.6195
At most 3	1.270904	6.634897	3.841466	0.2596

Note: *Critical values based on MacKinnon-Haug-Michelis (1999)

On the Johansen table above we observe that the Trace statistic indicates that there is exactly one cointegrating equation at the 0.05 level of significance. Specifically, for the stated null hypothesis on the first column, i.e. the number of cointegrating equation(s), which is 'none' on the first row, we can 'reject' the respective null hypothesis –at the chosen 0.05 and not at the 0.01 level of statistical significance– given that the Trace statistic of 52.95078 which is greater than the respective critical value of 47.85613, but not of 54.68150 (these critical values are based again on the MacKinnon-Haug-Michelis (1999)). Thus, there is enough statistical evidence, for the given specification, to reject the hypothesis of 'no cointegration', which means that at 95%, a bit below 99% –for the given provided probability value of 0.0154– we can state that there is one cointegrating equation in the case of Romania.

On the above, we could add also the exact estimated form of the cointegrating equation, which is under one cointegrating vector based on the Trace statistic (which is presented in the respective tables on Appendix E, table B2, both within the Johansen Cointegrating framework and the final VEC, augmented with the Global variables, model, Appendix E: Tables E1 and E3). The normalized cointegrating coefficients of the CE, for the imposed restriction of one on the respective coefficient of IP, are bearing the expected signs, i.e. IP is negatively related to the Interest rate, with an estimated coefficient in the VECM cointegrating equation part equal to -1.9321338 and for the estimated standard error of 0.45189 the t-statistic is 4.27573, a highly statistically significant result. IP is also negatively related both to REER in a statistically significant way (at the 0.01 level), which means that an increase in REER – translated as a worsening of its competitive position– affects negatively IP, as expected (a result that will be evident on the VECM also (see below 5.1.6.3). The aforementioned estimated coefficient in the VECM cointegrating equation is equal to -1.328391 and for the estimated standard error of 0.5022 the t-statistic is 2.62933.

Last but not least, IP is positively related to the movements of FS, which is an expected result, but not a statistically significant one (See Appendix E, Table E3).

Overall, from the above results we can report that two out of the four variables appear to be cointegrated, thus we are able to proceed –for the given established at the 0.05 level of statistical significance cointegrating equation– with a VEC model for the Romanian economy.

5.1.6.*2* The lag length criteria within the VECM structure

The lag length criterion being used, as before, is the Akaike Information Criterion (AIC). These results are available in Appendix E, table D4. Note that all four variables in the VEC model are considered to be in their first difference in the case of Romania, given that the final model is a stable one in this case. The choice of the first differenced variables, as stated repeatedly, is supported by the stationarity properties of the time series that applied on the 'unit root' related part (these results are available in Appendix E. parts C1 and C2, and on the final G-VAR (see Chapter 6). Thus, overall, based on AIC the chosen number of lags is one, which means that the VEC model for the case of Greece is a VECM(1).

5.1.6.3 The Vector Error Correction Model (VECM)

Following the discussion already presented in the previous sections we have grounds to proceed to a structural Vector Autoregressive Model for the case of Romania.[35]

---

[35] In terms of the stability condition of the VEC model, in the case of the fifth investigated SEE, i.e. Romania, the roots of the characteristic polynomial are again within the unit root circle (Pesaran, 2015; Brooks, 2014). The Vector Error Correction Residual Serial Correlation LM Test, applied under the null hypothesis of 'no serial correlation at lag order h', where the LM statistic of 16.84153 at one lag, for the respective critical value (a chi-square with 16 degrees of freedom, the included observations are 178) or the calculated probability value of 0.3959, provide statistical evidence that there is no serial correlation at the 0.01 and 0.05 level of significance. Also, the VEC Residual Normality tests are applied under a Cholesky (Lütkepohl) Orthogonalization and under the null hypothesis that 'residuals are multivariately normal', a test that generates statistical evidence that the null hypothesis should not be rejected, indicating through the Jarque-Bera statistics and the respective Chi-squared critical values that the 'residuals are multivariately normal'. The stability VECM test and the commented results are provided on the Appendix (see Appendix E, Figure D1 and Tables D1, D2 and D3).

Thus, for the given stability of the VEC model, we can proceed with the interpretation of the respective results in the case of Romania. Note that in the table below we report only the respective coefficients and the t-statistics (provided within brackets) as it was the practice in the previous cases. Note also that the VECM incorporates the Error Correction Term, as it was the case in the previous countries.

The VECM is applied with one cointegrating equation based on the cointegrating results we received before (see subsection 5.1.6.1). The results are provided in further detail in Appendix E (see Table E1). Below we provide the VECM with one cointegrating equation and the respective estimated sample regression functions.

Table 5-10: VECM(1)

	dIP	**dREER**	**dFS**	**dI**
dIP	-0.328502* [-4.53743]	0.092282** [2.01147]	0.363005* [3.27247]	
dREER		0.283415* [3.89602]	0.570119* [3.24139]	-0.169931* [-2.81457]
dFS				
dI				0.562588* [9.83443]
cointEq1	-0.013334*** [-1.92917]		0.018951*** [1.78948]	-0.017989* [-4.94860]

Note: t-statistics are provided within brackets. One * denotes a statistically significant parameter at the 0.01, ** at 0.05 and *** at 0.10. Also note that the Error Correction component is statistically significant.

```
VECM(1):
D(IP) =  - 0.013334110585*( IP(-1) + 0.887604965154*REER(-1) + 0.206512424895*FS(-1) +
2.86058790697*I(-1) - 4.94163372169 ) - 0.328502418771*D(IP(-1)) -
0.146940326627*D(REER(-1)) - 0.0242305729543*D(FS(-1)) - 0.0758058562917*D(I(-1)) +
0.00166670261504

D(REER) =  - 0.00580342119502*( IP(-1) + 0.887604965154*REER(-1) +
0.206512424895*FS(-1) + 2.86058790697*I(-1) - 4.94163372169 ) +
0.0922823134375*D(IP(-1)) + 0.283415021758*D(REER(-1)) + 0.012194894437*D(FS(-1)) -
0.0623608136643*D(I(-1)) - 9.70665085245e-05

D(FS) = 0.0189508283782*( IP(-1) + 0.887604965154*REER(-1) + 0.206512424895*FS(-1) +
2.86058790697*I(-1) - 4.94163372169 ) + 0.363004843758*D(IP(-1)) +
0.57011856967*D(REER(-1)) + 0.11082177564*D(FS(-1)) + 0.077415043453*D(I(-1)) +
0.003665846975

D(I) =  - 0.0179890797924*( IP(-1) + 0.887604965154*REER(-1) + 0.206512424895*FS(-1) +
2.86058790697*I(-1) - 4.94163372169 ) - 0.0051587509844*D(IP(-1)) -
```

0.169930510406*D(REER(-1)) + 0.00555992055375*D(FS(-1)) + 0.562587666802*D(I(-1)) - 0.000774597066047

As it can be observed on the provided table above (for further detail see Appendix E, Table E3) there is again a statistically significant impact running from the cointegrating equations to the dependent variables, and specifically on the IP, REER and the 'I' as well. The signs of the three statistically significant CE are negative as expected.

The Industrial Production (IP) of Romania is also affected by its own past values in the short run, while, as stated, in the long run the cointegrating equations show also long run co-movements of the investigated variables that hold close to 0.05 level of significance. Also, the Romanian REER is affected by its past values in a positive and statistically significant way. This result holds even at the 0.01 level given that the estimated t is equal to 3.89. It is interesting to add that the estimated coefficient is 0.28, which shows that a relatively high proportion of the variation of the investigated variable is related to its own past 'history'.

The Foreign Reserves (FS) of Romania, seem to be also of a special interest, given that they are not only sensitive to the long run co-movements of the investigated variables (at 0.10 level of significance), for the given statistically significant coefficient of the cointegrating equation, but on the IP and REER as well. Specifically, the Romanian REER impacts the country's FS, which means that when the economy's competitiveness is worse off, the Central Bank increases the FS and the inverse, and thus adds further to our understating both theoretically and empirically of the role played by the Foreign Exchange Reserves in the transmission channel not only of monetary but of non-monetary policy shocks. Also, FS, as stated, is affected positively and in a statistically significant way from the IP –the estimated coefficient is 0.36 (the t-statistic is 3.27)– providing statistical evidence that FS grow in this country as the economy grows, relating this finding not only to the promoted and perceived stability of the exchange rate regime, but of the expected extra need of FS for the international transactions of the economy.

Last but not least, the Interest rate (I) of Romania seems to be affected in the long run highly by the cointegrating equation –an equation that was discussed above (see 5.1.6.1)– and in the short run, apart from the REER, mainly from its own past values. A finding that holds at a much lower to the 0.01 level of significance (the t value is 9.83) and the estimated coefficient is also really high (0.56), showing that the main driver of the interest rate of this economy is the rate at the previous month[36].

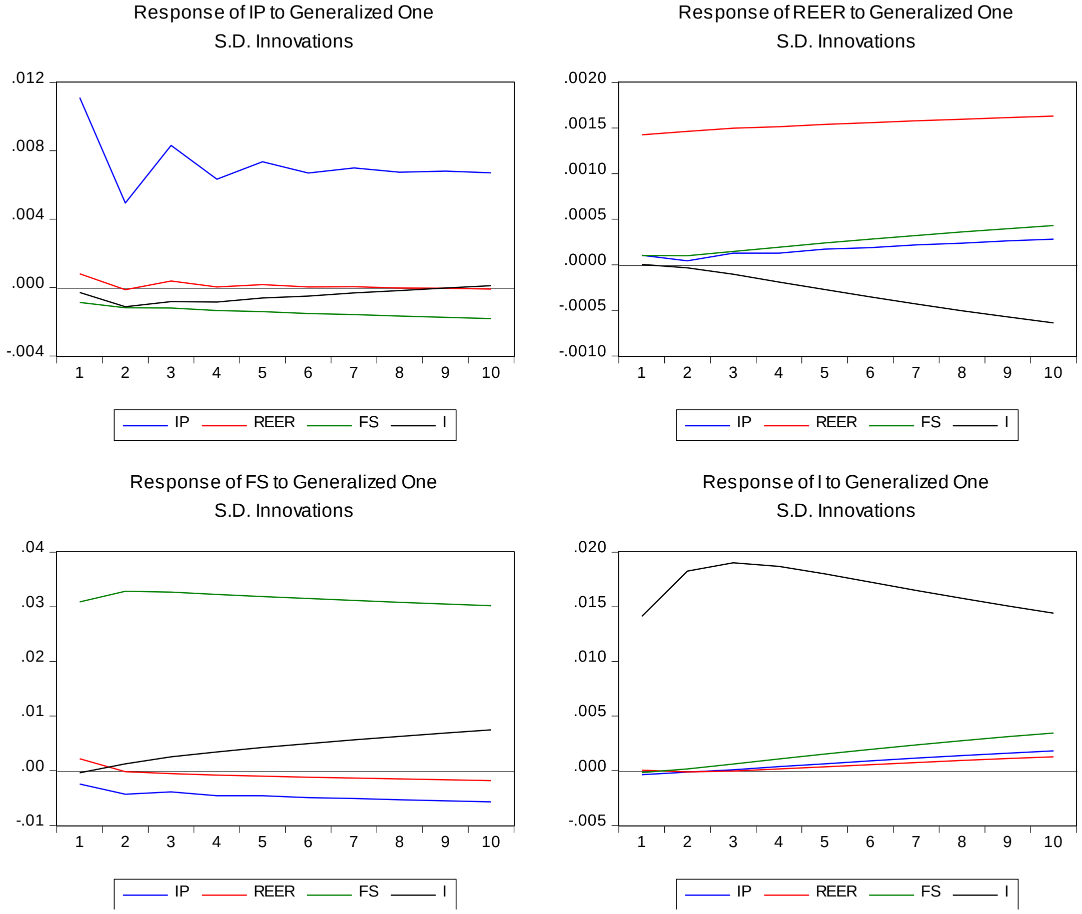
5.1.6.4 Generalized Impulse Response Functions (GIRFs)

The Generalized Impulse Response Functions (GIRFs) will help us at this last stage of the VECM to further understand the time profiles of the investigated variables in the case of Romania. GIRFs help us to capture the responsiveness of the investigated variables to one standard deviation (s.d.) shocks of the rest of the variables. On the figure below, we provide multiple graphs of the Response of IP, REER, FS and I to Generalized one s.d. innovations.

---

[36] Additionally, if a dummy variable is added to the VECM of Romania we will manage to capture at least a part of the outburst effect of the global financial crisis since September of 2008 in the case of this country as well (See Appendix E and Table E3 for the VECM with the dummy variables). Thus, when a dummy variable is introduced in the case of the Romanian economy its coefficients are statistically significant and bearing rather interesting signs from an economic perspective. This perspective requires further investigation and does not seem to have very clear results compared to the rest of the investigated SEE countries. When REER is treated as the endogenous variable of the Romanian VEC model, the 2008 crisis –as approximated with the specific dummy variable– impacts the variable in a statistically significant way (marginally above the 0.05 level of significance though given that its t-statistic is -1.91859), which means that the economy became more competitive in time, being the economic interpretation of a REER decrease. Still, the estimated coefficient is close to zero, i.e. -0.002019 which should be considered in the above context as well, showing obviously an economy that is under a continuous transition. At the same time, when the FS is on the LHS of the system, the estimated coefficient of the dummy variable is negative and very close to zero, i.e. equal to -0.005128, with a t-statistic equal to -2.34371, showing that the Romanian FS were affected by the 2008 crisis in a statistically significant way (at the 0.05 level) but not to a significant extent. Also, when the Interest rate is on the LHS the coefficient of the dummy variable is negative and equal to -0.00187 with a t-statistic of -2.04610, i.e. close to the 0.05 level of significance, which even though is still low it shows that the 2008 crisis caused changes to this economy that require further investigation. Also, apart from the above findings, it has to be underlined that the incorporation of this 2008 crisis related dummy variable has not changed neither the statistical significance nor the estimated signs of the coefficients of the VECM, excluding relatively minor changes that include the coefficient of the cointegrating equation that raises its significance and becomes statistically significant at the 0.05 level when REER is on the LHS of the VEC system, as expected, for the given statistical significance of the incorporated dummy in this equation of the model. On the contrary, the CE impact on the FS loses part of its significance and becomes statistically significant at a level greater than 0.05.

Figure 5-10: Generalized Impulse Response Functions (GIRFs)



The Industrial Production response of Romania to the aforementioned in terms of its size shock, to the domestic REER is a negative one, as expected and shows no signs of weakening, a finding that persists even if the time profile increases to 40 months. Also, IP responds negatively to a positive Interest rate (I) shock as it is also expected from economic theory, which also persists through time (see the 40 month graph on Appendix E: Figure E2).

From the REER results it is interesting to comment on the non-sustainable and positive responsiveness to IP, which also weakens after the first year. Still, it has to be reported that we cannot state if this is a statistically significant response and thus further investigation is required. The Romanian REER responds negatively to an increasing interest rate related shock, which could mean that the country's economy becomes more competitive even though the domestic 'I' is increased. Inversely the economy is worse off in terms of its competitiveness, which is the case of FYROM and Greece, even when the rates tend to go down and remain at relatively low levels. The latter shows that the economy cannot 'respond' positively to low rates, and at the same time these results point towards the more complex and dynamic interlinkages that exist between the domestic money and market rate to the EMU ones and to the real economies, that call for further and careful examination.

The FS sustained by the Central Bank of the country responds negative to an Interest rate shock during the first six months, and then they turn to a positive ground and remain there for the remaining of the used time profile, not only in the case of 10 months, but also when 40 months are being used (see Appendix E, Figure E2). The positive responsiveness of FS is also evident but in the case of IP and of REER, which goes along with the aforementioned interpretation that we have provided on the VECM part (see Subsection 5.1.6.3).

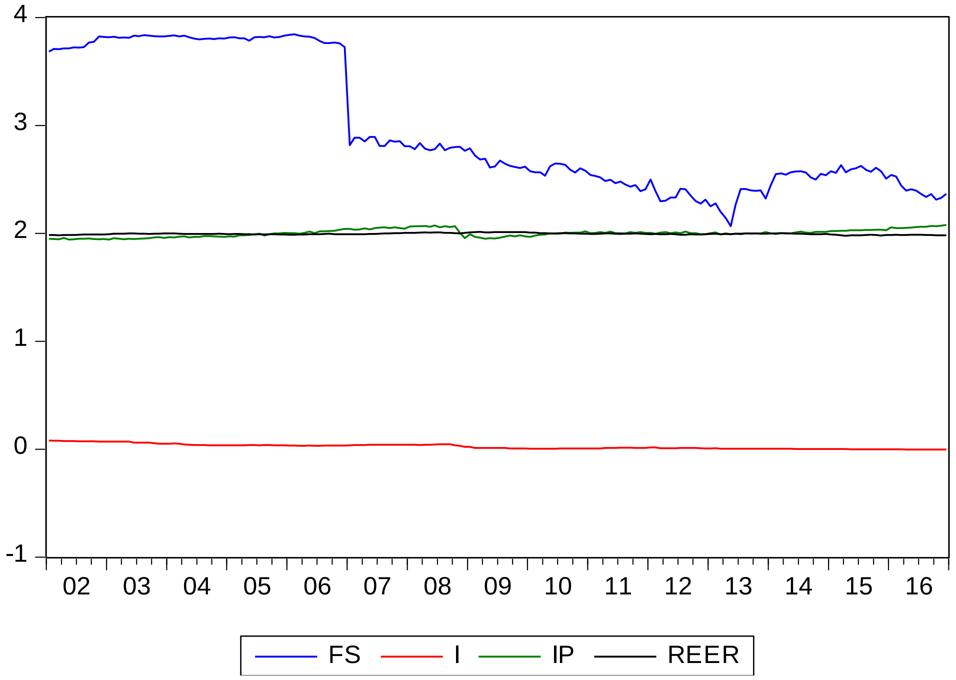
Last but not least, the responsiveness of 'I' in the case of Romania shows that the investigated variable is self-related to its own past values depicting, as expected, some evidence of a 'lasting memory'. Also the Interest rate responds negatively to a positive FS shock, again as expected, meaning that an increase of Foreign Exchange Reserves is 'interpreted' by the markets as a positive boost to the stability of the economy. Also a positive shock of IP drives down the Interest rate, a finding that seems to last for many periods without showing signs of a forthcoming weakening. Lastly, the responsiveness of this variable to REER is the most puzzling one and should be considered along with the VECM and the G-VAR findings for the specific country in order to reach a safe, nevertheless dynamically exposed, conclusion. Overall, the above results, given that there is no evidence in terms of their statistical significance, should be addressed within the G-VARs.

5.1.7 The case of Slovenia - Empirical tests and results

5.1.7.1 Testing for Cointegration

On the figure below the four variables are now presented at level in the case of Slovenia, the last of the six investigated SEE countries. Interest rate (I), as in all cases above, is in a percentage form, while FS, IP and REER are in logarithms. The implementation of the Johansen Technique in testing the cointegrating equations (see Pesaran, 2015, Smith and Galesi, 2014; Brooks, 2014) will provide us with the needed statistical evidence of co-integrating relations that might exist between the investigated time series and thus, acting like a prerequisite will allow us to proceed with the construction of a VEC model.

Figure 5-11: The four variables in level from 1/1/2002-31/12/2016. The case of Slovenia



Based on the AIC within the VECM (see Appendix F, D4 and 5.1.7.2 below) the chosen number of lags is equal to one. In order to test the probable long run 'co-movements' that probably exist between the investigated variables in the case of Slovenia, we use again (see Subsections 5.1.2.1-5.1.6.1) cases 2, 3 and 4, i.e. the following Johansen cointegrating equations: case 2, if none of the time series have a time-trend, case 3, for the trending ones, which is being used if 'all trends' are stochastic. If we find some evidence that some of the series are trend-stationary, then we should use case 4. Below, for the given properties of the used data set, we present case 3 (see Appendix F, tables B2 and B3 for the presentation of the rest of the estimated cases).

Table 5-11: Cointegration results using Trace statistics. The case of Romania

Hypothesized No. of CE(s)	**Trace statistic**	**0.01 critical value**	**0.05 critical value**	**Probability**
None *	48.38596	54.68150	47.85613	0.0445
At most 1	25.39006	35.45817	29.79707	0.1480
At most 2	12.06888	19.93711	15.49471	0.1537
At most 3	4.830800	6.634897	3.841466	0.0279

Note: *Critical values based on MacKinnon-Haug-Michelis (1999)

On the Johansen table above we observe that the Trace statistic indicates that there is exactly one cointegrating equation at the 0.05 level of significance. Specifically, for the stated null hypothesis on the first column, i.e. the number of cointegrating equation(s), which is none on the first row, we can 'reject' the respective null hypothesis –at the chosen 0.05 and not at the 0.01 level of statistical significance– given that the Trace statistic of 48.38596 which is greater than the respective critical value of 47.85613, but not of a 0.01 level of significance critical value of 54.68150. Note that these values, as stated, are based on the MacKinnon-Haug-Michelis (1999). Thus, there is enough statistical evidence, for the given used Johansen specification, to reject the hypothesis of 'no cointegration', which means that at 95%, we can support that there is one cointegrating equation in the case of Slovenia.

On the above we could add also the exact estimated form of the cointegrating equation, which is under one cointegrating vector based on the Trace statistic (provided in the respective tables in Appendix F, Table B1, both within the Johansen Cointegrating framework and the final VEC model). The normalized cointegrating coefficients of the CE, for the imposed restriction of one on the respective coefficient of IP in the VECM, are bearing the expected signs, i.e. IP is negatively related to interest rate, especially when a dummy variable for the 2008 crisis is being added (see 5.1.7.3 below) with an estimated coefficient in the VECM cointegrating equation part equal to -2.068644 and for the estimated standard error of 0.40599 the t-statistic is 5.09528, a rather highly statistically significant result. IP is also negatively related both to REER in a statistically significant way (at the 0.01 level), which means that an increase in REER –translated as a worsening of its competitive position– affects negatively IP, as expected (a result that will be evident on the VECM as well (see below 5.1.7.3). This aforementioned estimated coefficient in the VECM cointegrating equation is equal to -1.674815 and for the estimated standard error of 0.62277 the t-statistic is -2.68930. Last but not least, IP is negatively related to the movements of FS, as expected, given that Slovenia joined EMU in the 1st of January of 2007, a result which is also statistically significant at a very high level, given that the t-statistic is 5.41683, which could be interpreted as a boost in the growth proxy of Slovenia due to a Eurozone entrance that does not require any FS to defend any exchange rate and thus FS decrease enormously after such an entry. Still the above will be analysed further within the VECM below and also in the finally applied G-VARs.

Overall, from the above cointegrating results we can report that two out of the four variables appear to be cointegrated, and thus we are able to proceed –for the given established at the 0.05 level of statistical significance cointegrating equation– with a VEC model for the Slovenian economy.

5.1.7.2 The lag length criteria within the VECM structure

The lag length criterion being used, as in the previous cases, is the Akaike Information Criterion (AIC). The respective results are available on Appendix F (see Table D4). Note that all four variables in the VEC model are considered once again to be in their first difference in the case of Slovenia, given that the final model is a stable one in this case (See Appendix F, Parts C1 and C2).

The choice of the first differenced variables is supported by the stationarity properties of the time series that were applied on the 'unit root' related part (these results are available on the Appendix F: C1, C2 and on the final G-VAR also (see

Chapter 6). Thus, overall, based on AIC the chosen number of lags is one, which means that the VEC model for the case of Slovenia is a VECM(1).

5.1.7.3 The Vector Error Correction Model (VECM)

We have grounds to proceed with a structural Vector Autoregressive Model for the case of this country, i.e. Slovenia.[37]

Thus, for the given stability of the Slovenian VEC model, we can now proceed with the interpretation of the respective results. Note that on the table below we report only the respective coefficients and the t-statistics (provided within brackets) as it was the practice in the previous cases, including the Error Correction Term. Note also that only the statistically significant results are being reported.

The VECM applied with one cointegrating equation based on the cointegrating results we have already seen (available on subsection 5.1.7.1) are provided on the table below (the results in full detail are on Appendix F, Table E1) along with the estimated equations.

Table 5-12: VECM(1)

	dIP	dREER	dFS	dI
dIP	-0.306319* [-4.11435]			
dREER				
dFS				
dI	1.306898* [3.45571]			0.212109* [2.80838]
cointEq1		-0.05083** [-2.59213]	-0.156096** [-2.04546]	0.03933** [2.09593]

---

[37] In terms of the stability condition of the VEC model, in the case of the sixth alphabetically investigated SEE, i.e. Slovenia, the roots of the characteristic polynomial are within the unit root circle (Pesaran, 2015; Brooks, 2014), the Vector Error Correction Residual Serial Correlation LM Test, applied under the null hypothesis of 'no serial correlation at lag order h', where the LM statistic of 24.81246 at one lag, for the respective critical value (a Chi-square with 16 degrees of freedom, the included observations are 178) or the calculated probability value of 0.0732, provide statistical evidence that there is no serial correlation at the 0.01 and 0.05 level of significance. Also, the VEC Residual Normality tests are applied under a Cholesky (Lütkepohl) Orthogonalization and under the null hypothesis that 'residuals are multivariately normal', we generate enough statistical evidence that the null hypothesis should not be rejected, indicating through the Jarque-Bera statistics and the respective Chi-squared critical values that the 'residuals are multivariately normal'. The stability VECM test and the commented results are provided on the Appendix (See Appendix F, Figure D1 and Tables D1, D2 and D3).

Note: t-statistics are provided within brackets. One * denotes a statistically significant parameter at the 0.01, ** at 0.05 and *** at 0.10. Also note that the Error Correction component is statistically significant.

VECM(1):

D(IP) = 0.00983774722316*(IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-1) - 10.6417607207) - 0.306319484981*D(IP(-1)) + 0.361995589907*D(REER(-1)) + 0.00132407392423*D(FS(-1)) + 1.30689762506*D(I(-1)) + 0.00155640370243

D(REER) = - 0.00508286412507*(IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-1) - 10.6417607207) - 0.0165357304447*D(IP(-1)) + 0.105808041973*D(REER(-1)) - 0.000232948310098*D(FS(-1)) - 0.062345132731*D(I(-1)) - 3.37523732508e-05

D(FS) = - 0.1560960352*(IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-1) - 10.6417607207) - 0.100313108531*D(IP(-1)) - 1.5372656667*D(REER(-1)) - 0.0281685978801*D(FS(-1)) - 0.0842821176039*D(I(-1)) - 0.00774657159413

D(I) = 0.00393338985523*(IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-1) - 10.6417607207) - 0.00856057060841*D(IP(-1)) + 0.0625752188328*D(REER(-1)) - 0.00172944910262*D(FS(-1)) + 0.212109124786*D(I(-1)) - 0.000367389696779

As it can be observed on the provided table above (for further detail see Appendix F, Table E3) there is once again a statistically significant impact running from the cointegrating equations to the dependent variables of REER, FS and I. This result, as expected, is based on statistical significance of the Error Correction parameter, which is statistically significant and bears the correct negative sign in two out of the three cases.

The Industrial Production (IP) of Slovenia is not only, as expected, affected by its own past values in the short run, but from the Interest rate as well. More specifically, the IP of Slovenia is positively related to the domestic Interest rate, showing probably that a possible increase of it, affects the economy positively, a finding that shows that even when the domestic rates decline the IP remains low as well and vice versa. This finding could be further related to the REER, pointing towards different transmission channels of monetary policy to the real economy. Still, the latter finding requires further investigation for the given financial integration of this SEE country to the EMU and for the given partial inability of the financial sector to boost economic growth, without at least further assistance in terms of policy making and other institutional and structural related changes and reforms.

Also, the cointegrating equation related coefficient when REER is treated as an endogenous variable, is highly statistically significant and bears a negative sign as expected (the estimated coefficient is -0.005 and the t-statistic is -2.59). This result is consistent with the cointegrating relations that we have investigated in advance. Still, within the CE, it has to be noted that the effect of I on IP is a positive one also, and shows, within this context, that the lower Interest rates does not boost the growth proxy. In any case this is a result that requires careful and further investigation, which will take place in the G-VAR chapters. On top of that, note also that the sign of this coefficient, as stated both on the VECM and the Cointegrating equation does change when the model is not using the 2008 related dummy variable.

Slovenia's Foreign Reserves (FS) seem not to be of any special interest within the VEC model, given that the country has joined EMU in 2007 and thus, the importance of this variable weakens. Within this context we are expected to find relations that are statistically insignificant, something which is also evident in the case of Greece.

Last but not least, the Interest rate (I) of Slovenia seems to be affected in the long run highly by the cointegrating equation component. This equation was discussed above (see 5.1.7.1). Note though that the estimated sign is not negative, as expected, and also the t-statistic is 2.09593, showing that the statistical significance of the population parameter holds at a 0.05 level of significance[38].

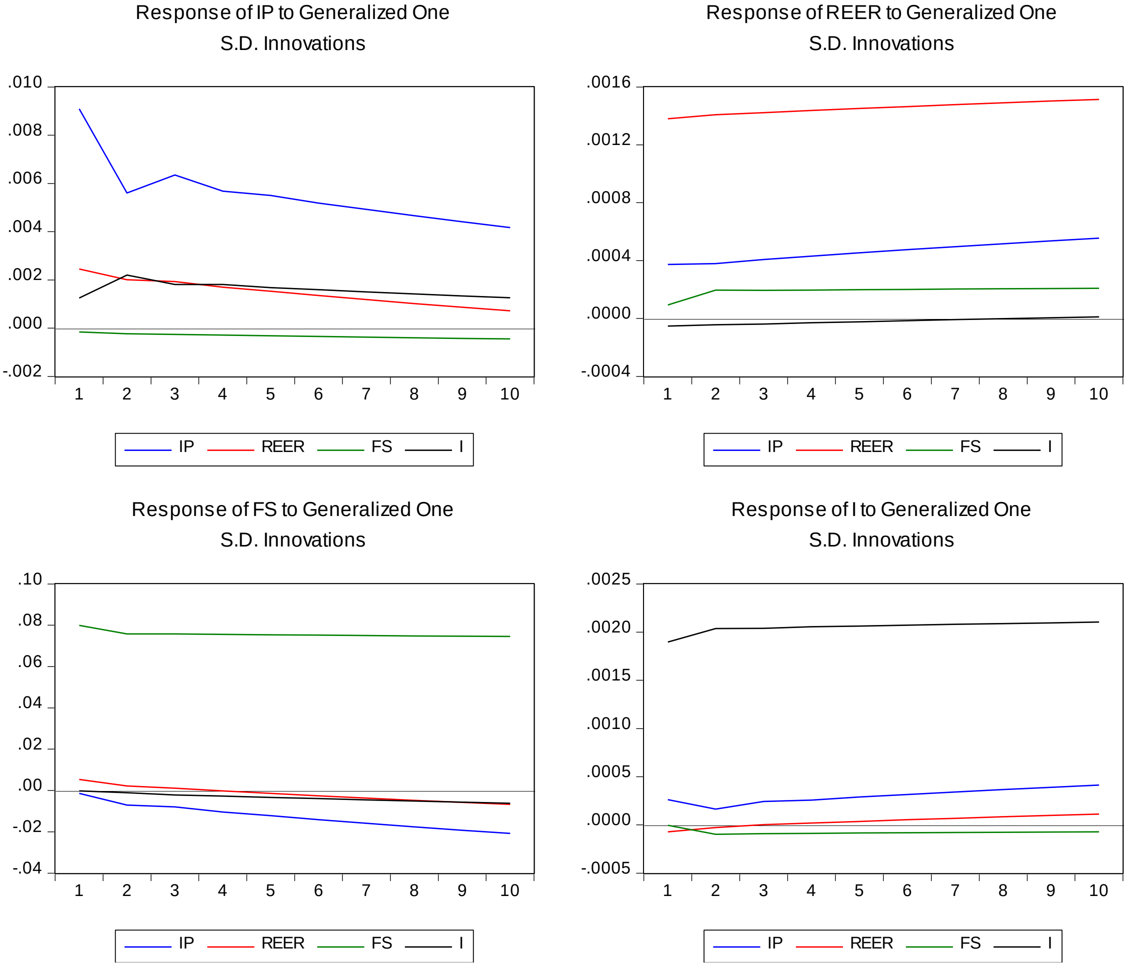
---

[38] To comment briefly on the dummy variables that are added on the VEC model, the respective coefficients are statistically significant at the 0.01 level in the cases of IP and I, i.e. when these variables are on the LHS of the system, and also they bear the expected signs, i.e. the 2008 dummy variable captured crisis, affected negatively the growth proxy and positively the Interest rate. It could be added that the addition of the dummy variable changes the results as follows: the Interest rate of the IP equation loses its statistical significance (as stated the sign of this coefficient is a positive one. See Appendix F, table E3) and also the REER in the same equation loses its significance as well even though it was statistically significant at the 0.10 level (the t-statistic of this estimated parameter is 1.76072). Last but not least, the addition of the dummy variable weakens the statistical significance of the cointegration equation related parameter of the Interest rate equation (i.e. when I is on the LHS of the system).

5.1.7.4 Generalized Impulse Response Functions (GIRFs)

The Generalized Impulse Response Functions (GIRFs) will help us now to further understand the time profiles of the investigated variables in the case of Slovenia, given that they allow us to further capture, in a time dynamically manner, the responsiveness of the investigated variables to one standard deviation (s.d.) shocks of the rest of the variables. On the figure below, we provide the multiple graphs of the Response of IP, REER, FS and I to Generalized one s.d. innovations.

Figure 5-12: Generalized Impulse Response Functions (GIRFs)


Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

The Industrial Production response of Slovenia to the aforementioned in terms of size shock, to the domestic REER is a positive one and shows signs of weakening and becomes negative after the second year as it is expected from the theory (see Appendix F, Figure E2), which is obvious when the time profile increases to 40 months.

Also, IP responds positively to a positive interest rate (I) shock, not as expected from the economic theory, which does not insist though through time and wears out.

Skipping FS, which are not of a special further interest for this EMU country, the responsiveness of 'I' in the case of Slovenia shows that the investigated variable, under this framework, seems to respond positively to REER shock, as expected, showing that an increase of domestic REER, translated as a worsening of the competitive position of the economy, increases the domestic Interest rate and vice versa. Still, in all cases the aforementioned should be blended not only with the VECM provided above, but also they should be further analysed within the G-VAR in order to reach safer conclusions.

5.2 Modelling Southeastern European transmissions. A G-VAR approach for all six countries (2002-2016). Using Euribor as a global variable

After having studied all six countries through their respective VEC models, this section will explore the international linkages of all six countries simultaneously by implementing a global VAR (G-VAR) model. As stated on the respective methodological chapter (see Section 4), we will follow the global modelling approach that was introduced by Pesaran et al. (2004) and was further developed and advanced by Dees et. al. (2007). Note, that the theoretical presentation of the G-VAR approach is available on Chudik and Pesaran (2014). Chudik and Pesaran (2014) provide a simple and essential definition: "*[the] country-specific models in the form of VARX* structures are estimated relating a vector of domestic variables,* x_{it}, *to their foreign counterparts,* x_{it}^*, *and then consistently combined to form a global Vector Autoregression*" (p. 1). On their research paper they show that the VARX* models are derived as the solution to a 'dynamic stochastic general equilibrium model' (DSGE), where as it is known the over-identifying long-run theoretical relations can be tested and imposed if acceptable.

By doing so Dees et al. (2007, p.1) give to the "*the system a transparent long-run theoretical structure*" and also they test if the "*short-run over-identifying theoretical restrictions*", that could be imposed to the model, are acceptable. On top of that, the assumption of the weak exogeneity of the foreign variables for the long-run parameters is tested as well, and as expected the star variables (x_{it}^* variables) are interpreted as proxies both for regional and global factors. Overall, the research paper manages to effectively avoid using deviations from ad hoc statistical trends and uses instead "*the equilibrium values of the variables reflecting the long-run theory embodied in the model*".

Chudik and Pesaran (2014) provide a brief summary of the two step approach that a G-VAR essentially follows. In the first out of the two steps, "*small country specific models are estimated conditional of the rest of the world*", where domestic variables and the respective weighted cross-section averages of the star variables, i.e. the foreign variables, are being treated as exogenous ones or as -commonly named- 'long run forcing' variables. Then, in the second step, "*individual country VARX* models are stacked and solved simultaneously as one large global VAR model*" (pp. 1-2). The "solution" of the above two step approach model can be used either for a shock scenario analysis, which is the one that we will follow on this thesis, or alternatively or on top of that, forecasting could be released as well. Note that the forecasting process that is commonly being used, takes place with 'standard' low dimensional VAR models.

5.2.1 Trade and Aggregation Weights

The first crucial step in producing a global model, i.e. a G-VAR, where individual country 'Vector Error Correcting Models' (VECM) are combined (see also Section 4), is to construct country specific foreign variables (or star variables). To do so we have to generate a Trade and Aggregation Weights Matrix that will help us produce star variables, which will act as a proxy for the ‘common unobserved factors’. In order to manage the above, international trade data is being used, coming from the International Monetary Fund (IMF) international trade data set. It can be added also here that instead of international trade data, Trade and Aggregation Weights Matrix could be constructed by using financial or any other desired pattern of the investigated country and countries. Still, for the given interlinkages that exist between SEE and for the relatively limited financial or Foreign Direct Investment (FDI) flows, it is better to capture the common unobserved factor that links the investigated countries through the trade values.

Analytically, the weight matrix provided below contains one set of trade weights, which is used to generate the foreign variables.[39]

Table 5-13: Fixed weight matrix

countries	**Bg**	**Cr**	**Fyr**	**Gr**	**Ro**	**Sl**
Bg	0	0.032446	0.397504	0.471878	0.602283	0.069005
Cr	0.021421	0	0.126021	0.021636	0.042882	0.682076
Fyr	0.091421	0.070227	0	0.229697	0.043343	0.071756
Gr	0.388301	0.054231	0.261439	0	0.228262	0.030161
Ro	0.458074	0.065397	0.129938	0.220779	0	0.147002
Sl	0.040782	0.777699	0.085097	0.056011	0.083231	0

The fixed weight matrix within a SEE context provides a ‘picture’ of the relationship of the current and the future dynamics of the investigated countries. Needless to add that it is ensured that the sets of different weights add up to one across the countries chosen for our G-VAR model.

Note also that we have used Purchasing Power Parity-Gross Domestic Product (PPP-GDP) data that are averaged over 2012-2016. Meaning that we have chosen to use the average of the last five years, which is a common practice in the field (Smith

---

[39] Additional weight matrices as stated, e.g. financially related weights, available for generation within a G-VAR, are not used. First because they are not needed, as long as we manage to introduce the Trade Weights Matrix, a prerequisite for the application of a G-VAR, by using the respective trade relations, and secondly, because the financial relations between the SEE countries are underdeveloped and thus would not act as a proper proxy that would be efficient in capturing the common unobserved factors’.

and Galesi, 2014)[40]. The above data set is needed for the computation of the weights that are being used for the aggregation. The respective table is provided below:

Table 5-14: Data for aggregation weights

Data for constructing aggregation weights	Average PPP-GDP 2012-2016
Bg	119493983460.76
Cr	86766320650.43
Fyr	25572005647.46
Gr	262453713095.35
Tom	394372465435.52
sl	58944719012.04

Note: Bg is Bulgaria, Cr is Croatia, Fyr is FYROM, Gr is Greece,
Rom is Romania and Sl is Slovenia.

5.2.2 Unit Root Tests

We have performed the Augmented Dickey-Fuller (ADF) and Weighted-Symmetric Dickey Fuller (WS) unit root tests in order to investigate the stationarity properties of our variables (for a theoretical discussion and analysis of this and the coming concepts and tests as well, see Section 4). The tests, provided on the table below, are applied for all domestic, foreign specific (star variables) and global variables. Note that asymptotic 5% critical values are being used for both tests.

Practically we run a set of unit root test sample regression functions for every variable of all six countries separately and thus within this context we could also see the previous part (Subsection 5.1 and the Unit root related appendices that are available on A-F appendices, parts C, and on the G-VAR appendix also, on appendix G), where the respective results and the chosen final functional forms are provided

---

[40] On choosing the fixed weight matrix, instead of the time varying one, it should be stated that this is done due to the fact that no substantial changes in the trade shares of every country key trading partners took place during the investigated period. Their computation is based on averages of trade flows over the last 5-year period. W_{ij} is measured as the total trade of country i with all of its trading partners, where $w_{ii} = 0$ for all i.

analytically. Note also that the ‘number of lagged changes’ varies from zero lags to the maximum number which is specified by using the “Maximum Lag Order”, both in the G-VAR context here, and before on a VECM context.[41]

As opposed to the Unit root tests that are being used within a VECM structure, in a G-VAR context, there is no need to specify the deterministic components. As stated in Smith and Galesi (2014, p. 37), “*for each variable tested in levels, the program runs two regressions: one including an intercept and a trend, and another one including an intercept only*”. Furthermore, given that by taking the differences we are in practice de-trending the variables the aforementioned authors continue by stating: “*Regressions performed using first and second differences of the variables as regressands are carried out including an intercept only*”. Which clearly indicates that the trend is not part of these finally used regression functions, for the given fact that variables are not integrated of order zero.

On the table provided below, apart from the aforementioned, ADF and WS unit root statistics the respective critical values are provided at the 0.05 level of significance. As it is known the critical value is a pseudo-t critical value and is always a negative one, meaning it is a left tail related hypothesis testing. To reject this null hypothesis, the hypothesis of a non-stationary series, the statistic (ADF and/or WS) must be lower from the respective pseudo-t critical value.

As already reported in the previous part (see Section 5.1), the variables in their vast majority for all six countries are integrated of order one, which means that they become stationary in their first difference. For example all four variables (Industrial Production, Foreign Reserves, Interest Rates and Real Effective Exchange Rate) in the case of Bulgaria are integrated of order one given that based on both or either ADF and WS the values are lower than the critical ones.

---

[41] Both software packages, the toolbox of Matlab and the Eviews, provide the Unit root related statistical measures by selecting specific regressions that are having statistically significant lags. The lag order selection criteria are either the Akaike Information Criteria (AIC) or the Schwartz-Bayesian (SBC) (see Section 4.2.4). Note that we have chosen to use the preselected one, i.e. the AIC (see on this choice the previous Section 4.2.4).

The ADF value Dip is -3.06979 and the critical value is -2.89, the WS of the DFS is -2.68708 and the respective critical one is -2.55, the WS of the Di is -2.7462 and the respective critical one is again -2.55 and the ADF and the WS of Dreer are lower than the critical values, and specifically -4.26446 and -4.11533 are lower than -2.89 and 2.55, respectively. Note that FS and 'I' seem not to be stationary in their first difference in the case of Bulgaria if we use the ADF statistic.

In the cases of Croatia, FYROM, Romania and Slovenia, all four variables are stationary on their first difference, using both ADF and WS, given that their values are lower than the critical ones.[42] In the case of Greece, we observe an exception, as opposed to the rest of the results, where Foreign Reserves (FS) do not become stationary in their first difference and thus we have to generate the second difference in order to "make" them stationary. This result is supported by both statistics and it can be attributed to the fact that the specific variable declined significantly once the country joined the Eurozone. Given that there is no need for a country to hold a lot of reserves in supporting a fixed exchange rate regime and also by assuming that the Eurozone entry is irreversible, it is natural for this variable to lose its stationarity properties given that there is no mean value to return to, and also its variance has changed a lot after the initial shock entry, that acts or should act positively from an economic perspective.

Table 5-15: Unit Root Tests for the Domestic Variables at the 5% Significance Level

Domestic Variables	**Statistic**	**Critical Value**	**BULGARIA**	**CROATIA**	**FYROM**	**GREECE**	**ROMANIA**	**SLOVENIA**
ip (with trend)	ADF	-3.45	-2.3917	-1.8826	-1.83221	-1.86987	-2.56137	-1.70797
ip (with trend)	WS	-3.24	-1.09289	-0.8044	-2.00334	-1.56105	-2.36779	-1.87683
ip (no trend)	ADF	-2.89	-2.68941	-1.54308	-0.98141	-0.70211	-0.08102	-1.22704
ip (no trend)	WS	-2.55	0.047323	-0.87041	0.093005	-0.67998	0.381066	-0.80557
Dip	ADF	-2.89	**-3.06979**	**-9.46012**	**-4.95508**	**-9.23951**	**-5.43961**	**-10.9825**
Dip	WS	-2.55	**-3.22418**	**-9.64993**	**-5.26204**	**-9.42567**	**-5.63333**	**-11.1058**
DDip	ADF	-2.89	-6.1847	-7.60649	-6.10422	-9.04698	-8.71442	-9.58609
DDip	WS	-2.55	-6.07086	-7.42247	-6.38242	-9.44226	-8.92724	-9.83182

---

[42] Note though, as we have seen on the Unit root section of the previous VECM part, the results are consistent in this part as well and show that the Foreign Reserves (FS) variable of Croatia is stationary in level and the Interest rate (I) of FYROM is integrated of order zero.

fs (with trend)	ADF	-3.45	-2.84125	-8.19056	-1.57818	-4.29992	-1.11583	-1.65705
fs (with trend)	WS	-3.24	-2.42238	-8.30574	-0.82612	-1.59466	-0.42897	-1.83551
fs (no trend)	ADF	-2.89	-1.36851	-1.52404	-2.47455	-2.40018	-2.8266	-0.99299
fs (no trend)	WS	-2.55	0.419007	-0.60399	0.985714	-1.63944	0.913562	-0.73303
Dfs	ADF	-2.89	-2.38966	**-9.87943**	**-6.63654**	-2.07766	**-4.11139**	**-9.99545**
Dfs	WS	-2.55	**-2.68708**	**-10.075**	**-6.73888**	-2.22268	**-4.21511**	**-10.1225**
DDfs	ADF	-2.89	-10.8955	-7.888	-11.4276	-6.14157	-7.76684	-10.2486
DDfs	WS	-2.55	-11.2797	-8.3027	-11.639	-6.10663	-8.00209	-10.5104
i (with trend)	ADF	-3.45	-2.75873	-1.61459	-5.53934	-2.39149	-2.29796	-2.19603
i (with trend)	WS	-3.24	-2.39347	-1.82756	-3.17002	-2.58632	-0.71969	-1.38384
i (no trend)	ADF	-2.89	-1.26244	-0.07131	-3.3564	-2.23539	-2.47558	-2.19118
i (no trend)	WS	-2.55	-1.61136	0.035871	-0.6364	-2.42897	1.439483	0.994641
Di	ADF	-2.89	-2.55684	**-9.53753**	**-3.32239**	**-5.34897**	**-5.6287**	**-7.49592**
Di	WS	-2.55	**-2.7462**	**-9.66875**	**-3.6043**	**-5.51922**	**-5.09802**	**-7.60405**
DDi	ADF	-2.89	-7.54622	-10.0568	-7.35154	-9.1383	-7.27267	-7.91613
DDi	WS	-2.55	-7.02074	-10.2372	-6.03394	-9.41178	-7.24525	-8.19146
reer (with trend)	ADF	-3.45	-0.65737	-1.4298	-1.869	-1.96759	-1.39817	-2.21296
reer (with trend)	WS	-3.24	-0.45952	-0.69331	-1.80507	0.409126	-1.54589	-1.78681
reer (no trend)	ADF	-2.89	-2.43595	-1.49986	-2.09426	-1.76768	-1.85408	-1.96878
reer (no trend)	WS	-2.55	0.273444	-0.90901	-1.50905	0.391876	-1.37298	-1.74546
Dreer	ADF	-2.89	**-4.26446**	**-10.3302**	**-8.65549**	**-4.54149**	**-7.59939**	**-9.89682**
Dreer	WS	-2.55	**-4.11533**	**-10.4661**	**-8.69413**	**-4.27696**	**-7.63238**	**-9.9813**
DDreer	ADF	-2.89	-8.47904	-5.63492	-7.81443	-9.1677	-6.27475	-9.21655
DDreer	WS	-2.55	-8.65158	-5.52879	-7.95694	-9.41905	-6.63348	-9.47225

The next table below (5.16), i.e. the Unit Root Tests for the Foreign Variables at the 0.05 level of significance, is further interesting in a way, given that it can be generated in a G-VAR context only, as long as it uses the Trade Weight and Aggregation matrix that we have addressed on Section 5.2.1. The Unit root tests, using both the ADF and the WS statistics are provided on this case for the star variables that are generated from the previous domestic variables once the Trade Weight and Aggregation matrix with the respective trade weights of each country is being used. Given that these results are newly generated ones, i.e. they were not available on the previous VECM section, we will discuss them more explicitly in the present section.

It is interesting to observe that the foreign variables, at the provided and chosen 0.05 level of significance, follow the same 'pattern' of the domestic variables in terms of their stationarity properties. Even though this could expected mathematically up to a degree −given that the foreign variables are generated by the domestic ones− economically the results could help us further in understanding the final outcomes of this research, within the final G-VAR framework.[43]

Specifically, all six Industrial Production Indexes (IPIs, where s stands for star, i.e. the star variable) are stationary in their first difference. The Dips yield ADFs that vary from -5.68 in the case of Slovenia and -5.73 in the case of Croatia up to -7.41 in the case of Bulgaria, that are all lower than the respective pseudo-t critical value of -2.89 provided. Meaning that the null hypotheses of non-stationary series are rejected and thus the IP of all six countries becomes stationary in the first difference, or differently stated IPs are integrated of order one, or the first difference IPs (Dips) are integrated of order zero. The same applies if we use the WS statistic, where values vary from -5.77 in Slovenia, up to -7.43 in Bulgaria, which means that these values are also lower than the respective pseudo-t critical value of -2.55 in the case of this Weighted-Symmetric Dickey Fuller statistic. The same results are evident for all variables, i.e. Dis, Dreers and Dfss, with the only difference that if we use the ADF statistic in the case of Greece and Dfss, then we will find a similar result as in the case of the respective domestic variable of Foreign Exchange Reserves. The variable FS, for all six countries seems not to be integrated of order one. It has to be noted that this finding is consistent with the provided explanation for the non-stared variable, which is related to the Greek entry into the Eurozone and the respective absence of the need to maintain Foreign Reserves as a mechanism that could provide and promote the exchange rate related stability of the country.

---

[43] The existing interlinkages between the countries are captured as stated in practice through the foreign variables (known as star variables). Star variables that are being generated through the Trade Weight and Aggregation matrix and thus the stationarity properties within the VECM are now weighted based on the respective trade proportions that exist between the countries. These specific proportions of trade seem to smoothen further the time series, as they are expressed via the star variables now, and thus these variables seem to generate greater, in absolute values, ADF and WS statistics, and thus their respective probabilities, as they are related to the rejection of null hypothesis, are now closer to zero or alternatively the gap between these statistics and the provided critical pseudo-t values are now greater. A result that makes the level of integration a more statistically significant one and allows us to further determine the non-existence of unit root processes more clearly.

It is interesting to add that the star FS of FYROM now becomes stationary in its level, i.e. it is integrated of order zero, a result which is evident with both statistics (ADF and WS). This finding holds in the case of using a time trend in the respective regression function[44] as opposed to the non-trended one where this specific outcome is lost.

The Greek stared Interest Rate (is) becomes stationary in level also, for the ADF statistic comparison to the respective pseudo-t, for the time trended functional form. The ADF is equal to -3.656 and is slightly lower than the -3.45, meaning that this non-rejection of the null hypothesis of a non-stationary time series holds somewhat more than 95%. The same applies for the non-trended Bulgarian stared Interest rate (is) where the ADF is equal to -3.05 and the critical value is -2.89.

Table 5-16: Unit Root Tests for the Foreign Variables at the 5% Significance Level

Foreign Variables	**Statistic**	**Critical Value**	**BULGARIA**	**CROATIA**	**FYROM**	**GREECE**	**ROMANIA**	**SLOVENIA**
ips (with trend)	ADF	-3.45	-1.76582	-1.64214	-1.87771	-2.2792	-2.09619	-1.8948
ips (with trend)	WS	-3.24	-2.01561	-1.77951	-1.30203	-1.66405	-1.17592	-1.15319
ips (no trend)	ADF	-2.89	-1.04648	-1.13455	-1.9045	-1.91042	-2.18499	-1.87678
ips (no trend)	WS	-2.55	-0.6268	-0.54147	-0.82558	0.411259	-0.7983	-0.2418
Dips	ADF	-2.89	**-7.41513**	**-5.72593**	**-6.24171**	**-6.36632**	**-6.37913**	**-5.67663**
Dips	WS	-2.55	**-7.43895**	**-5.86913**	**-6.37442**	**-6.52064**	**-6.50353**	**-5.76856**
DDips	ADF	-2.89	-6.26844	-9.42122	-6.0849	-5.52342	-5.80244	-7.08203
DDips	WS	-2.55	-6.54626	-9.66745	-6.19662	-5.70241	-5.93278	-7.07588
fss (with trend)	ADF	-3.45	-2.65324	-1.76103	-4.11677	-2.28773	-2.8474	-4.57196
fss (with trend)	WS	-3.24	-2.10667	-1.92001	-4.0628	-1.07846	-2.943	-4.59877
fss (no trend)	ADF	-2.89	-0.13923	-1.04084	0.808791	-2.25345	0.687065	-1.50339
fss (no trend)	WS	-2.55	-0.21769	-0.87274	1.118472	0.750068	0.786957	0.45176
Dfss	ADF	-2.89	**-2.84367**	**-10.0202**	**-6.9074**	-2.476	**-3.56025**	**-9.72596**
Dfss	WS	-2.55	**-3.10576**	**-10.1486**	**-7.18894**	**-2.56272**	**-3.8098**	**-9.91866**
DDfss	ADF	-2.89	-6.92357	-10.2422	-7.89183	-10.6944	-10.5948	-8.04946
DDfss	WS	-2.55	-6.93885	-10.5039	-8.10996	-11.0814	-10.9475	-8.46537
is (with trend)	ADF	-3.45	-3.02531	-3.03217	-2.36254	-3.656	-2.13612	-2.16448
is (with trend)	WS	-3.24	-1.65866	-0.96247	-2.284	-2.42058	-2.41424	-1.48665
is (no trend)	ADF	-2.89	-3.05104	-2.76696	-2.12018	-1.34216	-1.96722	-1.29992
is (no trend)	WS	-2.55	-0.55554	1.519152	-1.49803	0.830359	-2.18086	1.629402
Dis	ADF	-2.89	**-4.82588**	**-7.54975**	**-8.09085**	**-4.04998**	**-5.17158**	**-8.68327**
Dis	WS	-2.55	**-4.94627**	**-7.61965**	**-8.21796**	**-3.51139**	**-5.31638**	**-8.80916**

---

[44] This finding could be compared with the initial unit root within the VECM context, where we test the functional forms to a further detail (see Appendix C, part C).

DDis	ADF	-2.89	-8.79951	-8.31538	-8.95191	-4.23553	-8.82474	-9.27658
DDis	WS	-2.55	-8.94909	-8.6058	-9.20045	-4.20189	-9.09163	-9.39457
reers (with trend)	ADF	-3.45	-1.07908	-1.64066	-0.60278	-0.64755	-0.56699	-1.06755
reers (with trend)	WS	-3.24	-0.76274	-1.01546	-0.03971	-0.4895	-0.2102	-0.44981
reers (no trend)	ADF	-2.89	-1.78666	-2.02538	-2.25603	-2.18066	-2.17733	-1.78612
reers (no trend)	WS	-2.55	-0.66215	-1.27889	0.322117	0.124976	0.345938	-0.33002
Dreers	ADF	-2.89	**-8.23604**	**-9.75294**	**-4.11889**	**-9.26141**	**-4.34103**	**-10.1169**
Dreers	WS	-2.55	**-8.29729**	**-9.84978**	**-4.18135**	**-9.35741**	**-4.12924**	**-10.2488**
DDreers	ADF	-2.89	-6.44954	-8.94078	-8.71825	-5.83146	-8.39114	-6.0689
DDreers	WS	-2.55	-6.81538	-9.20553	-8.98083	-6.13959	-8.6069	-6.15406

The next and last Unit root related results are provided on the table below, named as the Unit Root Tests for the Global Variables at the 0.05 level of significance. As stated, the chosen Global variables are the Euribor (eur) and the Real Effective Exchange rate of Eurozone (euREER) and thus we test these two variables in terms of their stationarity. The Global variables are responsible for quantifying the shocks within the G-VAR model and thus must be tested in terms of their level of integration. At this stage within the VECM, we test again both Global variables one by one in terms of having or not having a Unit root by using the same two statistics, the Augmented Dickey-Fuller (ADF) and Weighted-Symmetric Dickey Fuller (WS). The provided results originate from regressions that are time trended and not in the case of the tests in level variables.

Euribor and the Real Effective Exchange rate are both, as expected, not integrated of order zero, but of order one. The ADF of Deur is equal to -5.40 and is lower than the critical value of -2.89 and thus, the Deur does not have a unit root, meaning it is stationary in its first difference. The same result is being reached if we use the WS statistic, where the magnitude of -5.53, is lower than the respective critical value of -2.55. In terms of euREER, excluding the ADF result which shows that the variable is stationary in level when the regression is time trended, this result s lost, if we use the WS statistic, given that it is significantly lower, equal to -0.70, compared to the respective critical value of -3.24. In the first difference both the ADF and the WS are lower than the respective critical values and specifically -8.32 and -8.45 are lower than the critical pseudo-t values of -2.89 and -2.55, respectively.

Table 5-17: Unit Root Tests for the Global Variables at the 5% Significance level

Global Variables	**Test**	**Critical Value**	**Statistic**
eur (with trend)	ADF	-3.45	-2.36571
eur (with trend)	WS	-3.24	-2.57543
eur (no trend)	ADF	-2.89	-1.51442
eur (no trend)	WS	-2.55	-1.49366
Deur	ADF	**-2.89**	**-5.40382**
Deur	WS	**-2.55**	**-5.52986**
DDeur	ADF	-2.89	-7.2095
Deur	WS	-2.55	-7.46044
eureer (with trend)	ADF	-3.45	-3.61609
eureer (with trend)	WS	-3.24	-0.70208
eureer (no trend)	ADF	-2.89	-1.91662
eureer (no trend)	WS	-2.55	-0.98686
Deureer	ADF	**-2.89**	**-8.31891**
Deureer	WS	**-2.55**	**-8.44795**
DDeureer	ADF	-2.89	-8.19876
Deureer	WS	-2.55	-8.47714

5.2.3 Specification and Estimation of the Country-Specific Models

In selecting the final model we have to specify the information criteria for the lag order both for the endogenous (domestic) and weakly exogenous (foreign or star) variables as they are inserted into the country specific Vector Autoregressive X* (VARX*) models.[45] As expected the lag orders of the above stated variables are entered as regressors in the VEC models of every country separately, and are denoted by p_i and q_i respectively. The lag orders on VARX* are chosen by Matlab software, as it is set by Smith and Galesi (2014), according to the lag order selected

---

[45] Note, as stated, that the star X* denotes the weakly exogenous variables that are being added to the system.

criteria, which is the Schwartz Bayesian Criteria (SBC). The maximum lag order both for p_i and q_i are specified as well.

It should be added here that overall six different G-VAR models were tested in this thesis, to conclude with the sixth one, which was proven to be the more stable, consistent and efficient one[46]. Thus within this section, in terms of the specification of the G-VAR and the respective estimation of the country specific models, it can be reported, that within the 6th finally used model we used p_i and q_i that were equal to 12 (i.e. one year) and 6 (i.e. half year) respectively under the SBC, and not for example like the 1st used model where p_i and q_i were lower, equal to 4 and 2 under the AIC. This choice is rather more consistent with the respective literature and practice in terms of the chosen time horizon, given that we use monthly data.

A year (12 months) is also more consistent with the practice in the G-VAR field. When the data commonly used in G-VAR is having a quarterly frequency, p equals four, thus a year is chosen to be used (see also Smith and Galesi, 2014). The choice to use p_i and q_i equal to 12 and 6 respectively under the Schwartz-Bayesian (SBC) (and not the AIC) and having Greece as the “entry VECM” for the global shocks, and not Slovenia for example, was based on the yielded results, for the given Trade Weight Matrices. Note that the use of Slovenia instead of Greece, generated amongst other results a non-inverse relationship (within the used GIRFs) between the Euribor and the Industrial Production (IP) for all six countries, a finding that contradicted the persistence of the inverse relationship of these two variables that were evident and statistically significant in all other cases throughout. The imposed restrictions, as a way to correct this result, instead of improving the outcome made the results even weaker. It can be added here, within this context, that the restriction was introduced

---

[46] Indicatively the following p’s and q’s were used respectively under AIC or SBC, 4 and 2 under AIC, 12 and 4 under AIC, 12 and 6 under SBC, where also the Euribor shock was introduced through Slovenia and not Greece (i.e. the second country listed in terms of the proportion of trade flows), 12 and 6 under SBC using Greece again as the ‘shock entry country’, where additionally restrictions were imposed onto the cointegrating equations, not to be kept, 12 and 6 under SBC, where the shocks, negative ones, were given as before to Euribor and EUREER, acting as a driver that drove into the sixth and finally used GVAR where 500 bootstraps were used in making the model more robust.

on the cointegrating equations and was equal to minus one lag (within a VAR, at level, based on AIC). Thus, testing the over-identifying restrictions on the coefficients of the co-integrating relations –as they are associated and tested in capturing the long run relationships between the variables– we have chosen one, but for the yield output we have set them equal to zero.

The results generated above led to the fifth applied model and then to the finally used G-VAR model where p_i and q_i were equal to 12 and 6 respectively, and were under the Schwartz-Bayesian (SBC) criteria. Negative shocks were used for both Global variables and the results generated, apart from a stable G-VAR, which was the case in all six models, promising results that could contribute to fill in a gap in literature not only in the region but overall. This model was used as a persistent driver and eventually led to the sixth and final model, where p, q and SBC were the same as on the fifth model, Greece was the 'shock VECM entry country', having the greater proportions of trade between the six countries within the generated Trade Weight and Aggregation matrix and eventually allowed us to introduce 500 bootstraps (instead of fifty on the previous model) that as expected, increase the robustness of the model overall. [47]

The first table below provides the final and used Lags on our sixth, as discussed above, VARX* model. The respective p and q provided for all six countries are referred to domestic and foreign (star) variables respectively in terms of their lag

---

[47] The chosen shocks both on Euribor and on euREER were negative and equal to one in all cases, suggesting a positive shock to the respective VECMs and to the economies. It is widely known and expected according to economic theory that a drop to Euribor and to Real Effective Exchange Rate of Eurozone (i.e. an increase to the competition of the EMU) to have a positive impact on the investigated economies. In terms of a positive boost to Industrial production and to a negative one to Foreign reserves, given that a more favourable environment, where risk premium is expected to be lower and generally when Interest rates are low, and when the economy turns more competitive, the need to hold plenty of Foreign reserves becomes less important. Also, the lag order for serial correlation test was commonly introduced, given that the setup of the Matlab software requires us to do so, and was equal to 12 throughout. A number which is referred to months and given that a year is being commonly used as a proper time frame for this purpose was selected as well. It is useful to add here that this lag order for serial correlation performs an F version of the Lagrange Multiplier (LM) statistic, by applying the statistic on the residuals of every country as it is expressed through the VECM. Needless to add here that the star variables are included, thus the model which is used is a VARX* model.

orders. On the second table below we observe the Cointegrating relationships for the individual VARX* models, that show how many variables out of the four ones in every country separately seem to move together in the long run. We have established three cointegrating relations in the case of Greece and Bulgaria, two in the case of FYROM and one for the rest, i.e. Croatia, Romania and Slovenia. It is important to note that within a G-VAR all countries must be having at least one cointegrating relation, which is our case. Also it has to be noted that both Trace Statistic and Max Eigenvalues had been used in determining the dimensions of the cointegrating space of the individual VARX* models. The critical values that are used are the Trace Statistic ones at the 0.05 level of significance. These critical values are taken from Mackinnon et al. (1999) and are unique given that they include weakly exogenous variables.

*Table 5-18: Lags on VARX**

Lags on VARX*
Cointegrating vectors in each model
Domestic and foreign (star) variables
Deterministic i.e. time trend or not
VARX* Order of Individual Models (p: lag order of domestic variables, q: lag order of foreign variables)

	p	q
BULGARIA	1	1
CROATIA	1	1
FYROM	1	1
GREECE	1	1
ROMANIA	2	1
SLOVENIA	1	1

Cointegrating Relationships for the Individual VARX* Models

Country	**Cointegrating relations (#)**
BULGARIA	3
CROATIA	1
FYROM	2
GREECE	3
ROMANIA	1
SLOVENIA	1

5.2.4 Testing Weak Exogeneity

The weak exogeneity test is applied on the star variables of the VARX*, for every country specific model separately. The maximum number of lags is specified for every variable, both for domestic and star ones and these variables, as expected from the given econometric structure of the model, are inserted as regressors in the weakly exogenous regressions, denoted by the lag order of domestic variables (p*) and the lag order of foreign ones (q*) as well. The selection of lags is chosen by the Matlab software under the selection of Akaike and the Schwartz-Bayesian criteria. We have selected to use the SBC.

Also, it has to be added that the 'lag order for serial correlation performs an F version of the Lagrange Multiplier (LM) statistic' here as well (see Section 5.2.3) and it is done so by applying the LM statistic on the residuals of every separate country. Following the previous choice we introduce 12 lags, which is the recommended number of lags for monthly data.[48]

The weak exogeneity test was based on the lags provided on the table below, once the order of Weak exogeneity regression equations was set. The lag order, as stated above, of domestic variables is denoted again with p* and the lag order of foreign variables with q*.

Table 5-19: Order of Weak Exogeneity

Order of Weak Exogeneity Regression Equations
(p*: lag order of domestic variables, q*: lag order of foreign variables)

	p*	q*
BULGARIA	1	1
CROATIA	1	1
FYROM	1	1
GREECE	1	1
ROMANIA	1	1
SLOVENIA	1	1

---

[48] These F-statistics of serial correlation of the estimated error terms are calculated for the weak exogeneity regression residuals both at the lag order selection stage and for the final G-VAR model.

Test for Weak Exogeneity at the 5% Significance Level

Country	**F test**	**Fcrit_0.05**	**ips**	**fss**	**is**	**reers**	**eur**	**eureer**
BULGARIA	F(3,153)	2.663715	1.645342	0.770173	0.806829	0.997864	0.56636	1.312676
CROATIA	F(1,155)	3.902154	0.323088	0.784859	0.006404	2.033963	0.186908	3.120333
FYROM	F(2,154)	3.054771	0.521125	1.622045	0.018076	0.225526	2.913183	0.225858
GREECE	F(3,153)	2.663715	3.714682	2.93132	2.024071	0.818919		
ROMANIA	F(1,155)	3.902154	0.881084	0.195475	0.101898	0.791101	0.10914	1.098002
SLOVENIA	F(1,155)	3.902154	3.904657	1.247881	2.086936	0.00104	2.716999	0.836414

Note that the Industrial production star variables (IPs) must be lower than the respective F critical values that are provided on the tables above and below (Table 5.19 and 5.20) for a 0.05 level of significance. The respective F critical values (Fcrit_0.05) are on the first column of the table below and can help us in determining for the given level of significance, to reject or not (i.e. "accept") the respective Null hypothesis (H_o). Particularly the H_o is that the domestic variables do not 'affect' (force) the foreign variables in the long run, i.e. H_o: it is not long run forcing. Against the alternative that provides evidence for the opposite. Thus, excluding Greece which is the 'entry shock country to the VECM', all 'ips' are lower than the respective F critical values and thus we have statistical grounds to claim at the 0.05 level of significance that the null hypotheses cannot be rejected. The above means that the domestic variables do not 'affect' (force) the foreign variables in the long run, a prerequisite for the effective and proper application of the G-VAR model.

Table 5-20: The F critical values for the Weak Exogeneity Test

Fcrit_0.05	**ips**
2.663715	1.645342
3.902154	0.323088
3.054771	0.521125
2.663715	3.714682
3.902154	0.881084
3.902154	3.904657

5.2.5 Testing Structural stability

The Structural Stability Statistics and Structural Stability bootstrapped critical values are both needed in order to detect a possible presence of structural breaks. The Structural Stability Statistics for all four variables, plus the Global variables and the Structural Stability bootstrapped critical values for 0.10, 0.05 and 0.01 levels of significance, are computed and provided on the Appendix (see part G). Note that the critical values are computed based on sieve bootstrap samples that come from the specific solution of the G-VAR model (the bootstrapping procedure and the mathematical expressions that are being used are available also in the Appendix).

Briefly note, as described on Smith and Galesi (2014) and as is evident on the respective table, that these tests include from the Ploberger and Kramer's (1992) CUSUM statistic (PK sup) to Andrews and Ploberger (1994) exponential average (APW) Wald Statistic. Other statistics that are computed and provided are the heteroskedasticity robust versions of the Nyblom test (robust Nyblom) and the sequential Wald statistics (robust QLR, robust MW and robust APW).

The null hypotheses follow the common structural stability test framework, i.e. the stability of the parameters of the model is stated on the null hypothesis (H_o), which subsequently means that the non-stability and the detection of a structural break is stated on the alternative hypothesis (H_1). The computation of the respective critical values of the aforementioned tests use bootstrapped samples that are in turn obtained from the solution of the final and specifically applied G-VAR.

Before we proceed with the interpretation of the results note that the first table provided on Appendix G (Part E, Table 5.21) provides the statistics, while the critical values of the structural stability tests are on the second, third and fourth table (Appendix G, part E, Tables 5.22, 5.23 and 5.24) at 90%, 95% and 99% respectively.

Based on the PKsup statistic we cannot reject not even once the null hypothesis of coefficient stability at the 0.10 level of significance in the cases of IP and FS for all six countries.[49]

The same results, using PKsup statistic, hold also in the case of 0.05 level of significance for the IP and FS, where all estimated statistics for all six countries are lower than the respective critical values. At 99% critical values we keep on having the same results excluding the IP and FS statistics that are lower than the respective critical values too.

In terms of the Interest rates and the Real Effective Exchange Rates, both for domestic variables and Global variables, we have ground not to reject the null hypotheses, which means that we have stable coefficients, in the cases of Croatia and Romania for both variables at 0.10 and for the Romanian Interest rate and the Bulgarian Real Effective Exchange Rates. Similar results are reached for Slovenia at 0.05 and for Slovenia, Romania and Croatia at 0.05 and 0.01. The statistic of short term Interest rate of FYROM shows that there is no structural break both at 95% and 99%. It is interesting to add that the statistic used for the REER of Greece indicates stable coefficients at 99%, which is not the case for the Interest rate. The same holds for Bulgaria's 'I' for all used level of significance. From the Global variables the PKsup statistic of Real Effective Exchange Rates of EMU (euREER) being equal to 1.08 is lower than the critical value of 1.19.

Quite similar results hold if we use the PKsmq statistic, with the interesting difference that has to be noted, that both statistics of EMU interest rate (eur) and the EMU reef (euREER) are pointing towards an absence of a structural break at 90% and 99% for both variables and at 95% for eur.

---

[49] Indicatively the respective statistic IP of Bulgaria is 0.58 which is lower than the respective critical value of 0.61, the statistic of IP of Croatia is 0.51 which is lower than the critical value of 1.06, the Romania IP statistic is 0.64 while the critical value is 0.98, etc. The statistic of FS of Croatia is 0.46 which is lower than the critical value of 0.57, while the statistic of FS of Bulgaria is 0.65 is also lower than the respective critical value of 0.99.

As far as Nyblom statistics −both the simple and the robust one− are concerned overall results are even better given that the statistics of both Global variables are providing statistical evidence that hold in 90%, 95% and 99% for the stability of our coefficients. The results are also better in terms of the Interest rates and the Real Effective Exchange Rates of SEE economies, suggesting similar stability. It is interesting to add that based on the Robust Nyblom statistic all variables, domestic for all six countries and global ones, are related to no structural breaks.

A mix of the above results, i.e. of PKsup, PKsmq and Nyblom and Robust Nyblom, is rather evident if the QLR and the Robust QLR statistic is used. The statistics provided for all six counties yield similar and robust results in terms of stability for the IP and FS and there is a mix tendency for the structural stability when 'I' and REER are being used. The Global variables provide statistical evidence that hold at 0.10 and 0.05 and 0.01 either for the one or both 'Eur' (i.e. Euribor) and euREER (i.e. EMU Real Effective Exchange Rate) variables. These results are also similar to the ones which are generated when the MW statistic is being used where indicatively at 99% both Global variables indicate towards the absence of a structural break, while the Robust MW suggests the same for 'Eur' (at 99% again).

We obtain the most robust results when the APW statistic is used. The statistics of all variables for the six counties, and the global ones, are lower than the respective critical values at 0.10 and with few exceptions the same seems to hold for 0.05 and 0.01 as well. It is interesting to add that based on the APW statistic the REER indicates stable coefficients even at 99%. The same finding tends to hold to an extent if the Robust APW is used, with the exception of Romania that yields no problem of a possible break for the IP only and the same applies for the global variables. At 95% we have a combination of the aforementioned, where for example on APW context all IP and FS are indicating that stability is evident while the rest 'I', REER, Eur and euREER are suggesting both tending though towards the absence of structural breaks. Last but not least, the Robust APW indicates toward stability even at 99% when short-term interest rate is used for all six countries.

Thus, overall even though the results vary across the tests and to a substantially lower extent in terms of the variables, we can state with confidence that the rejection of the null hypothesis of stable coefficients, i.e. the absence of a structural break, tends to be the exception rather than the rule. The rate of rejection overall is considered to be low compared to the related research output. On top of that, it also important to note that when heteroskedasticity-robust statistics are being used, still the results remain strong and in cases they become even more robust and cross consistent as well. In generalizing our results, out of the 260 statistics being used for the structural break testing, compared with 780 respective critical values (for the three used different levels of significance) the percentage of rejection of the null hypothesis is close to 6,7% in the accumulated cases of IP and FS, at the 0.10 level of significance, while the percentage increases close to17% in the cases of i and REER at the same used level of significance. Similar percentages hold for the domestic variables at the 0.05 level of significance, while in the 0.01 level of significance it is lower tha 1% for the IP and the FS, and close 10% for the 'I' and the REER. The null hypothesis rejection percentages at the 0.10, 0.05 and 0.01 levels of significance for the global variable of Euribor (Eur) and the EMU Real Effective Exchange Rate (euREER) are 45%, 50% and 30% respectively.

Based on the above available and used tests there is relatively and comparatively limited statistical evidence related to the rejection of the null hypothesis of the stability of the coefficients overall. To be precise, accumulating the provided percentages, we can state that in the case of 88% of the used equations that comprise the G-VAR model coefficients are stable, and if we exclude the Global variables this percentage surpasses the 90% (at 99% critical values) and 80% (at 95% critical values), which are the ones used, for example, in Dees et al. (2007). Also following Dees et al. (2007) we could add that the relatively large number of rejections that are related to some statistics like the APW in the non-robust version could be attributed to the breaks in error variances and not on the parameter-coefficients. A conclusion that is similar to studies that find evidence, a statistically significant one, of changing volatility (Ceccheti et al., 2005; Artis et al. 2004; Stock and Watson 2002).

Concluding, the not surprisingly limited evidence of some instability detected above, can be attributed and confined to the error variances. This result increases the importance of using robust standard errors[50] in our G-VAR, as we do, in capturing the impact of the star variables. This goes along with the respective choice to use on our Generalized Impulse Response Functions (GIRFs) not the point estimates, but the bootstraps and the respective confidence bounds.[51]

Specifically, as can be seen on the figure below (5.13), persistent profiles converge to zero to a period which is low, and definitely much lower than the 40 periods suggested by Smith and Galesi (2014) who work with quarterly and not monthly data as is the case with the current research. PPs also converge to zero and they do so in a manner that clearly indicates no problem in the underlying individual model specifications. Note also that the PPs are based on a sample covariance matrix without any restrictions being imposed or any shrinkage performed (cointegrating relations rise from the individual country variables and thus from the respective country specific VECMX*).

According to G-VAR theory and practice the estimated eigenvalues must be lower than one in order for the G-VAR model to be a stable one (see Section 4.2.5 for

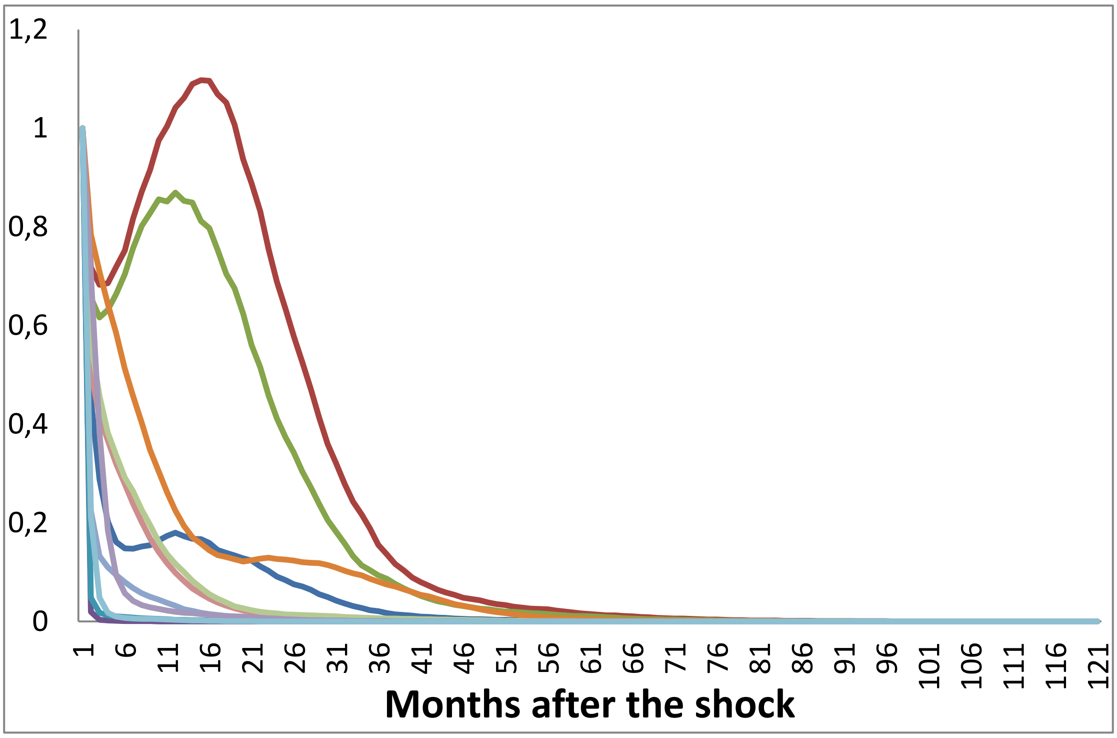
---

[50] Standard errors are calculated through an HAC Newey-West matrix.

[51] On top of the above results and their interpretations, it is useful to briefly comment on the eigenvalues and their corresponding moduli (see Appendix G) and the Persistent Profiles as well, in establishing and demonstrating further the overall stability of the model (see Section 4.4.7). Here, focusing on PPs, we will stress that Pesaran and Shin (1996), who introduced and supported the persistent profiles (PPs) in a G-VAR framework, clarify that the PPs refer to the time profiles of the effects of system or variable specific shocks on the cointegrating relations in the G-VAR model. In other words PPs provide information related to the speed of adjustment of relations of cointegration towards equilibrium points. It is also important to note, in interpreting our results that PPs have a value of unity on impact and also they should tend to zero, in terms of time horizon that tends to infinity. The above presuppose that the used vector is a valid cointegrating one.

a theoretical discussion and below). In our model the eigenvalues are lower than one (see Table 5.24b, Appendix G) which means that apart from the previous stability related tests we can further support that the G-VAR model is a stable one. Also note, that the eigenvalues must be addressed along with the Persistent profiles (PPs). PPs in turn, are expected to tend to zero, which they do in our case, as it is evident on the provided figure below. The bootstrap median estimates with 90 percent bootstrap error bounds, together with bootstrap lower and upper bounds are computed and provided also on the Appendix.

Figure 5-13: Bootstrap Median estimates of persistent profiles



Note: On the vertical axis we capture the magnitude of every shock and on the horizontal axis the number of months that every shock lasts.

Bootstrapping, in the context of inferential statistics, by repeatedly generalizing from sample to population, delivers point estimates of all 'dynamic analysis results'. On the table above we observe the Bootstrap Median estimates of persistent profiles of the final G-VAR model with 500 bootstraps, where on the vertical axis we capture the magnitude of every shock and on the horizontal one the number of months that every shock lasts. We should also add here that the aforementioned persistent profiles (PPs) are related to the dynamic analysis of the specified G-VAR (see also Section 5.2.3.) A dynamic analysis that is also related and captured by the Impulse response functions, IRFs (see Section 5.2.10 below for the Generalized version of GIRFs) and Forecast error variance decompositions (see Appendix G for the Generalized ones GFEVDs).

Also, it is important to note here the computational complexity of this inferential procedure, which is a time-consuming process that is dependent both on the number of bootstrap replications and the length of the forecasted horizon. As stated above, 500 replications were chosen for the final G-VAR model, approaching the "actual" bootstrapping. In terms of the computed and used critical values of bootstrap, in the context of the structural stability tests, a covariance matrix is used too. A comparison of the estimated statistics to the respective critical values allows us to proceed to statistically significant "generalizations", which means that it acts as a statistical inference procedure that addresses the population through a sample. Lastly, out of the available bootstrap approaches, inverse or shuffle, we have selected the inverse one.

5.2.6 Contemporaneous Effects of Foreign Variables on their Domestic Counterparts

The contemporaneous effects of foreign variables (star variables)* to domestic ones are informative in capturing the existing international linkages within our model. These estimated coefficients can be interpreted as impact elasticities that hold between the domestic and the corresponding star variables.

On the table below we provide for each country the estimated contemporaneous coefficients. These coefficients that capture the effect of the foreign variables on their domestic counterparts are provided along with the t-values (the standard errors are calculated and are available in Appendix G). The t-values are t-ratio-White, which means that the standard errors and the corresponding t-values are heteroskedasticity and autocorrelation consistent. The above adds to the robustness of these t-values further.

Table 5-21: Contemporaneous Effects of Foreign Variables on their Domestic Counterparts

Country	**Measure**	**ip**	**fs**	**i**	**Reer**
BULGARIA	Coefficient	0.473918	0.057516	0.030742	-0.09554
	t-ratio_White	5.378921	0.57585	1.346209	-1.0108
CROATIA	Coefficient	0.156609	-0.05275	-0.12815	0.247896
	t-ratio_White	1.55563	-2.65468	-0.64185	1.364644
FYROM	Coefficient	0.856777	0.130409	-0.05127	0.085023
	t-ratio_White	3.095901	2.780551	-1.34558	0.649204
GREECE	Coefficient	0.388569	0.045642	0.003717	0.526042
	t-ratio_White	4.581238	0.236358	0.016852	7.738245
ROMANIA	Coefficient	0.097308	-0.03193	0.025244	-0.51918
	t-ratio_White	0.996333	-0.52791	0.503303	-1.58058
SLOVENIA	Coefficient	0.344191	-0.03589	-0.00323	0.050871
	t-ratio_White	3.317337	-2.26184	-0.12871	0.929051

When interpreting the estimated and provided coefficients for the given statistical significance of the respective population parameters, we will comment the most important, i.e. the statistically significant, results of the table. Before doing so it has to be noted that no variable overreacts to counterparts' changes, i.e. not even one coefficient is greater than one.

Thus, it is interesting to start by noting that there is statistically significant impact of the Industrial production (IP) of the rest of the countries to the Bulgarian IP. A 1% increase on the IP of the five SEE countries will boost the Bulgarian IP by 0,47%. This result is consistent with economic theory and has a probability close to zero, which means that the null hypothesis cannot be rejected even at a 0.01 level of significance. In terms of IP again, a 1% increase on the IP of the remaining five SEE countries will boost the IP of FYROM by 0,86%, which is the highest impact of all, indicating towards the sensitivity and the exposure of the economy, while a 1% increase on the IP of the five SEE countries will boost the Slovenian IP by 0,34%. Last but not least, a 1% increase on the IP of the five SEE countries will boost the Greek IP by 0,39%. Inverse relations hold as well.

There is also a statistically significant impact of the Foreign reserves (FS) of the rest of the countries to the Croatian FS. A 1% increase on the FS of the remaining five SEE countries will decrease the Croatian FS by 0,05%.[52] Thus, this negative sign suggests that the Croatian can decrease the FS when the rest or some of the remaining countries –e.g. FYROM–might have to increase them. This is obviously happening since they are responding differently both to the external and to the internal shocks and it is clear evidence of the country being to a different stage in the integration phase towards EMU admission. Thus, a 1% decrease on the FS of the remaining five SEE countries will decrease the FS of FYROM by 0,13%, while a 1% increase on the FS of the remaining five SEE countries will increase FYROM's FS by 0,13%. As opposed to these last contemporaneous effects of foreign variables on their domestic counterparts, the Slovenian results resemble the Croatian ones. Thus, a 1% increase on the FS of the remaining five SEE countries will decrease the Slovenian FS by 0.04% and vice versa. The same negative sign holds in this case for the Romanian economy, but in this country it is not a statistically significant one.

Opposite to the rest of the cases, the contemporaneous effects of foreign variable Interest rate (I)* to domestic Interest rates (I) shows no signs of statistically significant results, indicating towards an underdeveloped financial region that is not really co-integrated not only to 'itself" but to the rest of the Eurozone (as we will see on the global shock context within the GIRFs). Still, this is an interesting feature of the results given that it exposes the very weak linkages that seem to exist in terms of short-term interest rates in the SEE region. The latter indicates not only towards a really weak interbank Interest rate marked in the region, but to non-common monetary policy reactions as well.

Last but not least, the older of the two EMU members in our SEE context, i.e. Greece, shows clear signs of a statistically significant relation in the contemporaneous

---

[52] A result that will be integrated further with the rest of the empirical findings of the G-VAR and especially the ones of the GIRFs. Still, we can report here that the results could probably indicate a more stable economy -like the Slovenian one- that moves more strongly towards a sustainable Eurozone participation.

effects of foreign variable Real Effective Exchange Rate (REER)* to the domestic one (REER). More specifically, a 1% increase on the REER of the remaining five SEE countries will increase Greece's REER by 0.53%. A result that goes along with a really high t-ratio White value, which further stresses in its turn the related statistical robustness. It would be good to add here that the Greek economy is the economy with the higher share on the respective Trade Weight matrix, a fact that contributes to this outcome too.

5.2.7 Pair-wise cross-section correlations: Variables and residuals

It would be useful to repeat at this stage that the "idiosyncratic" shocks of the individual country VECMX* should be cross-sectionally "weakly correlated" in such a way that the covariance of the star variable with the error term, i.e. the Cov(x_{it}*, U_{it}), tends to zero as the sample size tends to infinity. Thus we can verify, through these results, following the research output of Dees et al. (2007) and Pesaran (2004), that the foreign variables (star variables) are weakly exogenous.

The average pairwise correlations of the G-VAR model and the estimated residuals for each separate country model (VECMX*) are computed and provided on the table below (5.22). The correlations are provided for the G-VAR variables in levels, in first differences and for the VECMX* residuals too.

Keeping in mind that The G-VAR model allows cross-section dependence between the variables (see Dees et al. 2007) we have to observe up to what degree the provided values tend to go to zero. This practically means that we have to check if the "dependence" wears out. On calculated values, both in levels, first differences and VECMX* residuals must be low in absolute values.

Overall we can report that at level the values of correlation are relatively low, which is positive and was expected to be as such, and the values tend to be decreased in the case of the first differenced results. The same applies for the VECMX* residuals which in absolute values is close to zero as well, for all four variables in all six countries. The Real Effective Exchange Rate result in level, but also in the first difference, in the cases of Bulgaria, Slovenia, Croatia, Greece and FYROM (i.e. excluding Romania) tends to receive the highest values of all cases. The overall outcome allows us to state that the covariance of these star variables with the respective error terms (Cov(x_{it}*, U_{it})) tends to zero, and it would most probably keep on doing so, if the sample size tends to increase and theoretically if it would go to infinity.

Specifically, given that these results should be interpreted in percentage terms, we can state indicatively that the Real Effective Exchange Rate (REER) provides comparatively a high degree of cross-section correlations varying from 14.5% to 44% which compared to other studies, is still really low. The same applies for the Interest rate levels as well, where the respective percentages start from 37% (in an absolute value) to reach the highest percentage of all results, the 51% of Croatia (excluding the Foreign reserves of Slovenia). Finally, Industrial production in level varies from 15% to 50%.

The effect of first differenced cross-section correlations, as expected, is substantially lower, given that the results must tend to zero, in all four cases, excluding the REER, that apart from the Romanian that was the lowest in level as well, the rest of the REER results are better but not that closer to zero. Thus, by comparison, we can state that the first differencing of REER has some, limited, but still evident effect on cross-section correlations. In any case their level does not imply any possible problem of an undesired correlation.

It has to be added that the 78% that we have seen for the case of Slovenia in level, reaches almost zero (2%) once the first difference is taken. Thus, the average cross section correlations of industrial production, $\Delta IP_{it,}$ range from 7 to 8% only, which the ΔFS_{it} almost 0 to 8% (in absolute values). The above described outcomes add further to the stability and usefulness of the used G-VAR model.

Last but not least, analytically, the VECMX* residuals in absolute values are close to zero as well. These correlations are very small and it is evident that they do not depend on the choice of the variable or country. This outcome shows clearly that we have been successful in capturing the common effects driving all four variables and to an even further degree the Foreign reserves of all six countries (the percentages vary from close to 0 to 3.8%) and the short term Interest rate as well (the percentages in this case are close to zero in five countries and 4% in the case of Bulgaria).

Table 5-22: Average Pairwise Cross-Section Correlations: Variables and Residuals

Variable	**Country**	**Levels**	**First Differences**	**VECMX* Residuals**
ip	**BULGARIA**	0.501046	0.137809	-0.06436
ip	**CROATIA**	0.314406	0.077096	0.001385
ip	**FYROM**	0.38891	0.074274	-0.05537
ip	**GREECE**	-0.21411	0.070066	-0.07739
ip	**ROMANIA**	0.13226	0.089476	0.004424
ip	**SLOVENIA**	0.50385	0.071046	-0.01298
fs	**BULGARIA**	0.439491	0.070135	0.023232
fs	**CROATIA**	0.403192	-0.03722	-0.03152
fs	**FYROM**	0.447023	0.084994	0.026739
fs	**GREECE**	0.218276	0.007864	-0.00827
fs	**ROMANIA**	0.393831	0.004618	0.001149
fs	**SLOVENIA**	-0.78754	0.028245	0.038609
i	**BULGARIA**	0.422605	0.006263	-0.04009
i	**CROATIA**	0.516783	-0.01934	0.006107
i	**FYROM**	0.421463	0.008417	0.011643
i	**GREECE**	-0.3679	-0.00705	0.005209
i	**ROMANIA**	0.46864	0.003928	-0.00487
i	**SLOVENIA**	0.456334	0.013331	-0.00763
reer	**BULGARIA**	0.237112	0.411699	0.069875
reer	**CROATIA**	0.440875	0.355615	0.037295
reer	**FYROM**	-0.40873	0.306303	0.014204
reer	**GREECE**	0.369801	0.40117	-0.14474
reer	**ROMANIA**	0.145198	0.075206	-0.02553
reer	**SLOVENIA**	0.411066	0.445942	0.058092

Overall, following Dees et al. (2007), we can state that the cross-section correlations "*show the importance of country specific variables in dealing with often significant dependencies that exist across macroeconomic variables*" (p. 19). The specific researchers add that the average pairwise cross-section correlations provide an important indication of the usefulness of the star variables in modelling international interlinkages.

5.2.8 Generalized Impulse Response Functions (GIRFs)

In studying the dynamic properties of a G-VAR model and to capture the "time profile" of the impact of a shock to star variables (known as foreign variables within the G-VAR) on South East Europe (SEE), we will now address the consequences of two different Global (i.e. external) shocks. First, a one standard error negative shock to Euribor; second, a one standard error negative shock to Real Effective Exchange Rate (REER). Note that both shocks are expected, according to economic theory, to be beneficial for the economies. Note also that a drop on the REER means that the economy becomes more competitive. [53]

The main idea that underlies the Generalized Impulse Response Functions (GIRFs) is to overcome the problem of the ordering of variables, as the variables are being introduced in a Vector Autoregressive model. This problem is directly related to the dependence of the 'Orthogonalized Impulse Response Function' to the specifically chosen ordering of the variables Sims (1980). A problem that eventually was solved through the GIRFs, and thus there is no need to insist on this solution at this empirical part of this research. [54]

Still, it is important to note that the 'OIR' approach computes the Impulse Responses (IRs) by using Orthogonalized shocks. On the other hand the GIRF quantifies the shocks via the 'individual errors' and thus manages to avoid the

---

[53] On this section we use the Generalized Impulse Response Functions (GIRFs) that, as known and commonly reported within the G-VAR context and methodology, were introduced by Koop et al (1996) and were upgraded by Pesaran and Shin (1998). Pesaran and Shin were the ones that introduced and used the GIRF for Vector Error Correction Models (VECM) and managed to resolve the problems that were faced in the existing alternative of the Orthogonalized Impulse Responses (OIR) that were introduced by Sims (1980).

[54] Still, it has to be reported that the GIRFs are not structural in the sense shock are not orthogonal, but the Recursive shock are orthogonal therefore structural.

Orthogonalization, by integrating the impact of the other shocks, and thus by implementing "*the observed distribution of all the shocks*" (Dees et al., 2007, p. 21).[55]

To proceed, even though the GIRFs are "silent" by nature for the underlying reasons beyond the changes, they manage to capture and provide useful information about the 'dynamics of the transmission of shocks' from the Eurozone to the sensitive region of Southeast Europe. A region, for the given six selected countries, that is multi-speed by definition, given that it has Eurozone members (Slovenia and the special case of Greece, almost 'constantly' under a bail-out program and a European Stability Mechanism (ESM) 'supervision', that is expected to last for decades), European Union (EU) members (such as Romania, Bulgaria and Croatia), that are not Eurozone members yet, and lastly FYROM, a country that is neither a Eurozone nor a European Union member yet, and struggles to become a member of the North Atlantic Treaty Organization (NATO).

Before we proceed to the presentation and the analysis of our results, we should add that the time frame of the forecast horizon of GIRFs which are being used is a 40 month one (Smith and Galesi, 2014), thus, we focus on the first three years and four months after every shock. A reasonable and relatively extended time frame, one could suggest, that is attributed to the special properties of SEE that by being not that 'fully' integrated with the rest of the Eurozone and Europe (that in their own turn are not integrated, in an Optimum Currency Area (OCA) context at least) it would need more time to absorb the shocks. These shocks are negative and equal to one standard error.

---

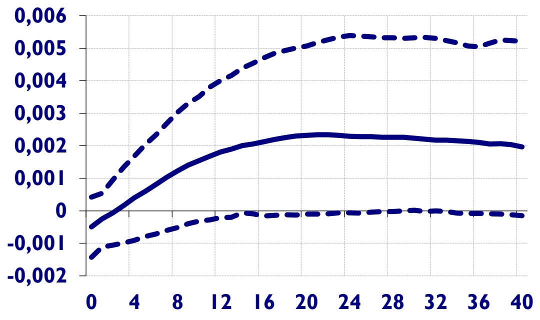
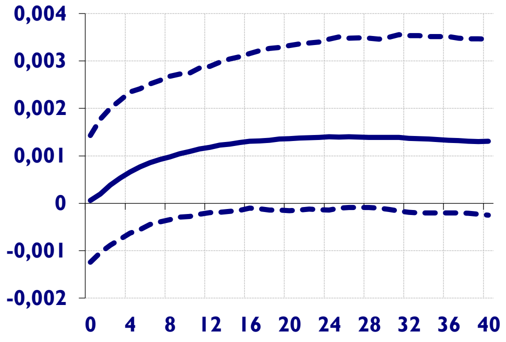
[55] We therefore, use GIRFs to overcome the problem of ordering of the variables. Even if it could be supported generally or specifically by the economic theory in some cases, in the given context of this research, and for the given selected domestic and foreign variables of Industrial production (IP), Real Effective Exchange Rate (REER), short term Interest rate (I) and Foreign reserves (FS), we would face problems that it would be hard to overcome. Instead, through the non-Orthogonalized approach with the VECM, we manage to focus further on the transmission channels of the European monetary policy, as it is quantified through the use of Euribor, and the effect of REER from a broader macroeconomic policy perspective, to the "web" of the variables under investigation. All the above mean that it is not only the absence of "a priori" beliefs on how we should order the variables or even the countries within our model, but the absence of a solid economic theory that would be capable of capturing the complexity and the dynamic properties of the macroeconomic and financial variables, always in relation to policy intervention, within a complex, multi-level and multi-speed structure.

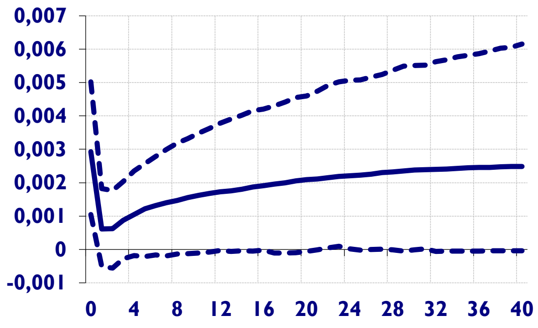
The figures, as reported below, display the bootstrap mean estimates with 90% bootstrap error bounds. A 90% error bound is commonly used in G-VAR literature (see for example Dees et al. (2007) and Smith and Galesi (2014)).

5.2.9 Shock to Euribor

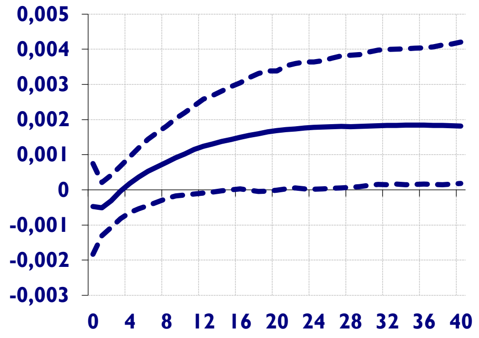
On the figures below we observe the Generalized Impulse Response Functions (GIRFs) of each variable, i.e. of Industrial Production (IP), Real Effective Exchange Rate (REER), short term Interest rate (I), Foreign reserves (FS) respectively of every country in terms of their responsiveness to a negative shock to Euribor. On the horizontal axis we observe the time in terms of months, for the given monthly frequency of the data and on the vertical axis the magnitude of the impact of the shock that could be positive or negative. It has to be noted practically, in terms of interpreting the statistical significance of the results, that if the dotted lines, i.e. the provided standard errors –both the upper and the lower bound– are not only on the positive or only on the negative side, then the statistical significance of the Euribor shock to the investigated variable is lost. Note also that all shocks are equal to one standard error.

Figure 5-14: Generalized impulse response -Industrial Production- functions (GIRF) of a negative unit (1 standard error) shock to EMU-Euribor (bootstrap mean estimates with 90% bootstrap error bounds)

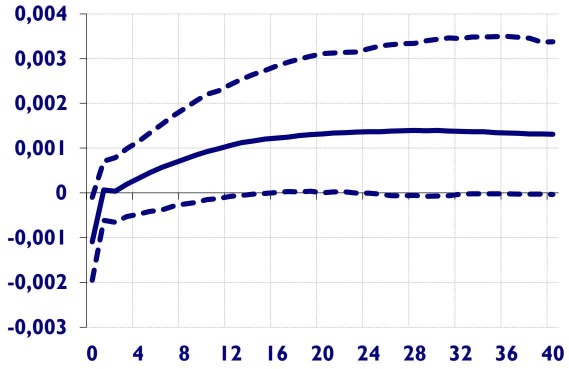
Response of Bulgarian IP	**Response of Croatian IP**
	
Response of FYROM IP	**Response of Greek IP**

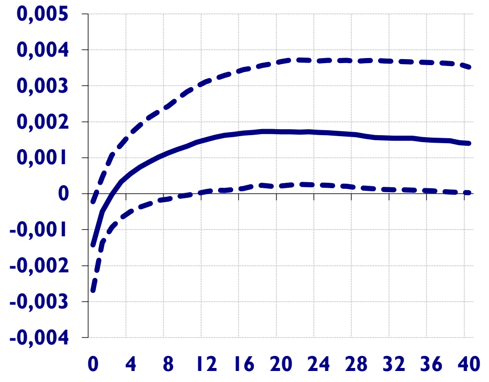


Response of Romanian IP



Response of Slovenian IP





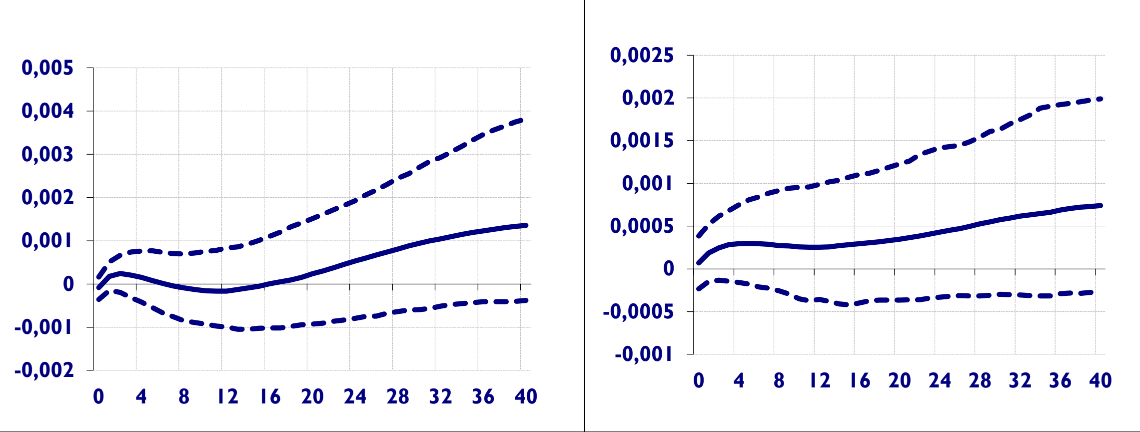
Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

First, by considering the GIRFs for one standard error negative shock to Industrial production, it is really important to stress that in all cases above, the negative shock of the Euribor keeps on having only a positive and statistically significant –after the 1st year– lasting impact to the Industrial Productions of all six countries under investigation. This goes along with the formulated expectations of the economic theory, given that we expect an inverse relationship between the two variables. Also, the fact that the statistical significance of this shock seems to become almost evident after the first year could be explained within the context of the particularities of the region and also to a non-'real', adequate and active financial and economic integration of the Southeast Europe region with the rest of the European continent. Thus, within this context we can refer to the transmission of a shock to the Industrial Production in SEE that takes place rather slowly and becomes statistically significant over time, i.e. after the 12th month.

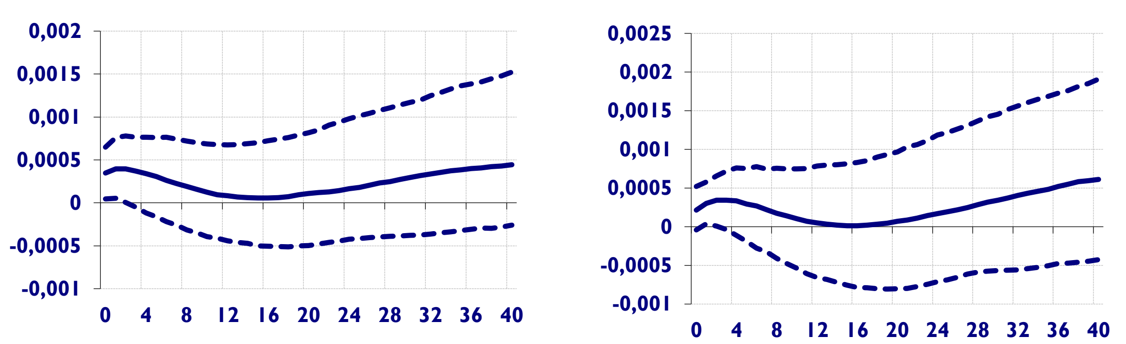
In terms of the magnitude of this shock, we observe that on average the responsiveness of the IP, within the statistically significant region, varies from the 0.13-0.14% for the Croatian and the Romanian case: to 0.17-0.18% for the Slovenian one: to the Greek which is slightly lower than 0.2% and the Bulgarian that is slightly above 0.2%: finally to the highest over-performing impact for FYROM where the IP is above 0.2% on average and grows further to more than 0.25% after the 2nd and a half year. A lasting impact that should be stressed as an important finding of this research.

Figure 5-15: Generalized impulse response -real effective exchange rate- functions (GIRF) of a negative unit (1 standard error) shock to EMU-euribor (bootstrap mean estimates with 90% bootstrap error bounds)

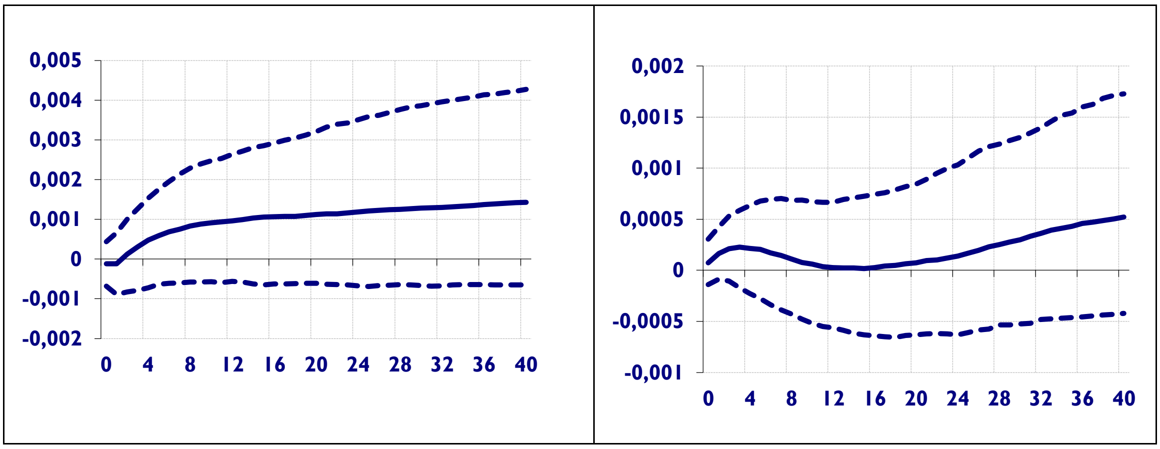
Response of Bulgarian REER | **Response of Croatian REER**



Response of FYROM REER | **Response of Greek REER**



Response of Romanian REER | **Response of Slovenian REER**



Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

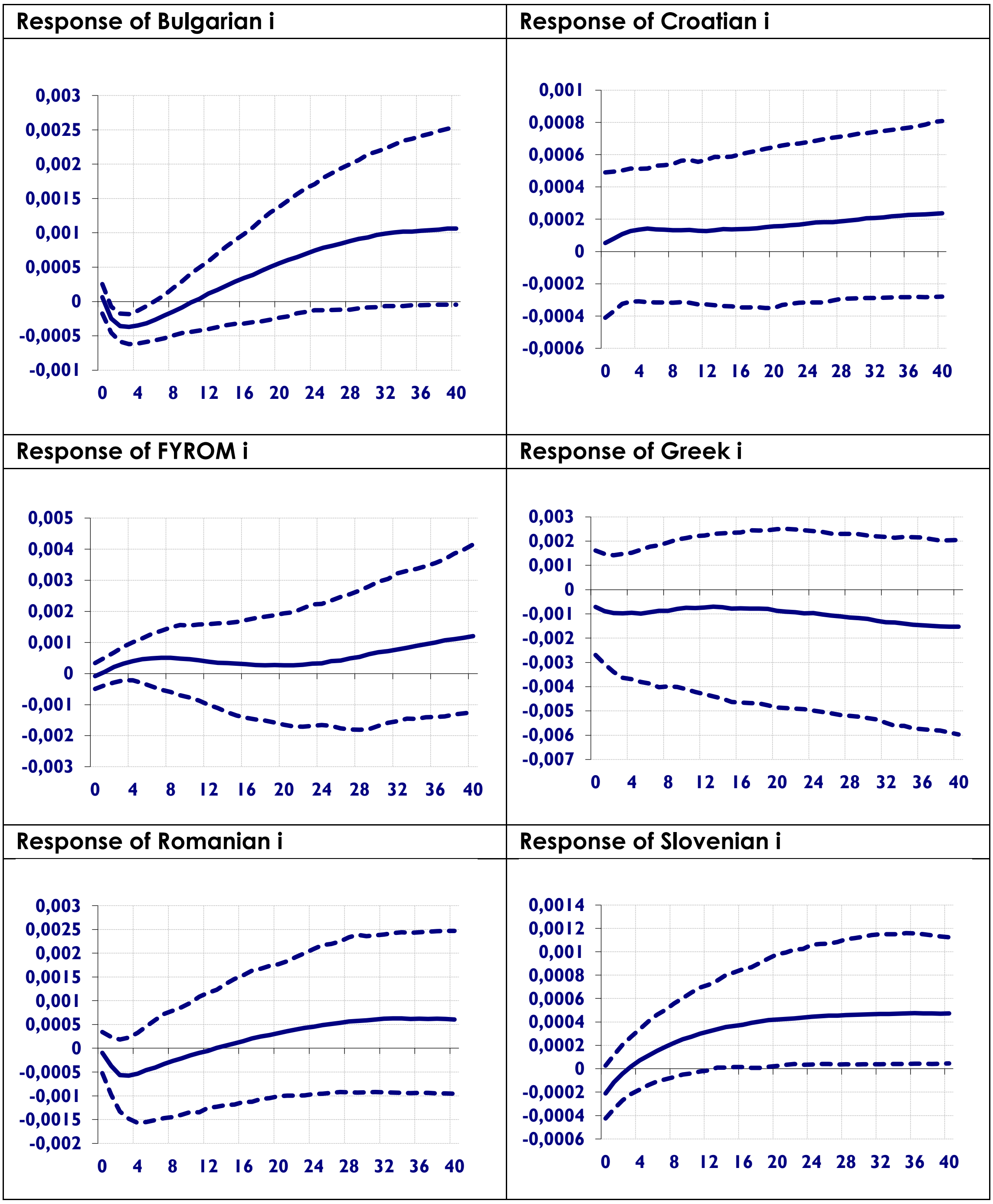
The GIRFs above, for one standard error negative shock to Real Effective Exchange Rate (REER), are not statistically significant. [56]

The respective magnitude of this shock is low and is common, for all six countries, positive and increasing in its tendency, calling for further research in this area and probably stressing the fact that low rates are not that good for the countries in the region, meaning that investors are not willing to "over-invest" in SEE at such low Interest rates, and thus require a great risk premium, indicating towards a key finding of this thesis, which is related to the fact that the SEE is a special region that is not integrated, financially and economically to the rest of Europe. Still, this research area overall requires further investigation and it will be addressed to a greater extent on the next empirical chapter of this thesis in the context of the EMU REER effect on the SEE REERs.

---

[56] Still, even in such a statistical context, we could report the positive reaction of the REER to a negative shock on the Euribor, which means that the countries lose in terms of their competitiveness (this is what a positive response on REER means) after such a drop. A drop, and thus must be stressed, that should be expected economically to be beneficial given that at lower rates indicatively the Gross Fixed Capital Formation (GFCF) tends to increase and thus, respectively the economies could be better off in an international context.

Figure 5-16: Generalized impulse response -short term interest rate- functions (GIRF) of a negative unit (1 standard error) shock to EMU-euribor (bootstrap mean estimates with 90% bootstrap error bounds)



Response of Bulgarian i

Response of Croatian i

Response of FYROM i

Response of Greek i

Response of Romanian i

Response of Slovenian i

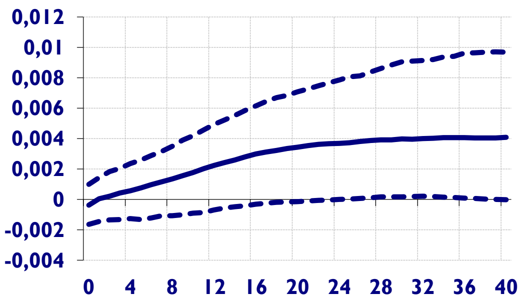
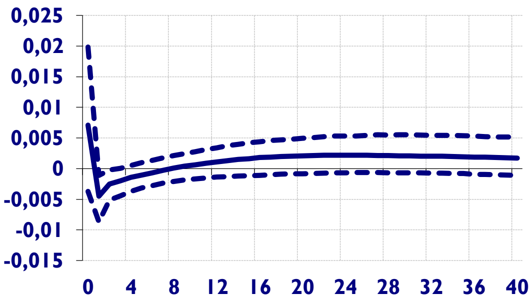
Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

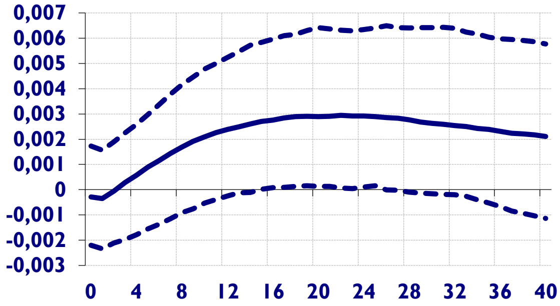
It is very interesting to observe that the Bulgarian short term interest rate ('I') is affected negatively after a negative shock on Euribor. A shock that is not only statistically significant, as we observe on the figure above (5.16), but also seems to last for at least 7 to 8 months, without losing its statistical significance. Then, after this period, the effect still remains negative for the coming 4 months, i.e. reaching a year of negative impact of Euribor on the short term Bulgarian Interest rate, that seems to "co-move" for this time frame, but loses its statistical significance.

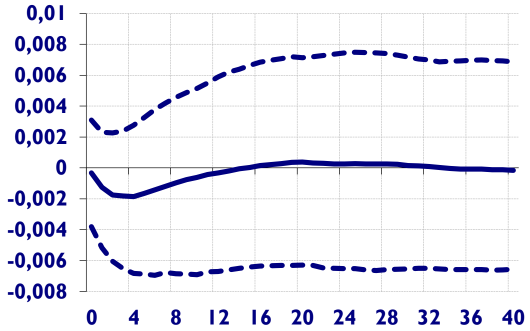
It has to be added that on the rest of the cases, there is no statistically significant impact of the Euribor shock to the short term Interest rate of the rest of the countries, excluding the time horizon after the 1st year, in the case of Slovenia, that a negative Euribor shock drives the Slovenian short term Interest rate into a positive path. Still, even though the first year is not statistically significant, within these first four months of the first year of the impact, the relation of the two variables, and specifically the responsiveness of the Slovenian Interest rate, seems to follow the negative sign of the European one.

It is also interesting to add and observe that the one standard error negative shock of the Euribor keeps on having only a negative lasting impact to the Greek short term Interest rate. Even though it is not a statistically significant one, it seems to have a rationale with the context of the Greek failure to remain not only a member of the bond markets but of the interbank market as well for an extended period of time.

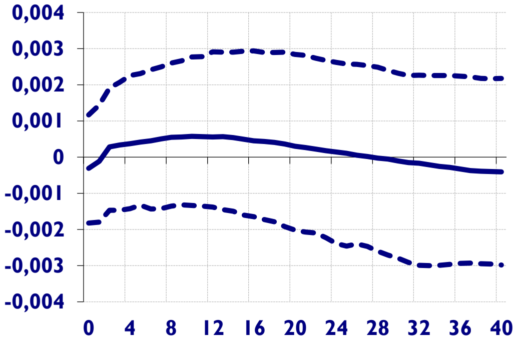
Figure 5-17: Generalized impulse response –foreign reserves– functions (GIRF) of a negative unit (1 standard error) shock to EMU-Euribor (bootstrap mean estimates with 90% bootstrap error bounds)

Response of Bulgarian FS	**Response of Croatian FS**
	
Response of FYROM FS	**Response of Greek FS**

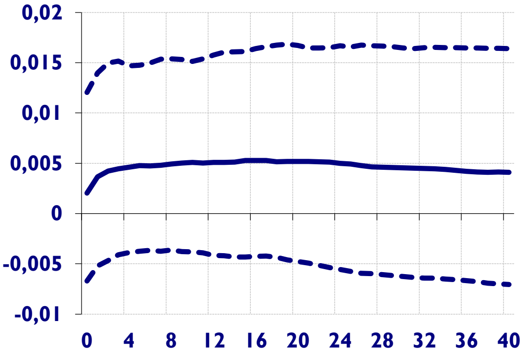




Response of Romanian FS



Response of Slovenian FS



Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

It is also important to note that Bulgarian Foreign Reserves are affected positively after a negative shock on the Euribor. A shock that becomes statistically significant, after one year and a half, i.e. after the 18th to 19th month, as we observe on the figure above. This statistical significance is not lost in the following months and also has economic meaning. The same applies for the Croatian Foreign Reserves with the difference that the lower bound tends slightly below 0, as opposed to the upper one which is positive throughout, minimizing marginally the statistical significance of the responsiveness of this variable to one standard error shock of the Euribor. The same responsiveness is observed in the case of the Foreign Reserves of FYROM (note that they include Gold as well, given that this is how the variable is being reported from the Central Bank), which is a positive one and statistically significant from the 16th month up to the 30th.

The Greek and the Slovenian Foreign Reserves are affected in a statistically insignificant way to this negative shock on the Euribor, as expected. Given that the entry to the Eurozone not only made these Reserves less important for defending any fixed exchange rate parity, but also diminished their usefulness in the context of any macroeconomic related stability that could be attributed to their existence and their high level.

5.3 The G-VAR for all six countries. Using the Real Effective Exchange Rate as a global variable

As stated above in capturing the dynamic properties of the G-VAR model and their respective "time profiles", in terms of quantifying the impact of a shock to foreign variables (star variables) on SEE countries, we will now address the consequences of a second global shock. Thus, apart from applying a negative shock equal to one standard error to Euribor, we will now proceed with a one standard error negative shock to the EMU Real Effective Exchange Rate (euREER). As is established from economic theory a drop on the REER is expected to be beneficial for the economy, given that its decline boosts the economy's competitiveness.

5.3.1 Considerations and the model framework

On this last empirical part of the current thesis we will address the responsiveness of all investigated variables of the six SEE economies on an individual basis, following the advent a global shock of the EMU Real Effective Exchange Rate.[57]

---

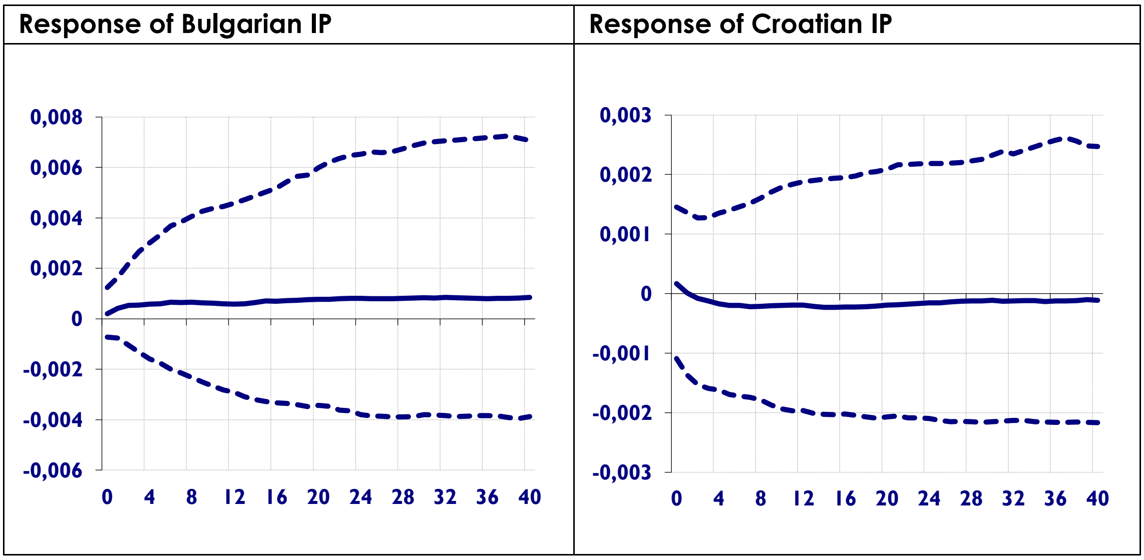
[57] It has to be noted that the structure and the construction of the G-VAR model used is similar to the one in the previous section (see Section 5.2) and thus there is no reason to present it again here.

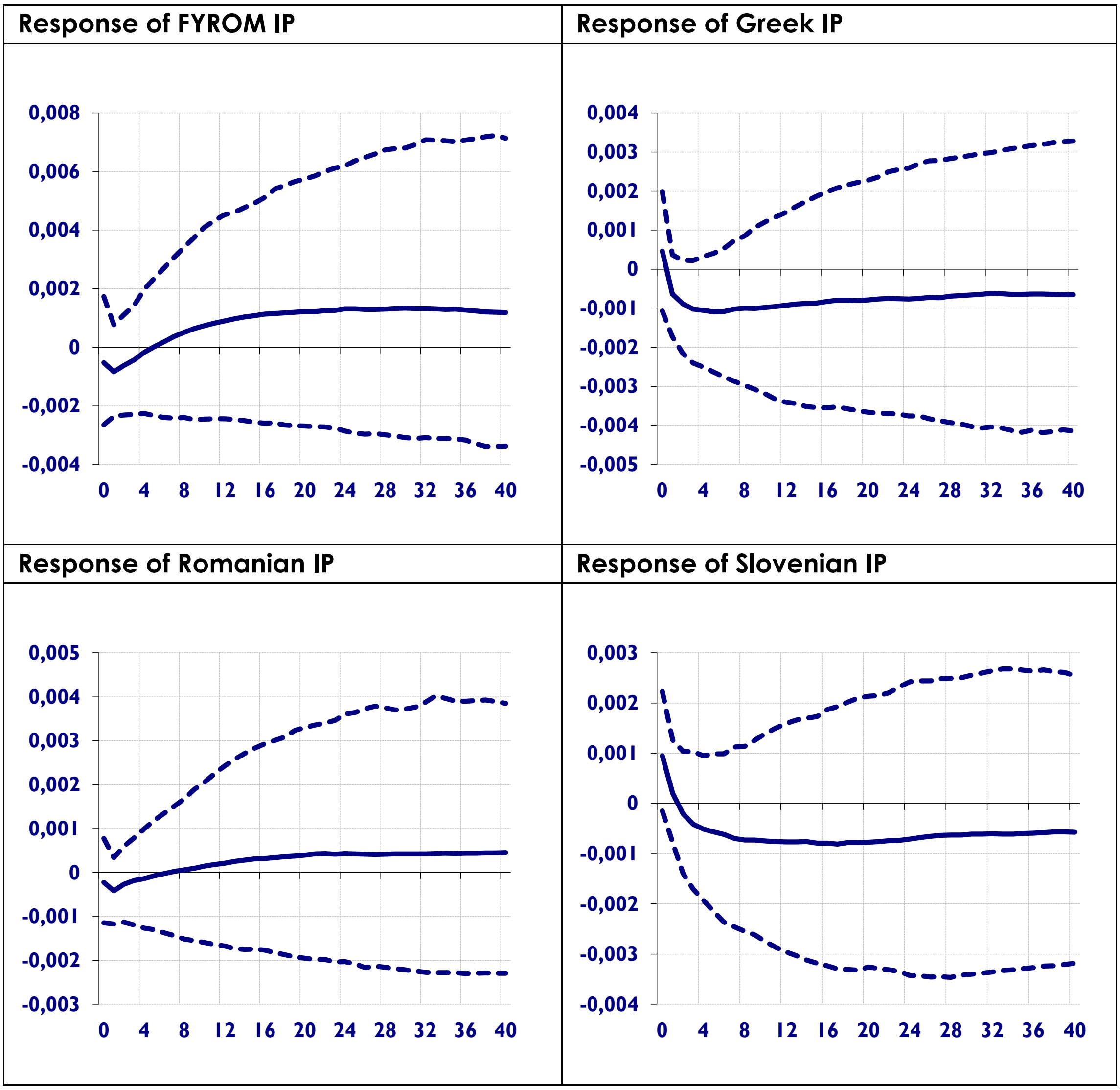
5.3.2 Shock to the Real Effective Exchange Rate

The Generalized impulse response functions (GIRFs) of all variables presented in the figures below, i.e. Industrial Production (IP), Real Effective Exchange Rate (REER), short term Interest rate (I) and Foreign reserves (FS) are provided respectively for every SEE country in terms of their responsiveness to a negative shock which is equal to one standard error. In contradiction to the EMU Euribor global shock, the Real Effective Exchange Rate (REER) related responses of the investigated variables provide evidence that the spillovers are now heterogeneous, which means that they are not as clear and statistically significant as before.

As stated, the horizontal axis is refereed to time in months while the vertical one captures the measured magnitude of the one standard error global shock to the investigated variables on an individual basis, for every country separately. A shock could be either positive or negative and what is chosen is a negative one on the source variable and subsequently the impact it exerts on the investigated variables which could be positive or negative for the given time profile. Note again, for practical purposes, that the statistical significance is sustained and evident if both bounds, i.e. the upper and the lower ones, are on the same side of the vertical axis (i.e. they must both be only on the positive or on the negative side).

Figure 5-18: Generalized impulse response –Industrial Production– functions (GIRF) of a negative unit (1 standard error) shock to EMU-Real Effective Exchange Rate (bootstrap mean estimates with 90% bootstrap error bounds)



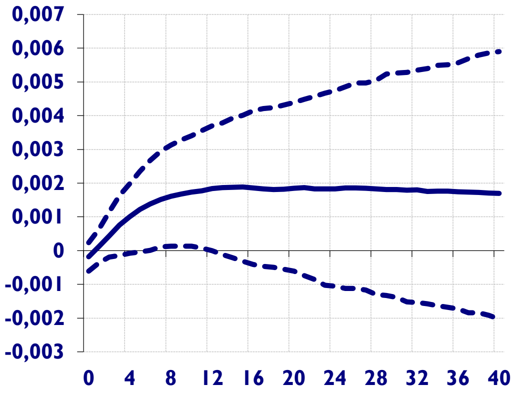
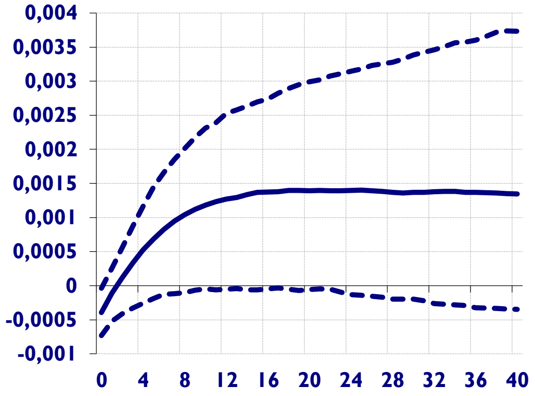
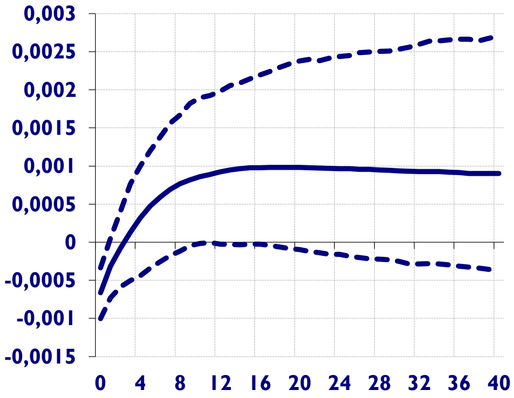
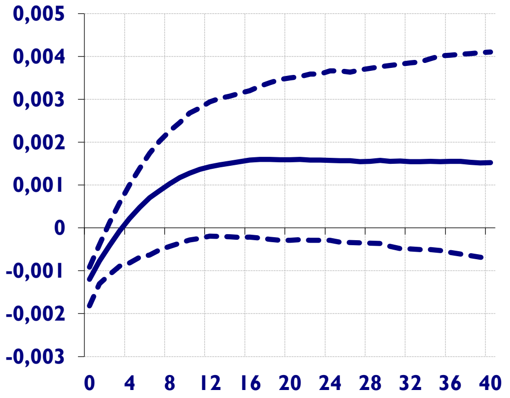


Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

We start by considering that the GIRFs above are equal to one standard error negative shock of Real Effective Exchange Rate of EMU (euREER) –which is translated into an increase of Eurozone’s competitiveness – to Industrial Production (IP).

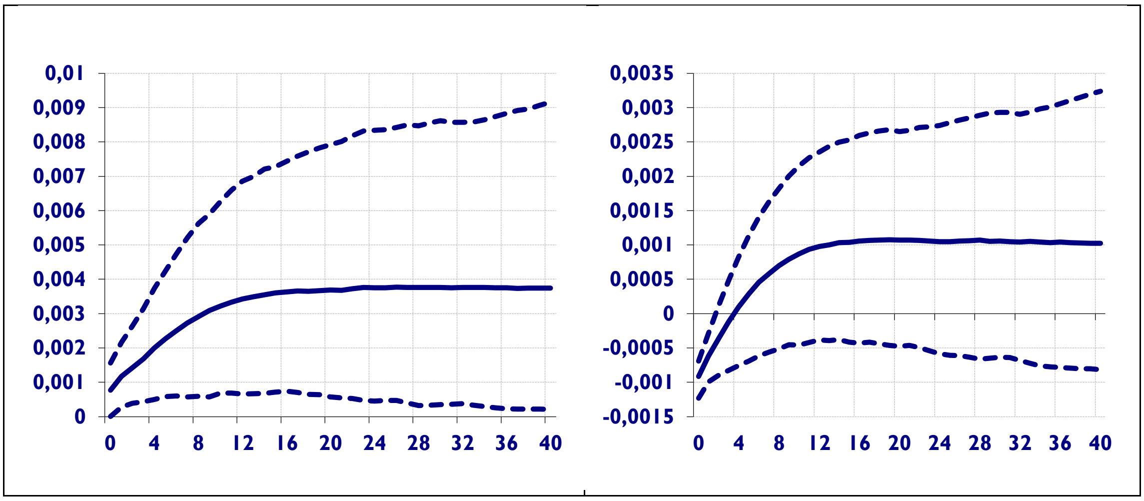
This negative shock of the euREER keeps on having a statistically insignificant and heterogeneous impact –in terms of the changing signs and the various time profiles– on the Industrial Productions of all six countries. These results could be explained within the framework of the SEE region which is not really integrated with the Eurozone as a whole. This result could act in practice as an indicator that points towards the non-existence of such an integrated status.[58] Still, it is further interesting in addressing the GIRFs of REER to euREER in bridging the gap that will help us understand this outcome and subsequently to understand the transmission of a euREER shock to the Industrial Production in the SEE through the REERs.

Figure 5-19: Generalized impulse response –Real Effective Exchange Rate– functions (GIRF) of a negative unit (1 standard error) shock to EMU-Real Effective Exchange Rate (bootstrap mean estimates with 90% bootstrap error bounds)

Response of Bulgarian REER	**Response of Croatian REER**
	
Response of FYROM REER	**Response of Greek REER**
	
Response of Romanian REER	**Response of Slovenian REER**

---

[58] Alternatively, from another point of view, the REER could be understood as a mechanism that is not efficient to improve competitiveness.



Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

The GIRFs provided on the figure above, for one standard error negative shock of EMU Real Effective Exchange Rate (EUREER) to Real Effective Exchange Rate (REER) are highly and persistently statistically significant overall. It is very interesting to report that under such a context the positive reactions of the REERs to this negative shock of the EUREER, means that the SEE countries lose in terms of their competitiveness (which is what a positive response of REER means).

This drop of EUREER seems to be economically beneficial only for the two out of six SEE countries that are EMU members, i.e. Greece and Slovenia, but this happens only in the short run given that it lasts only for two months. Both Greece and Slovenia are depicting a negative initial response to the drop of EUREER, meaning that their competitiveness is boosted from the increased competitiveness of the EMU –a result that it is also statistically significant– but after the second month, in both countries, it turns positive and increasing lasting for a subsequent period of three years. Note though that the lower bound in the case of Greece, and of Slovenia but to a lower extent, is very close to the positive side as well –as it is related to the upper bound–, which means that the results especially from the 12th to the 30th month are close but not really statistically significant. Thus, overall, the aforementioned results provide evidence that the EMU entry is initially beneficial for the new SEE member states, but it turns into a negative one as time passes by a result that could be further blended with the previous results of the responsiveness of Industrial Production (IP) to EUREER and thus, indicates towards the non-heterogeneous-responsiveness of domestic IPs, where REER acts like a mid-part of the transmission channel of the effect of EUREER to SEE REERs.

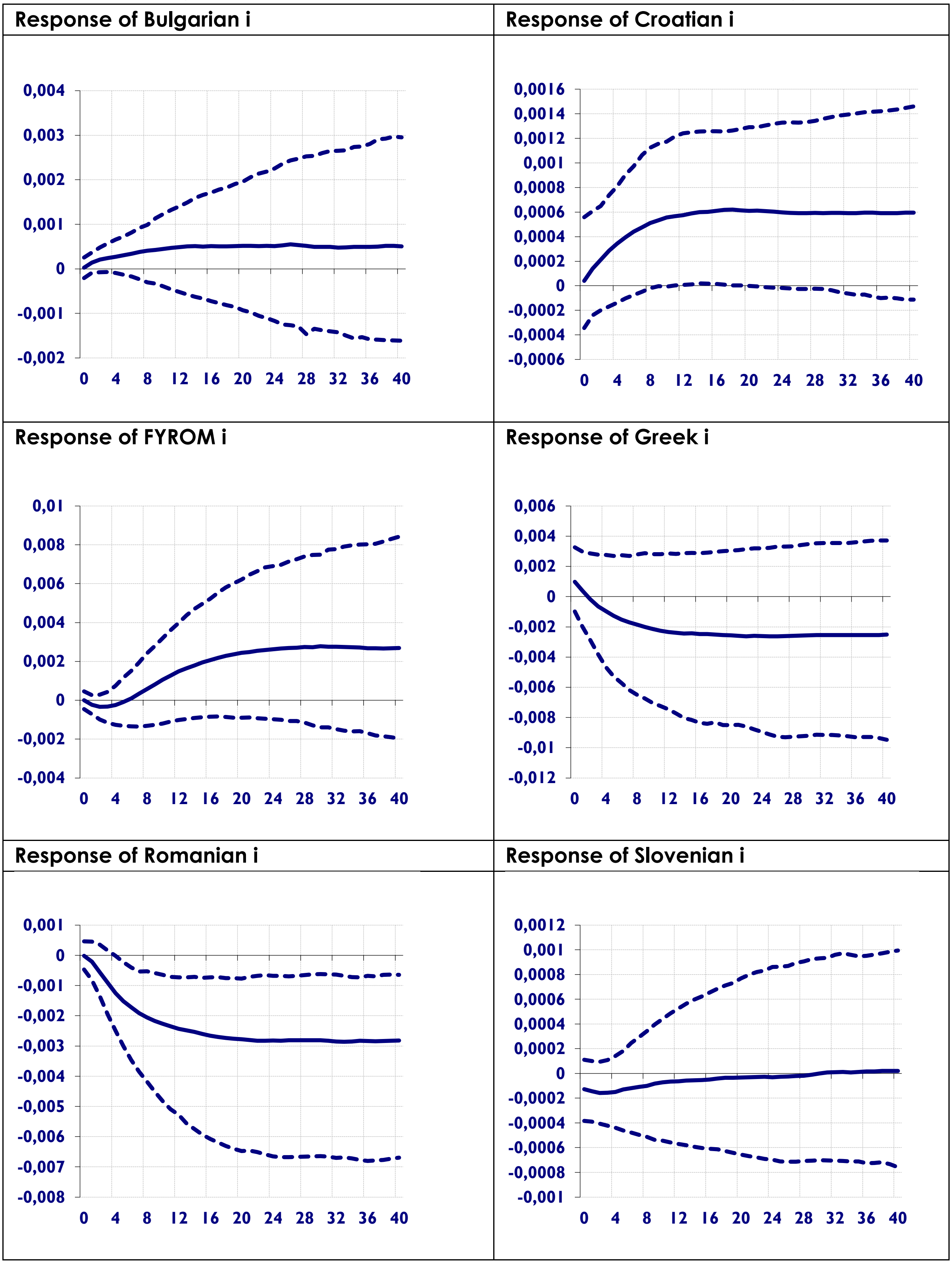
In terms of the magnitude of this shock and of the time path as well –to insist in the two EMU members of SEE first, Greece and Slovenia– the initial negative response during the first two months starts from a -0.12% in the case of Greece and -0.1% in the case of Slovenia, to reach -0.025% for both countries, remaining statistically significant also throughout this period. Once the shock is transmitted to the positive side of the axis, the Greek responsiveness of the REER is on average 0.15%, especially on the period from the 12th month to the 30th, which is the period that is very close in being statistically significant throughout. The Slovenian responsiveness of the REER is on average 0.1% and seems to remain as such from the 1st year onwards, without though sustaining its statistical significance. Last but not least, note that these two SEE countries are part of the EUREER as well and thus, even though their weight on this EMU variable and shock related variable, is really low –and have not been jeopardized by any means the exogeneity of this variable– could help us in understanding further the complexity of the above results.

To proceed now with the rest of the non-EMU members of the investigated SEE economies, it has to be stressed that the results, apart from being statistically significant, depict the same pattern a pattern which shows that the investigated REERs are acting inversely on the EMU ones. Specifically, the Romanian REER is statistically significant throughout the whole time period, i.e. from the 1st month to the 40th month, and is responding positively to the negative shock of the EUREER. It is important to note that after the first year, the average responsiveness of this REER is close to 0.38-0.39%, which means that the Romanian REER is persistently worse off after the increase of competitive stance of the EMU members. The above results seem to be evident and up to a degree similar to the rest of the countries as well, i.e. Bulgaria, Croatia and FYROM.

The Bulgarian REER responds positively to the EUREER and specifically from the 4th month to the 12th month this positive response starts from 0.1% and grows to 0.2% and then remains on average at 0.2% showing some signs of a minor and gradual wear out. Note also that from the 4th to the 12th month the results are statistically significant. The Croatian REER responds positively to the EUREER as well, excluding the 1st month that shows a similar reaction with the ones of Slovenia and Greece a negative and statistically significant response that lasts only for the 1st month in a statistically significant way and then turns to positive ground, which is, economically speaking, a negative one. For example, we observe that from the 9th month to the 22th month this positive response starts from 0.125% and grows to 0.145% and then remains on average slightly below 0.15%, showing some signs of a minor and gradual decline. The above provide evidence that Croatia is not 'favoured' –the contrary rather seems to be the case– by the increased competiveness of the EMU members as well.

Similar results with the above are evident in the case of the only non-EMU and non-EU country, for the six countries under study, i.e. FYROM. The REER of FYROM responds positively to the EUREER and specifically it shows a similar response, in terms of signs and path, with the Bulgarian one, with an observed difference in terms of the time profile, given that the REER responsiveness in FYROM operates with a delay compared to the Bulgarian one. This positive response, i.e. the worsening of the REER, takes place in a statistically significant manner from the 9th month to the 17th month and it reaches 0.1% and stays as such for the periods to come. The first two months, following the Slovenian-Greek pattern, could be attributed either to similar factors that could rise given that the country looks towards a NATO, EU and an EMU entry, or to the existing and detected within the G-VAR strong interlinkages that exist between FYROM and the two neighbouring countries, i.e. Greece and Bulgaria.

Figure 5-20: Generalized impulse response –short term interest rate– functions (GIRF) of a negative unit (1 standard error) shock to EMU-real effective exchange rate (bootstrap mean estimates with 90% bootstrap error bounds)



Response of Bulgarian i

Response of Croatian i

Response of FYROM i

Response of Greek i

Response of Romanian i

Response of Slovenian i

Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

The above results of the short term interest rate functions (GIRFs) of a negative unit (one standard error) shock to EMU-Real Effective Exchange Rate are heterogeneous and informative.

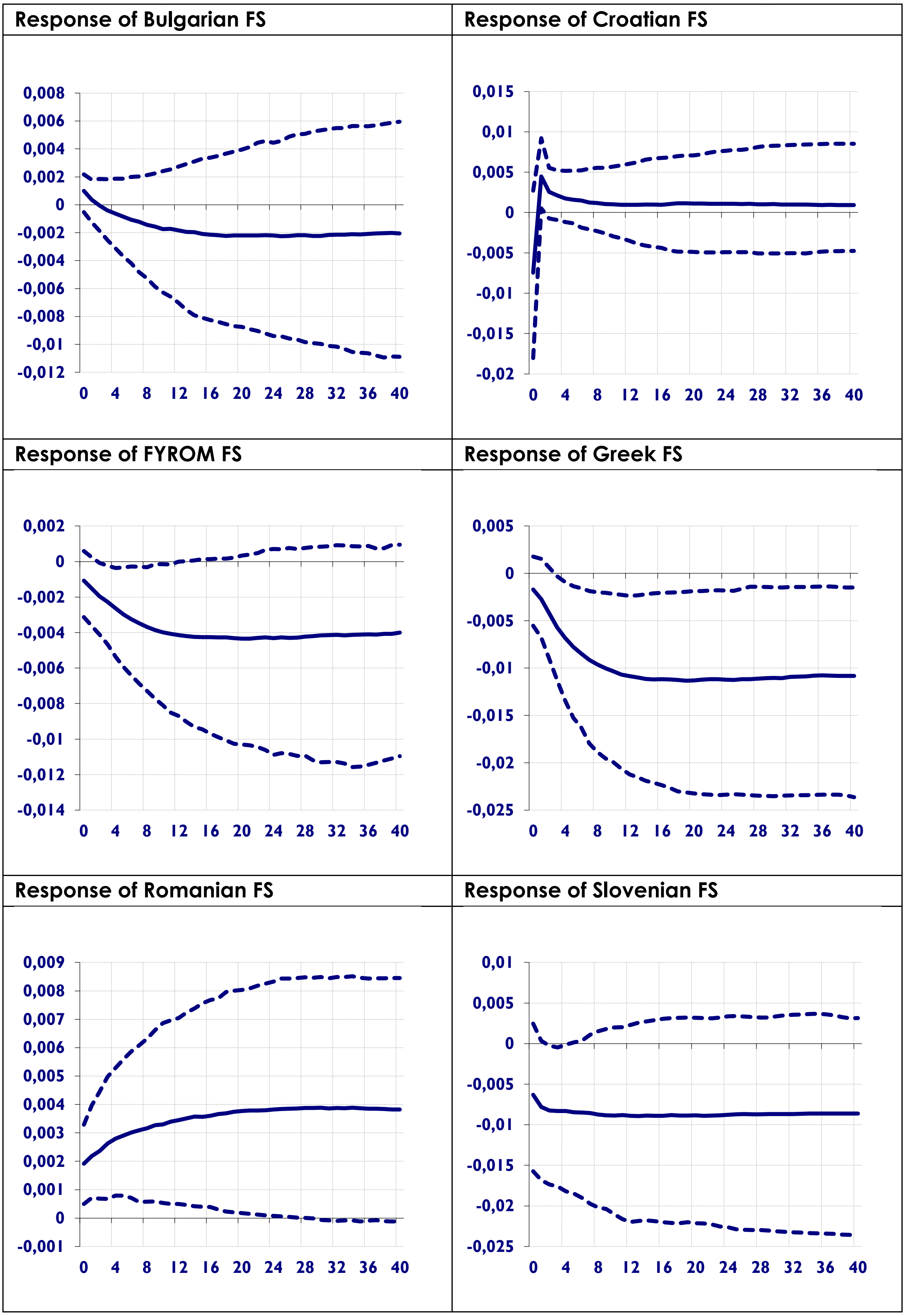
We will start with the Romanian short term Interest rate given that responsiveness of this variable is not only statistically significant on the vast proportion of the provided time profile, but also it provides evidence of a different stage of a financial and economic integration between this EU member state and the EMU ones, which is not only important on its own, but also it curves a path towards the possible EMU entry of the rest of the SEE countries.

Specifically, the short term Interest rate (I) of Romania responds negatively after a negative shock on the EUREER. This shock is statistically significant, as we can observe on the provided figure, and also lasts from the 4th month until the end of the period under study. The first four months are they only ones that are statistically insignificant, which does not come as a surprise given that we relate economically an EMU variable, EUREER, to a financial variable (I) for a SEE and non-EMU member country. It is therefore expected that this variable will respond in a statistically significant way after a short period of time, measured in months. What is really important though is the fact that the Romanian short term Interest rate responding negatively to a negative shock on the EUREER, means that the demanded risk premium, on this interbank related Romanian Interest rate, goes down after an increase in the EMU competitiveness as this is quantified through the EUREER. This result is not only statistically significant but persists for the given time period. In terms of the magnitude of this responsiveness, on the 4th month the related percentage is -0.15%, then goes further down smoothly, reaching -0.28% to -0.29% on the 20th month, to remain on average just below -0.3% without showing any signs of weakening.

It is important to add that the same negative time profile related paths are evident both in the cases of the EMU members of SEE investigated, i.e. Greece and Slovenia, remaining as such for the whole time profile in the case of Slovenia and for the case of Greece (if we exclude the first two months though, the above are not statistically significant). An outcome that signifies not only the need for further investigation of the relation of these variables, EUREER and 'I', but also the importance of financial integration of SEE to EU and EMU that will improve the efficiency of the transmission channels of economic policy EMU-related variables to the financial and economic variables of SEE counties as well.

Croatia, as expected, is a country that could be positioned between the EMU ones −Greece and Slovenia− and Romania, which is further advanced in its relation to the EMU banking sector as we have seen, and to the rest of the countries, i.e. Bulgaria and FYROM. The responsiveness of the short term Interest rate of Croatia, Bulgaria and FYROM to a EUREER shock is a positive one, meaning that the demanded risk premium on the short term Interest rates from these countries is increased. More importantly, the response of the Croatian Interest rate ('I') is positive throughout, statistically significant from the 8th to 22th month, and reaching two years without though being high. For example on the statistically significant period it is starting slightly above 0.05% and remains on average to 0.06%, which is a percentage that remains at this level for many months to follow. The same positive responsiveness is also evident in the cases of Bulgaria and FYROM, being of a comparatively greater magnitude and also without being statistically significant too. Note though that the Interest rate ('I') of FYROM shows an upward trend that reaches 0.25% and the Bulgarian one is close to being statistically significant from the 1st to the 4th month. The above results, for the cases of Croatia, Bulgaria and FYROM, suggest that the increased competitiveness of the EMU members, as it is quantified through the EUREER, makes the investors ask for a greater risk premium in entrusting the banking systems and the economies of these countries.

Figure 5-21: Generalized impulse response –Foreign reserves– functions (GIRF) of a negative unit (1 standard error) shock to EMU-Real Effective Exchange Rate (bootstrap mean estimates with 90% bootstrap error bounds)



Note: On the vertical axis the percentage change of every response is captured and on the horizontal axis the number of months.

We will now address the Foreign reserves (FS) GIRFs of a negative unit (one standard error) shock to EMU-Real Effective Exchange Rate (euREER). We will start by noting the responsiveness of the FS of the EMU members, Greece and Slovenia, given that these two countries do not need their FS to defend any existing or possible fixed exchange rate regime, as long as they are already members of the Eurozone. As expected for these two countries, even though these interlinkages are not expected to be that important, at least directly, the Greek FS responds negatively to the increased competitiveness of the EMU, in a statistically significant way that starts from the 3rd month and lasts to the end of the provided time profile. The magnitude of this responsiveness settles down to -1.1% to -1.2%. A similar result is evident in the case of Slovenia as well, where the FS responds negatively and is statistically significant for the 1st-2nd month to the 8th one, a response that remains negative and is equal to slightly below -1% on average. The above results indicate obviously that the FS are not needed furthermore, once a country becomes a member of the EMU, which means that these FS are set 'free' and thus they could be used in different ways in terms of economic policy making.

It is important to continue with the Romanian Foreign Reserve (FS) response to EUREER which is a positive one. An outcome that is rather interesting suggesting that the country's Central Bank increases the FS after the EMU REER related shocks. A result which is statistically significant for the first 30 months, starting from a 0.2% responsiveness, gradually growing onto 0.38% on the 20th month, reaching an average close to 0.4% from the 20th month and onwards.

The Croatian Foreign reserves respond differently compared to the rest of the countries indicating the heterogeneity of the investigated GIRFs. The first two months are the statistically significant ones and even though the variable FS responds initially negatively after the first month, it reaches a positive ground to reach a statistically significant peak close to 0.5%. Then this response wears out and loses its statistical significance. The FS variable of FYROM is statistically significant from the 2nd to the 12th month and responds negatively to the EUREER shock. This implies that the EUREER, in terms of the increased competitiveness of the EMU economies, allows the economy to sustain a lower amount of FS. The same holds for the Bulgarian economy also, but without a statistically significant framework and a ‘one to two months’ initial positive response.

Chapter 6 - Summary and conclusions. Limitations of the Current Study and Suggestions for Future Research

Despite the voluminous work on monetary policy transmission, a limited number of studies have considered the transmission mechanisms of monetary and economic shocks at Southeast Europe in a Eurozone context. To investigate this, the appropriate method is the a Global Vector Autoregressive model (G-VAR) that captures the interdependencies that exist across economies in a country, regional, and global context.

Following Pesaran (2015), Longstaff et al. (2011) and Dees et al. (2007), on our econometric approach, we put more weight on global (exogenous) variables to the investigated country factors. Thus we support and provide empirical evidence that a G-VAR model is an econometric technique that can test the investigated variables effectively and also manages to capture and partly clarify the complexity and the dynamic properties of the variables in the SEE region as a whole within an EMU context. More specifically, given that the speed of EU and EMU convergence was expected to accelerate, after the financial crisis of 2008 not only this acceleration did not last, but also led to the Greek crisis and to the formal articulation on behalf of the European Commission of a proposal for 'Grexit', which paved the way towards a multi-speed, multi-layer EMU and EU. The above seem to be further interesting not only within the economic policy context, but broadly, economically, politically, and geopolitically as well.

In addressing the aforementioned convergence issue, we have applied econometrics. Specifically, our research approach uses a multi-country Vector Error

Correction Models (VECMs) where the six SEE investigated countries are treated separately (in a country specific mode) in an EMU framework, and a Global Vector Autoregressive model (G-VAR) where all six countries are treated simultaneously in an EMU framework, where the EMU euribor is initially used as a global shock variable and then the EMU real effective exchange rate.

The investigated period of the thesis, i.e. from January of 2002 to December 2016, includes important and unprecedented, in a post-war framework, global events that took place and had a severe impact not only to USA and EU, but also to South-eastern Europe (SEE). Especially, given that the investigated countries of this research are Bulgaria, Croatia, FYROM, Greece, Romania, and Slovenia –that could be grouped into EU members, Eurozone members and non-EU-Eurozone members– it is interesting to briefly review the broader context of the events of the investigated period and the multifaceted impact that these events had on the different countries of this rather unique region, and then to proceed with the concluding remarks. This context will help us to address and review the econometric results and the respective impact of the global shocks to the SEE region in terms of their existing and complex interlinkages, as they were generated through the VECMs and the G-VARs, and thus overall the results will be interpreted more effectively and efficiently.

Thus, at the time of writing the thesis, most of the countries under investigation have not managed to recover, at least to a satisfactory degree, from the consequences of the global crisis that started from 2007-2008, and it can be safely reported that the effects of this crisis still last in different aspects of their economies.[59]

---

[59] The crisis, as known, started as a 'subprime mortgage' one, but was also related to the energy-oil shock of 2007-2008 –leveraged through the usage of financial derivatives further– and eventually developed into a multifaceted one, varying from financial and sovereign debt to a broader economic crisis. It eventually threatened the existing structure of Eurozone, changed the conduct and the magnitude of monetary intervention, gave birth to a new European Institution like the European Financial Stability Facility (EFSF) that sublimated and developed into the European Stability Mechanism (ESM), which is in the process of becoming a so-called European Monetary Fund, etc. Within such a fragile recovery, partial geopolitical instability and potentially the refugee and migrant crisis as well, the monetary policy transmission channels from Eurozone to SEE and the impact of the Real Effective Exchange Rate of Eurozone to the monetary and economic indicators of the investigated countries, are not just economically related matters, but actual examples that test the stability of the EU. This stability is being tested, directly and indirectly, by measuring the level of integration of a multi-

The data and the respective literature on economic integration in the Eurozone and the EU, for the given existing limitations and absence of instruments that make a fiscal integration and a fiscal expansion impossible as well, as these are limited by the Maastricht Criteria, indicates that the emphasis, on this historical phase, is given towards increasing competiveness, as it is captured through REER, and the respective role that could be given to monetary policy conduct. The puzzling results of this global shock to the investigated variables of real effective exchange rate (REER), interest rates (I), foreign reserves (FS) and industrial production (IP) of the region, indicates the critical role of G-VARs that can monitor the process of ‘real’, i.e. deep, stronger and sustainable, as it is opposed to a superficial, integration.

Within this framework, policy makers and ‘structure developers’, should set a more efficient framework and cultivate the conditions that would favour the long run co-movement (known as cointegration in econometrical terms) of the investigated and other related variables. Variables that should be addressed in a way that would provide signs of a “correctional procedure” towards a sustainable and long run partnership within a really integrated −economically and fiscally− Eurozone. A fiscal integration that is not supposed to limit and put constraints on “competitiveness, innovation and productivity”, but rather to boost them in a sustainable and persistent manner.

The aforementioned are related and quantified directly by the impact of the two global positive shocks, i.e. of a drop on the euribor (EUR) and a drop of the real effective exchange rate of Eurozone (EUREER), which is translated as an increase on the respective competitive advantage. These shocks that are investigated in the

---

layered SEE to the rest of a multi-speed Eurozone. A lagging integration that is captured by the specific results of this research, either through the impact of the increased competitiveness of the Eurozone to SEE economies, the need of the Central Banks (CBs) to hold more than “expected” foreign reserves to defend the exchange rate regimes, or the “financial and economic gap” that exists between the countries in the region and between SEE and the Eurozone. A gap and a multi-speed special status of a region that is not related only to the poor performance of key economic indicators −such as the industrial production (IP), the Interest rates (I) and real effective exchange rates (REER) coupled with the need of CBs to hold extra foreign reserves (FS)− give rise to “Euroscepticism” and put in danger the economic and political stability, the social coherence, or even the peaceful coexistence between nations in this fragile region.

applied G-VAR structure help us to focus, apart from the domestic REERs, on factors such as foreign reserves (FS) that could act as an 'indicator', or as a bridging step, towards a country at the gates of the Eurozone, and thus enhancing further our understanding on the economic policy transmission channels. The above is interesting, given that by now, we have already observed two countries, i.e. Greece and Slovenia, on SEE region, to literary abolish their need to sustain FS, which become redundant once a country joins the Eurozone. An outcome which is attributed to the fact that FS are no longer needed in defending an exchange rate regime, or to 'import' any international credibility that could follow a rather general doctrine that became known as "Mrs Machlup's Wardrobe Theory of Monetary Reserves". Where Central Bankers imitated one another on the sustained level of FS, which in our context could call for more FS, that could be used for a smoother EMU entry.[60]

The star (foreign) variables and the global (shock) variables −based on the empirical results of the G-VARs− switches the statistical significance of the population parameters from the country studied variables onto the EMU ones. Furthermore, the selected variables, as they are being tested in terms of the weak exogeneity test, seem to be carefully selected given that this test did not call for exclusion of any variables. This outcome is further supported by the inspection of the persistent profiles and the General Impulse Response Functions (GIRFs).

Overall, before we proceed with the final presentations and interpretations of our research findings, it has to be repeated that the conditions of stability and convergence are being met and thus a sound G-VAR model specification was

---

[60] Before we proceed to our conclusions we have to repeat that the VECMs and the G-VARs applied in this research are stable and the convergence hypotheses of G-VARs are being met. Specifically and indicatively, in terms of the stability of the VEC model, the unit circle, as known and tested, captures and depicts the presence of unit roots, by allowing additionally for the possibility of rounding error. It is evident that in our case there are no eigenvalues that lie above the unit circle and thus in terms of the Stationarity properties the model is a stable one. In terms of convergence, i.e. the dynamic properties of the G-VAR model and its ability to properly capture the transition of variables under different shocks, we have provided statistical evidence that the persistent profiles not only converge to zero to a period which is lower than 40 periods, but also they do so in a manner that clearly indicates that there is no problem in the underlying individual model specifications.

achieved. A specification that helped us to deliver sound and sensible Generalized Impulse Response Functions (GIRFs), and the rest of our research output that stays in line with the expectations of economic theory.

Now, given that we have stressed the framework under which this thesis takes place, we can proceed in summarising the aim of this study, as stated in the respective section (see Subsection 1.1), which is to address the initial research question: "What is the role of monetary policies −for the given economic interlinkages in the SEE− on sustaining economic, and financial stability, and promoting real growth within the region on an EMU context?".

Specifically, in answering the research questions and research objectives, we group and present on the tables below the empirical findings of the G-VARs, using the Euribor of EMU and the Real Effective Exchange Rate as shock variables respectively.

Table 6-1: Country-specific summary of IP findings

	G-VAR
Bulgaria	- from EUR (from 14th month and onwards)
Croatia	- from EUR (from 16th month and onwards)
FYROM	- from EUR (from 0–1st and 12th month and onwards)
Greece	- from EUR (from 12th month and onwards)
Romania	- from EUR (from 13th month and onwards)
Slovenia	- from EUR (from 12th month and onwards)

On GIRFs bootstrap estimates with 90% bootstrap error bounds are being used. Only statistically significant results are reported.

Table 6-2: Country-specific summary of REER findings

	G-VAR
Bulgaria	- from EUR (on 2nd month, marginally) - from EUREER (statistically significant 5th-12th month)
Croatia	- from EUREER (statistically significant 10th-22th month) +from EUREER (statistically significant from 0-1st month)
FYROM	- from EUR (up to 3rd month) - from EUREER (statistically

	significant 10th-18th month) +from EUREER (statistically significant from 0-1st month)
Greece	- from EUR (up to 4th month) - from EUREER (almost statistically significant 12th-28th month) +from EUREER (statistically significant from 0-2nd month)
Romania	- from EUREER (statistically significant 0th-40th month)
Slovenia	- from EUR (on 2nd month marginally) - from EUREER (not statistically significant, from 4th month and onwards) +from EUREER (statistically significant from 0-2nd month)

On GIRFs bootstrap estimates with 90% bootstrap error bounds are being used. Only statistically significant results are reported.

Table 6-3: Country-specific summary of FS findings

	G-VAR
Bulgaria	- from EUR (from 16th month)
Croatia	- from EUR (from 18th month, marginally)
FYROM	- from EUR (from 14th-30th month) + from EUREER (from 2nd-14th month)
Greece	+ from EUREER (from 3rd month)
Romania	- from EUREER (from 0th-30th month)
Slovenia	+ from EUREER (from 1-4th month)

On GIRFs bootstrap estimates with 90% bootstrap error bounds are being used. Only statistically significant results are reported.

Table 6-4: Country-specific summary of 'I' findings

	G-VAR
Bulgaria	+ from EUR (from 1-6th month) - from EUR (from 32th month)
Croatia	- from EUREER (from 10th-24th month)
FYROM	
Greece	
Romania	+ from EUREER (from 6th month)
Slovenia	+ from EUR (at 0) - from EUR (from 12th month)

On GIRFs bootstrap estimates with 90% bootstrap error bounds are being used. Only statistically significant results are reported.

Note that the results on the tables above are elaborated in relation to the contemporaneous effects of foreign variables on their domestic counterparts as well (available in Section 5.2.6 and Table 5.21) to address, within the context of transmission channels, the specific research questions and the research objectives of the thesis.

Overall in answering to what extent "does each transmission path affect the nominal and the real performance of the economy" and "what is the "ideal" level of foreign exchange reserves that SEE countries should hold?", the countries, based on the results, are split into different groups. Thus, in answering if it is a proper decision for the SEE countries to eventually join EMU following the Greek example and Slovenian example or not, we address one by one the research questions of this thesis. The research questions are:

1. What are the different transmission mechanisms by which the 'monetary effect', through the money and market rate, Foreign Exchange Reserves and Real Effective Exchange Rates, contributes to the nominal and the real economy, as they are approximated by the Industrial Production Index and the Real Effective Exchange Rate?

Starting with IP, we can say that there is statistical evidence that a drop of Euribor increases the Bulgarian, the Croatian, the Greek, Romanian, the Slovenian, and the IP of FYROM as well, a finding which is consistent with economic theory. Subsequently, along with the aforementioned results the contemporaneous effects of foreign variables on their domestic counterparts must be considered (see as stated Section 5.2.6 and Table 5.21 for an analytical presentation of the results) in capturing the spillovers within SEE economies effectively. On these specific effects, for the given trade weight matrix, we observe that there is statistically significant impact of the industrial production (IP) of the five SEE countries to the Bulgarian IP, where an 1% increase on the IP of the five SEE countries will boost the Bulgarian IP by 0,47%. Also in terms of IP, a 1% increase on the IP of the remaining five SEE countries will boost the IP of FYROM by 0.86%, which is the highest impact of all, indicating the sensitivity and the exposure of the economy, while a 1% increase on the IP of the five SEE countries will boost the Slovenian IP by 0.34%. Last but not least, a 1% increase on the IP of the five SEE countries will boost the Greek IP by 0.39%.

2. To what extent does each transmission path affect the nominal and the real performance of the economy?

Given that this research question is addressed in the previous part, we will focus on the impact of the investigated variables on Real Effective Exchange Rate, and on the Interest rates as well. Starting with the country-specific REER findings, it can be stated that the main driver of the domestic REERs, apart from the Euribor, seems to be the EMU REER. It is important, for the given set up of this research and the research objectives, to understand that this impact bears a positive sign, which means that the increasing competitiveness of EMU makes SEE economies worse off in terms of their own competitiveness (for the given negative shock which is given to the EMU REER). The statistical significance of these results lasts for the entire investigated time profile of the forty months in Romania, from the 4th to the 12th month in Bulgaria, from the 10th to 22nd in Croatia, from the 10th to 18th in FYROM. Then, moving to EMU members, this impact lasts from the 12th to 28th in Greece, but is 'marginally' statistically significant, and from the 4th month and onwards in Slovenia, but without being statistically significant.

The second factor, as stated, that impacts the domestic REERs of the SEE economies is the Euribor. Specifically, when Euribor goes down the REER of Bulgaria, FYROM, Greece and Romania go up in a statistically significant way. This means that the decreasing EMU Interest rates, as they are approximated through the Euribor, are increasing the domestic REERs which make these economies less competitive, even though there is a positive impact on the growth proxies, i.e. the IPs. This key finding helps us in understanding the transmission channels and the dynamics of the investigated economies within the EMU framework.

To continue, and add on the above, we now focus on the determinants of the domestic Interest rates. We can state that there is strong statistical evidence that a drop of Euribor impact only the Interest rate of the economy of Slovenia. Specifically, the Slovenian Interest rate moves to the same direction with the EMU one, providing further evidence on the better chances of this economy to become really co-integrated with those in the EMU in the long run. Within the VECMs (as we have seen on part 5.1), we also find out that Foreign reserves (FS) impact strongly and positively the Bulgarian Interest rates, meaning that more reserves are not driving the domestic Interest rates down, but rather absorb liquidity that becomes scarcer and subsequently more expensive, while the Romanian REER impacts negatively, as expected, the domestic Interest rates, meaning that the markets request a lower risk premium due to the increase competitive position of the Romanian economy.

Proceeding to the contemporaneous effects of foreign variables to the domestic counterparts, i.e. of Interest rates (I)* to domestic Interest rates (I), we have found no signs of statistically significant results, indicating towards an underdeveloped financial region that is not that co-integrated not only to ‘itself” but to the rest of the Eurozone as it is also evident on a global shock context within the GIRFs. The latter finding means that these variables are EMU driven. These results also provide statistical evidence that the linkages that seem to exist in terms of short-term Interest rates in the SEE region are very weak, indicating clearly not only towards a really weak interbank Interest rate marked in the region, but to unusual monetary policy reactions in SEE as well.

Last but not least, the first −historically speaking− EMU member of SEE, i.e. Greece, exhibits clear signs of a statistically significant relation to the contemporaneous effects of the foreign variable real effective exchange rate (REER)* to the domestic one (REER). A 1% increase of the REER of the remaining five

SEE countries will increase the REER of Greece by 0.53%. It would be useful to state again here that the Greek economy is the economy with the higher share in the trade weight matrix, a fact that obviously contributes to this outcome.

3. What is the “ideal” level of Foreign exchange reserves that SEE countries should hold?

There is no ‘ideal’ level of foreign exchange reserves. There is strong statistical evidence coming from the G-VAR results providing evidence that the main source that drives the level of SEE Foreign reserves is the Euribor, which has a strong positive and insisting impact on FS in the cases of Bulgaria, Croatia and FYROM. The EUREER, which is used as a second global-shock variable within the G-VAR, provides strong statistical evidence that in the case of FYROM, a negative shock on it, drives the FS of this small economy down, meaning that a stronger in competitive terms EMU, makes FYROM more confident that can afford to sustain a lower level of FS. Last but not least, it has to be added that EUREER impact on the FS of Romania it becomes positive and remains statistically significant for the entire first thirty months of the investigated time period, which means that an increase in EMU’s competitiveness increases the FS withheld by the Romanian Central Bank.

Using contemporaneous effects of foreign variables on their domestic counterparts, there is also a statistically significant impact of the Foreign reserves (FS) of the rest of the countries to the Croatian FS. A 1% increase on the FS of the remaining five SEE countries will decrease the Croatian FS by 0.05%. This result must be integrated further with the rest of the empirical findings of the G-VAR and specifically with the finding of the GIRFs. Thus, overall there is evidence that the coupled results of the contemporaneous effects and the G-VAR ones, point towards a more stable economy −like the Slovenian one− that moves more strongly into an ‘adequate’ Eurozone participation. Note that the negative aforementioned sign suggests that the Croatian economy is in a position to decrease the FS when the rest or some of the remaining countries –it would be good to focus on FYROM– might have to increase them. Obviously, in responding differently both to the external and internal shocks and providing evidence of being to a different stage in the integration process towards EMU. Thus, a 1% decrease on the FS of the remaining five SEE countries will decrease the FS of FYROM by 0.13%, while a 1% increase on the FS of the remaining five SEE countries will increase the FS of FYROM by 0.13% as well. As opposed to the contemporaneous effects of foreign variables on their domestic counterparts in FYROM, the Slovenian results resemble the Croatian ones. Particularly a 1% increase on the FS of the remaining five SEE countries will decrease the Slovenian FS by 0.04% and the inverse. The same negative sign holds in this case for the Romanian economy too, but the results in this country are not statistically significant.

4. Is it a proper decision for the SEE countries to eventually join the EMU following the Greek and the Slovenian example or not?

Based on the previous answers, we could argue that the Slovenian and the Greek examples are two extremes in terms of a possible EMU membership. We could rank the economies, in terms of the findings, in the following way. First it is Croatia that has more chances in becoming a co-integrated EMU member, given that at least in the 'short-run' it will be paying the cost of a worsening domestic REER, comparatively to the EMU one, in getting the advantage of co-moving and sustainably facing lower Interest rates close or even 'identical' to the European ones. On top of that, the Foreign exchange reserves of Croatia could be used for policy making purposes –to stabilize the economy more in the future– given that they will not be needed once the country joins the Eurozone. The same applies for the Bulgarian economy, in terms of its Foreign reserves but still it will be harder for this economy, given that there is evidence that the requested risk premium will be comparatively greater, and thus it might not be enough in the long run to compensate for the REER loses. FYROM could be viewed as a case of a 'lagged' Bulgaria, economically speaking, given that this

SEE economy is not only dependent on its neighbouring countries −mainly Bulgaria and Greece− but is not even an EU and a NATO member yet. Last but not least, Romania seems to curve its own path, and calls for further investigation. In all cases it should be positioned between Croatia and FYROM.

Thus, to summarise, the focus of the G-VARs results was to capture the international transmission of EMU Euribor and Real Effective Exchange Rate shocks on the respective SEE countries. Differently stated, how are Euribor and Real Effective Exchange Rate shocks on an EMU basis being transmitted to the real economies of the investigated region, and specifically to the following variables: Industrial Production, Foreign reserves, short-term Interest Rates and Real Effective Exchange Rates?

As it is further evident now, proceeding towards the Research objectives, the final conclusion, the limitations and the considerations for future research of this thesis, the most persistent findings are the negative impact of EUREER to SEE REERs, which means that an increase of the competitiveness of EMU countries as a whole, make the SEE countries worse off, and this should be coupled and viewed in relation to the 'positive', in economic terms, impact of an Interest rate (EMU Euribor) shock, which – on its drop– boosts the Industrial productions, i.e. the growth proxies of SEE economies.

Within the monetary transmission channel, the Interest rate related literature attempts and manages to explain the Interest rate differences of the emerging-developing economies to the developed world (in our research, the SEE countries in relation to non-SEE EMU countries, i.e. excluding Greece which was not part of Euribor for half of the investigated period and Slovenia that has comparatively limited presence in our model for the given trade weights that it has within the investigated region) through currency pegs. Pegs which are highly dependent on the credibility and rigidness of the peg, as it can be measured and related to the sufficiency of reserves and the corresponding importance of macroeconomic fundamentals (see

Ciarlone, et al., 2009; Rosenberg and Tirpák, 2008; González-Rozada and Yeyati, 2008; Schmukler and Serven, 2002). The 'pegs', it has to be underlined, are additionally important in the current state of the SEE region, and elsewhere, as a pre-stage towards an EMU entry.

Thus, within this thesis we have managed to measure the responsiveness sensitivity of reserves to Euribor shocks through the GIRFs and we have reached outcomes that are consistent with the expectations of the respective economic theory. A theory suggesting that the cointegrating Interest rates are or should be a pre-stage of any Eurozone-entry, a perspective that still should be coupled with the respective REERs. An outcome, i.e. the cointegrating domestic and EMU Interest rates, which is partly evident in the cases of Slovenia mainly, of Croatia too, and in the case of Bulgaria to a lower extent. Thus, opposed to the wrong academic belief and historical choice and practice in the case of Greece, where scholars and politicians expected that the Greek economy would "transform" into a co-integrating one, once the country joined the EMU, we should now be more cautious in terms of the 'lead-lag' relationships. The above means that policy makers should first ensure that an economy is really co-integrated with the EMU ones, and then join the Union and not the inverse. A false belief that goes along with our research results, and specifically in terms of the responsiveness of key Greek macroeconomic variables, like the Industrial production, to a favourable Real Effective Exchange Rate Eurozone related shock.

Thus, in terms of the Greek 'market failure', the controlled default of the Greek economy and in econometric terms, the persistent results of a 'non-normal' EMU member, are opposed, up to a point, to the Slovenian, Croatian and Bulgarian ones where the GIRFs of these counties, e.g. in the case of these 'REERs', point towards more economically sensitive countries that seem to be more competitive or more capable to adopt, showing signs of an economic and financial co-movement with the rest of the EMU countries, as opposed, for the investigated time frame, to Greece.

This is a rather crucial point that should be related to the early and over-optimistic findings of Pesaran et al. (2007) that considered that UK would be better off if they had joined the Euro in 1999, and of Baele et al. (2004) who had found even earlier (in the very early years of EMU, after the adoption of the Euro in 1999 and the subsequent circulation of the currency in 2002) statistical evidence of financial integration; an integration that, as expected from the theory, in a financial context, should include not only the money market and government bond market, but the corporate bond markets as well. An integration that was only partly accomplished and when it was tested empirically in the Eurozone since 2008, it drove to a financial meltdown without any post-war incidence and to the respective bailout programs offered and received by Greece, Portugal, Ireland, Spain and Cyprus.

Thus, the above findings were not sustained in the years to come, given that we have experienced a fundamental collapse of an EMU member, Greece, which, at the time of writing of the current section, is still in a bailout program. At the same time, it is important to add, in a financial context, that new EU members, non-EMU ones, like Bulgaria and Croatia and partly Romania, managed to experience cointegrating Interest rates with the rest of the EMU, as we have seen on our quantitative part and as this is supported by the aforementioned presented results. These results are consistent with the existing literature (for example, in the case of the Bulgarian Interest rates and their relation to the European ones see: Petrevski and Bogoev, 2012; Minea and Rault, 2011; Vizek and Condic-Jurkic, 2010; Holtemöller, 2005) that provides strong evidence that the Bulgarian Interest rates are co-integrated with the European ones. A finding that partly holds in our research, but it is still interesting to add that at the same time these researchers fail to detect other factors that could be responsible in explaining the variation, for example, of the Bulgarian Interest rates, showing towards the importance and the direct relation of the respective financial markets.

It has to be noted also, within this Interest rate context, that our results confirm the finding of researchers such as the aforementioned (Petrevski and Bogoev, 2012; Minea and Rault, 2011; Vizek and Condic-Jurkic, 2010; Holtemöller, 2005; Hartmann et al. 2003; Adam et al. 2002; Hartmann et al. 2001; and Gaspar et al. 2001) that provide statistical evidence that the Interest rate related coefficients were negative, supporting the convergence of the spreads hypotheses towards a theoretical common steady level. A finding that goes along with our Cointegrating Equations in the VECMs and holds within the G-VAR and GIRFs context, as well. Still, it has to be added that the regression findings for example of Adam et al. (2002), provide evidence that the absolute value of the slope coefficient increased over time, meaning that after EMU launch, the speed of convergence was accelerated. An acceleration though that historically did not last and drove to the Greek problem and to official European Commission proposals of a multi-speed, multi-layer EMU and EU, which is evident in our research output and it is already discussed above.

Shambaugh (2004) provides statistically significant evidence that economies with fixed exchange rate regimes follow the Interest rates of the base country more closely; a finding that should be related to the case of Bulgaria in our context. While Rivera-Batiz and Sy (2013) elaborate on the ‘implied’ Interest rate difference of the foreign exchange forward contracts under fixed exchange rate regime in developing countries. These researchers provide evidence that in periods of crisis, the Interest rate difference demonstrates an upward tendency that even though it could lead to an increased probability of non-sustainable exchange rate regime, in the case of SEE with the EMU, it might also indicate a false entry, which is already the case of Greece. The latter seems to be, at least partly, and if nothing changes in terms of economic policy, the case of Bulgaria and even the cases of Croatia and Slovenia, if we consider the EUREER impact on the domestic REERs of these countries, which shows that the increased competitiveness of the EMU reduces the individual competitiveness of the investigated SEE economies.

Merging the above, we could now support along with Frankel et al. (2004), within the context of our GIRFs results, that the Interest rates from the developed economies (the Euribor of EMU in our case) are transmitted at a greater speed to countries with 'currency boards' arrangements, as we have seen on the time horizon of the responsiveness of our GIRFs, and also that the countries with 'currency boards' experience lower Interest rate spreads. A result that smoothly drives to the questions and approach of Belke and Zenkić (2007), where not only the choice of a proper exchange rate regime, throughout the different phases of the transition process, is raised, but the question of *"how the choice of a specific exchange-rate system affects the economic success of a country in transition and, above all, its gradual integration into the European Union (EU) and European Monetary Union (EMU)" (p. 267),* is added.

A question that was effectively addressed by Slavov (2017) that shows, in researching thirteen Central, Eastern and Southeastern Europe (CESEE) and by extending the work of Frankel and Wei (2008) and Frankel and Wei (1994), that "*the extent to which each country's currency tracks the Euro* [or the dollar in his research] *is correlated with the structure of its external trade and finance*" (p. 2). These findings are now further supported by our research output that also shows that SEE countries also, appear to track the Euro to a degree which seems to be inconsistent with inflation targeting, trade or financial integration, or the extent of business cycle synchronization. A statement that is being based on the EMU REER impact on the domestic REERs, where as we have seen the SEE economies are losing their competitiveness after a positive boost of the competitiveness of EMU. Which can be translated directly, stressing here one of the main outcomes of our research, as a phenomenon where apart from the CESEE countries, the SEE ones are maintaining a "deliberate gravitation around the Euro" in their anticipation of an eventual, or a probable Eurozone entry, that drove to the Greek 'negative' example. This result is consistent with our own research findings in terms of the GIRFs of EMU REER and helps us in capturing and understanding the existing complexity and the policy related dynamics. The complexity, in the case of Greece, is further evident from our research output, and can be explained by the fact that the "gravitation is deliberate", or even worse that the merge has occurred, and is not evident from the economic conditions and the well-being of the specific countries, including, primarily, Greece.

In line with this detected problem, and the puzzling results of our G-VAR when the Real Effective Exchange Rate is used as the global variable, i.e. as an exogenous shock to our SEE econometric system, Backé and Wójcik (2008) have reviewed the 'credit growth' of the new member states of European Union, and support that within the integration path of a new EU member and the subsequent expectation of an EMU entrance, the Interest rates converge further to the European average ones. This result seems not to be the case statistically in our research, contradicting the 'rational' expectations that are indicatively being supported by Lothian (2002) where the economies can be considered as really integrated ones, if the real returns of assets (physical and financial ones, including interest rates) converge. A fact that does not hold for all investigated SEE countries, based on our findings, in an EMU context.

Holtemöller (2005), as stated in the literature review part, having investigated the spread between the domestic money market rates of Central and Eastern European (CEE) new EU member states and EU candidates and the Euribor and by incorporating a pre-EU and post-EU approach, paved the way for us in doing something similar in terms of an EMU pre- and post- period. A similar path that we have taken for SEE countries in our research in capturing the responsiveness of the Interest rates to Euribor shocks.

It has to be noted, before we finish, that our empirical GIRF findings for SEE are consistent with the ones of Holtemöller (2005) and Orlowski (2003). Holtemöller (2005) finds that the integration process is not similar around the Central and Eastern European countries and as expected some of these countries experienced a higher degree of integration and subsequently their Interest rate compared to the Eurozone one was lower, as opposed to the inverse cases. This result is attributed to country-specific factors and leads to a subsequent addition of a country based risk premium which is being added to the domestic Interest rates. This could be further related not only to the Euribor shock on our investigated variables, but also to the shock of EMU Real Effective Exchange Rate to the SEE variables.

Orlowski (2003) specifically supports that the country-specific requested premium (of CEE countries) can be explained by the inflation and the exchange rate differences that exist between the investigated countries and the EMU, which is in line with our REER findings that blend these two variables into one, justifying further the usage of the REER.

Ahmed et al. (2017) investigating the ‘transmission of international shocks’ to financial markets in various emerging market economies (EMEs), provide evidence that the emerging economies with better macro-economic fundamentals suffered less, while the ones that had experienced earlier larger private capital inflows and greater exchange rate appreciation were worse off. These results are consistent with the outcome of our GIRFs, especially in the case of Greece, where the EMU entry of this county caused a Real Exchange Rate appreciation, as it is quantified in our case through an increase of the REER (which means that the competitiveness of the economy is comparatively worse off). A REER that was not able in keeping up with the EMU REER, given that we have detected heterogeneous results. The above provide clear evidence that the policy makers can and need to do a lot in sustaining the cointegrating path of SEE towards the EMU.

Last but not least, the findings of Cruz (2015), as we have stressed in the literature review, underlines that the hoarding of Foreign Exchange Reserves in emerging economies does not increase the economic growth in the region, at least directly, and thus there is no need to prioritize this strategy. When we combine this outcome with our own research output, we reach the conclusion that FS should be treated as a 'mid-point' of the transmission channel, and as such it can promote stability and pave a more sustainable path towards the EMU. This adds to our understanding of a different 'monetary transmission channel'. The empirical findings of Cruz (2015) also provide statistical evidence that Foreign Exchange Reserves in Latin America appreciate the real exchange rate which is also in line with our own results as well, as we have seen in the cases both of Greece and Slovenia. Also, it could be added here that Cruz uses the Foreign Reserves as a determinant of the Real Exchange rate, which is the route we have followed.

The maintenance of FS, does not seem to follow the patterns of demand conditions (still this matter requires further research and a different set of variables), but rather adds on the credibility of every country. In all cases, it seems not only to increase the chances of sustaining a 'credible exchange rate regime' (meeting the Maastricht exchange rate related criterion −of not devaluating the currency in the last three years prior to succession− but also diminishes the requested risk premium, as it is measured through the Interest rates; a risk premium that tends to be higher than expected or suggested by other economic and financial indicators, and thus points towards a non-integrating path; a premium which evident and consistent with our results). The above subsequently leads to the need of simultaneously pursued policies of economic control and intervention and also calls for further financial and economic integration not only of SEE to the EMU, but to the EMU as it is.

Overall, after the presentation and analysis of our cumulative findings, the direct and final answers of the research questions of the thesis, and a combination of our output to the respective literature, we have now grounds to proceed with the research objectives of this thesis. Thus, we can report overall that, we have provided evidence in identifying and analysing the monetary transmission mechanism and its channels in the case of SEE in an EMU context (RO1), we have managed to contribute to the analysis of the main concepts, tools and developments in Foreign Exchange Reserve practices in relation to financial stability and monetary efficiency

(RO2), we have shown that the 'stability' and mainly the adequacy of Foreign Exchange Reserves in the long run is a determinant and a prerequisite towards EMU entrance of the investigated non-EMU members SEE counties (RO3), we have tested and related Foreign Exchange Reserves with the stability of the exchange rate regimes and exchange rate values, as quantified though REER, overtime in the case of SEE economies (RO4), we have made contributions on the identification and on the analysis of the factors that drive the Real Effective Exchange Rates in SEE, adding further on the complexity and the factors that should be added on the theories of PPP and IRP (RO5), we have evaluated and measured the stability of exchange rate regimes in SEE countries (RO6), and last but not least, we have drawn macroeconomic policy design recommendations for SEE Central Banks and governments (RO7) within the existing EMU framework.

These policy recommendations include the following ones that should be stressed, before we proceed to the 'Limitations of the Current Study and Suggestions for Future Research'. If the Central Bank of Bulgaria, for example, decreases the Foreign Exchange Reserves (this will happen when/if Bulgaria joins EMU) then Interest rates will go further down and thus IP will be further boosted, thus it could work as a constant stimulus of growth, buying time to change the REER into a co-moving one with the EMU-REER. Also, in investigating the transmission channels further, we have seen that the drop of Euribor boosts all IPs, considering additionally the contemporaneous positive impacts of the Greek Industrial Production Index to the neighboring ones, which means that policy makers should be aware of that process and these interlinkages in SEE, in the context of their monetary policy making. Last but not least, on the transition of the aforementioned impact, the Foreign Reserves of Bulgaria, Croatia and FYROM are increased, the Real Effective Exchange Rates of Bulgaria, FYROM and Greece are increased –thus the economies lose their comparative competitive stance–, and also Interest rate increases in the long run −in the short run Interest rates in Bulgaria and Slovenia are going down−, highlighting an interesting trade off overall, that should be incorporated within the macroeconomic policy design of the respective agents.

At this final stage, the limitations of the current study and the suggestions for future research must be reported. It has to be noted that overall, the employed G-VAR model needed no re-specification and thus the implemented version was a robust one. Still, any changes that might occur in it, could be related to an increase or a decrease of the number of cointegrating equations (relations) of the individual VARX* model, or an increase of the lag order of the domestic and/or the star variables (foreign variables). Thus, this matter, from a given econometric perspective, could be considered as a limitation. Also, on top of that, different number of lags could be applied further in terms of a robustness check.

The 500 bootstraps that are finally being used in the inferential statistical procedure of the G-VAR of this thesis could be considered as another limitation as well. Still, this number is adequate in providing strong statistical evidence that support the inferential statements that we have made.

It also has to be underlined that the structural breaks within VECM are properly detected and incorporated in the models, but they were not detected within the G-VAR and thus those models are not “dummy augmented” ones. The failure to detect structural breaks on the G-VAR parameters could be attributed mainly on the relatively limited time frame used, i.e. from 2002 to 2016. Still, the used dummy variables within the VECM did not change the main findings of the model that have persisted with and without their addition, and thus, the same could be concluded, up to a degree, that could hold for the G-VAR. This is rather the case, up to the econometrically commonly used 0.10 level of statistical significance which is being applied for these tests within the G-VAR framework at the time that this thesis was conducted.

The aforementioned ‘structural break’ could also be viewed as an area of future research. As more data becomes available, the G-VAR model could detect possible structural breaks more effectively. It has to be noted, that if the structural breaks in the G-VAR were detected and considered within the model, we might be able to further investigate and capture in a more robust way the existing interlinkages of the SEE economies in their relation between them and within their individual and cumulative relation to the EMU as well.

Also, the current non-fiscal integration of EMU members, even though it is not supposed to limit and put constraints on "competitiveness, innovation and productivity", but rather to boost them in a sustainable and persistent manner (at least based on a particular economic view) is not considered within our approach. Thus, by first providing statistical evidence that there is no impact of EMU related fiscal policy, both in Government spending or/and Taxation terms, running from EMU to SEE economies and then by considering this path, within the economic policy making context, we could advance further our understanding of economic transmission channels and thus enhance EMU and EU stability, cohesion and integration. Econometrically, this could be achieved by adding a third global (shock) variable in the GVAR model, something that we plan to do in the future. Last but not least, similarly, we could include in our future research another exogenous –global– shock related variable, the foreign direct investment (FDI) and examine its impact, through GIRFs to SEE countries, again within an EMU framework, where we will particularly seek econometric evidence on what we could summarise as 'when Germany sneezes the Balkans are catching a cold'.

Last but not least, it would be interesting to change the trade related construction of the 'trade' weight matrix of the G-VAR, and construct it instead, for the case of SEE economies, through financial or other economic related flows. Finally, more SEE countries could be added, along with other Central Eastern European ones, in a future research.

Bibliography

Abdul, J. and Sheharyar, B. (2008) The Optimal Demand for Foreign Exchange Reserves in Pakistan. *International Journal of Applied Econometrics and Quantitative Studies,* 5(1-2).

Adam, K. et al. (2002) *Study to analyze, compare and apply alternative indicators and monitoring methodologies to measure the evolution of capital market integration in the European Union,* s.l.: European Commission.

Agung, G. (2009) *Time Series Data Analyses Using E-Views*. Chichester. Wiley.

Ahmad, A. H. and Pentecost, E. J. (2009) Exchange Rates and International Reserves: A Threshold Cointegration Analysis. In: 14th Annual Conference on Econometric Modelling for Africa, 8-10 July, Nigeria.

Ahmed, S. Coulibaly, B. and Zlate, A. (2017) International financial spillovers to emerging market economies: How important are economic fundamentals? *Journal of International Money and Finance*, 76, pp. 132-152.

Aizenman, J., Chinn, M.D. and Ito, H. (2013) The "Impossible Trinity" Hypothesis in an Era of Global Imbalances: Measurement and Testing. *Review of International Economics*, 21(3), pp. 447–458.

Aizenman, J. & Hutchison, M.M. (2012) The Exchange market pressure and absorption by international reserves: Emerging markets and fear of reserve loss during the 2008–2009 crisis, *Journal of International Money and Finance*, Elsevier.> [Accessed 16.06.2015].

Aizenman, J. & Sun, Y. (2012) The financial crisis and sizable international reserves depletion: From 'fear of floating' to the 'fear of losing international reserves'?, *International Review of Economics & Finance,* Elsevier. > [Accessed 16.06.2015].

Aizenman, J., Lee, Y. and Rhee, Y. (2007) International Reserves Management and Capital Mobility in a Volatile World: Policy Considerations and a Case Study of Korea. *Journal of Japanese and International Economies*, 21, pp. 1–15.

Aizenman, J. (2005) International reserves. *The New Palgrave Dictionary of Economics,* 2nd edition.

Aizenman, J. and Marion, N. (2003) The high Demand for International Reserves in the FAR East: What is going on? *Journal of the Japanese and International Economies,* 17, pp. 370-400.

Aizenman, J. and Marion, N. (2003) Foreign exchange reserves in East Asia: why the high demand?. *FRBSF Economic Letter,* no. 2003, pp. 1-4.

Aizenman, J. and Marion, N. (2002) International Reserve Holdings with sovereign risk and costly tax collection. *NBER Working Paper,* 9154.

Akaike, H (1973) Information theory and an extension of the maximum likelihood principle, *2nd International Symposium on Information Theory*, pp. 267–281.

Akaike, H. (1974) A new look at the statistical model identification, *IEEE Transactions on Automatic Control* AC-19, pp. 716–723.

Alexander, C. (2001) *Market models: A guide to financial data analysis,* John Wiley & Sons Ltd.

Allsopp. C and Vines, D. (2000) The Assessment: Macroeconomic Policy, *Oxford Review of Economic Policy,* 16(4), pp. 1-32.

Alogoskoufis, G. S. and Philippopoulos, A. (1992) Inflationary expectations, political parties and the exchange rate regime: Greece 1958-1989. *European Journal of Political Economy*, 8(3), pp. 375-399.

Anderton, R., Galesi, A. Lombardi, M. and Mauro, F. (2010) Key elements of global inflation. In R Fry, C. Jones and C. Kent (eds.), *Inflation in an Era of Relative Price Shocks.* RBA Annual Conference Volume. Sydney: Reserve Bank of Australia.

Andrews, D.W.K. and Ploberger, W. (1994) Optimal Tests when a Nuisance Parameter is Present Only Under the Alternative. *Econometrica*, 62, pp. 1383-1414.

Archibald, G. C. and Richmond, J. (1971) On the Theory of Foreign Exchange Reserve Requirements, *The Review of Economic Studies,* 38(2), pp. 245-263.

Aristei, D. & Gallo, M. (2012) The Relationship Between Bank and Interbank Interest Rates during the Financial Crisis: Empirical Results for the Euro Area. Available from: <http://economics.soc.uoc.gr/macro/docs/Year/2012/papers/paper_3_70.pdf>. [Accessed 30.05.2015].

Arnone, M. & Romelli, D. (2013) Dynamic central bank independence indices and Inflation rate: A new empirical exploration. *Journal of Financial Stability.* Elsevier, 9(3), pp. 385-398.

Aron, J. (1997) Measuring Currency Misalignment: The Importance of Shocks and Regime Changes. *Centre for Research into Economics and Finance in Southern Africa*, *Quarterly Review*, 10, pp. 2-14.

Aron, J., Elbadawi, I., and Kahn, B. (1997) Determinants of the Real Exchange Rate in South Africa. *Center for the Study of African Economies, WPS/97-16*, CSAE Publishing, Oxford.

Artis, M.J., Osborn, D, and Perez, PJ. (2004) The international business cycle in a changing world: volatility and the propagation of shocks in the G7. *CEPR Working Paper No. 4652*.

Asari, F. F. A. H., Baharuddin, N. S., Jusoh, N., Zuraida Mohamad, Shamsudin, N. & Jusoff, K. (2011) A Vector Error Correction Model (VECM) Approach in Explaining the Relationship Between Interest Rate and Inflation Towards Exchange Rate Volatility in Malaysia. *World Applied Sciences Journal* 12, pp. 49-56.

Backé, P. and Wójcik, C. (2008) Credit booms, monetary integration and the new neoclassical synthesis. *Journal of Banking & Finance,* 32(3), pp. 458-470.

Badinger, H. (2004) Austria's Demand for International Reserves and Monetary Disequilibrium: The Case of a Small Open Economy with a Fixed Exchange Rate Regime. *Economica*, 71(281), pp. 39-55.

Baele, L. et al. (2004) Measuring European financial integration. *Oxford Review of Economic Policy ,* 20(4), pp. 509-530.

Bahmani-Oskooee, M. and Brown, F. (2002) Demand for International Reserves: A Review Article. *Applied Economics*, 34(10), pp. 1209-1226.

Bahmani-Oskooee, M. (1985) Demand for International Reserves: Survey of Recent Empirical Studies. *Applied Economics*, 19, pp. 609–618.

Baldwin, R. and Wyplosz, C. (2012) *The Economics of European Integration*. 4th edition, New York: McGraw Hill.

Balassa, B. (1964) The Purchasing-Power Parity Doctrine: A Reappraisal. *Journal of Political Economy*, 72(6), pp. 584-96.

Baltagi, B. H. (2002) *Econometrics* (3rd ed.). Berlin: Springer-Verlag.

Baltas, N. C. (2013) *The Greek financial crisis and the outlook of the Greek economy*. [Online]. Available from: http://www.econ.aueb.gr/en/uploadfiles/AllDP192013.pdf [Accessed 05.09.2015].

Basso, H., Calvo-Gonzalez, O. and Jurgilas, M. (2007) Financial dollarization: the role of banks and interest rates. *ECB Working Paper,* Volume 748.

Batten, S. D. (1982) Central Banks Demand for Foreign Reserves Under Fixed and Floating Exchange Rates. *Journal of Review*, 3, pp. 20-30.

Beetsma, R.M., Debrun, X., Klaasen, F. (2001) Is fiscal policy coordination in EMU desirable? *International Monetary Fund*.

Beetsma, R.M., Guiliodori, M., Klaasen, F. (2008) The effects of public spending on trade balances and budget deficits in the European Union. *Journal of European Economic Association, 6,* pp. 414-423.

Beetsma, R.M. and Bovenberg, A.L. (1998) Monetary union without fiscal coordination may discipline policymakers, *Journal of International Economics, 45,* pp. 239-258.

Belke, A. and Zenkić, A. (2007) Exchange-rate Regimes and the Transition Process in the Western Balkans. *Intereconomics*, 42(5), pp. 267-280.

Ben-Bassat, A. and Gottlieb, D. (1992) Optimal international reserves and sovereign risk. *Journal of International Economics*, 33, pp. 345-362.

Bernanke, B.S. and Gertler, M. (1995) Inside the Black Box: The Credit Channel of Monetary Policy Transmission. *Journal of Economic Perspectives,* 9, pp. 27-48.

Berument, H. and Dincer, N. (2004) The Effects of Exchange Rate Risk on Economic Performance: The Turkish Experience. *Applied Economics*, 36, pp. 2429-2441.

Bianchi, J., Hatchondo, J.C. and Martinez, L. (2012) The international reserves and the rollover risk is analyzed, *Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute Working Paper No. 151,* nber.org. > [Accessed 17.06.2014].

Bird, G. and Rajan, R. (2003) Too Much of a Good Thing? The Adequacy of International Reserves in the Aftermath of Crises. *The World Economy*, 26, pp. 873-891.

Blagov, B. and Funke, M. (2013) The regime-dependent evolution of credibility: A fresh look at Hong Kong's linked exchange rate system. *BOFIT Discussion Papers,* 24.

Blagov, B. and Funke, M. (2014) The Credibility of Hong Kong's Currency Board System: Looking Through the Prism of MS-VAR Models with Time-Varying Transition Probabilities. *BOFIT Discussion Papers,* 15.

BMI Research (2015) *Greece country risk report*. [Online]. Available from: http://web.a.ebscohost.com/ehost/detail/detail?sid=8dd9aaef-b2de-4548-9810-43c4b11acc26%40sessionmgr4002&vid=2&hid=4201&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ%3d%3d#db=bth&AN=101808400 [Accessed 04.09.2015].

Boivin, J. and Giannoni, M. (2006) Has Monetary Policy Become More Effective? *The Review of Economics and Statistics*, 88(3).

Boivin, J., Kiley, M. T., Mishkin, F. S. (2010) How has the monetary transmission mechanism evolved over time?. *National Bureau of Economic Research*, No. w15879.

Bondt, G. d. (2005) Interest Rate Pass-Through: Empirical Results for the Euro Area. *German economic review ,* 6(1), pp. 37-78.

Bordo, M. D., Johung, L., Markiewicz, A. (2013) A fiscal union for the Euro: Some lessons from history. *CESifo Economic Studies,* 59, pp. 449-488.

Bordo, M. D. (2003) *Exchange rate regime choice in historical perspective.* [Online]. Available from: http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.491.8228&rep=rep1&type=pdf [Accessed 02.09.2015].

Brooks, C. (2014) *Introductory Econometrics for Finance (*3rded.). Cambridge: University Press Cambridge UK.

Brooks, C. (2008) *Introductory Econometrics for Finance (*2nded.). Cambridge: University Press Cambridge UK.

Brown, R.L., J. Durbin, and J.M. Evans (1975) Techniques for Testing the Constancy of Regression Relationships Over Time (with discussion). *Journal of the Royal Statistical Society B*, 37, pp. 149-163.

Buiter, W.H. (2003) Ten Commandments for a fiscal rule in the E(M)U. *Oxford Review of Economic Policy,19,* pp. 84-99.

Bussière, M., Cheng, G., Chinn. M.D. and Lisack, N. (2015) For a few dollars more: Reserves and growth in times of crises. Journal of International Money and Finance, 52, pp. 127-145.

Bussière, M., Chudik, A. and Sestieri, G. (2012) Modeling global trade flows: results from GVAR model. Globalization and Monetary Policy Institute working Paper 119, *Federal Reserve Bank of Dallas*.

Caglayan, M., Mouratidis, K. & Saeidinezhad, E. (2011) Monetary Policy Effects on Output and Exchange Rates: Results from U.S., U.K. and Japan. University of Sheffield. Available at: <http://www.shef.ac.uk/polopoly_fs/1.119502!/file/2011016.pdf> [Accessed 29.05.2014].

Calvo, G. et al. (1995) Targeting the real exchange rate: Theory and evidence. *Journal of Development Economics*, 47, pp. 97-133.

Calvo, G. and Mishkin, F. (2003) The Mirage of Exchange Rate Regimes for Emerging Market Countries. *The Journal of Economic Perspectives,* 17(4), pp. 99-118.

Calvo, G.A., Izquierdo, A. & Loo-Kung, R. (2012) Optimal holdings of international reserves and self-insurance against sudden stop, Nber.org.
[Online] Available at http://www.nber.org/papers/w18219 [Accessed 09.09.2015].

Caporaso, J., Durrett, W.., Kim, M. (2014) 'Still a regulatory state? The European Union and the financial crisis' *Journal of European Public Policy*. [Online] Available at: http://www.tandfonline.com/doi/abs/10.1080/13501763.2014.988638?journalCode=rjpp20&#preview [Accessed 09.09.2015].

Case, K. E., Fair, R. C., Oster, S. M. (2012) *Principles of Economics*. 10th edition. Pearson Education, Inc.

Cecchetti, S.G. (1995) Distinguishing Theories of the Monetary Transmission Mechanism. *Federal Reserve Bank of St. Louis Review, 77*, pp. 83-97.

Cecchetti, S.G., Flores-Lagunes, A. and Krause S. (2005) Assessing the sources of changes in the volatility of real growth: RBA annual conference volume. In *The*

Changing Nature of the Business Cycle, Kent C, Norman D (eds). *Reserve Bank of Australia*: Sydney, pp. 115–138.

Cesa-Bianchi, A. (2013) "Housing cycles and macroeconomic fluctuations: A global perspective". *Journal of International Money and Finance,* 37, pp. 215-238.
Cesa-Bianchi, A, Pesaran, M.H., Rebucci, A. and Xu, T. (2012) China's emergence in the world economy and business cycles in Latin America. *Journal of LACEA Economia,* 12, pp. 5-46.

Chan, T.H. (2011) *A structural modelling of exchange rate, prices and interest rates between Malaysia-China in the liberalization era.* mpra.ub.uni-muenchen.de. [Accessed 08.06.2014].

Cheng, G. (2014) Balance sheet effects, foreign reserves and public policies. *MRPA paper*, University Library of Munich, Germany.

Cheung, Y. W. and Sengupta, R. (2011) Accumulation of Reserves and Keeping Up with the Joneses: The Case of LATAM Economies. *International Review of Economics and Finance*, 20, pp.19-31.

Cheung, Y.W. and Xingwang, Q. (2009) Hoarding of international reserves: Mrs Machlup's wardrobe and the Joneses. *Review of International Economics*, 17 (4), pp. 824−843.

Cheung, Y. and Lai, K. S. (1993) Finite-sample sizes of Johansen's likelihood ratio tests for cointegration. *Oxford Bulletin of Economics and Statistics*, 55, pp. 315-328.

Chinn, M.D. and Ito, H. (2006) What matters for financial development? Capital controls, institutions, and interactions. *Journal of Development Economics,* 81 (1): pp. 163–192.

Chinn, M.D. and Meredith, G. (2004) Monetary Policy and Long-Horizon Uncovered Interest Parity. *IMF Staff Papers,* 51(3), pp. 409-430.

Chudik, A. and Pesaran, M.H. (2014) Theory and Practice of GVAR Modeling, Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute. Working Paper No. 180.

Chudik, A. and Smith, L.V. (2013) The GVAR approach and the dominance of the U.S. economy. Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute Working Paper No. 136.

Ciarlone, A., Piselli, P. and Trebeschi, G. (2009) Emerging markets' spreads and global financial conditions. *Journal of international financial markets, institutions and money,* 19(2), pp. 222-239.

Claassen, E.M. (1975) Demand for International Reserves and the Optimum Mix and Speed of Adjustment Policies, *The American Economic Review*, 65, No. 3, pp. 446-453.

Clark, P.B. (1970) Optimum International Reserves and the Speed of Adjustment, *Journal of Political Economy,* 78(2), pp. 356-376.

Clarida, R. et al. (2000) Monetary Policy Rules and Macroeconomic Stability: Evidence and Some Theory. *The Quarterly Journal of Economics*, 115(1), pp.147-80.

Clarida, R. et al. (2002) A simple framework for international monetary policy analysis. *Journal of Monetary Economics*, 49(5), pp. 879-904.

Clements, M.P. and Hendry, D.F. (1998) *Forecasting Economic Time Series*. Cambridge University Press: Cambridge, UK.

Clements, M.P. and Hendry, D.F. (1999) *Forecasting Non-stationary Economic Time Series*. MIT Press: Cambridge, MA.

Cline, W. (1995) *International Debt Reexamined. Institute for International Finance.* Washington DC: Institute for International Finance.

Cline, W. and Barnes, K. (1997) *Spreads and risk in emerging markets lending.* Washington DC: Institute of International Finance.

Clower, R. and Lipsey, R. (1968) The Present State of International Liquidity Theory, *The American Economic Review,*58, No. 2, pp. 586-595.

Cohen, B. J. (1979) The Need for International Reserves and Credit Facilities. *Journal of International Economics*, 9(4), pp. 594-595.

Cook, D. and Yetman, J. (2014) Currency Boards when Interest Rates are Zero. *Pacific Economic Review,* 19(1), pp. 135–151.

Cooper, R. N. (1970) International Liquidity and Balance of Payments Adjustment. *Life Science Journal 2014*; 11(3) http://www.lifesciencesite.com 169 International Reserves; Needs and Availability". IMF, pp. 125-145. [Accessed 30.08.2017].

Cooper, R. (1969) Macroeconomic Adjustment in Interdepedent Economies, *Quarterly Journal of Economics,* 98(11), pp. 1-24.

Cruz, M. (2015) International reserves and growth: assessing the mercantilist motive in Latin America. *Journal of Post Keynesian Economics*, 37(3) pp. 481-502.

Currie, D. and Levine, P. (1985) Single macropolicy rules for the open economy, *The Economic Journal,* 95, pp. 60-70.

Daianu, D., D'Adda, C., Basevi, G., Kumar, R. (Eds.), (2014) *The eurozone crisis and the future of Europe: The political economy of further integration and governance*, Palgrame Macmillan.

Deceanu, L., Pintea, M., Thalassinos, E., and Zampeta, V. (2010) New dimensions of country risk in the context of the current crisis: A case study for Romania and Greece. *European Research Studies*, 13(3), pp. 225-236.

Dees, S. and Saint-Guilhem, A. (2011) The role of the United Stated in the global economy and its evolution over time. *Empirical Economics,* 41, pp. 573-591.

Dees, S., Di Mauro, F., Pesaran, M.H., Smith, V. (2007) Exploring the international linkages of the euroarea: a Global VAR analysis, *Journal of Applied Econometrics,* 22(1), pp. 1-38.

Dellas, H. and Tavlas, G. S. (2012) The road to Ithaca: the Gold Standard, the Euro and the origins of the Greek sovereign debt crisis. Bank of Greece. Eurosystem. Available from: www.bankofgreece.gr/BogEkdoseis/Paper2012149.pdf [Accessed 03.09.2015].

Devereux, M.B. and Engel, C. (2007) Expenditure switching versus real exchange rate stabilization: Competing objectives for exchange rate policy. *Journal of Monetary Economics*, 54(8), pp.2346-74.

Dickey, D. & Fuller, W. (1979) Distribution of the estimators for autoregressive time series with a Unit Root. *Journal of the American Statistical Association,* 74(366).pp. 427-431.

Dixit, A. and Lambertini, L. (2003) Interactions of commitment and discretion in monetary and fiscal policies. *American Economic Review* 93, pp. 1522-1542.

Dobrev, D. (1999) *The currency board in Bulgaria: Design, peculiarities and management of foreign exchange cover.,* Sofia: The Bulgarian National Bank. Edwards.

Dragomirescu-Gaina, C. and Phillipas, D. (2015) Strategic interactions of fiscal policies in Europe: a global VAR perspective, *IAEC,* Working Paper.

Dreger, C. And Zhang, Y. (2013) Does the economic integration of China affect growth and inflation in industrial countries? *FIW Working Paper Series,* 116. FIW.

Dritsaki, M., Dritsaki C. & Adamopoulos, A. (2004) A causal Relationship between *Trade,* Foreign Direct Investment and Economic Growth for Greece. *American Journal of Applied Sciences,* 1(3), pp. 230-5.

Dominguez, K.M.E., Hashimoto, Y. & Ito, T., (2012) International reserves and the global financial crisis, *Journal of International Economics,* Elsevier. > [Accessed 15.06.2014].

Duasa, J., (2007) Malaysian foreign direct investment and growth: Does stability matter. *Journal of Economic Cooperation*, 28(2), pp.83-98.

Dubois, E. Hericourt, J. and Mignon, V. (2009) What if the euro had never been launched? A counterfactual analysis of the macroeconomic impact of euro membership. *Economics Bulletin,* 29, Pp. 2241-2255.

Edison, H. (2003) Are foreign exchange reserves in Asia too high? *World Economic Outlook*. *International Monetary Fund*, Washington D.C.

Edwards, S. (1983) The demand for international reserves and exchange rate adjustments: the case of LCDs, 1964-1972, *Economica,* 50, pp. 269-280.

Égert, B., Crespo-Cuaresma, J. and Reininger, T. (2007) Interest rate pass-through in central and Eastern Europe: Reborn from ashes merely to pass away?. *Journal of Policy Modeling* , 29(2), pp. 209-225.

Eichengreen, B. and Mody, A. (1998) What Explains Changing Spreads on Emerging-Market Debt: Fundamentals or Market Sentiment?. *NBER Working Paper* , Volume 6408, pp. 1-45.

Eickmeier, S. and Ng. T. (2011) How do credit supply shocks propagate internationally? A GVAR approach. Discussion Paper Series 1: Economic Studies 2011-27, Deutsche Bundesbank, Research Centre.

Einaudi, L. (2000) From the franc to the 'Europe': the attempted transformation of the Latin Monetary Union into a European Monetary Union, 1865-1873. *Economic History Review*, 53(2), pp. 284-308.

Elbadawi, I. A. (1990) The Sudan Demand for International Reserve: A Case of a Labour Exporting Country. *Economica*, 57(225), pp. 73-89.

Elliot, G., T.J. Rothenberg, and J.H. Stock (1996) Efficient Tests for an Autoregressive Unit Root. *Econometrica*, 64, pp. 813-836.

Engle, R.F. and Granger, C.W.J. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica,* 55, pp. 251-276.

Engle, R.F., D.F. Hendry and J.-F. Richard, (1983), Exogeneity. *Econometrica*, 51, 277–304.

Erjavec, N. & Cota, B.(2003) Macroeconomic Granger Causal Dynamics in Croatia: Evidence based on a Vector Error-Correction Modeling Analysis. *Ekonomski Pregled*, 54(1), pp.139-156.

Epstein, R. J. (1987) *A History of Econometrics*. Amsterdam: North-Holland.

Fadajeva, L., Feldkircher, M. And Reininger, T. (2017) International spillovers from Euro area and US credit and demand shocks: A focus on emerging Europe. *Journal of International Money and Finance*, 70, pp. 1-25.

Fama, E. (1984) Forward and spot exchange rates. *Journal of Monetary Economics,* 14(3), p. 319–338.

Faruqee, H. (1995) Long-Run Determinants of the Real Exchange Rate: A Stock-Flow Perspective. *IMF Staff Papers*, 42, pp. 80-107.

Fatas, A. and Mihov, I. (2003) On constraining fiscal policy discretion in EMU. *Oxford Review of Economic Policy 19,* pp. 112-131.

Favero, C.A. (2013) Modelling and forecasting government bond spreads in the euro area: A GVAR model. *Journal of Econometrics,* 177(2), pp. 343-356.

Favero, C.A., Giavazzi, F. and Perego, J. (2011) Country heterogeneity and the international evidence on the effects of fiscal policy. *IMF Economic Review,* 59, pp. 652-682.

Feldkircher, M. (2013) A global macro model for Emerging Europe. *Working Papers, 185, Oesterreichische Nationalbank* (Austrian Central Bank).

Feldkircher, M. and Huber, H. (2016) the international transmission of U.S. shocks: evidence from bayesian global vector autoregressions. *European Economic Review,* 81, pp. 167-188.

Feldkircher, M. and Korhonen, I. (2014) The rise of China and its implications for emerging markets. Evidence from a GVAR model. *BOFIT Discussion Papers* 20/2012, Bank of Finland, Institute for Economies in Transition.

Ferreira, A. and Ledesma, M. (2007) Does the real interest parity hypothesis hold? Evidence for developed and emerging markets. *Journal of International Money and Finance ,* 26(3), pp. 364-382.

Fetai, B. (2013) Assessing Monetary and Fiscal Policy Interaction in a Small Open Economy: the Case Republic of FYROM. *Transition Studies Review*, 20, pp. 89-104.

Flood, R.P. and Marion, N.P. (2002) Holding International Reserves in an Era of High Capital Mobility. *Brooking Trade Forum 2001*, Washington D.C., The Brookings Institution, pp. 1-68.

Flood, R. and Rose, A. (2001) *Uncovered Interest Parity in Crisis: The Interest Rate Defense in the 1990s.* s.l.: International Monetary Fund.

Fitousi, J.P. and Saraceno, F. (2013) European economic governance: The Berlin-Washington Consensus. *Cambridge Journal of Economics 37,* pp. 479-496.

Forbes, K., Fratzscher, M. and Straub, R. (2013) *Capital controls and macroprudential measures: what are they good for? MIT-Sloan Working Paper 5061–13.*

Ford, J.L. and Huang, G. (1994) The demand for international reserves in China: an ECM model with domestic monetary equilibrium. *Economica, 67*, pp. 379–397.

Frankel, J. and Wei, S-J. (1994) *Yen Bloc or Dollar Bloc? Exchange Rate Policies of the East Asian. Economies, in Macroeconomic Linkages: Savings, Exchange Rates, and*

Capital Flows. Takatoshi Ito and Anne Krueger, eds. Chicago: University of Chicago Press, pp. 295-329.

Frankel, J. A. (1999) No single currency regime is right for all countries or at all times. *National Bureau of Economic Research.* [online]. Available from: http://www.nber.org/papers/w7338 [Accessed 02.09.2015].

Frankel, J., Schmukler, S. and Servén, L. (2004) Global transmission of interest rates: monetary independence and currency regime. *Journal of International Money and Finance,* 23(5), p. 701–733.

Frankel, J. and Wei, S-J. (2008) Estimation of De Facto Exchange Rate Regimes: Synthesis of the Techniques for Inferring Flexibility and Basket Weights. *IMF Staff Papers*, 55:3 pp. 384- 416.

Frenkel, J. and Jovanovic, B. (1981) Optimal international reserves: a stochastic framework, *Economicc Journal*, 91, pp. 507-514.

Caglayan, M, Mouratidis, K. and Saeidinezhad, E. (2011), Monetary Policy Effects on Output and Exchange rates: Results from US, UK and Japan. *Sheffield Economic Research Papers*, SERP number: 2011016.

Galesi, A. and Lombardi, M.J. (2009) External shocks and international inflation linkages: a Global VAR analysis. *European Central Bank,* Working Paper No. 1062.

Galí, J. and Gambetti, L. (2008) On the sources of the great moderation. *American Economic Journal:Macroeconomics,* 1(1), pp. 26-57.

Gandolfo, G. (1995) *International Economics, II,* 2nd ed. New York: Springer.

Garcimartin, C., Alonso, J.A. & Rivas, L., (2014) Balance-of-payments-constrained growth and convergence: one more piece of the jigsaw, *Journal of Post Keynesian Economics*, 36, (3), pp. 555-585.

Garratt, A., Lee, K, Pesaran, M.H. and Wright, S. (2006) Global and National Macroeconometric Modelling: A Long Run Structural Approach. Oxford University Press.

Gaspar, V., Gabriel, P. and Jorge, S. (2001) The ECB monetary policy strategy and the money market. *International journal of finance & economics ,* 6(4), pp. 325-342.

Georgiadis, G. (2014a) Determinants of global spillovers from US monetary policy. *Mimeo*, May 2014.

Georgiadis, G. (2014b) Examining asymmetries in the transmission of monetary policy in the Euro Area: Evidence from a mixed cross-section global VAR model. *Mimeo,* June 2014.

Ghosh, A., Glude, A. M., Wolf, H. (2012) *Exchange rate regimes: classification and consequences,* Working paper, 149, November 2012. [Online]. Available from: http://www.researchgate.net/profile/AnneMarie_Gulde/publication/228966970_Exchange_rate_regimes_Classification_and_consequences/links/0046352445a04224d8000000.pdf [Accessed 10.9.2015].

Gibson, H. D., Palivos, T., Tavlas, G. S. (2013) *The crisis in the euro area: an analytic overview: Proceedings of the 2013 Special Conference held at the Bank of Greece.* Athens, Bank of Greece.

Godfrey, L.G. (1978a) Testing Against General Autoregressive and Moving Average Error Models When the Regressors Include Lagged Dependent Variables. *Econometrica*, 46, pp. 1293–1302.

Godfrey, L.G. (1987b) Testing for Higher Order Serial Correlation in Regression Equations When the Regressors Include Lagged Dependent Variables. *Econometrica*, 46, pp. 1303-1310.

González-Rozada, M. and Yeyati, E. L. (2008) Global Factors and Emerging Market Spreads. *The Economic Journal,*118(3), pp. 1917-1936.

Granger, C.W.J. and J.L. Lin (1995) Causality in the Long Run, *Econometric Theory*, 11, pp. 530-536.

Granger, C. W. J. (1987) Developments in the study of cointegrated economic variables. *Oxford Bulletin of Economics and Statistics,* 1(48), pp.213-228.

Granger, C. W. J. and Weiss, A.A. (1983) *Studies in econometrics*, Academic Press New York.

Granger, C. W. J. (1981) Some properties of time series data and their use in econometric model specification. *Journal of Econometrics,* 16(1), pp. 121-130.

Granger, C. W. J. (1969) Investigating Causal Relations by Econometric Models and Cross-spectral Methods, *Econometrica,* 37(3). pp. 424-438.

Greene, W. H. (2002) *Econometric Analysis* (5th ed.).United States of America: Prentice-Hall, Inc.

Griffiths, W. E., Hill, R. C. & Judge, G. G. (1992) *Learning and Practicing Econometrics.* Singapore: John Wiley & Sons.

Grubel, H. G. (1971) The Demand for International Reserves: A Critical Review of the of Economic Literature, *Journal of Economic Literature,* 9(4), pp. 1148-1166.

Güney , P.Ö. and Hasanov, M. (2014) Real interest rate parity hypothesis in post-Soviet countries: Evidence from unit root tests, *Economic Modelling***,** 36, pp. 120-129.

Gujarati, D. N. (2009) Basic Econometrics, 5th edition, McGraw-Hill.

Gujarati, D.N. and Porter, D.C. (2008) *Basic Econometrics,* 5th Edition, Mc-Graw-Hill.
Gul, E. & Ekinc, A. (2006). The causal relationship between nominal Interest Rates and Inflation: The case of Turkey, *Scientific Journal of Administrative Development,* 4, pp. 54-69.

Hacker, S. (2010) The Effectiveness of Information Criteria in Determining Unit Root and Trend Status. *CESIS Electronic Working Paper Series*. No.213. pp. 1 – 33.

Halpern, L. and Wyplosz, C. (2001) Economic transformation and real exchange rates in the 2000s: the Balassa-Samuelson connection. *Economic Survey of Europe*, 1, pp. 227-40.

Hameed, A. and Rose, A.K. (2016) Exchange Rate Behavior with Negative Interest Rates: Some Early Negative Observations, *CEPR Discussion Paper No. DP11498*.

Hannan, E.J. and Quinn, B.G. (1979) The determination of the order of an autoregression, *Journal of the Royal Statistical Society* B41, pp. 190–195.

Hansen, B.E. (1992) Tests for Parameter Instability in Regressions With I(1) Processes. *Journal of Business and Economic Statistics*, 10, pp. 321-336.

Harbo, I., S. Johansen, B. Nielsen, and A. Rahbek (1998) Asymptotic Inference on Cointegrating Rank in Partial Systems. *Journal of Business and Economic Statistics*, 16, pp. 388-399.

Hartmann, P., Angela, M. and Simonei, M. (2003) The Euro-area Financial System: Structure, Integration, and Policy Initiatives. *Oxford review of economic policy,*19(1), pp.180-213.

Hartmann, P., Manna, M. and Manzanares, A. (2001) The microstructure of the euro money market. *Journal of International Money and Finance,* 20(6), pp. 895-948.

Hebous, S. (2013) The effects of discretionary fiscal policy on macroeconomic aggregates: A reappraisal. *Journal of Economic Surveys 25,* pp. 674-707.

Hebous, S. and Zimmermann (2013) Estimating the effects of coordinated fiscal actions in the Euro Area. *European Economic Review,* 58, pp. 110-121.

Heller, R. (1966) Optimal international reserves. *The Economic Journal*. 76, pp. 296–311.
Hendry, D.F. (1996) *A theory of co-breaking*. Mimeo, Nuffield College, University of Oxford.

Hendry, D.F. and Mizon, G.E. (1998) Exogeneity, causality, and co-breaking in economic policy analysis of a small econometric model of money in the UK. *Empirical Economics* 23: pp. 267–294.

Hirata, H., Kose, M.A. and Otrok, C. (2013) Regionalization vs. Globalization. *CAMA Working Paper 09.*

Ho, T. and Saunders, A. (1981) The Determinants of Bank Interest Margins: Theory and Empirical Evidence. *Journal of Financial and Quantitative Analysis,* 16(4), pp. 581-600.

Holtemöller, O. (2005) Uncovered interest rate parity and analysis of monetary convergence of potential EMU accession countries. *International Economics and Economic Policy,* 2(1), pp. 33-63.

Horváth, R. and Podpiera, A. (2012) Heterogeneity in bank pricing policies: The Czech evidence. *Economic systems,* 36(1), pp. 87-108.

Hsieh, D. A. (1982) The Determination of the Real Exchange Rate. *Journal of International Economics*, 12 (3-4), pp. 355-362.

Huang, G. (1995) Modelling China's demand for international reserves. *Applied Financial Economics*, 5 (5), pp. 357–366.

Huang, T.H. and Shen, C.H. (1999) Applying the seasonal error correction model to the demand for international reserves in Taiwan. *Journal of International Money and Finance*, 18, pp. 107-131.

Hubbard, R.G. (1995) Is There a 'Credit Channel' for Monetary Policy? *Federal Reserve Bank of St. Louis Review, 77*, pp. 63-74.

Hviding,, K. Nowak, M. and Ricci, L.A. (2004) Can higher reserves help reduce exchange rate volatility? *IMF Working Paper*, WP/04/189.

Ibrahim, W. (2011) External reserve holdings in Nigeria: Implications for investment, inflation and exchange rate. *Journal of Public Administration and Policy Research*, 3 (4), pp. 106-112.

Issing, O. (2002) On macroeconomic policy coordination in EMU. *Journal of Common Market Studies 40,* pp. 345-358.

Issing, O. (2011) Lessons for Monetary Policy: What Should the Consensus Be? *Center for Financial Studies*, Working Paper No. 2011/13.

Iyoha, M. A. (1976) Demand for International Reserves in Less Developed Countries: A Distributed Lag Specification. *Economics and Statistics*, 58 (3), pp. 351-355.

Jeanne, O and Ranciere, R. (2011) The optimal level of international reserves for emerging market countries: A new formula and some applications. *Economic Journal*, 121(fixed and floating exchange rates. *IMF Staff Papers,* 14(54). pp. 623–649.

Johansen, S. (1988) Statistical Analysis of cointegrating vectors. *Journal of Economic Dynamics and Control,* 12, pp. 231-254.

Kaminsky, G. and Schmukler, S. (2002) Emerging Market Instability: Do Sovereign Ratings Affect Country Risk and Stock Returns?. *The World Bank Economic Review,* 16(2), pp. 171-195.

Kapetanios, G., Shin, Y. and Snell, A. (2003) Testing for a unit root in the nonlinear STAR framework, *Journal of Econometrics,* 112(2), pp. 359-379.

Karagiannis, S., Panagopoulos, Y. and Vlamis, P. (2011) Symmetric or asymmetric interest rate adjustments? Evidence from Southeastern Europe. *Review of Development Economics,* 15(2), pp. 370-385.

Karfakis, C. (1997) The Demand for International Liquidity: a Cointegration Approach. *Applied Financial Economics*, 7(6), pp. 673-678.

Kasman, A. and Ayhan, D. (2008) Foreign Exchange Reserves and Exchange Rates in Turkey: Structural Breaks, Unit Roots and Cointegration. *Economic Modeling,* 25(1), pp. 83-92.

Kehoe, P.J. (1987) Coordination of fiscal policies in a world economy. *Journal of Monetary Economics,* 19, pp. 349-376.

Kelly, M. (1970) Demand for international reserves. *American Economic Review, 59*, pp. 655–667.

Kenen, P.B. and Yudin, E.B. (1965) The demand for International Reserves, *Review of Economics and Statistics,* 47(3), pp. 242-250.

Khan, K. and Ahmed, E. (2005) The Demand for International Reserves: A Case Study of Pakistan. *The Pakistan Development Review*, 44 (4), pp. 939-957.

Kim, J.I., Dabla-Norris, E. & Shirono, K. (2011) Optimal precautionary reserves for low-income countries: a cost-benefit analysis, *IMF Working Papers,* papers.ssrn.com. > [Accessed 12.06.2014].

Klein, M .(2012) Capital controls: Gates versus walls. *Brookings Papers on Economic Activity* (2), pp. 317–355.

Kohler, M. (2010) Exchange Rates during financial crises. *BIS Quarterly Review*. pp. 39-50. Available at: <http://www.bis.org/publ/qtrpdf/r_qt1003f.pdf>.
[Accessed 30.05.2014].

Konstantakis, K.N. and Michailides, P.G. (2014) Transmission of the debt crisis: from EU15 to USA or vice versa? A GVAR approach. *Journal of Economics and Business, 76*, pp. 115-132.

Koop, G., Pesaran, M.H. and Potter, S.M. (1996) Impulse response analysis in nonlinear multivariate models, *Journal of Econometrics* 74, pp. 119-147.

Kose, N., Emirmahmutoglu, F. & Aksoy, S. (2012) The interest-rate Inflation relationship under an Inflation targeting regime: The case of Turkey. *Journal of Asian Economies,* 23(4). pp.476-485. Elsevier Science Inc.

Kose, M.A., Otrok, C. & Prasad, E., (2012) Global business cycles: convergence or decoupling, *International Economic Review,* Volume 53, Issue 2, pp. 511–538.

Kouretas, G. P. and Vlamis, P. (2010) The Greek crisis: causes and implications. *Panoeconomicus*, 57(4), pp. 391-404.

Krugman, Paul (19 July 2015) "The Euroskeptic Vindication". NY Times, [Online]. Available at: http://krugman.blogs.nytimes.com/2015/07/19/the-euroskeptic-vindication/?_r=1[Accessed 09.09.2015]

Krugman, P. (1999) Balance sheets, the transfer problem, and financial crises. *International Tax and Public Finance*, 6(4):pp. 459–472.

Kwiatkowski, D., Phillips, P.C., Schmidt, P., and Shin, Y. (1992) Testing the Null Hypothesis of Stationarity against Alternative of a Unit Root. *Journal of Econometrics,* 54, pp. 159-178.

Kydland, F.E. and Prescott, E.C. (1977) Rules rather than Discretion: The Inconsistency of optimal plans.*The Journal of Political Economy*, Volume 85 (3), pp 473—492.

Landauro, I. (2012). *Carrefour checks itself out of Greece*. [Online]. Available from: http://www.wsj.com/articles/SB10001424052702303822204577467833359744926 [Accessed 04.09.2015].

Landel-Mills, J. M. (1989) The Demand For International Reserves and Opportunity Cost. *IMF Staff Papers*, 36, pp. 708-732.

Lane, P.R. and Burke, D. (2001) The Empirics of Foreign Reserves. *Open Economies Review*, 12(4), pp. 423-434.

Lazaretou, S. (2003) *Greek monetary economics in retrospect: the adventures of the drachma.*[Online]. Available from: http://www.bankofgreece.gr/BogEkdoseis/Paper200302.pdf [Accessed 03.09.2015].

Lazaretou, S. (2005) Greek monetary economics in retrospect: The adventures of the Drachma. *Economic notes*, 34(3), pp. 331-370.

Levine, P. and Brociner, A. (1994) Fiscal policy coordination in EMU: A dynamic game approach. *Journal of Economic Dynamics and Control 18,* pp. 699-729.

Leybourne, S., T.-H. Kim, and P. Newbold (2005) Examination of Some More Powerful Modifications of the Dickey-Fuller Test. *Journal of Time Series Analysis*, 26, pp. 355-369.

Longstaff, F., Pan, J., Pedersen, L. and Singleton, K. (2011) How sovereign is sovereign credit risk?. *American Economic Journal: Macroeconomics* , 3(2), pp. 75-103.

Lothian, J. (2002) The internationalization of money and finance and the globalization of financial markets. *Journal of International Money and Finance,* 21(6), p. 699–724.

Lothian, J. and Taylor, M. (2004) Real Exchange Rates Over the Past Two Centuries: How Important is the Harrod-Balassa-Samuelson Effect? *CRIF Working Paper series*, 9.

Luetkepohl, H. (2011) *Vector Autoregressive Models*, EUI Working Paper, ECO 2011/30.

Luetkepohl, H. (2008) Impulse response function. *The New Palgrave Dictionary of Economics*. 2nd.ed.

Luetkepohl, H. (2005) *New Introduction to Multiple Time Series Analysis,* Springer-Verlag, Berlin.

Luetkepohl, H. (2001) *Handbook of Computational Econometrics,*. John Wiley & Sons, Ltd.

Luetkepohl, H. and Saikkonen, P. (1999) Order selection in testing for the cointegrating rank of a VAR process In Cointegration, Causality, and Forecasting. *A Festschrift in Honour of Clive W.J. Granger* (ed. Engle, R.F. and White, H.), Oxford University Press Oxford, pp. 168–199.

Machlup, F. (1966) The need for monetary reserves. *Banca Nazionale Del Lavoro Quarterly Review,* 68, pp. 175-222.

Mackinnon, J.G, Haug, A.A. and Michelis, L. (1999) Numerical Distribution Functions of Likelihood Ratio Tests for Cointegration. *Journal of Applied Econometrics,* 14, pp. 563-577.

Maddala, G.S. & Lahiri, K. (2009) *Introduction to Econometrics.*4th editions. Wiley.

Malliaropoulos, D. (2010) How much did competitiveness of the Greek economy decline since EMU entry?. *Eurobank Research, Economy & Markets*, 5(4), pp. 1-16.

Marcal, E.F., Zimmermann, B., Prince, D.D. and Merlin, G.T. (2014) Assessing interdepedence among countries' fundamentals and its implications for exchange rate misalignment estimates. An empirical exercise based on GVAR. Available at SSRN: https://ssrn.com/abstract=2364508 or http://dx.doi.org/10.2139/ssrn.2364508

Mauro, F.D. & Pesaran, M.H. (2013) *The GVAR Handbook: Structure and Applications of a Macro Model of the Global Economy for Policy Analysis*, Oxford University Press.

Mihailov, M. (2010) Modeling interest rates on corporate loans in Bulgaria. *Bulgarian National Bank Discussion Papers,* 80.

Miller, J. B. (1999) *The Currency Board in Bulgaria: The First Two Years,* Sofia: Bulgarian National Bank. Min, H. (1998) Determinants of emerging market bond spread: do economic fundamentals matter?. *World Bank Publications*.

Minea, A. and Rault, C. (2011) External monetary shocks and monetary integration: Evidence from the Bulgarian currency board. *Economic modelling,* 28(5), pp. 2271-2281.

Mishkin, F. (2008) *The economics of money, banking, and financial markets,* 8th edition, Pearson International Edition.

Mishkin, F. (2008) Challenges for Inflation Targeting in Emerging Market Countries. *Emerging Markets Finance & Trade*, 44(6), pp. 5-16.

Mishkin, F. (1996) The Channels of Monetary Transmission: Lessons for Monetary Policy. *National Bureau of Economic Research.* NBER Working Paper 5464*,* pp. 1-27.

Mishkin, F. (1978) The Household Balance Sheet and the Great Depresion. *Journal of Economic History,* 38(4), pp. 918-937.

Modigliani, F. (1971) Monetary Policy and Consumption in Consumer Spending and Monetary Policy: The Linkages. *Federal Reserve Bank of Boston,* pp. 9-84.

Moffett, M., Stonehill, A., Eiteman, D. (2009) *Fundamentals of multinational finance.* 3d edition. USA, Pearson Education, Inc.

Mohaddes, K. and Pesaran, M.H. (2016) Country-specific oil supply shocks and the global economy: A counterfactual analysis. *Energy Economics, 59*, pp. 382-399.

Mohanty, D. (2012) Evidence on Interest Rate Channel of Monetary Policy Transmission in India. *Reserve Bank of India Working Paper.* Series 6/2012.

Moody's Investors Services, Inc (2009) *Moody's rating symbols and definitions*. [Online].Available from: https://www.moodys.com/sites/products/AboutMoodysRatingsAttachments/MoodysRatingsSymbolsand%20Definitions.pdf [Accessed 04.09.2015].

Mumtaz, H. and Sunder-Plassmann, L. (2010) Time-varying dynamics of the real Exchange Rate. A structural VAR analysis. *Bank of England. Working Paper No.382*.

Mundell, R. A. (1961) A Theory of Optimum Currency Areas. *American Economic Review*, 51 (4), pp. 657–665.

Mundell, R.A. (1997) Currency areas, common currencies, and EMU. *The American Economic Review*, 87(2), pp. 214-216.

Nenovsky, N. and Rizopoulos, Y. (2003) Extreme Monetary Regime Change: Evidence from Currency Board Introduction in Bulgaria. *Journal of Economic Issues,* 37(4), pp. 909-941.

Neumeyer, P. & Perri, F. (2005) Business cycles in emerging economies: the role of interest rates. *Journal of Monetary Economics 52,* 52(2), pp. 345-380.

Newey, W.K. and K.D. West (1987) A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix. *Econometrica*, 55, pp. 703-708.

Nyblom, J. (1989) Testing for the Constancy of Parameters Over Time. *Journal of the American Statistical Association*, 84, pp. 223-230.

Obstfeld, M. and Rogoff, K. (2000) Do we really need a new international monetary compact? *National Bureau of Economic Research*, No. w7864.

Obstfeld, M. and Rogoff, K. (2000) New directions for stochastic open economy models. *Journal of international economics*, 50(1), pp. 117-53.

Obstfeld, M., et al. (2005) The trilemma in history: tradeoffs among exchange rates, monetary policies, and capital mobility. *Review of Economics and Statistics*, 87(3), pp. 423-38.

Omer, M., Haan, J. d. & Scholtens, B. (2013) Does Uncovered Interest rate Parity Hold After All?. *SBP Working Paper Series,* Volume 57.

Orlowski, L. (2003) Monetary convergence and risk premiums in the EU accession countries. *Open Economies Review,* 14(3), pp. 251-267.

Pagan, A.R. andM.H. Pesaran (2008) ‘Econometric analysis of structural systems with permanent and transitory shocks’. *Journal of Economic Dynamics and Control*, 32, pp. 3376-3395.

Pantula, S.G., G. Gonzalez-Farias, and W.A. Fuller (1994) A Comparison of Unit-Root Test Criteria. *Journal of Business and Economic Statistics*, 12, pp. 449-459.

Park, H.J. and W.A. Fuller (1995) Alternative Estimators and Unit Root Tests for the Autoregressive Process. *Journal of Time Series Analysis*, 16, pp. 415-429.

Pesaran, M. H. (2015) *Time Series and Panel Data Econometrics.* Oxford University Press.

Pesaran, M. H. (2014) Theory and Practice of GVAR Modelling, *University of Southern California, Center for Applied Financial Economics (CAFE) Research Paper Series No. 14.04*.

Pesaran, M.H., Smith, L.V. and Smith, R. (2007) What if the UK or Sweden had joined the euro in 1999? An empirical investigation using a global VAR. *International Journal of Finance and Economics,* 12, pp. 55-87.

Pesaran, M.H, Petenuzzo, D. and Timmermann, A. (2006) Forecasting time series subject to multiple structural breaks. *Review of Economic Studies*, 73(4), pp. 1057-1084.

Pesaran, M.H. and Smith, R. (2006) Macroeconomic Modelling with a Global Perspective, *CESifo Working Paper 1659.*

Pesaran, M.H., Schueramann, T., Treutler, B.J. and Weiner, S.M. (2006) Macroeconomic Dynamics and Credit Risk: A Global Perspective, *Journal of Money, Credit and Banking,* Blackwell Publishing, 38(5), pp. 1211-1261.

Pesaran, M.H., Schueramann, T. and Weiner, S.M. (2004) Modelling Regional Interdepecies using a Global Error-Correcting macroeconomic model, *Journal of Business and Economic Statistics,* 22(2), pp. 129-162.

Pesaran, M. H., Shin, Y., and Smith, R. J. (2001) Bounds testing approaches to the analysis of level relationships. *Journal of applied econometrics*, 16(3), pp. 289-326.

Pesaran, M.H., Y. Shin, and R. Smith (2000) Structural Analysis of Vector Error Correction Models with Exogenous I(1) Variables. *Journal of Econometrics*, 97, pp. 293-343.

Pesaran, M.H. and Shin, Y. (1998) Generalized impulse response analysis in linear multivariate models, *Economics Letters,* 58, pp. 17-29.

Pesaran, M.H. and Y. Shin (1996) Cointegration and the Speed of Convergence to Equilibrium. *Journal of Econometrics*, 71, pp. 117-143.

Pesaran, M.H. & Wickens, M. R. (1995) *Handbook of Applied Econometrics*. Volume I: Macroeconomics, Blackwell Publishing: Oxford.

Petrevski, G. and Bogoev, J. (2012) Interest rate pass-through in South East Europe: An empirical analysis. *Economic Systems,* 36(4), pp. 571-593.

Phillips, P.C. & Perron, P. (1988) *Testing for a unit root in time series regression*. *Biometrika*, 75(2). pp. 335-346.

Pineau, G. and Dorrucci, E. (2006) The Accumulation of Foreign Reserves. European Central Bank *Occasional Paper Series*, No. 43.

Ploberger, W. and W. Krämer (1992) The CUSUM test with OLS residuals. *Econometrica*, 60, pp. 271-286.

Pollock, D.S.G. (1999) *A Handbook of Time Series Analysis, Signal Processing, and Dynamics,* Academic Press Inc.

Pourahmadi, M. Daniels, M.J. and Park, T. (2007) Simultaneous modelling of the Cholesky decomposition of several covariance matrices. *Journal of Multivariate Analysis,* 98(3), pp. 568-587.

Pourahmadi, M. (2007) Cholesky Decompositions and Estimation of A Covariance Matrix: Orthogonality of Variance–Correlation Parameters. *Biometrika*, 94(4), pp. 1006–1013.

Prabheesha, K.P., Malathya, D. and Madhumathi, R. (2009) Precautionary and mercantilist approaches to demand for international reserves: An empirical investigation in the Indian context. *Macroeconomics and Finance in Emerging Market Economies*, 2, pp. 279–291.

Primiceri, G. (2005) Time Varying Structural Vector Autoregressions and Monetary Policy. *The Review of Economic Studies*, 72(3), pp.821-52.

Ricci, L.A. (2008) "A Model of an Optimum Currency Area". *Economics: the Open-Access, Open-Assessment E-Journal* 2 (8), pp. 1–31.

Rissanen, J. (1978) Modeling by shortest data description, *Automatica,* 14, pp. 465–471.

Rivera-Batiz, L. and Sy, A. (2013) Currency Boards, Credibility, and Macroeconomic Behavior. *Annals of Economics and Finance,* 14(2), pp. 813-852.

Romero, A.M. (2005) Comparative Study: Factors that Affect Foreign Currency Reserves in China and India. *The Park Place Economist,* XIII, pp. 79-88.

Ronald, B. and MacDonald, É. (2009) Monetary transmission mechanism in Central and Eastern Europe: surveying the surveyable. *Journal of economic surveys,* 23(2), pp. 277-327.

Rosenberg, C. and Tirpák, M. (2008) Determinants of Foreign Currency Borrowing in the New Member States of the EU. *IMF Working Paper,* pp. 1-24.

Sack, B. and Wieland, V. (2000) Interest-Rate Smoothing and Optimal Monetary Policy: A Review of Recent Empirical Evidence. *Journal of Economics and Business*, 52, pp. 205-28.

Salachas, E.N., Laopodis, N.T. and Kouretas, G. P. (2017). The bank-lending channel and monetary policy during pre- and post-2007 crisis, Journal of International Financial Markets, Institutions and Money, 47, pp. 176-187.

Salvatore, D. & Reagle, D. (2011) *Statistics and Econometrics*. 2nd edition. Schaum's Outlines.

Samuelson, P.A. (1964) Theoretical notes on trade problems. *The Review of Economics and Statistics*, 46(2), pp. 145-54.

Sander, H. and Kleimeier, S. (2004) Convergence in euro-zone retail banking? What interest rate pass-through tells us about monetary policy transmission, competition and integration. *Journal of International Money and Finance,* 23(3), pp. 461-492.

Schmukler, S. and Serven, L. (2002) Pricing currency risk under currency boards. *Journal of Development Economics,* 69(1), pp. 367-391.

Schwarz, G. (1978) Estimating the dimension of a model, *Annals of Statistics* 6, pp. 461-464.

Selçuk, B. and Yılmaz, N. (2011) The Effects of Global Crisis into Euro Region: A Case Study of Greek Crisis. *European Journal of Economic and Political Studies,* 4(2), pp. 49-72.

Shaari, M. S. , Hussain, N. E. & Abdullah, H. (2012) The Effects of Oil Price Shocks and Exchange Rate Volatility Inflation: Evidence from Malaysia. *International Business Research,* 5(9), pp.106-112.

Shambaugh, J. (2004) The Effect of Fixed Exchange Rates on Monetary Policy. *The Quarterly Journal of Economics,* 119(1), pp. 301-352.

Sims, C.A. (1980) Macroeconomics and reality, *Econometrica,* 48, pp. 1-48.

Sirichand, K., Vivian, A. and Wohar, M.E. (2015) Examining real interest parity: Which component reverts quickest and in which regime?, *International Review of Financial Analysis*, 39, pp. 72-83.

Slaveski, T., and Nedanovski, P. (2002) Foreign direct investment in the Balkans: the case of Albania, FYROM, and Bulgaria. *Eastern European Economics*, 6 (3), pp. 83-99.

Slavov, S.T. (2017) Exchange Rate Regimes in Central, Eastern and Southeastern Europe: A Euro Bloc and a Dollar Bloc?. IMF Working Paper, No. 1783.

Smith, L.V. and Galesi, A. (2014) *GVAR Toolbox 2.0. User Guide*.

Stock, J.H. and Watson, M.W. (2002) Macroeconomic forecasting using diffusion indexes. *Journal of Business and Economic Statistics,* 20: pp. 147–162.

Stock, J.H. and M.W. Watson (1996) Evidence on Structural Instability in Macroeconomic Time Series Relations. *Journal of Business and Economic Statistics*, 14, pp. 11-30.

Sula, O. (2011) Demand for international reserves in developing nations: A quantile regression approach. *Journal of International Money and Finance*, 30, pp. 764–777.

Sun, Y., Heinz, F.F. and Ho, G. (2013) Cross-country linkages in Europe: a global VAR analysis. *IMF Working Papers,* 13/94, Internationaly Monetary Fund.

Tanzi, V. and Davoodi, H. (1997) Corruption, Public Investment and Growth. *International Monetary Fund Working Paper,* 97/139.

Tariq , M., Haq, Z.U., Jan, S., Jehangir, M. and Aamir, M. (2014) Real Exchange Rate and Foreign Exchange Reserves: A Mercantilist View. *Life Science Journal,* 11(3), pp. 160-174.

Taylor, J. (1995) The Monetary Transmission Mechanism: An Empirical Framework. *Journal of Economic Perspectives*, 9(4), pp. 11-26.

Taylor, M. P. (2003) Purchasing Power Parity. *Review of International Economics*, 11(3), pp. 436-452.

Thirlwall, A.P. (1979) Balance of payments constraint as an explanation of international growth rate differences, *BNL Quarterly Review,* 32(128), ideas.repec.org, pp. 45-53.

Thomas, R. L. (1997) *Modern Econometrics: An Introduction*. Harlow UK: Addison-Wesley-Longman Ltd.

Tobin, J. (1969) A General Equilibrium Approach to Monetary Theory. *Journal of Money, Credit, and Banking,* 1, pp. 15-29.

Quandt, R. (1960) Tests of the Hypothesis that a Linear Regression System Obeys Two Separate Regimes. *Journal of the American Statistical Association*, 55, pp. 324-330.

Quinn, C., Coleman, T. & Kiyavash (2011) A Generalized Prediction Framework for Granger Causality. *Workshop on Network Science for Communication Network,* pp. 1-6.

Quinn, BG. (1980) Order determination for a multivariate autoregression, *Journal of the Royal Statistical Society* B42, pp. 182–185.

Uribe, M. and Yue, V. (2006) Country spreads and emerging countries: Who drives whom?. *Journal of International Economics, 69*(1), pp. 6-36.

Vazakidis, A. and Adamopoulos, A. (2009) Financial development and economic growth: An empirical analysis for Greece. *American Journal of Applied Sciences, 6*(7), pp. 1410-1417.

Verbeek, M. (2008) *A Guide to Modern Econometrics* (3rd ed.). Chichester: John Wiley & Sons.

Vij, M. and Kapoor, M. C. (2007) Country risk analysis. *Journal of Management Research, 7*(2), pp. 87-102.

Vizek, M. and Condic-Jurkic, I. (2010) *Integration of CEE and EU-15 money market, deposit and lending markets: does bank ownership matter?*. Dubrovnik, 12th Dubrovnik Conference.

White, H. (1980) A Heteroskedasticity-Consistent Covariance Matrix Estimator and a Direct Test for Heteroskedasticity. *Econometrica*, 48, pp. 817-838.

Winjholds, J.O.B. και Kapteyn, A. (2001). Reserve adequacy in emerging market economies. *IMF Working Paper,* WP/01/143.

Worstall, T. (2012) *Why Coca Cola is leaving Greece*. [Online]. Available from: http://www.forbes.com/sites/timworstall/2012/10/13/why-coca-cola-is-leaving-greece/[Accessed 04.09.2015].

Xu, T. (2012) The role of credit in international business cycles. *Cambridge Working Papers in Economics 2012,* Faculty of Economics, University of Cambridge.

Yong, H. and Shin, P. (1998) Generalized impulse response analysis in linear multivariate models. *Economics letters,* 58(1), pp. 17-29.

APPENDIX A

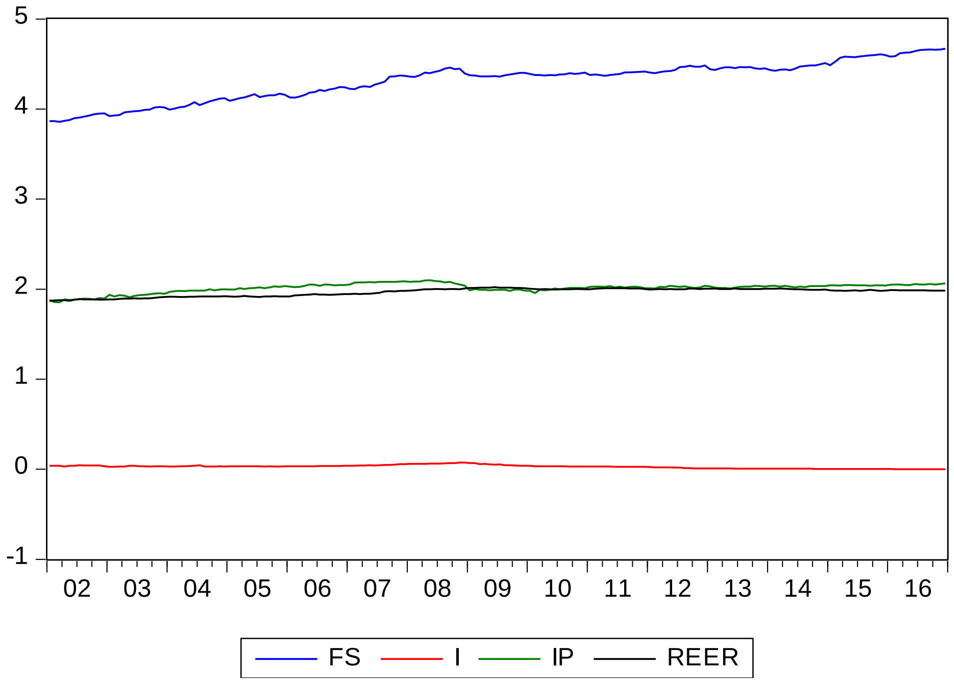
Determining the Relationships between the investigated variables. The case of Bulgaria

Part A: Statistical measures and level graphs

Table A1: STATISTICAL TABLES FOR ALL FOUR VARIABLES

	FS	I	IP	REER
Mean	4.313106	0.028589	2.013056	1.967143
Median	4.378805	0.031450	2.024280	1.986590
Maximum	4.669703	0.073000	2.098298	2.022662
Minimum	3.857101	-0.000750	1.854306	1.868392
Std. Dev.	0.211175	0.018697	0.050568	0.043779
Skewness	-0.503917	0.173051	-1.098097	-0.717576
Kurtosis	2.294015	2.429353	4.087847	2.028179
Jarque-Bera	11.35610	3.340685	45.05009	22.53070
Probability	0.003420	0.188183	0.000000	0.000013
Sum	776.3590	5.145950	362.3500	354.0858
Sum Sq. Dev.	7.982508	0.062577	0.457731	0.343076
Observations	180	180	180	180

FIGURE A1: All four variables in logarithms and percentages from 1/1/2002-31/12/2016



Part B: On Cointegration

Table B1: Cointegration (all four variables in level)

Date: 11/08/17 Time: 09:54
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to **1**

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.170306	62.62969	47.85613	0.0012
At most 1	0.094784	29.39732	29.79707	0.0555
At most 2	0.058543	11.67184	15.49471	0.1734
At most 3	0.005232	0.933675	3.841466	0.3339

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.170306	33.23237	27.58434	0.0084
At most 1	0.094784	17.72548	21.13162	0.1405
At most 2	0.058543	10.73817	14.26460	0.1678
At most 3	0.005232	0.933675	3.841466	0.3339

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

IP	REER	FS	I
-26.98015	8.332127	6.850594	33.83957
-11.94174	13.05700	-3.746894	-51.01251
-16.34273	-35.09960	8.017419	53.31613
7.764301	50.13581	-13.60203	-15.26335

Unrestricted Adjustment Coefficients (alpha):

D(IP)	-0.001228	0.002544	0.000942	-9.66E-05
D(REER)	-0.000531	-0.000513	0.000597	2.47E-05
D(FS)	-0.002946	0.000649	-0.000928	0.000865
D(I)	-0.000692	-0.000215	-0.000272	-8.75E-05

1 Cointegrating Equation(s):	Log likelihood	2675.046

```
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS              I
    1.000000      -0.308824      -0.253912      -1.254239
                  (0.37957)      (0.08639)      (0.45948)

Adjustment coefficients (standard error in parentheses)
      D(IP)        0.033119
                  (0.01979)
     D(REER)       0.014331
                  (0.00662)
      D(FS)        0.079493
                  (0.02942)
       D(I)        0.018668
                  (0.00485)
===============================================================

2 Cointegrating Equation(s):      Log likelihood      2683.909
===============================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS              I
    1.000000       0.000000      -0.477363      -3.429412
                                 (0.06467)      (0.72620)
    0.000000       1.000000      -0.723554      -7.043398
                                 (0.14633)      (1.64315)

Adjustment coefficients (standard error in parentheses)
      D(IP)        0.002743       0.022985
                  (0.02087)      (0.01096)
     D(REER)       0.020459      -0.011126
                  (0.00715)      (0.00375)
      D(FS)        0.071744      -0.016077
                  (0.03214)      (0.01687)
       D(I)        0.021237      -0.008574
                  (0.00528)      (0.00277)
===============================================================

3 Cointegrating Equation(s):      Log likelihood      2689.278
===============================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS              I
    1.000000       0.000000       0.000000       1.309069
                                                (0.71491)
    0.000000       1.000000       0.000000       0.138859
                                                (0.58468)
    0.000000       0.000000       1.000000       9.926359
                                                (2.52232)

Adjustment coefficients (standard error in parentheses)
      D(IP)       -0.012646      -0.010065      -0.010391
                  (0.02374)      (0.02700)      (0.00788)
     D(REER)       0.010702      -0.032081       0.003071
                  (0.00803)      (0.00913)      (0.00266)
      D(FS)        0.086915       0.016505      -0.030058
                  (0.03666)      (0.04170)      (0.01217)
       D(I)        0.025690       0.000989      -0.006119
                  (0.00599)      (0.00682)      (0.00199)
===============================================================
```

Table B2:

```
Date: 11/08/17   Time: 09:57
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)
==========================================================================
 Hypothesized                      Trace           0.05
  No. of CE(s)     Eigenvalue     Statistic    Critical Value     Prob.**
==========================================================================
     None *         0.131638      60.43141       47.85613         0.0022
   At most 1 *      0.127436      35.44843       29.79707         0.0100
   At most 2        0.059502      11.31986       15.49471         0.1926
   At most 3        0.002605      0.461716       3.841466         0.4968
==========================================================================
 Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
==========================================================================
 Hypothesized                    Max-Eigen         0.05
  No. of CE(s)     Eigenvalue     Statistic    Critical Value     Prob.**
==========================================================================
     None           0.131638      24.98298       27.58434         0.1039
   At most 1 *      0.127436      24.12857       21.13162         0.0183
   At most 2        0.059502      10.85814       14.26460         0.1614
   At most 3        0.002605      0.461716       3.841466         0.4968
==========================================================================
 Max-eigenvalue test indicates no cointegration at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
==========================================================================
       IP            REER            FS              I
    -25.36617      14.54270       0.840074       -28.89076
    -14.98137      11.77436       5.687717        44.98371
    -20.63510     -30.57112       8.729409        63.20484
    -9.304797     -54.36304       15.17296        25.82920
==========================================================================

 Unrestricted Adjustment Coefficients (alpha):
==========================================================================
     D(IP)         0.001841      -0.002703       0.000604        9.69E-05
    D(REER)       -0.000815      -0.000271       0.000538       -8.98E-06
     D(FS)        -0.000741      -0.002354      -0.001219       -0.000593
      D(I)        -0.000475      -0.000211      -0.000353        6.18E-05
==========================================================================

1 Cointegrating Equation(s):       Log likelihood      2666.536
==========================================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS              I
```

```
 1.000000   -0.573311   -0.033118    1.138949
             (0.49471)   (0.11269)   (0.60291)

Adjustment coefficients (standard error in parentheses)
D(IP)       -0.046711
             (0.01856)
D(REER)      0.020665
             (0.00616)
D(FS)        0.018794
             (0.02826)
D(I)         0.012054
             (0.00456)
==================================================================

2 Cointegrating Equation(s):     Log likelihood     2678.600
==================================================================
Normalized cointegrating coefficients (standard error in parentheses)
    IP          REER         FS           I
 1.000000     0.000000    0.901272    12.30626
                          (0.27298)   (3.03044)
 0.000000     1.000000    1.629813    19.47863
                          (0.43087)   (4.78331)

Adjustment coefficients (standard error in parentheses)
D(IP)       -0.006223   -0.005041
             (0.02066)   (0.01312)
D(REER)      0.024723   -0.015037
             (0.00713)   (0.00453)
D(FS)        0.054064   -0.038494
             (0.03237)   (0.02056)
D(I)         0.015218   -0.009398
             (0.00527)   (0.00335)
==================================================================

3 Cointegrating Equation(s):     Log likelihood     2684.029
==================================================================
Normalized cointegrating coefficients (standard error in parentheses)
    IP          REER         FS           I
 1.000000     0.000000    0.000000    1.645199
                                      (0.62034)
 0.000000     1.000000    0.000000    0.199720
                                      (0.53691)
 0.000000     0.000000    1.000000    11.82891
                                      (2.40702)

Adjustment coefficients (standard error in parentheses)
D(IP)       -0.018690   -0.023512   -0.008550
             (0.02517)   (0.02508)   (0.00731)
D(REER)      0.013624   -0.031480    0.002470
             (0.00857)   (0.00854)   (0.00249)
D(FS)        0.079219   -0.001226   -0.024654
             (0.03938)   (0.03924)   (0.01144)
D(I)         0.022497    0.001386   -0.004680
             (0.00636)   (0.00634)   (0.00185)
==================================================================
```

Table B3:

```
Date: 11/08/17   Time: 09:59
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments
Trend assumption: Linear deterministic trend
Series: FS I IP REER
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)
======================================================================
 Hypothesized                    Trace          0.05
  No. of CE(s)    Eigenvalue    Statistic   Critical Value    Prob.**
======================================================================
   None *          0.131638     60.43141      47.85613        0.0022
  At most 1 *      0.127436     35.44843      29.79707        0.0100
  At most 2        0.059502     11.31986      15.49471        0.1926
  At most 3        0.002605     0.461716      3.841466        0.4968
======================================================================
 Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
======================================================================
 Hypothesized                  Max-Eigen        0.05
  No. of CE(s)    Eigenvalue    Statistic   Critical Value    Prob.**
======================================================================
    None           0.131638     24.98298      27.58434        0.1039
  At most 1 *      0.127436     24.12857      21.13162        0.0183
  At most 2        0.059502     10.85814      14.26460        0.1614
  At most 3        0.002605     0.461716      3.841466        0.4968
======================================================================
 Max-eigenvalue test indicates no cointegration at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
======================================================================
     FS              I              IP            REER
  0.840074      -28.89076      -25.36617      14.54270
 -5.687717      -44.98371       14.98137     -11.77436
 -8.729409      -63.20484       20.63510      30.57112
 -15.17296      -25.82920       9.304797      54.36304
======================================================================

 Unrestricted Adjustment Coefficients (alpha):
======================================================================
    D(FS)       -0.000741      0.002354      0.001219       0.000593
    D(I)        -0.000475      0.000211      0.000353      -6.18E-05
    D(IP)        0.001841      0.002703     -0.000604      -9.69E-05
   D(REER)      -0.000815      0.000271     -0.000538       8.98E-06
======================================================================

1 Cointegrating Equation(s):     Log likelihood     2666.536
======================================================================
Normalized cointegrating coefficients (standard error in parentheses)
     FS              I              IP            REER
```

```
 1.000000      -34.39074     -30.19516      17.31122
               (13.8995)     (6.86126)     (8.26373)

Adjustment coefficients (standard error in parentheses)
D(FS)          -0.000622
               (0.00094)
D(I)           -0.000399
               (0.00015)
D(IP)           0.001547
               (0.00061)
D(REER)        -0.000684
               (0.00020)
==============================================================

2 Cointegrating Equation(s):     Log likelihood     2678.600
==============================================================
Normalized cointegrating coefficients (standard error in parentheses)
    FS             I             IP           REER
 1.000000      0.000000     -7.787200      4.919818
                            (1.53310)     (1.82941)
 0.000000      1.000000      0.651570     -0.360312
                            (0.16403)     (0.19574)

Adjustment coefficients (standard error in parentheses)
D(FS)          -0.014013     -0.084496
               (0.00632)     (0.05875)
D(I)           -0.001601      0.004227
               (0.00103)     (0.00957)
D(IP)          -0.013824     -0.174772
               (0.00403)     (0.03749)
D(REER)        -0.002225      0.011353
               (0.00139)     (0.01293)
==============================================================

3 Cointegrating Equation(s):     Log likelihood     2684.029
==============================================================
Normalized cointegrating coefficients (standard error in parentheses)
    FS             I             IP           REER
 1.000000      0.000000      0.000000     -59.22732
                                          (13.3765)
 0.000000      1.000000      0.000000      5.006999
                                          (1.17797)
 0.000000      0.000000      1.000000     -8.237510
                                          (1.78781)

Adjustment coefficients (standard error in parentheses)
D(FS)          -0.024654     -0.161547      0.079219
               (0.01144)     (0.09064)     (0.03938)
D(I)           -0.004680     -0.018068      0.022497
               (0.00185)     (0.01465)     (0.00636)
D(IP)          -0.008550     -0.136584     -0.018690
               (0.00731)     (0.05792)     (0.02517)
D(REER)         0.002470      0.045348      0.013624
               (0.00249)     (0.01973)     (0.00857)
==============================================================
```

Table B4:

Date: 11/08/17 Time: 10:00
Sample: 2002M01 2016M12
Included observations: 178
Series: IP REER FS I
Lags interval: 1 to 1

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	**Linear**	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	**Intercept** **No Trend**	Intercept Trend	Intercept Trend
Trace	3	3	**1**	2	2
Max-Eig	3	3	**1**	1	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2646.961	2646.961	2658.430	2658.430	2663.607
1	2664.422	2664.422	2675.046	2675.497	2678.842
2	2676.498	2677.448	2683.909	2686.050	2689.395
3	2685.159	2686.140	2689.278	2693.412	2696.504
4	2686.031	2689.745	2689.745	2698.405	2698.405
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-29.56136	-29.56136	-29.64528	-29.64528	-29.65851
1	-29.66766	-29.65642	-29.74209	-29.73592	-29.73980
2	-29.71346	-29.70166	-29.75179	-29.75337	-29.76848*
3	-29.72088	-29.69820	-29.72222	-29.73496	-29.75847
4	-29.64080	-29.63758	-29.63758	-29.68995	-29.68995
	Schwarz Criteria by Rank (rows)				

	and Model (columns)				
0	-29.27535	-29.27535	-29.28778*	-29.28778*	-29.22950
1	-29.23865	-29.20955	-29.24159	-29.21754	-29.16780
2	-29.14145	-29.09390	-29.10828	-29.07412	-29.05348
3	-29.00588	-28.92957	-28.93572	-28.89483	-28.90046
4	-28.78279	-28.70807	-28.70807	-28.68894	-28.68894

Table B5:
Date: 11/08/17 Time: 10:00
Sample: 2002M01 2016M12
Included observations: 177
Series: **IP REER FS I**
Lags interval: 1 to 2

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	3	3	2	2	3
Max-Eig	3	3	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2642.543	2642.543	2654.045	2654.045	2659.377
1	2658.456	2659.412	2666.536	2668.887	2673.805
2	2670.276	2671.902	2678.600	2680.965	2684.384
3	2679.298	2681.170	2684.029	2688.675	2692.069
4	2680.308	2684.260	2684.260	2693.783	2693.783

Akaike Information Criteria by Rank (rows) and Model (columns)

0	-29.49766	-29.49766	-29.58243	-29.58243	-29.59748
1	-29.58707	-29.58657	-29.63318	-29.64845	-29.67012
2	-29.63024	-29.62601	-29.67910	-29.68323	-29.69925*
3	-29.64179	-29.62904	-29.65005	-29.66865	-29.69569
4	-29.56281	-29.56226	-29.56226	-29.62467	-29.62467
	Schwarz Criteria by Rank (rows) and Model (columns)				
0	-28.92344	-28.92344	-28.93643*	-28.93643*	-28.87970
1	-28.86930	-28.85086	-28.84363	-28.84095	-28.80879
2	-28.76891	-28.72880	-28.74599	-28.71423	-28.69437
3	-28.63690	-28.57032	-28.57339	-28.53815	-28.54725
4	-28.41437	-28.34205	-28.34205	-28.33267	-28.33267

Table B6:

Date: 11/02/17 Time: 13:17
Sample: 2002M01 2016M12
Included observations: 177
Series: FS I IP REER
Lags interval: 1 to 2

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	3	3	2	2	3
Max-Eig	3	3	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2642.543	2642.543	2654.045	2654.045	2659.377
1	2658.456	2659.412	2666.536	2668.887	2673.805

2	2670.276	2671.902	2678.600	2680.965	2684.384
3	2679.298	2681.170	2684.029	2688.675	2692.069
4	2680.308	2684.260	2684.260	2693.783	2693.783

	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-29.49766	-29.49766	-29.58243	-29.58243	-29.59748
1	-29.58707	-29.58657	-29.63318	-29.64845	-29.67012
2	-29.63024	-29.62601	-29.67910	-29.68323	-29.69925*
3	-29.64179	-29.62904	-29.65005	-29.66865	-29.69569
4	-29.56281	-29.56226	-29.56226	-29.62467	-29.62467

	Schwarz Criteria by Rank (rows) and Model (columns)				
0	-28.92344	-28.92344	-28.93643*	-28.93643*	-28.87970
1	-28.86930	-28.85086	-28.84363	-28.84095	-28.80879
2	-28.76891	-28.72880	-28.74599	-28.71423	-28.69437
3	-28.63690	-28.57032	-28.57339	-28.53815	-28.54725
4	-28.41437	-28.34205	-28.34205	-28.33267	-28.33267

Table B7:

Date: 11/02/17 Time: 13:23
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments
Trend assumption: Linear deterministic trend
Series: FS I IP REER
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	**0.01** Critical Value	Prob.**
None *	0.131638	60.43141	54.68150	0.0022
At most 1	0.127436	35.44843	35.45817	0.0100
At most 2	0.059502	11.31986	19.93711	0.1926
At most 3	0.002605	0.461716	6.634897	0.4968

Trace test indicates 1 cointegrating eqn(s) at the 0.01 level
* denotes rejection of the hypothesis at the 0.01 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.01 Critical Value	Prob.**
None	0.131638	24.98298	32.71527	0.1039
At most 1	0.127436	24.12857	25.86121	0.0183

```
     At most 2          0.059502          10.85814          18.52001          0.1614
     At most 3          0.002605          0.461716          6.634897          0.4968
==========================================================================================

 Max-eigenvalue test indicates no cointegration at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
==========================================================================================
        FS                  I                 IP               REER
     0.840074          -28.89076          -25.36617          14.54270
    -5.687717          -44.98371           14.98137         -11.77436
    -8.729409          -63.20484           20.63510          30.57112
    -15.17296          -25.82920           9.304797          54.36304
==========================================================================================

 Unrestricted Adjustment Coefficients (alpha):
==========================================================================================
      D(FS)            -0.000741          0.002354          0.001219          0.000593
       D(I)            -0.000475          0.000211          0.000353         -6.18E-05
      D(IP)             0.001841          0.002703         -0.000604         -9.69E-05
     D(REER)           -0.000815          0.000271         -0.000538          8.98E-06
==========================================================================================

1 Cointegrating Equation(s):        Log likelihood        2666.536
==========================================================================================
Normalized cointegrating coefficients (standard error in parentheses)
        FS                  I                 IP               REER
     1.000000          -34.39074          -30.19516          17.31122
                       (13.8995)          (6.86126)          (8.26373)

Adjustment coefficients (standard error in parentheses)
      D(FS)            -0.000622
                       (0.00094)
       D(I)            -0.000399
                       (0.00015)
      D(IP)             0.001547
                       (0.00061)
     D(REER)           -0.000684
                       (0.00020)
==========================================================================================

2 Cointegrating Equation(s):        Log likelihood        2678.600
==========================================================================================
Normalized cointegrating coefficients (standard error in parentheses)
        FS                  I                 IP               REER
     1.000000           0.000000          -7.787200          4.919818
                                          (1.53310)          (1.82941)
     0.000000           1.000000           0.651570         -0.360312
                                          (0.16403)          (0.19574)

Adjustment coefficients (standard error in parentheses)
      D(FS)            -0.014013         -0.084496
                       (0.00632)         (0.05875)
       D(I)            -0.001601          0.004227
                       (0.00103)         (0.00957)
      D(IP)            -0.013824         -0.174772
```

	(0.00403)	(0.03749)
D(REER)	-0.002225	0.011353
	(0.00139)	(0.01293)

3 Cointegrating Equation(s): Log likelihood 2684.029

Normalized cointegrating coefficients (standard error in parentheses)

FS	I	IP	REER
1.000000	0.000000	0.000000	-59.22732
			(13.3765)
0.000000	1.000000	0.000000	5.006999
			(1.17797)
0.000000	0.000000	1.000000	-8.237510
			(1.78781)

Adjustment coefficients (standard error in parentheses)

D(FS)	-0.024654	-0.161547	0.079219
	(0.01144)	(0.09064)	(0.03938)
D(I)	-0.004680	-0.018068	0.022497
	(0.00185)	(0.01465)	(0.00636)
D(IP)	-0.008550	-0.136584	-0.018690
	(0.00731)	(0.05792)	(0.02517)
D(REER)	0.002470	0.045348	0.013624
	(0.00249)	(0.01973)	(0.00857)

Table B8: Group cointegration summary

Date: 08/28/17 Time: 13:14
Sample: 2002M01 2016M12
Included observations: 175
Series: FS I IP REER
Lags interval: 1 to 4

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	3	3	2	3	4
Max-Eig	3	2	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend

	Log Likelihood by Rank (rows) and Model (columns)				
0	2643.516	2643.516	2653.913	2653.913	2659.187
1	2657.369	2659.268	2666.852	2669.524	2674.396
2	2668.990	2671.709	2675.483	2679.587	2684.295
3	2676.450	2679.169	2681.924	2687.992	2691.399
4	2677.682	2681.990	2681.990	2693.728	2693.728

	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-29.48018	-29.48018	-29.55329	-29.55329	-29.56785
1	-29.54707	-29.55735	-29.60973	-29.62885	-29.65025
2	-29.58846	-29.59667	-29.61695	-29.64100	-29.67194*
3	-29.58228	-29.57907	-29.59913	-29.63419	-29.66170
4	-29.50493	-29.50846	-29.50846	-29.59690	-29.59690

	Schwarz Criteria by Rank (rows) and Model (columns)				
0	-28.32277	-28.32277	-28.32355*	-28.32355*	-28.26576
1	-28.24499	-28.23718	-28.23531	-28.23634	-28.20349
2	-28.14170	-28.11374	-28.09785	-28.08573	-28.08051
3	-27.99085	-27.93338	-27.93536	-27.91617	-27.92559
4	-27.76882	-27.70001	-27.70001	-27.71611	-27.71611

Part C: On Unit Root

Part C1: Unit root tests in level variables

Table C1.1: Unit root in level variables

Null Hypothesis: FS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.338022	0.6114
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(FS)
Method: Least Squares
Date: 08/28/17 Time: 13:18
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.007037	0.005259	-1.338022	0.1826
C	0.034819	0.022700	1.533842	**0.1269**

R-squared	0.010013	Mean dependent var	0.004481
Adjusted R-squared	0.004420	S.D. dependent var	0.014773
S.E. of regression	0.014740	Akaike info criterion	-5.585414
Sum squared resid	0.038456	Schwarz criterion	-5.549801
Log likelihood	501.8945	Hannan-Quinn criter.	-5.570973
F-statistic	1.790303	Durbin-Watson stat	1.782892
Prob(F-statistic)	0.182606		

Table C1.2:

Null Hypothesis: FS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.974561	0.6108
Test critical values:	1% level	-4.010143	
	5% level	-3.435125	
	10% level	-3.141565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/28/17 Time: 13:18
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.034483	0.017464	-1.974561	0.0499
C	0.142645	0.069244	2.060033	**0.0409**
@TREND("2002M01")	0.000117	7.08E-05	1.647333	**0.1013**

R-squared	0.025046	Mean dependent var	0.004481
Adjusted R-squared	0.013967	S.D. dependent var	0.014773
S.E. of regression	0.014669	Akaike info criterion	-5.589542
Sum squared resid	0.037872	Schwarz criterion	-5.536122
Log likelihood	503.2640	Hannan-Quinn criter.	-5.567881
F-statistic	2.260671	Durbin-Watson stat	1.761511
Prob(F-statistic)	0.107301		

Table C1.3:

```
Null Hypothesis: FS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
============================================================
                                          t-Statistic   Prob.*
============================================================
Augmented Dickey-Fuller test statistic     3.982455    1.0000
------------------------------------------------------------
Test critical values:       1% level      -2.577945
                            5% level      -1.942614
                            10% level     -1.615522
============================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/28/17   Time: 13:19
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
============================================================
    Variable        Coefficient   Std. Error   t-Statistic   Prob.
============================================================
     FS(-1)           0.001020     0.000256     3.982455    0.0001
============================================================
R-squared            -0.003145   Mean dependent var      0.004481
Adjusted R-squared   -0.003145   S.D. dependent var      0.014773
S.E. of regression    0.014796   Akaike info criterion  -5.583383
Sum squared resid     0.038967   Schwarz criterion      -5.565576
Log likelihood        500.7128   Hannan-Quinn criter.   -5.576162
Durbin-Watson stat    1.773716
============================================================
```

(No stationary in level)

Table C1.4:

```
Null Hypothesis: I has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
============================================================
                                          t-Statistic   Prob.*
============================================================
Augmented Dickey-Fuller test statistic    -0.346144    0.9141
------------------------------------------------------------
Test critical values:       1% level      -3.466994
                            5% level      -2.877544
                            10% level     -2.575381
============================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/28/17   Time: 13:19
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
============================================================
```

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.003671	0.010606	-0.346144	0.7296
C	-0.000111	0.000363	-0.305546	**0.7603**

R-squared	0.000676	Mean dependent var	-0.000216
Adjusted R-squared	-0.004969	S.D. dependent var	0.002628
S.E. of regression	0.002635	Akaike info criterion	-9.028886
Sum squared resid	0.001229	Schwarz criterion	-8.993273
Log likelihood	810.0853	Hannan-Quinn criter.	-9.014445
F-statistic	0.119816	Durbin-Watson stat	2.087958
Prob(F-statistic)	0.729646		

Table C1.5:

Null Hypothesis: I has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.341629	0.8741
Test critical values:	1% level	-4.010143	
	5% level	-3.435125	
	10% level	-3.141565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/28/17 Time: 13:20
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.018928	0.014108	-1.341629	0.1814
C	0.001072	0.000810	1.322285	**0.1878**
@TREND("2002M01")	-8.26E-06	5.07E-06	-1.630191	**0.1048**

R-squared	0.015541	Mean dependent var	-0.000216
Adjusted R-squared	0.004354	S.D. dependent var	0.002628
S.E. of regression	0.002623	Akaike info criterion	-9.032700
Sum squared resid	0.001211	Schwarz criterion	-8.979280
Log likelihood	811.4266	Hannan-Quinn criter.	-9.011038
F-statistic	1.389230	Durbin-Watson stat	2.087355
Prob(F-statistic)	0.251987		

Table C1.6:

Null Hypothesis: I has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.114050	0.2404
Test critical values:	1% level	-2.577945	
	5% level	-1.942614	
	10% level	-1.615522	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/28/17   Time: 13:20
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.006394	0.005739	-1.114050	0.2668

R-squared	0.000149	Mean dependent var	-0.000216
Adjusted R-squared	0.000149	S.D. dependent var	0.002628
S.E. of regression	0.002628	Akaike info criterion	-9.039532
Sum squared resid	0.001229	Schwarz criterion	-9.021725
Log likelihood	810.0381	Hannan-Quinn criter.	-9.032311
Durbin-Watson stat	2.081181		

(No stationary in level)

Table C1.7:
Null Hypothesis: IP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.086511	0.0294
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/28/17   Time: 13:20
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.045274	0.014668	-3.086511	0.0024
D(IP(-1))	-0.232037	0.070629	-3.285286	0.0012
C	0.092553	0.029543	3.132821	**0.0020**

R-squared	0.105529	Mean dependent var	0.001160
Adjusted R-squared	0.095306	S.D. dependent var	0.010195
S.E. of regression	0.009697	Akaike info criterion	-6.417358
Sum squared resid	0.016454	Schwarz criterion	-6.363733
Log likelihood	574.1449	Hannan-Quinn criter.	-6.395612
F-statistic	10.32313	Durbin-Watson stat	2.032885
Prob(F-statistic)	0.000058		

Table C1.8:
Null Hypothesis: IP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.565617	0.2967
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/28/17 Time: 13:21
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.045722	0.017821	-2.565617	0.0111
D(IP(-1))	-0.231677	0.071289	-3.249822	0.0014
C	0.093386	0.035028	2.665997	0.0084
@TREND("2002M01")	7.68E-07	1.72E-05	0.044546	0.9645

R-squared	0.105539	Mean dependent var	0.001160
Adjusted R-squared	0.090117	S.D. dependent var	0.010195
S.E. of regression	0.009724	Akaike info criterion	-6.406134
Sum squared resid	0.016454	Schwarz criterion	-6.334633
Log likelihood	574.1459	Hannan-Quinn criter.	-6.377138
F-statistic	6.843499	Durbin-Watson stat	2.032733
Prob(F-statistic)	0.000219		

Table C1.9:
Null Hypothesis: IP has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.790548	0.9823
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/28/17 Time: 13:21
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	0.000665	0.000372	1.790548	0.0751
D(IP(-1))	-0.235013	0.072370	-3.247402	0.0014

R-squared	0.055364	Mean dependent var	0.001160
Adjusted R-squared	0.049996	S.D. dependent var	0.010195
S.E. of regression	0.009937	Akaike info criterion	-6.374027
Sum squared resid	0.017377	Schwarz criterion	-6.338277
Log likelihood	569.2884	Hannan-Quinn criter.	-6.359529
Durbin-Watson stat	2.009618		

(No stationary in level)

Table C1.10:

Null Hypothesis: REER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.992698	0.0375
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/28/17 Time: 13:21
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-0.016935	0.005659	-2.992698	0.0032
C	0.033950	0.011134	3.049185	**0.0026**

R-squared	0.048163	Mean dependent var	0.000637
Adjusted R-squared	0.042786	S.D. dependent var	0.003387
S.E. of regression	0.003313	Akaike info criterion	-8.570553
Sum squared resid	0.001943	Schwarz criterion	-8.534940
Log likelihood	769.0645	Hannan-Quinn criter.	-8.556112

F-statistic	8.956241	Durbin-Watson stat	1.724703
Prob(F-statistic)	0.003160		

Table C1.11:

Null Hypothesis: REER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.556232	0.9800
Test critical values:	1% level	-4.010143	
	5% level	-3.435125	
	10% level	-3.141565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/28/17 Time: 13:22
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-0.005411	0.009729	-0.556232	0.5788
C	0.012360	0.018540	0.666685	**0.5058**
@TREND("2002M01")	-1.20E-05	8.24E-06	-1.453881	**0.1478**

R-squared	0.059459	Mean dependent var	0.000637
Adjusted R-squared	0.048771	S.D. dependent var	0.003387
S.E. of regression	0.003303	Akaike info criterion	-8.571318
Sum squared resid	0.001920	Schwarz criterion	-8.517898
Log likelihood	770.1330	Hannan-Quinn criter.	-8.549657
F-statistic	5.563185	Durbin-Watson stat	1.765691
Prob(F-statistic)	0.004542		

Table C1.12:

Null Hypothesis: REER has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.938579	0.9875
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/28/17 Time: 13:22
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	0.000251	0.000130	1.938579	0.0542
D(REER(-1))	0.161377	0.074076	2.178546	0.0307

R-squared	0.024653	Mean dependent var	0.000613
Adjusted R-squared	0.019111	S.D. dependent var	0.003380
S.E. of regression	0.003348	Akaike info criterion	-8.549916
Sum squared resid	0.001972	Schwarz criterion	-8.514166
Log likelihood	762.9425	Hannan-Quinn criter.	-8.535418
Durbin-Watson stat	1.991936		

(No stationary in level at 0.01=a)

Table C1.13: Group unit root test summary

Group unit root test: Summary
Series: FS, I, IP, REER
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 12
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	2.86472	0.9979	4	702
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	2.95330	0.9373	4	702
PP - Fisher Chi-square	2.93565	0.9383	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/28/17 Time: 13:24
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	3.85752	0.9999	4	714

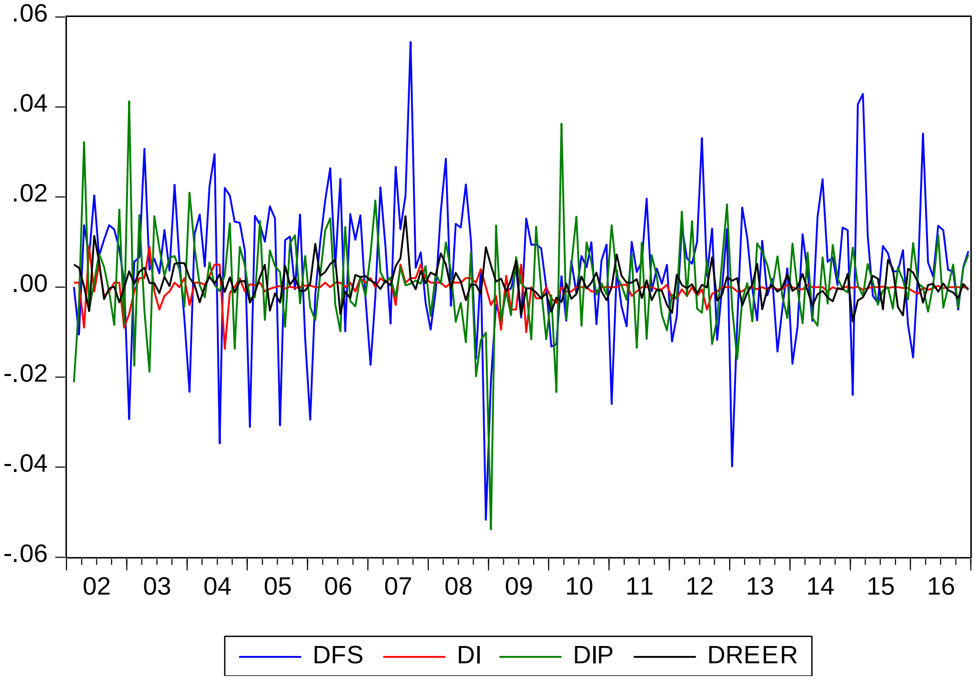
```
Null: Unit root (assumes individual unit root process)
----------------------------------------------------------------------
ADF - Fisher Chi-square             2.91202     0.9398      4       714
PP - Fisher Chi-square              2.93565     0.9383      4       716
======================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

Table C1.14:

```
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/28/17   Time: 13:24
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
======================================================================
                                                        Cross-
Method                             Statistic   Prob.**  sections    Obs
----------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
----------------------------------------------------------------------
Levin, Lin & Chu t*                -3.00307     0.0013      4       715

Null: Unit root (assumes individual unit root process)
----------------------------------------------------------------------
Im, Pesaran and Shin W-stat        -0.95332     0.1702      4       715
ADF - Fisher Chi-square             14.7869     0.0634      4       715
PP - Fisher Chi-square              10.9565     0.2042      4       716
======================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

```
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/28/17   Time: 13:24
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
======================================================================
                                                        Cross-
Method                             Statistic   Prob.**  sections    Obs
----------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
----------------------------------------------------------------------
Levin, Lin & Chu t*                -0.23377     0.4076      4       715
Breitung t-stat                     1.92430     0.9728      4       711

Null: Unit root (assumes individual unit root process)
----------------------------------------------------------------------
Im, Pesaran and Shin W-stat         1.46777     0.9289      4       715
ADF - Fisher Chi-square             3.72566     0.8810      4       715
PP - Fisher Chi-square              2.83034     0.9445      4       716
======================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

FIGURE C1: All four variables from 1/1/2002-31/12/2016 in first difference



Part C2: Unit root tests in first difference

Table C2.1: Unit root test in first difference

Null Hypothesis: DFS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.86982	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/28/17 Time: 13:25
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-0.889114	0.074905	-11.86982	0.0000
C	0.004011	0.001156	3.470712	**0.0007**

R-squared	0.444607	Mean dependent var	4.45E-05
Adjusted R-squared	0.441451	S.D. dependent var	0.019751

S.E. of regression	0.014761	Akaike info criterion	-5.582509
Sum squared resid	0.038347	Schwarz criterion	-5.546759
Log likelihood	498.8433	Hannan-Quinn criter.	-5.568011
F-statistic	140.8927	Durbin-Watson stat	1.984125
Prob(F-statistic)	0.000000		

Table C2.2:

Null Hypothesis: DFS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.87756	0.0000
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/28/17 Time: 13:25
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-0.892532	0.075144	-11.87756	0.0000
C	0.005472	0.002289	2.390023	0.0179
@TREND("2002M01")	-1.60E-05	2.16E-05	-0.739383	**0.4607**

R-squared	0.446337	Mean dependent var	4.45E-05
Adjusted R-squared	0.440009	S.D. dependent var	0.019751
S.E. of regression	0.014780	Akaike info criterion	-5.574392
Sum squared resid	0.038228	Schwarz criterion	-5.520767
Log likelihood	499.1209	Hannan-Quinn criter.	-5.552646
F-statistic	70.53826	Durbin-Watson stat	1.983909
Prob(F-statistic)	0.000000		

Table C2.3:

Null Hypothesis: DFS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.01272	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/28/17 Time: 13:25
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-0.813941	0.073909	-11.01272	0.0000

R-squared	0.406595	Mean dependent var	4.45E-05
Adjusted R-squared	0.406595	S.D. dependent var	0.019751
S.E. of regression	0.015214	Akaike info criterion	-5.527543
Sum squared resid	0.040972	Schwarz criterion	-5.509668
Log likelihood	492.9514	Hannan-Quinn criter.	-5.520295
Durbin-Watson stat	1.998930		

(Stationary in the first difference)

Table C2.4:

Null Hypothesis: DI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.92379	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/28/17 Time: 13:26
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-1.047714	0.075246	-13.92379	0.0000
C	-0.000234	0.000198	-1.177363	**0.2406**

R-squared	0.524159	Mean dependent var	-7.02E-06
Adjusted R-squared	0.521456	S.D. dependent var	0.003814
S.E. of regression	0.002639	Akaike info criterion	-9.025974
Sum squared resid	0.001225	Schwarz criterion	-8.990224
Log likelihood	805.3117	Hannan-Quinn criter.	-9.011477
F-statistic	193.8718	Durbin-Watson stat	1.990454
Prob(F-statistic)	0.000000		

Table C2.5:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                  t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -13.95671      0.0000
--------------------------------------------------------------------------
Test critical values:        1% level             -4.010440
                             5% level             -3.435269
                             10% level            -3.141649
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/28/17   Time: 13:27
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
       Variable           Coefficient    Std. Error    t-Statistic   Prob.
==========================================================================
        DI(-1)            -1.053229      0.075464      -13.95671     0.0000
          C                0.000108      0.000401       0.269317     0.7880
  @TREND("2002M01")       -3.79E-06      3.86E-06      -0.981143     0.3279
==========================================================================
R-squared                  0.526763   Mean dependent var       -7.02E-06
Adjusted R-squared         0.521354   S.D. dependent var        0.003814
S.E. of regression         0.002639   Akaike info criterion    -9.020224
Sum squared resid          0.001219   Schwarz criterion        -8.966599
Log likelihood             805.8000   Hannan-Quinn criter.     -8.998478
F-statistic                97.39665   Durbin-Watson stat        1.989106
Prob(F-statistic)          0.000000
==========================================================================
```

Table C2.6:

```
Null Hypothesis: DI has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                  t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -13.85885      0.0000
--------------------------------------------------------------------------
Test critical values:        1% level             -2.578018
                             5% level             -1.942624
                             10% level            -1.615515
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/28/17   Time: 13:27
Sample (adjusted): 2002M03 2016M12
```

Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-1.040448	0.075075	-13.85885	0.0000

R-squared	0.520412	Mean dependent var	-7.02E-06
Adjusted R-squared	0.520412	S.D. dependent var	0.003814
S.E. of regression	0.002641	Akaike info criterion	-9.029365
Sum squared resid	0.001235	Schwarz criterion	-9.011490
Log likelihood	804.6135	Hannan-Quinn criter.	-9.022116
Durbin-Watson stat	1.991073		

(Stationary in the first difference)

Table C2.7:

Null Hypothesis: DIP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.08589	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/28/17 Time: 13:28
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.235492	0.072311	-17.08589	0.0000
C	0.001396	0.000748	1.867022	**0.0636**

R-squared	0.623874	Mean dependent var	0.000159
Adjusted R-squared	0.621736	S.D. dependent var	0.016144
S.E. of regression	0.009929	Akaike info criterion	-6.375587
Sum squared resid	0.017350	Schwarz criterion	-6.339836
Log likelihood	569.4272	Hannan-Quinn criter.	-6.361089
F-statistic	291.9277	Durbin-Watson stat	2.010427
Prob(F-statistic)	0.000000		

Table C2.8:

Null Hypothesis: DIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.25325	0.0000
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/28/17 Time: 13:29
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.245738	0.072203	-17.25325	0.0000
C	0.003597	0.001511	2.381060	0.0183
@TREND("2002M01")	-2.42E-05	1.45E-05	-1.674043	**0.0959**

R-squared	0.629802	Mean dependent var	0.000159
Adjusted R-squared	0.625571	S.D. dependent var	0.016144
S.E. of regression	0.009878	Akaike info criterion	-6.380238
Sum squared resid	0.017077	Schwarz criterion	-6.326612
Log likelihood	570.8412	Hannan-Quinn criter.	-6.358491
F-statistic	148.8599	Durbin-Watson stat	2.021591
Prob(F-statistic)	0.000000		

Table C2.9:

Null Hypothesis: DIP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.86690	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/28/17 Time: 13:29
Sample (adjusted): 2002M03 2016M12

Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.222421	0.072475	-16.86690	0.0000

R-squared	0.616424	Mean dependent var	0.000159
Adjusted R-squared	0.616424	S.D. dependent var	0.016144
S.E. of regression	0.009998	Akaike info criterion	-6.367211
Sum squared resid	0.017694	Schwarz criterion	-6.349336
Log likelihood	567.6818	Hannan-Quinn criter.	-6.359962
Durbin-Watson stat	1.998135		

(Stationary in the first difference)

Table C2.10:

Null Hypothesis: DREER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.33815	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/28/17 Time: 13:29
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.839864	0.074074	-11.33815	0.0000
C	0.000509	0.000255	1.995537	**0.0475**

R-squared	0.422105	Mean dependent var	-3.18E-05
Adjusted R-squared	0.418822	S.D. dependent var	0.004389
S.E. of regression	0.003346	Akaike info criterion	-8.551162
Sum squared resid	0.001970	Schwarz criterion	-8.515411
Log likelihood	763.0534	Hannan-Quinn criter.	-8.536664
F-statistic	128.5536	Durbin-Watson stat	1.991542
Prob(F-statistic)	0.000000		

Table C2.11:

Null Hypothesis: DREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*

Augmented Dickey-Fuller test statistic		-11.85476	0.0000
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/28/17 Time: 13:29
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.888410	0.074941	-11.85476	0.0000
C	0.001752	0.000522	3.354155	**0.0010**
@TREND("2002M01")	-1.34E-05	4.94E-06	-2.712023	**0.0074**

R-squared	0.445414	Mean dependent var	-3.18E-05
Adjusted R-squared	0.439076	S.D. dependent var	0.004389
S.E. of regression	0.003287	Akaike info criterion	-8.581096
Sum squared resid	0.001891	Schwarz criterion	-8.527470
Log likelihood	766.7175	Hannan-Quinn criter.	-8.559349
F-statistic	70.27527	Durbin-Watson stat	1.982886
Prob(F-statistic)	0.000000		

Table C2.12:
Null Hypothesis: DREER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.06902	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/28/17 Time: 13:30
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.812224	0.073378	-11.06902	0.0000

```
R-squared                 0.409030   Mean dependent var      -3.18E-05
Adjusted R-squared        0.409030   S.D. dependent var       0.004389
S.E. of regression        0.003374   Akaike info criterion   -8.540024
Sum squared resid         0.002015   Schwarz criterion       -8.522149
Log likelihood            761.0621   Hannan-Quinn criter.    -8.532775
Durbin-Watson stat        2.000361
=====================================================================
```

(Stationary in the first difference)

Table C2.13: Group unit root test summary in first difference

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/28/17   Time: 13:31
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 2 to 13
Newey-West automatic bandwidth selection and Bartlett kernel
=====================================================================
                                                     Cross-
Method                           Statistic  Prob.**  sections    Obs
---------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
---------------------------------------------------------------------
Levin, Lin & Chu t*              -7.82135   0.0000      4        680

Null: Unit root (assumes individual unit root process)
---------------------------------------------------------------------
ADF - Fisher Chi-square           78.0539   0.0000      4        680
PP - Fisher Chi-square            446.418   0.0000      4        712
=====================================================================
** Probabilities for Fisher tests are computed using an asymptotic Chi
       -square distribution. All other tests assume asymptotic normality.
```

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/28/17   Time: 13:31
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test
=====================================================================
                                                     Cross-
Method                           Statistic  Prob.**  sections    Obs
---------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
---------------------------------------------------------------------
Levin, Lin & Chu t*              -26.0197   0.0000      4        712

Null: Unit root (assumes individual unit root process)
---------------------------------------------------------------------
ADF - Fisher Chi-square           446.354   0.0000      4        712
PP - Fisher Chi-square            446.418   0.0000      4        712
=====================================================================
** Probabilities for Fisher tests are computed using an asymptotic Chi
       -square distribution. All other tests assume asymptotic normality.
```

Table C2.14:

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/28/17   Time: 13:31
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test
=================================================================
                                                  Cross-
Method                          Statistic  Prob.**  sections   Obs
-----------------------------------------------------------------
Null: Unit root (assumes common unit root process)
-----------------------------------------------------------------
Levin, Lin & Chu t*             -30.6537   0.0000      4       712

Null: Unit root (assumes individual unit root process)
-----------------------------------------------------------------
Im, Pesaran and Shin W-stat     -28.0465   0.0000      4       712
ADF - Fisher Chi-square          377.785   0.0000      4       712
PP - Fisher Chi-square           377.859   0.0000      4       712
=================================================================
** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

Table C2.15:

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/28/17   Time: 13:31
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test
=================================================================
                                                  Cross-
Method                          Statistic  Prob.**  sections   Obs
-----------------------------------------------------------------
Null: Unit root (assumes common unit root process)
-----------------------------------------------------------------
Levin, Lin & Chu t*             -36.1843   0.0000      4       712
Breitung t-stat                 -19.4912   0.0000      4       708

Null: Unit root (assumes individual unit root process)
-----------------------------------------------------------------
Im, Pesaran and Shin W-stat     -29.9190   0.0000      4       712
ADF - Fisher Chi-square          371.347   0.0000      4       712
PP - Fisher Chi-square           370.437   0.0000      4       712
=================================================================
** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

Part D: On stability and on lag length

Figure D1: The unit circle

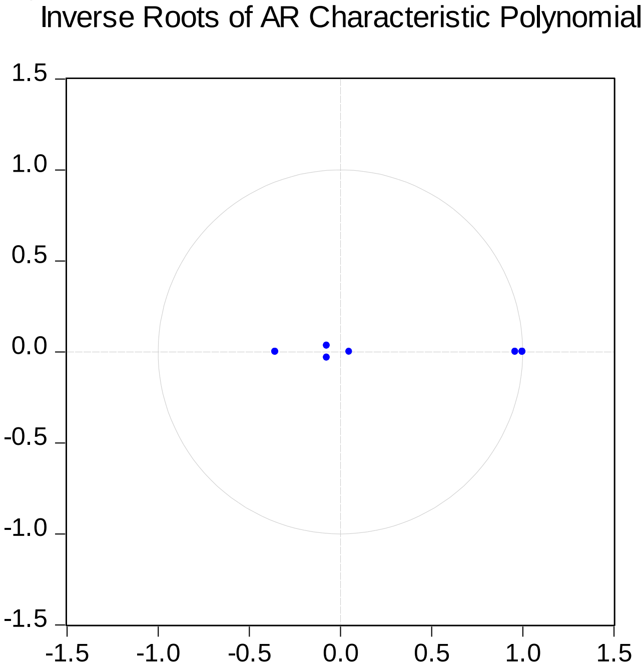


Table D1:

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/03/17 Time: 10:53
Sample: 2002M01 2016M12
Included observations: 178

Lags	LM-Stat	Prob
1	30.94539	0.0137

Probs from chi-square with 16 df.

Table D2:

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/03/17 Time: 11:02
Sample: 2002M01 2016M12
Included observations: 178

Component	Skewness	Chi-sq	df	Prob.
1	-0.424032	5.334161	1	0.0209
2	-0.966697	27.72357	1	0.0000
3	-0.074379	0.164125	1	0.6854
4	0.650133	12.53931	1	0.0004

Joint		45.76117	4	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	4.150776	9.821789	1	0.0017
2	8.558269	229.1331	1	0.0000
3	5.203850	36.02240	1	0.0000
4	7.626493	158.7496	1	0.0000
Joint		433.7269	4	0.0000

Component	Jarque-Bera	df	Prob.
1	15.15595	2	0.0005
2	256.8567	2	0.0000
3	36.18653	2	0.0000
4	171.2889	2	0.0000
Joint	479.4881	8	0.0000

Table D3: VECM lag order selection criteria

Endogenous variables: DFS DI DIP DREER
Exogenous variables: C **ECT**
Date: 11/03/17 Time: 10:19
Sample: 2002M01 2016M12
Included observations: 171

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2545.877	NA	1.51e-18	-29.68278	-29.53580*	-29.62314
1	2574.384	55.01273	1.30e-18*	**-29.82905***	-29.38812	-29.65014*
2	2582.030	14.39856	1.44e-18	-29.73135	-28.99646	-29.43316
3	2588.074	11.09784	1.62e-18	-29.61490	-28.58605	-29.19744
4	2596.108	14.37562	1.78e-18	-29.52173	-28.19892	-28.98499
5	2608.940	22.36391	1.85e-18	-29.48468	-27.86792	-28.82867
6	2620.169	19.04170	1.97e-18	-29.42887	-27.51815	-28.65358
7	2641.454	35.10174	1.86e-18	-29.49069	-27.28601	-28.59612
8	2659.811	29.41542*	1.82e-18	-29.51826	-27.01963	-28.50442

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Part E: The VECM and the GIRFs

Table E1: The VECM

Vector Error Correction Estimates
Date: 11/03/17 Time: 10:24
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
FS(-1)	1.000000
I(-1)	4.939654
	(1.39297)
	[3.54614]
IP(-1)	-3.938366
	(0.66851)
	[-5.89124]
REER(-1)	1.216263
	(0.79407)
	[1.53169]
C	1.081466

Error Correction:	D(FS)	D(I)	D(IP)	D(REER)
CointEq1	-0.020184	-0.004740	-0.008409	-0.003639
	(0.00747)	(0.00123)	(0.00502)	(0.00168)
	[-2.70197]	[-3.85168]	[-1.67358]	[-2.16453]
D(FS(-1))	0.078806	0.048343	0.102982	-0.018416
	(0.07469)	(0.01231)	(0.05024)	(0.01681)
	[1.05505]	[3.92865]	[2.04971]	[-1.09560]
D(I(-1))	-0.229788	-0.127870	-0.441853	0.186682
	(0.42839)	(0.07058)	(0.28815)	(0.09640)
	[-0.53639]	[-1.81183]	[-1.53339]	[1.93644]
D(IP(-1))	0.028257	-0.022294	-0.293848	0.003223
	(0.11328)	(0.01866)	(0.07620)	(0.02549)
	[0.24945]	[-1.19460]	[-3.85643]	[0.12641]
D(REER(-1))	0.048033	0.089068	-0.091515	0.129681
	(0.32962)	(0.05430)	(0.22172)	(0.07418)
	[0.14572]	[1.64019]	[-0.41276]	[1.74825]
C	0.004045	-0.000502	0.000958	0.000648
	(0.00117)	(0.00019)	(0.00079)	(0.00026)
	[3.45493]	[-2.60096]	[1.21679]	[2.46045]
R-squared	0.062332	0.195494	0.104622	0.088359
Adj. R-squared	0.035074	0.172107	0.078593	0.061857
Sum sq. resids	0.036405	0.000988	0.016471	0.001844
S.E. equation	0.014548	0.002397	0.009786	0.003274

F-statistic	2.286748	8.359160	4.019519	3.334133
Log likelihood	503.4699	824.4685	574.0547	768.9542
Akaike AIC	-5.589550	-9.196276	-6.382637	-8.572519
Schwarz SC	-5.482299	-9.089024	-6.275386	-8.465267
Mean dependent	0.004506	-0.000223	0.001160	0.000613
S.D. dependent	0.014810	0.002634	0.010195	0.003380

Determinant resid covariance (dof adj.)	1.19E-18
Determinant resid covariance	1.04E-18
Log likelihood	2675.046
Akaike information criterion	-29.74209
Schwarz criterion	-29.24159

Table E1b: The VECM (different and final ordering)

Vector Error Correction Estimates
Date: 09/18/18 Time: 15:05
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
IP(-1)	1.000000
REER(-1)	-0.308824
	(0.37957)
	[-0.81363]
FS(-1)	-0.253912
	(0.08639)
	[-2.93924]
I(-1)	-1.254239
	(0.45948)
	[-2.72967]
C	-0.274598

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	0.033119	0.014331	0.079493	0.018668
	(0.01979)	(0.00662)	(0.02942)	(0.00485)
	[1.67358]	[2.16453]	[2.70197]	[3.85168]
D(IP(-1))	-0.293848	0.003223	0.028257	-0.022294
	(0.07620)	(0.02549)	(0.11328)	(0.01866)
	[-3.85643]	[0.12641]	[0.24945]	[-1.19460]
D(REER(-1))	-0.091515	0.129681	0.048033	0.089068
	(0.22172)	(0.07418)	(0.32962)	(0.05430)
	[-0.41276]	[1.74825]	[0.14572]	[1.64019]
D(FS(-1))	0.102982	-0.018416	0.078806	0.048343
	(0.05024)	(0.01681)	(0.07469)	(0.01231)
	[2.04971]	[-1.09560]	[1.05505]	[3.92865]

D(I(-1))	-0.441853	0.186682	-0.229788	-0.127870
	(0.28815)	(0.09640)	(0.42839)	(0.07058)
	[-1.53339]	[1.93644]	[-0.53639]	[-1.81183]
C	0.000958	0.000648	0.004045	-0.000502
	(0.00079)	(0.00026)	(0.00117)	(0.00019)
	[1.21679]	[2.46045]	[3.45493]	[-2.60096]
R-squared	0.104622	0.088359	0.062332	0.195494
Adj. R-squared	0.078593	0.061857	0.035074	0.172107
Sum sq. resids	0.016471	0.001844	0.036405	0.000988
S.E. equation	0.009786	0.003274	0.014548	0.002397
F-statistic	4.019519	3.334133	2.286748	8.359160
Log likelihood	574.0547	768.9542	503.4699	824.4685
Akaike AIC	-6.382637	-8.572519	-5.589550	-9.196276
Schwarz SC	-6.275386	-8.465267	-5.482299	-9.089024
Mean dependent	0.001160	0.000613	0.004506	-0.000223
S.D. dependent	0.010195	0.003380	0.014810	0.002634
Determinant resid covariance (dof adj.)		1.19E-18		
Determinant resid covariance		1.04E-18		
Log likelihood		2675.046		
Akaike information criterion		-29.74209		
Schwarz criterion		-29.24159		

Table E2: THE VECM regressions (both PRF and SRF).

```
Estimation Proc:
===============================
EC(C,1) 1 1 FS I IP REER

VAR Model:
===============================
D(FS) = A(1,1)*(B(1,1)*FS(-1) + B(1,2)*I(-1) + B(1,3)*IP(-1) + B(1,4)*REER(-1) + B(1,5)) + C(1,1)*D(FS(-1)) +
C(1,2)*D(I(-1)) + C(1,3)*D(IP(-1)) + C(1,4)*D(REER(-1)) + C(1,5)

D(I) = A(2,1)*(B(1,1)*FS(-1) + B(1,2)*I(-1) + B(1,3)*IP(-1) + B(1,4)*REER(-1) + B(1,5)) + C(2,1)*D(FS(-1)) +
C(2,2)*D(I(-1)) + C(2,3)*D(IP(-1)) + C(2,4)*D(REER(-1)) + C(2,5)

D(IP) = A(3,1)*(B(1,1)*FS(-1) + B(1,2)*I(-1) + B(1,3)*IP(-1) + B(1,4)*REER(-1) + B(1,5)) + C(3,1)*D(FS(-1)) +
C(3,2)*D(I(-1)) + C(3,3)*D(IP(-1)) + C(3,4)*D(REER(-1)) + C(3,5)

D(REER) = A(4,1)*(B(1,1)*FS(-1) + B(1,2)*I(-1) + B(1,3)*IP(-1) + B(1,4)*REER(-1) + B(1,5)) + C(4,1)*D(FS(-1)) +
C(4,2)*D(I(-1)) + C(4,3)*D(IP(-1)) + C(4,4)*D(REER(-1)) + C(4,5)

VAR Model - Substituted Coefficients:
===============================
D(FS) =  - 0.0201842444336*( FS(-1) + 4.93965435734*I(-1) - 3.93836649902*IP(-1) + 1.21626341083*REER(-1) +
1.08146646256 ) + 0.0788057985392*D(FS(-1)) - 0.229787735832*D(I(-1)) + 0.0282571783441*D(IP(-1)) +
0.0480328305538*D(REER(-1)) + 0.00404542832285

D(I) =  - 0.00474014723905*( FS(-1) + 4.93965435734*I(-1) - 3.93836649902*IP(-1) + 1.21626341083*REER(-1) +
1.08146646256 ) + 0.0483434132657*D(FS(-1)) - 0.127870168277*D(I(-1)) - 0.0222938966777*D(IP(-1)) +
0.0890680129971*D(REER(-1)) - 0.000501728398882
```

D(IP) = - 0.00840936296584*(FS(-1) + 4.93965435734*I(-1) - 3.93836649902*IP(-1) + 1.21626341083*REER(-1) + 1.08146646256) + 0.102981595983*D(FS(-1)) - 0.441852620012*D(I(-1)) - 0.293848006573*D(IP(-1)) - 0.0915153246972*D(REER(-1)) + 0.000958352009648

D(REER) = - 0.00363875931845*(FS(-1) + 4.93965435734*I(-1) - 3.93836649902*IP(-1) + 1.21626341083*REER(-1) + 1.08146646256) - 0.0184159328771*D(FS(-1)) + 0.186681759152*D(I(-1)) + 0.00322252323252*D(IP(-1)) + 0.12968127245*D(REER(-1)) + 0.000648331228565

Table E2b: THE VECM regressions (both PRF and SRF). Different and final ordering

D(IP) = 0.0331191533827*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) - 0.293848006573*D(IP(-1)) - 0.0915153246972*D(REER(-1)) + 0.102981595983*D(FS(-1)) - 0.441852620012*D(I(-1)) + 0.000958352009648

D(REER) = 0.0143307677978*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) + 0.00322252323252*D(IP(-1)) + 0.12968127245*D(REER(-1)) - 0.0184159328771*D(FS(-1)) + 0.186681759152*D(I(-1)) + 0.000648331228565

D(FS) = 0.0794929520852*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) + 0.0282571783441*D(IP(-1)) + 0.0480328305538*D(REER(-1)) + 0.0788057985392*D(FS(-1)) - 0.229787735832*D(I(-1)) + 0.00404542832285

D(I) = 0.0186684370867*(IP(-1) - 0.30882433393*REER(-1) - 0.253912377187*FS(-1) - 1.25423938035*I(-1) - 0.274597720358) - 0.0222938966777*D(IP(-1)) + 0.0890680129971*D(REER(-1)) + 0.0483434132657*D(FS(-1)) - 0.127870168277*D(I(-1)) - 0.000501728398882

Table E3: The VECM regressions (both PRF and SRF). Plus Dummy variable (dum=1, since 2008M9)

Vector Error Correction Estimates
Date: 11/09/17 Time: 16:53
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

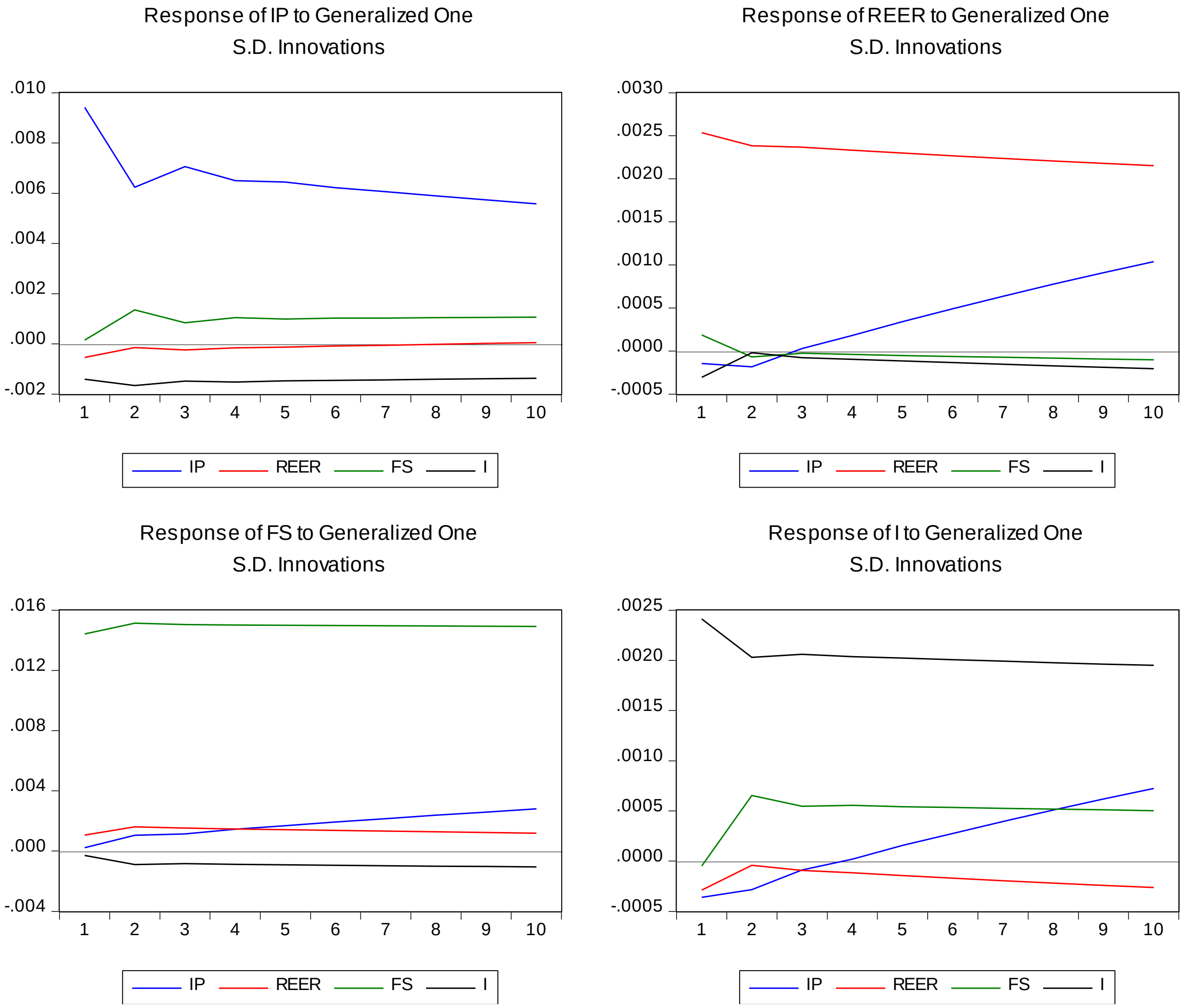
Cointegrating Eq:	CointEq1
IP(-1)	1.000000
REER(-1)	-0.706579
	(0.39960)
	[-1.76820]
FS(-1)	-0.093501
	(0.07010)
	[-1.33390]
I(-1)	1.115453
	(0.62505)
	[1.78457]
C	-0.251934

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.078744	0.024331	0.010042	0.023008

	(0.02534)	(0.00689)	(0.03963)	(0.00664)
	[-3.10742]	[3.52987]	[0.25341]	[3.46359]
D(IP(-1))	-0.309668	-0.024049	0.052542	-0.015772
	(0.07227)	(0.01966)	(0.11302)	(0.01895)
	[-4.28465]	[-1.22329]	[0.46490]	[-0.83243]
D(REER(-1))	-0.111596	-0.039925	0.170538	0.089856
	(0.22010)	(0.05987)	(0.34418)	(0.05770)
	[-0.50703]	[-0.66687]	[0.49549]	[1.55736]
D(FS(-1))	0.074395	-0.014746	0.046322	0.050926
	(0.04831)	(0.01314)	(0.07555)	(0.01267)
	[1.53979]	[-1.12203]	[0.61311]	[4.02084]
D(I(-1))	-0.256946	0.089364	-0.156172	-0.148547
	(0.27932)	(0.07598)	(0.43678)	(0.07322)
	[-0.91990]	[1.17620]	[-0.35755]	[-2.02871]
C	0.005443	0.000445	0.005701	-0.001244
	(0.00148)	(0.00040)	(0.00231)	(0.00039)
	[3.68350]	[1.10777]	[2.46714]	[-3.21029]
DUM	-0.007746	0.000627	-0.002331	0.001464
	(0.00246)	(0.00067)	(0.00385)	(0.00065)
	[-3.14357]	[0.93548]	[-0.60493]	[2.26644]
R-squared	0.216156	0.472448	0.091822	0.193159
Adj. R-squared	0.179051	0.447475	0.048831	0.154965
Sum sq. resids	0.014419	0.001067	0.035260	0.000991
S.E. equation	0.009237	0.002513	0.014444	0.002421
F-statistic	5.825512	18.91846	2.135853	5.057354
Log likelihood	585.8949	817.6371	506.3140	824.2106
Akaike AIC	-6.481965	-9.085810	-5.587798	-9.159669
Schwarz SC	-6.321089	-8.924934	-5.426921	-8.998793
Mean dependent	0.001160	0.000613	0.004506	-0.000223
S.D. dependent	0.010195	0.003380	0.014810	0.002634

Determinant resid covariance (dof adj.)	6.31E-19
Determinant resid covariance	5.13E-19
Log likelihood	2737.918
Akaike information criterion	-30.31369
Schwarz criterion	-29.59868

Figure E1: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=10)



Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

Figure E2: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=40)

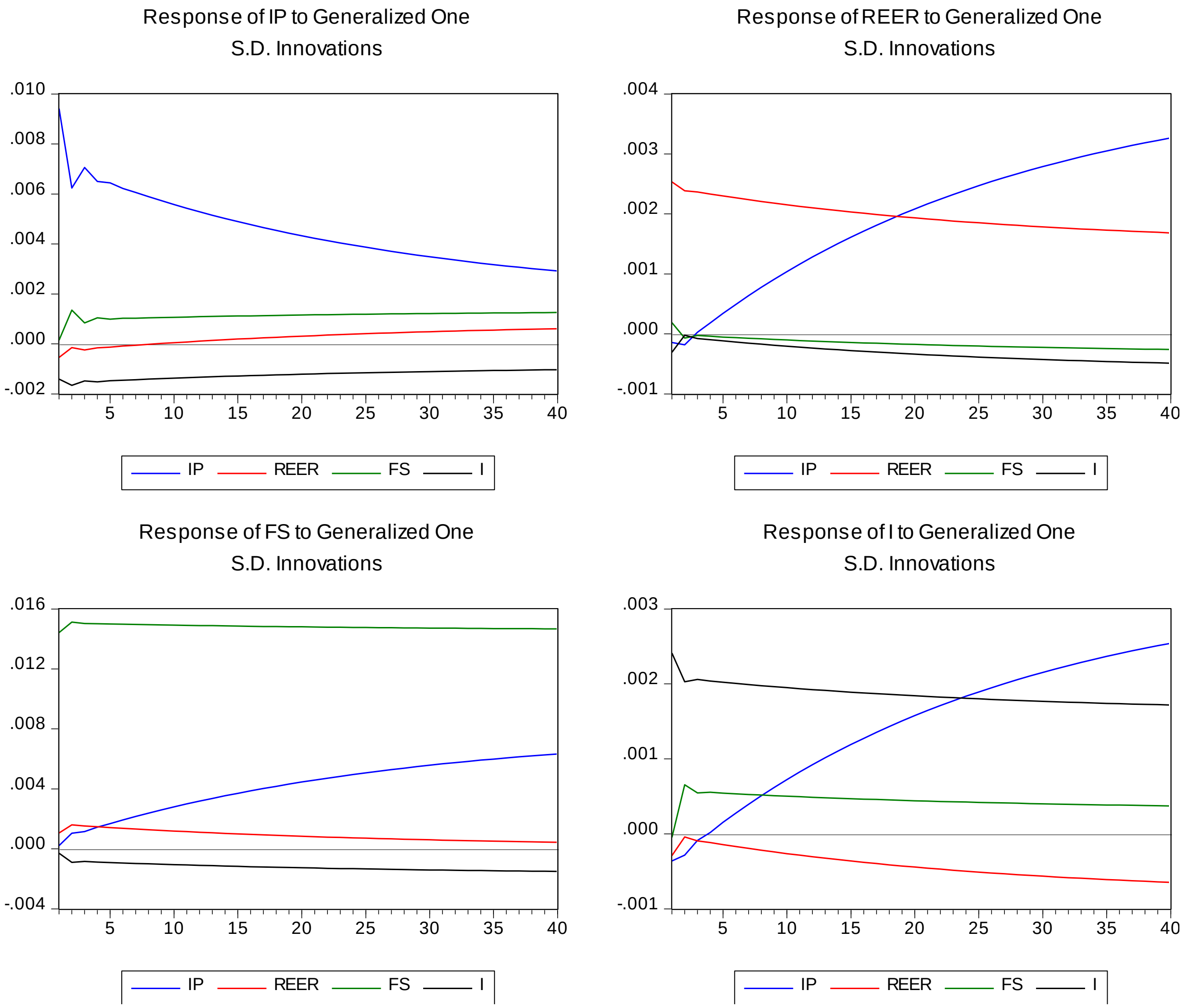


Figure E3: Cholesky decomposed Impulse Response Functions with specific ordering

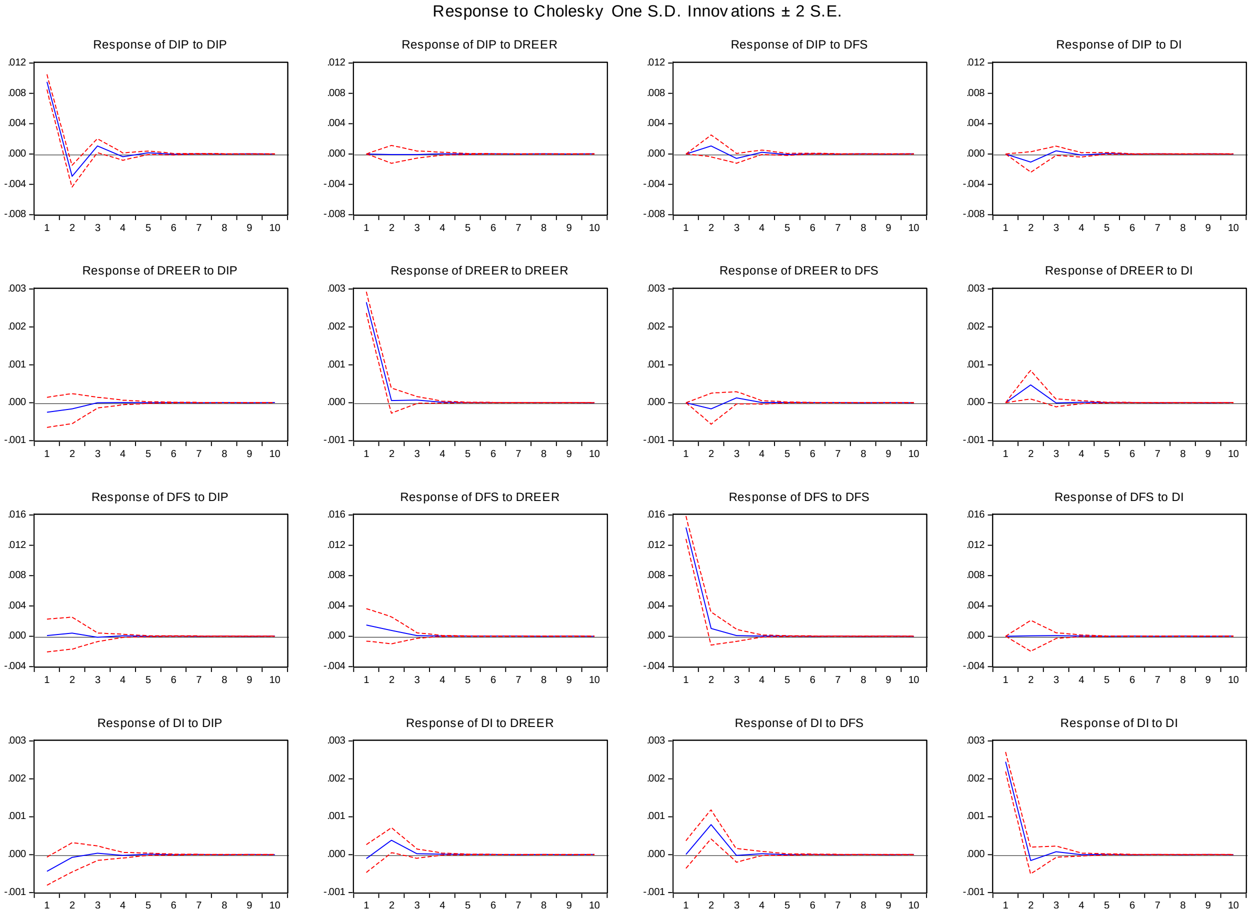
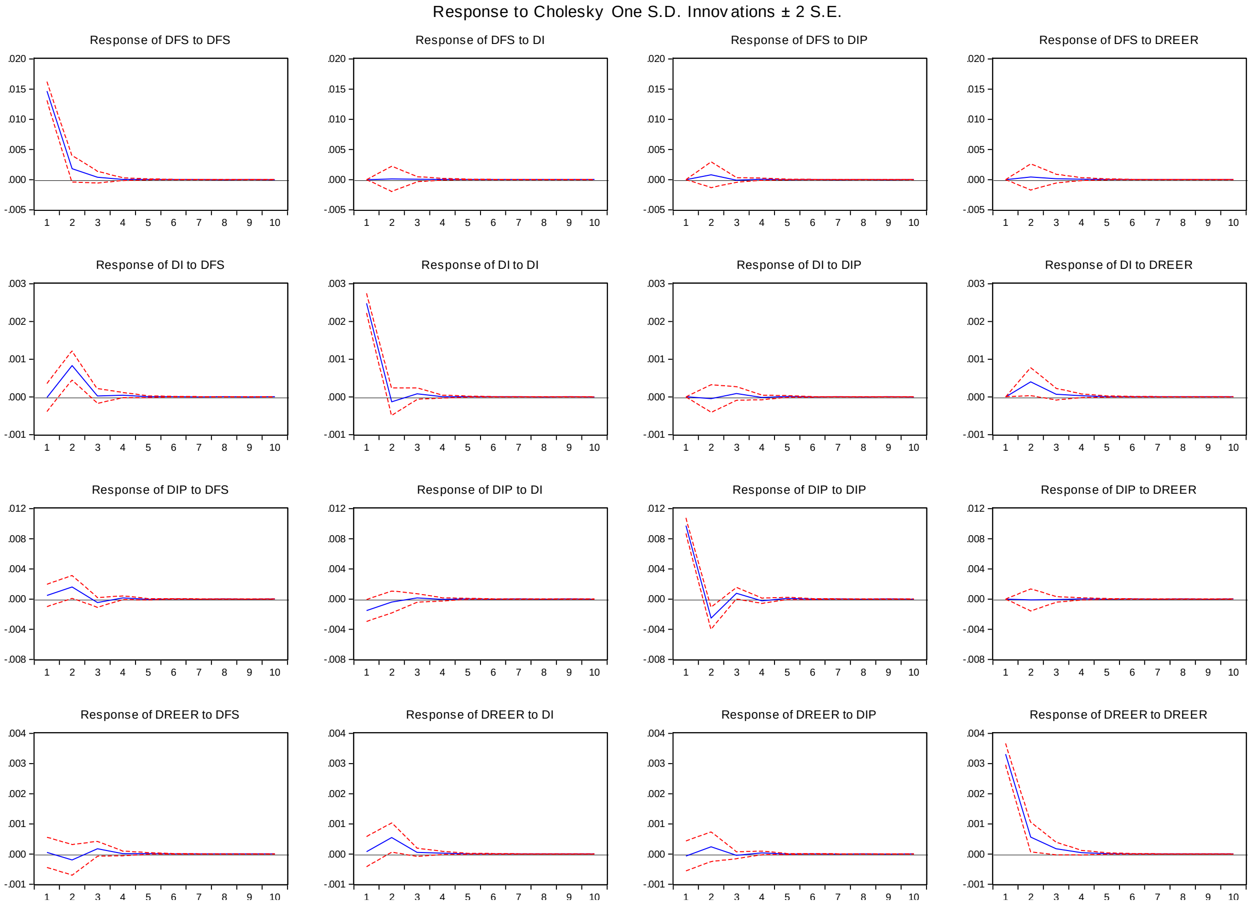


Figure E4: Cholesky decomposed Impulse Response Functions with different ordering



APPENDIX B

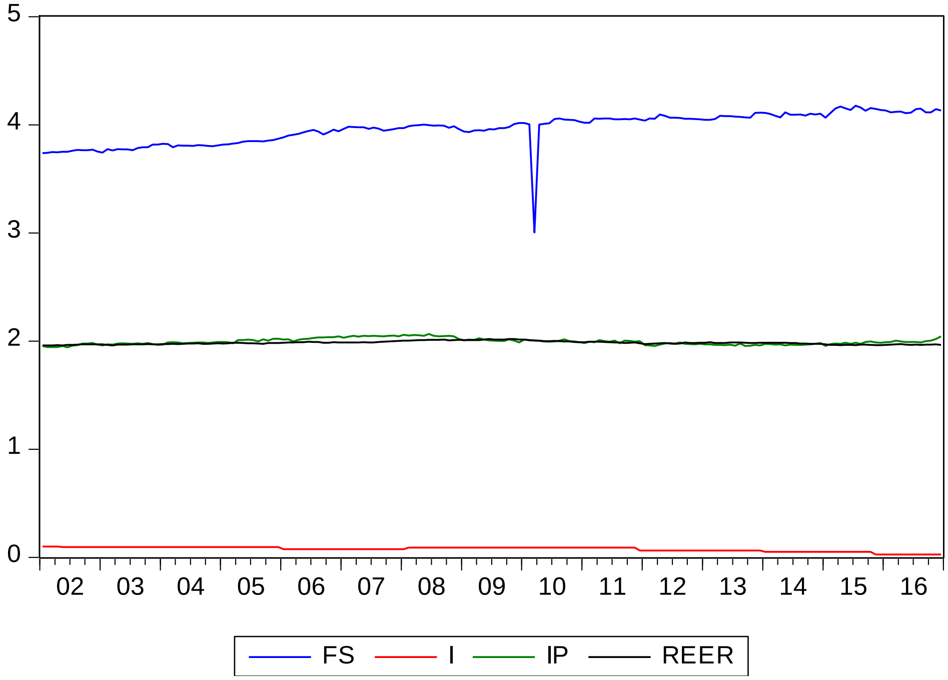
Determining the Relationship between the investigated variables. The case of Croatia

Part A: Statistical measures and level graphs

Table A1: STATISTICAL TABLES FOR ALL FOUR VARIABLES

	FS	I	IP	REER
Mean	3.967631	0.075597	1.994774	1.983274
Median	3.992300	0.090000	1.990117	1.982038
Maximum	4.175814	0.100000	2.065580	2.018918
Minimum	3.003508	0.025000	1.942504	1.958143
Std. Dev.	0.143407	0.021539	0.028629	0.015292
Skewness	-1.888259	-0.965237	0.532336	0.532066
Kurtosis	12.53115	2.912229	2.451495	2.447930
Jarque-Bera	788.2874	28.00827	10.75786	10.77869
Probability	0.000000	0.000001	0.004613	0.004565
Sum	714.1736	13.60750	359.0593	356.9893
Sum Sq. Dev.	3.681215	0.083042	0.146713	0.041860
Observations	180	180	180	180

Figure A1: All four variables from 1/1/2002 to 31/12/2016



Part B: On cointegration

Table B1: Cointegration (all four variables in level)

```
Date: 11/07/17   Time: 12:08
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)
==================================================================
 Hypothesized                  Trace         0.05
  No. of CE(s)   Eigenvalue   Statistic   Critical Value   Prob.**
==================================================================
    None *        0.142885    50.26614      47.85613       0.0292
   At most 1      0.077001    22.97565      29.79707       0.2473
   At most 2      0.046647    8.793115      15.49471       0.3849
   At most 3      0.001907    0.337775      3.841466       0.5611
==================================================================
 Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
==================================================================
 Hypothesized                Max-Eigen       0.05
  No. of CE(s)   Eigenvalue   Statistic   Critical Value   Prob.**
==================================================================
     None         0.142885    27.29049      27.58434       0.0545
   At most 1      0.077001    14.18254      21.13162       0.3503
   At most 2      0.046647    8.455341      14.26460       0.3343
   At most 3      0.001907    0.337775      3.841466       0.5611
==================================================================
 Max-eigenvalue test indicates no cointegration at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
==================================================================
      IP          REER          FS            I
   3.680865    -48.94178     14.72270     80.94969
  -6.776888     79.20890    -0.773225    -5.935858
  -39.08812     54.79072    -0.904886    -36.13507
   26.76184    -11.37201     0.765915    -36.90205
==================================================================

 Unrestricted Adjustment Coefficients (alpha):
==================================================================
    D(IP)      -0.000411    -0.002060     0.001058     0.000113
   D(REER)     -9.70E-05    -0.000381    -0.000474     4.17E-05
    D(FS)      -0.027618    -0.003397    -0.001196    -0.001988
    D(I)       -0.000677     0.000353     4.05E-05     0.000116
==================================================================

1 Cointegrating Equation(s):     Log likelihood     2315.142
==================================================================
```

```
Normalized cointegrating coefficients (standard error in parentheses)
        IP              REER            FS              I
     1.000000       -13.29627       3.999794       21.99203
                    (4.44653)      (0.75145)      (4.88547)

Adjustment coefficients (standard error in parentheses)
       D(IP)        -0.001511
                    (0.00265)
     D(REER)        -0.000357
                    (0.00079)
       D(FS)        -0.101659
                    (0.02354)
        D(I)        -0.002493
                    (0.00097)
=========================================================================

2 Cointegrating Equation(s):       Log likelihood        2322.233
=========================================================================
Normalized cointegrating coefficients (standard error in parentheses)
        IP              REER            FS              I
     1.000000        0.000000      -28.12684      -152.5945
                                   (6.09880)      (37.5938)
     0.000000        1.000000      -2.416214      -13.13049
                                   (0.49547)      (3.05415)

Adjustment coefficients (standard error in parentheses)
       D(IP)         0.012451      -0.143095
                    (0.00542)      (0.06548)
     D(REER)         0.002222      -0.025393
                    (0.00164)      (0.01977)
       D(FS)        -0.078640       1.082642
                    (0.04928)      (0.59494)
        D(I)        -0.004887       0.061132
                    (0.00201)      (0.02431)
=========================================================================

3 Cointegrating Equation(s):       Log likelihood        2326.461
=========================================================================
Normalized cointegrating coefficients (standard error in parentheses)
        IP              REER            FS              I
     1.000000        0.000000       0.000000       0.872378
                                                  (0.55761)
     0.000000        1.000000       0.000000       0.052962
                                                  (0.19704)
     0.000000        0.000000       1.000000       5.456242
                                                  (0.86655)

Adjustment coefficients (standard error in parentheses)
       D(IP)        -0.028897      -0.085137      -0.005409
                    (0.02783)      (0.07546)      (0.01032)
     D(REER)         0.020761      -0.051380      -0.000704
                    (0.00833)      (0.02259)      (0.00309)
       D(FS)        -0.031907       1.017135      -0.402909
                    (0.25455)      (0.69023)      (0.09437)
        D(I)        -0.006469       0.063349      -0.010282
                    (0.01040)      (0.02820)      (0.00386)
=========================================================================
```

Table B2:

```
Date: 11/07/17   Time: 12:21
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)
==========================================================================
 Hypothesized                      Trace           0.01
  No. of CE(s)     Eigenvalue     Statistic    Critical Value     Prob.**
==========================================================================
     None          0.142885       50.26614       54.68150         0.0292
   At most 1       0.077001       22.97565       35.45817         0.2473
   At most 2       0.046647       8.793115       19.93711         0.3849
   At most 3       0.001907       0.337775       6.634897         0.5611
==========================================================================
 Trace test indicates no cointegration at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
==========================================================================
 Hypothesized                    Max-Eigen         0.01
  No. of CE(s)     Eigenvalue     Statistic    Critical Value     Prob.**
==========================================================================
     None          0.142885       27.29049       32.71527         0.0545
   At most 1       0.077001       14.18254       25.86121         0.3503
   At most 2       0.046647       8.455341       18.52001         0.3343
   At most 3       0.001907       0.337775       6.634897         0.5611
==========================================================================
 Max-eigenvalue test indicates no cointegration at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
==========================================================================
       IP            REER            FS              I
    3.680865      -48.94178       14.72270       80.94969
   -6.776888       79.20890      -0.773225      -5.935858
   -39.08812       54.79072      -0.904886      -36.13507
    26.76184      -11.37201       0.765915      -36.90205
==========================================================================

 Unrestricted Adjustment Coefficients (alpha):
==========================================================================
     D(IP)        -0.000411      -0.002060       0.001058       0.000113
    D(REER)       -9.70E-05      -0.000381      -0.000474       4.17E-05
     D(FS)        -0.027618      -0.003397      -0.001196      -0.001988
     D(I)         -0.000677       0.000353       4.05E-05       0.000116
==========================================================================

1 Cointegrating Equation(s):       Log likelihood     2315.142
==========================================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS              I
```

```
 1.000000   -13.29627   3.999794   21.99203
            (4.44653)  (0.75145)  (4.88547)

Adjustment coefficients (standard error in parentheses)
D(IP)       -0.001511
            (0.00265)
D(REER)     -0.000357
            (0.00079)
D(FS)       -0.101659
            (0.02354)
D(I)        -0.002493
            (0.00097)
==========================================================

2 Cointegrating Equation(s):   Log likelihood   2322.233
==========================================================
Normalized cointegrating coefficients (standard error in parentheses)
    IP          REER        FS          I
 1.000000    0.000000   -28.12684   -152.5945
                        (6.09880)   (37.5938)
 0.000000    1.000000   -2.416214   -13.13049
                        (0.49547)   (3.05415)

Adjustment coefficients (standard error in parentheses)
D(IP)        0.012451   -0.143095
            (0.00542)   (0.06548)
D(REER)      0.002222   -0.025393
            (0.00164)   (0.01977)
D(FS)       -0.078640    1.082642
            (0.04928)   (0.59494)
D(I)        -0.004887    0.061132
            (0.00201)   (0.02431)
==========================================================

3 Cointegrating Equation(s):   Log likelihood   2326.461
==========================================================
Normalized cointegrating coefficients (standard error in parentheses)
    IP          REER        FS          I
 1.000000    0.000000    0.000000    0.872378
                                    (0.55761)
 0.000000    1.000000    0.000000    0.052962
                                    (0.19704)
 0.000000    0.000000    1.000000    5.456242
                                    (0.86655)

Adjustment coefficients (standard error in parentheses)
D(IP)       -0.028897   -0.085137   -0.005409
            (0.02783)   (0.07546)   (0.01032)
D(REER)      0.020761   -0.051380   -0.000704
            (0.00833)   (0.02259)   (0.00309)
D(FS)       -0.031907    1.017135   -0.402909
            (0.25455)   (0.69023)   (0.09437)
D(I)        -0.006469    0.063349   -0.010282
            (0.01040)   (0.02820)   (0.00386)
==========================================================
```

Table B3:

```
Date: 11/07/17   Time: 12:11
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)
==============================================================================
 Hypothesized                       Trace          0.01
  No. of CE(s)     Eigenvalue     Statistic    Critical Value      Prob.**
==============================================================================
   None *          0.205147       58.70086       54.68150          0.0035
  At most 1        0.059797       17.83237       35.45817          0.5785
  At most 2        0.036456       6.857063       19.93711          0.5943
  At most 3        0.001385       0.246674       6.634897          0.6194
==============================================================================
 Trace test indicates 1 cointegrating eqn(s) at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
==============================================================================
 Hypothesized                     Max-Eigen        0.01
  No. of CE(s)     Eigenvalue     Statistic    Critical Value      Prob.**
==============================================================================
   None *          0.205147       40.86849       32.71527          0.0006
  At most 1        0.059797       10.97531       25.86121          0.6498
  At most 2        0.036456       6.610389       18.52001          0.5362
  At most 3        0.001385       0.246674       6.634897          0.6194
==============================================================================
 Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
==============================================================================
      IP             REER            FS              I
   10.96615       -61.64173       13.08910       73.27987
  -11.07841        74.65405       1.710152       0.390551
  -36.40720        32.01768       0.853019      -23.78934
   24.84455       -8.409240      -0.311913      -42.85670
==============================================================================

 Unrestricted Adjustment Coefficients (alpha):
==============================================================================
    D(IP)        -0.000109       -0.001452       0.001285       0.000108
   D(REER)        0.000171       -0.000453      -0.000339       3.93E-05
    D(FS)        -0.037615       -0.006509      -0.001630      -0.001224
    D(I)         -0.000677        0.000275      -4.55E-05       0.000109
==============================================================================

1 Cointegrating Equation(s):       Log likelihood      2317.259
==============================================================================
Normalized cointegrating coefficients (standard error in parentheses)
      IP             REER            FS              I
```

```
     1.000000        -5.621093         1.193591         6.682372
                     (1.11864)        (0.17934)        (1.19376)

Adjustment coefficients (standard error in parentheses)
     D(IP)           -0.001193
                     (0.00789)
     D(REER)          0.001872
                     (0.00234)
     D(FS)           -0.412493
                     (0.07167)
     D(I)            -0.007424
                     (0.00285)
=================================================================

2 Cointegrating Equation(s):      Log likelihood      2322.747
=================================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP              REER              FS                I
     1.000000         0.000000         7.973286         40.46934
                                      (1.81666)        (11.4303)
     0.000000         1.000000         1.206117         6.010747
                                      (0.30986)        (1.94963)

Adjustment coefficients (standard error in parentheses)
     D(IP)            0.014891        -0.101680
                     (0.01108)        (0.06881)
     D(REER)          0.006891        -0.044344
                     (0.00328)        (0.02037)
     D(FS)           -0.340387         1.832760
                     (0.10158)        (0.63087)
     D(I)            -0.010465         0.062226
                     (0.00404)        (0.02507)
=================================================================

3 Cointegrating Equation(s):      Log likelihood      2326.052
=================================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP              REER              FS                I
     1.000000         0.000000         0.000000         0.775593
                                                       (0.62514)
     0.000000         1.000000         0.000000         0.006285
                                                       (0.22414)
     0.000000         0.000000         1.000000         4.978342
                                                       (0.94319)

Adjustment coefficients (standard error in parentheses)
     D(IP)           -0.031903        -0.060528        -0.002811
                     (0.02788)        (0.07178)        (0.00931)
     D(REER)          0.019251        -0.055214         0.001170
                     (0.00827)        (0.02129)        (0.00276)
     D(FS)           -0.281030         1.780560        -0.504870
                     (0.25802)        (0.66435)        (0.08618)
     D(I)            -0.008810         0.060771        -0.008430
                     (0.01026)        (0.02641)        (0.00343)
=================================================================
```

Table B4:

Date: 11/07/17 Time: 12:10
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.205147	58.70086	47.85613	0.0035
At most 1	0.059797	17.83237	29.79707	0.5785
At most 2	0.036456	6.857063	15.49471	0.5943
At most 3	0.001385	0.246674	3.841466	0.6194

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.205147	40.86849	27.58434	0.0006
At most 1	0.059797	10.97531	21.13162	0.6498
At most 2	0.036456	6.610389	14.26460	0.5362
At most 3	0.001385	0.246674	3.841466	0.6194

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

IP	REER	FS	I
10.96615	-61.64173	13.08910	73.27987
-11.07841	74.65405	1.710152	0.390551
-36.40720	32.01768	0.853019	-23.78934
24.84455	-8.409240	-0.311913	-42.85670

Unrestricted Adjustment Coefficients (alpha):

D(IP)	-0.000109	-0.001452	0.001285	0.000108
D(REER)	0.000171	-0.000453	-0.000339	3.93E-05
D(FS)	-0.037615	-0.006509	-0.001630	-0.001224
D(I)	-0.000677	0.000275	-4.55E-05	0.000109

1 Cointegrating Equation(s):	Log likelihood	2317.259

Normalized cointegrating coefficients (standard error in parentheses)

IP	REER	FS	I

```
       1.000000          -5.621093           1.193591           6.682372
                         (1.11864)          (0.17934)          (1.19376)

Adjustment coefficients (standard error in parentheses)
       D(IP)             -0.001193
                         (0.00789)
       D(REER)            0.001872
                         (0.00234)
       D(FS)             -0.412493
                         (0.07167)
       D(I)              -0.007424
                         (0.00285)
=======================================================================

2 Cointegrating Equation(s):       Log likelihood       2322.747
=======================================================================
Normalized cointegrating coefficients (standard error in parentheses)
          IP               REER                FS                  I
       1.000000           0.000000           7.973286           40.46934
                                            (1.81666)          (11.4303)
       0.000000           1.000000           1.206117           6.010747
                                            (0.30986)          (1.94963)

Adjustment coefficients (standard error in parentheses)
       D(IP)              0.014891          -0.101680
                         (0.01108)          (0.06881)
       D(REER)            0.006891          -0.044344
                         (0.00328)          (0.02037)
       D(FS)             -0.340387           1.832760
                         (0.10158)          (0.63087)
       D(I)              -0.010465           0.062226
                         (0.00404)          (0.02507)
=======================================================================

3 Cointegrating Equation(s):       Log likelihood       2326.052
=======================================================================
Normalized cointegrating coefficients (standard error in parentheses)
          IP               REER                FS                  I
       1.000000           0.000000           0.000000           0.775593
                                                               (0.62514)
       0.000000           1.000000           0.000000           0.006285
                                                               (0.22414)
       0.000000           0.000000           1.000000           4.978342
                                                               (0.94319)

Adjustment coefficients (standard error in parentheses)
       D(IP)             -0.031903          -0.060528          -0.002811
                         (0.02788)          (0.07178)          (0.00931)
       D(REER)            0.019251          -0.055214           0.001170
                         (0.00827)          (0.02129)          (0.00276)
       D(FS)             -0.281030           1.780560          -0.504870
                         (0.25802)          (0.66435)          (0.08618)
       D(I)              -0.008810           0.060771          -0.008430
                         (0.01026)          (0.02641)          (0.00343)
=======================================================================
```

Table B5:

```
Date: 11/07/17   Time: 12:23
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)
======================================================================
 Hypothesized                      Trace          0.01
  No. of CE(s)     Eigenvalue    Statistic    Critical Value    Prob.**
======================================================================
   None *          0.205147      58.70086      54.68150         0.0035
   At most 1       0.059797      17.83237      35.45817         0.5785
   At most 2       0.036456      6.857063      19.93711         0.5943
   At most 3       0.001385      0.246674      6.634897         0.6194
======================================================================
 Trace test indicates 1 cointegrating eqn(s) at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
======================================================================
 Hypothesized                    Max-Eigen        0.01
  No. of CE(s)     Eigenvalue    Statistic    Critical Value    Prob.**
======================================================================
   None *          0.205147      40.86849      32.71527         0.0006
   At most 1       0.059797      10.97531      25.86121         0.6498
   At most 2       0.036456      6.610389      18.52001         0.5362
   At most 3       0.001385      0.246674      6.634897         0.6194
======================================================================
 Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.01 level
 * denotes rejection of the hypothesis at the 0.01 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
======================================================================
       IP            REER            FS             I
   10.96615       -61.64173       13.08910       73.27987
  -11.07841        74.65405       1.710152       0.390551
  -36.40720        32.01768       0.853019      -23.78934
   24.84455       -8.409240      -0.311913      -42.85670
======================================================================

 Unrestricted Adjustment Coefficients (alpha):
======================================================================
     D(IP)       -0.000109      -0.001452       0.001285       0.000108
    D(REER)       0.000171      -0.000453      -0.000339       3.93E-05
     D(FS)       -0.037615      -0.006509      -0.001630      -0.001224
     D(I)        -0.000677       0.000275      -4.55E-05       0.000109
======================================================================

1 Cointegrating Equation(s):      Log likelihood      2317.259
======================================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS             I
```

```
 1.000000     -5.621093      1.193591      6.682372
              (1.11864)     (0.17934)     (1.19376)

Adjustment coefficients (standard error in parentheses)
   D(IP)      -0.001193
              (0.00789)
  D(REER)      0.001872
              (0.00234)
   D(FS)      -0.412493
              (0.07167)
    D(I)      -0.007424
              (0.00285)
================================================================

2 Cointegrating Equation(s):     Log likelihood     2322.747
================================================================

Normalized cointegrating coefficients (standard error in parentheses)
     IP          REER           FS             I
 1.000000      0.000000      7.973286      40.46934
                            (1.81666)     (11.4303)
 0.000000      1.000000      1.206117      6.010747
                            (0.30986)     (1.94963)

Adjustment coefficients (standard error in parentheses)
   D(IP)       0.014891     -0.101680
              (0.01108)     (0.06881)
  D(REER)      0.006891     -0.044344
              (0.00328)     (0.02037)
   D(FS)      -0.340387      1.832760
              (0.10158)     (0.63087)
    D(I)      -0.010465      0.062226
              (0.00404)     (0.02507)
================================================================

3 Cointegrating Equation(s):     Log likelihood     2326.052
================================================================

Normalized cointegrating coefficients (standard error in parentheses)
     IP          REER           FS             I
 1.000000      0.000000      0.000000      0.775593
                                          (0.62514)
 0.000000      1.000000      0.000000      0.006285
                                          (0.22414)
 0.000000      0.000000      1.000000      4.978342
                                          (0.94319)

Adjustment coefficients (standard error in parentheses)
   D(IP)      -0.031903     -0.060528     -0.002811
              (0.02788)     (0.07178)     (0.00931)
  D(REER)      0.019251     -0.055214      0.001170
              (0.00827)     (0.02129)     (0.00276)
   D(FS)      -0.281030      1.780560     -0.504870
              (0.25802)     (0.66435)     (0.08618)
    D(I)      -0.008810      0.060771     -0.008430
              (0.01026)     (0.02641)     (0.00343)
================================================================
```

Table B6: Group cointegration summary
Date: 11/07/17 Time: 12:24
Sample: 2002M01 2016M12
Included observations: 177
Series: IP REER FS I
Lags interval: 1 to **2**

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	1	1	1	1
Max-Eig	1	0	0	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2298.812	2298.812	2301.497	2301.497	2304.493
1	2312.277	2312.459	2315.142	2327.406	2330.368
2	2317.244	2321.695	2322.233	2336.369	2338.526
3	2319.278	2325.980	2326.461	2343.402	2345.558
4	2319.664	2326.630	2326.630	2347.598	2347.598
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-25.61369	-25.61369	-25.59883	-25.59883	-25.58749
1	-25.67545	-25.66621	-25.66262	-25.78989	-25.78947
2	-25.64118	-25.66887	-25.65235	-25.78948	-25.79125*
3	-25.57377	-25.61559	-25.60973	-25.76725	-25.78032
4	-25.48772	-25.52124	-25.52124	-25.71297	-25.71297
	Schwarz Criteria by Rank (rows)				

	and Model (columns)				
0	-25.03948*	-25.03948*	-24.95284	-24.95284	-24.86971
1	-24.95768	-24.93049	-24.87307	-24.98240	-24.92815
2	-24.77985	-24.77166	-24.71925	-24.82049	-24.78637
3	-24.56888	-24.55687	-24.53307	-24.63676	-24.63188
4	-24.33929	-24.30103	-24.30103	-24.42098	-24.42098

Table B7:

Date: 11/07/17 Time: 12:24
Sample: 2002M01 2016M12
Included observations: 178
Series: IP REER FS I
Lags interval: 1 to **1**

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	1	1	1	1
Max-Eig	1	1	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2294.547	2294.547	2296.825	2296.825	2298.984
1	2313.503	2315.050	2317.259	2331.594	2333.721
2	2317.235	2322.145	2322.747	2340.398	2342.287
3	2319.106	2325.628	2326.052	2345.791	2347.464
4	2319.393	2326.175	2326.175	2349.066	2349.066
	Akaike Information Criteria by Rank (rows) and Model				

	(columns)				
0	-25.60166	-25.60166	-25.58230	-25.58230	-25.56162
1	-25.72475	-25.73090	-25.72201	-25.87184*	-25.86203
2	-25.67680	-25.70949	-25.69378	-25.86964	-25.86839
3	-25.60793	-25.64751	-25.64103	-25.82911	-25.83668
4	-25.52127	-25.55253	-25.55253	-25.76478	-25.76478
	Schwarz Criteria by Rank (rows) and Model (columns)				
0	-25.31565	-25.31565	-25.22480	-25.22480	-25.13262
1	-25.29575	-25.28402	-25.22151	-25.35346*	-25.29003
2	-25.10479	-25.10174	-25.05028	-25.19038	-25.15338
3	-24.89292	-24.87887	-24.85452	-24.98898	-24.97867
4	-24.66327	-24.62302	-24.62302	-24.76377	-24.76377

Part C: On unit root tests

Part C1: Unit root tests in level variables

Table C1.1: Unit roots in level variables

Null Hypothesis: FS has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.155142	0.2237
Test critical values:	1% level	-3.467633	
	5% level	-2.877823	
	10% level	-2.575530	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/28/17 Time: 14:01
Sample (adjusted): 2002M05 2016M12
Included observations: 176 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.113403	0.052620	-2.155142	0.0325
D(FS(-1))	-0.619966	0.083074	-7.462839	0.0000
D(FS(-2))	-0.398256	0.087807	-4.535581	0.0000
D(FS(-3))	-0.185517	0.074796	-2.480304	0.0141
C	0.455108	0.208868	2.178927	**0.0307**

R-squared	0.358252	Mean dependent var	0.002194
Adjusted R-squared	0.343240	S.D. dependent var	0.107818
S.E. of regression	0.087377	Akaike info criterion	-2.009180

```
Sum squared resid        1.305530   Schwarz criterion         -1.919109
Log likelihood           181.8078   Hannan-Quinn criter.      -1.972648
F-statistic              23.86489   Durbin-Watson stat         2.064220
Prob(F-statistic)        0.000000
=======================================================================
```

Table C1.2:

```
Null Hypothesis: FS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=======================================================================
                                              t-Statistic     Prob.*
=======================================================================
Augmented Dickey-Fuller test statistic        -11.83401      0.0000
-----------------------------------------------------------------------
Test critical values:       1% level          -4.010143
                            5% level          -3.435125
                            10% level         -3.141565
=======================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/28/17   Time: 14:01
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
=======================================================================
      Variable          Coefficient    Std. Error   t-Statistic   Prob.
=======================================================================
       FS(-1)            -0.886697     0.074928     -11.83401    0.0000
         C                3.337796     0.282028      11.83500    0.0000
 @TREND("2002M01")        0.002019     0.000207      9.742839    0.0000
=======================================================================
R-squared                0.443136   Mean dependent var         0.002195
Adjusted R-squared       0.436808   S.D. dependent var         0.106908
S.E. of regression       0.080230   Akaike info criterion     -2.191214
Sum squared resid        1.132894   Schwarz criterion         -2.137794
Log likelihood           199.1136   Hannan-Quinn criter.      -2.169552
F-statistic              70.02771   Durbin-Watson stat         2.015009
Prob(F-statistic)        0.000000
=======================================================================
```

Table C1.3:

```
Null Hypothesis: FS has a unit root
Exogenous: None
Lag Length: 4 (Automatic - based on SIC, maxlag=13)
=======================================================================
                                              t-Statistic     Prob.*
=======================================================================
Augmented Dickey-Fuller test statistic         0.875840      0.8973
-----------------------------------------------------------------------
Test critical values:       1% level          -2.578243
                            5% level          -1.942655
                            10% level         -1.615495
=======================================================================
*MacKinnon (1996) one-sided p-values.
```

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/28/17 Time: 14:01
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	0.001460	0.001667	0.875840	0.3824
D(FS(-1))	-0.743454	0.075424	-9.857000	0.0000
D(FS(-2))	-0.537994	0.090741	-5.928924	0.0000
D(FS(-3))	-0.345363	0.090730	-3.806475	0.0002
D(FS(-4))	-0.189191	0.075397	-2.509257	0.0130

R-squared	0.363990	Mean dependent var	0.002177
Adjusted R-squared	0.349025	S.D. dependent var	0.108127
S.E. of regression	0.087240	Akaike info criterion	-2.012143
Sum squared resid	1.293851	Schwarz criterion	-1.921721
Log likelihood	181.0625	Hannan-Quinn criter.	-1.975465
Durbin-Watson stat	2.063758		

(Stationary in level)

Table C1.4:
Null Hypothesis: I has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.091168	0.9476
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/28/17 Time: 14:02
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.001122	0.012303	-0.091168	0.9275
C	-0.000334	0.000969	-0.344443	**0.7309**

R-squared	0.000047	Mean dependent var	-0.000419
Adjusted R-squared	-0.005602	S.D. dependent var	0.003480
S.E. of regression	0.003490	Akaike info criterion	-8.466675
Sum squared resid	0.002156	Schwarz criterion	-8.431062
Log likelihood	759.7674	Hannan-Quinn criter.	-8.452234
F-statistic	0.008312	Durbin-Watson stat	2.026970

```
Prob(F-statistic)          0.927462
==========================================================================
```

Table C1.5:

```
Null Hypothesis: I has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                 t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -1.644571      0.7713
--------------------------------------------------------------------------
Test critical values:          1% level           -4.010143
                               5% level           -3.435125
                               10% level          -3.141565
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/28/17   Time: 14:02
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
==========================================================================
        Variable            Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
          I(-1)              -0.036243      0.022038     -1.644571     0.1018
            C                 0.003889      0.002407      1.616086     0.1079
   @TREND("2002M01")         -1.73E-05      9.04E-06     -1.914487     0.0572
==========================================================================
R-squared                  0.020446    Mean dependent var       -0.000419
Adjusted R-squared         0.009315    S.D. dependent var        0.003480
S.E. of regression         0.003464    Akaike info criterion    -8.476113
Sum squared resid          0.002112    Schwarz criterion        -8.422693
Log likelihood             761.6121    Hannan-Quinn criter.     -8.454452
F-statistic                1.836848    Durbin-Watson stat        1.997769
Prob(F-statistic)          0.162360
==========================================================================
```

Table C1.6:

```
Null Hypothesis: I has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                 t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -1.575385      0.1082
--------------------------------------------------------------------------
Test critical values:          1% level           -2.577945
                               5% level           -1.942614
                               10% level          -1.615522
==========================================================================
*MacKinnon (1996) one-sided p-values.
```

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/28/17 Time: 14:02
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.005203	0.003303	-1.575385	0.1169

R-squared	-0.000623	Mean dependent var	-0.000419
Adjusted R-squared	-0.000623	S.D. dependent var	0.003480
S.E. of regression	0.003481	Akaike info criterion	-8.477178
Sum squared resid	0.002157	Schwarz criterion	-8.459371
Log likelihood	759.7074	Hannan-Quinn criter.	-8.469958
Durbin-Watson stat	2.017362		

(not stationary in level)

Table C1.7:
Null Hypothesis: IP has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.510294	0.5262
Test critical values:	1% level	-3.467851	
	5% level	-2.877919	
	10% level	-2.575581	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/28/17 Time: 14:03
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.039315	0.026031	-1.510294	0.1328
D(IP(-1))	-0.320768	0.075843	-4.229367	0.0000
D(IP(-2))	-0.067694	0.080323	-0.842766	0.4006
D(IP(-3))	-0.111222	0.080538	-1.380990	0.1691
D(IP(-4))	-0.320058	0.075537	-4.237092	0.0000
C	0.079217	0.051939	1.525191	**0.1291**

R-squared	0.199317	Mean dependent var	0.000515
Adjusted R-squared	0.175628	S.D. dependent var	0.010284
S.E. of regression	0.009337	Akaike info criterion	-6.475950
Sum squared resid	0.014734	Schwarz criterion	-6.367443
Log likelihood	572.6457	Hannan-Quinn criter.	-6.431937

```
F-statistic              8.413952   Durbin-Watson stat          1.857369
Prob(F-statistic)        0.000000
========================================================================
```

Table C1.8:

```
Null Hypothesis: IP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=13)
========================================================================
                                                 t-Statistic    Prob.*
========================================================================
Augmented Dickey-Fuller test statistic           -1.615725     0.7831
------------------------------------------------------------------------
Test critical values:       1% level             -4.011352
                            5% level             -3.435708
                           10% level             -3.141907
========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/28/17   Time: 14:03
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments
========================================================================
        Variable          Coefficient    Std. Error   t-Statistic   Prob.
========================================================================
         IP(-1)            -0.042882     0.026541     -1.615725    0.1080
        D(IP(-1))          -0.321605     0.075962     -4.233777    0.0000
        D(IP(-2))          -0.071072     0.080578     -0.882031    0.3790
        D(IP(-3))          -0.115315     0.080856     -1.426170    0.1557
        D(IP(-4))          -0.323302     0.075782     -4.266222    0.0000
            C               0.087285     0.053220      1.640062    0.1029
   @TREND("2002M01")       -1.03E-05     1.43E-05     -0.716054    0.4750
========================================================================
R-squared                0.201753   Mean dependent var          0.000515
Adjusted R-squared       0.173244   S.D. dependent var          0.010284
S.E. of regression       0.009351   Akaike info criterion      -6.467569
Sum squared resid        0.014689   Schwarz criterion          -6.340978
Log likelihood           572.9123   Hannan-Quinn criter.       -6.416220
F-statistic              7.076866   Durbin-Watson stat          1.854480
Prob(F-statistic)        0.000001
========================================================================
```

Table C1.9:

```
Null Hypothesis: IP has a unit root
Exogenous: None
Lag Length: 4 (Automatic - based on SIC, maxlag=13)
========================================================================
                                                 t-Statistic    Prob.*
========================================================================
Augmented Dickey-Fuller test statistic            1.077247     0.9264
------------------------------------------------------------------------
Test critical values:       1% level             -2.578243
                            5% level             -1.942655
```

```
                    10% level                   -1.615495
=================================================================

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/28/17   Time: 14:03
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments
=================================================================
      Variable        Coefficient    Std. Error    t-Statistic    Prob.
=================================================================
       IP(-1)           0.000384      0.000357      1.077247     0.2829
      D(IP(-1))        -0.342778      0.074747     -4.585822     0.0000
      D(IP(-2))        -0.082583      0.080038     -1.031789     0.3036
      D(IP(-3))        -0.123967      0.080415     -1.541593     0.1250
      D(IP(-4))        -0.329615      0.075570     -4.361733     0.0000
=================================================================
R-squared               0.188296    Mean dependent var       0.000515
Adjusted R-squared      0.169197    S.D. dependent var       0.010284
S.E. of regression      0.009373    Akaike info criterion   -6.473708
Sum squared resid       0.014937    Schwarz criterion       -6.383286
Log likelihood          571.4495    Hannan-Quinn criter.    -6.437030
Durbin-Watson stat      1.863163
=================================================================
```

(not stationary in level)

Table C1.10:

```
Null Hypothesis: REER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=================================================================
                                               t-Statistic   Prob.*
=================================================================
Augmented Dickey-Fuller test statistic         -1.461722    0.5508
-----------------------------------------------------------------
Test critical values:       1% level           -3.466994
                            5% level           -2.877544
                           10% level           -2.575381
=================================================================

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/28/17   Time: 14:04
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
=================================================================
      Variable        Coefficient    Std. Error    t-Statistic    Prob.
=================================================================
      REER(-1)         -0.020153      0.013787     -1.461722     0.1456
          C             0.040005      0.027346      1.462910     0.1453
=================================================================
R-squared               0.011927    Mean dependent var       3.37E-05
```

Adjusted R-squared	0.006345	S.D. dependent var	0.002818
S.E. of regression	0.002809	Akaike info criterion	-8.900631
Sum squared resid	0.001397	Schwarz criterion	-8.865018
Log likelihood	798.6065	Hannan-Quinn criter.	-8.886190
F-statistic	2.136631	Durbin-Watson stat	1.871252
Prob(F-statistic)	0.145590		

Table C1.11:
Null Hypothesis: REER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.450135	0.8427
Test critical values:	1% level	-4.010143	
	5% level	-3.435125	
	10% level	-3.141565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/28/17 Time: 14:04
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-0.019831	0.013675	-1.450135	0.1488
C	0.040086	0.027122	1.477981	**0.1412**
@TREND("2002M01")	-8.00E-06	4.03E-06	-1.984843	**0.0487**

R-squared	0.033560	Mean dependent var	3.37E-05
Adjusted R-squared	0.022578	S.D. dependent var	0.002818
S.E. of regression	0.002786	Akaike info criterion	-8.911595
Sum squared resid	0.001366	Schwarz criterion	-8.858175
Log likelihood	800.5878	Hannan-Quinn criter.	-8.889934
F-statistic	3.055859	Durbin-Watson stat	1.913719
Prob(F-statistic)	0.049588		

Table C1.12:
Null Hypothesis: REER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.148624	0.7280
Test critical values:	1% level	-2.577945	
	5% level	-1.942614	
	10% level	-1.615522	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/28/17 Time: 14:05
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	1.58E-05	0.000106	0.148624	0.8820

R-squared	-0.000019	Mean dependent var	3.37E-05
Adjusted R-squared	-0.000019	S.D. dependent var	0.002818
S.E. of regression	0.002818	Akaike info criterion	-8.899786
Sum squared resid	0.001414	Schwarz criterion	-8.881979
Log likelihood	797.5308	Hannan-Quinn criter.	-8.892566
Durbin-Watson stat	1.886396		

(not stationary in level)

Table C1.13: Group unit root test summary
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/28/17 Time: 14:07
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 9
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.51054	0.6952	4	703
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	5.28180	0.7271	4	703
PP - Fisher Chi-square	5.31931	0.7230	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Table C1.14: Group unit root test summary
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/28/17 Time: 14:07
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				

Levin, Lin & Chu t*	0.46042	0.6774	4	708
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	5.45259	0.7083	4	708
PP - Fisher Chi-square	5.31931	0.7230	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C1.15: Group unit root test summary
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/28/17 Time: 14:07
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.38513	0.6499	4	709
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.49213	0.6887	4	709
ADF - Fisher Chi-square	5.57964	0.6942	4	709
PP - Fisher Chi-square	29.9523	0.0002	4	716

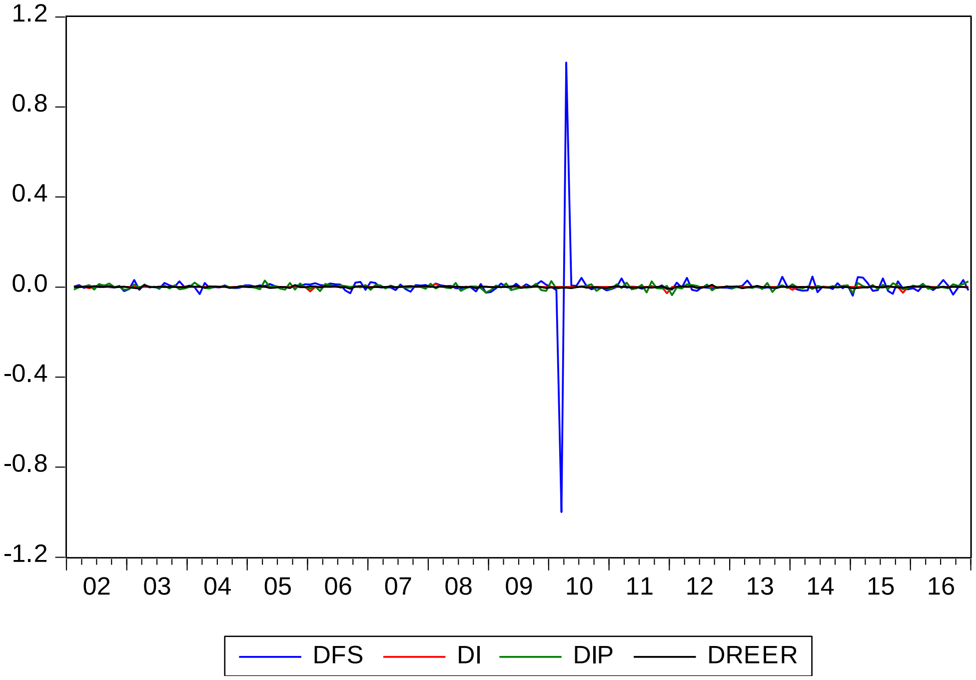
** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C1.16: Group unit root test summary
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/28/17 Time: 14:10
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, **individual linear trends**
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 4
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-2.21107	0.0135	4	712
Breitung t-stat	1.66890	0.9524	4	708
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-5.06445	0.0000	4	712
ADF - Fisher Chi-square	83.7220	0.0000	4	712
PP - Fisher Chi-square	85.9859	0.0000	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure C1: All four variables from 1/1/2002 to 31/12/2016 in first difference



Part C2: Unit root tests in first difference

Table C2.1:

Null Hypothesis: DFS has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.88365	0.0000
Test critical values:	1% level	-3.467851	
	5% level	-2.877919	
	10% level	-2.575581	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/28/17 Time: 14:15
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-2.814544	0.258603	-10.88365	0.0000
D(DFS(-1))	1.071948	0.213764	5.014637	0.0000
D(DFS(-2))	0.534388	0.147887	3.613484	0.0004
D(DFS(-3))	0.189178	0.075354	2.510527	0.0130
C	0.006183	0.006617	0.934420	**0.3514**

R-squared	0.785561	Mean dependent var	-0.000112
Adjusted R-squared	0.780515	S.D. dependent var	0.186157
S.E. of regression	0.087213	Akaike info criterion	-2.012764
Sum squared resid	1.293048	Schwarz criterion	-1.922341
Log likelihood	181.1168	Hannan-Quinn criter.	-1.976086
F-statistic	155.6911	Durbin-Watson stat	2.063830
Prob(F-statistic)	0.000000		

Table C2.2:

Null Hypothesis: DFS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.85716	0.0000
Test critical values:	1% level	-4.011352	
	5% level	-3.435708	
	10% level	-3.141907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/28/17 Time: 14:15
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-2.816271	0.259393	-10.85716	0.0000
D(DFS(-1))	1.073338	0.214413	5.005929	0.0000
D(DFS(-2))	0.535243	0.148327	3.608522	0.0004
D(DFS(-3))	0.189499	0.075570	2.507589	0.0131
C	0.009403	0.013762	0.683211	**0.4954**
@TREND("2002M01")	-3.50E-05	0.000131	-0.267013	**0.7898**

R-squared	0.785651	Mean dependent var	-0.000112
Adjusted R-squared	0.779309	S.D. dependent var	0.186157
S.E. of regression	0.087453	Akaike info criterion	-2.001757
Sum squared resid	1.292503	Schwarz criterion	-1.893250
Log likelihood	181.1537	Hannan-Quinn criter.	-1.957744
F-statistic	123.8867	Durbin-Watson stat	2.064134
Prob(F-statistic)	0.000000		

Table C2.3:

```
Null Hypothesis: DFS has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                   t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic             -10.84749     0.0000
--------------------------------------------------------------------------
Test critical values:         1% level             -2.578243
                              5% level             -1.942655
                              10% level            -1.615495
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/28/17   Time: 14:15
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments
==========================================================================
      Variable          Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
      DFS(-1)           -2.793791      0.257552     -10.84749      0.0000
     D(DFS(-1))          1.055379      0.212948      4.956039      0.0000
     D(DFS(-2))          0.523966      0.147411      3.554446      0.0005
     D(DFS(-3))          0.184941      0.075190      2.459667      0.0149
==========================================================================
R-squared                0.784459   Mean dependent var         -0.000112
Adjusted R-squared       0.780678   S.D. dependent var          0.186157
S.E. of regression       0.087181   Akaike info criterion      -2.019069
Sum squared resid        1.299689   Schwarz criterion          -1.946731
Log likelihood           180.6686   Hannan-Quinn criter.       -1.989727
Durbin-Watson stat       2.060229
==========================================================================
```

(Stationary in first difference as well)

Table C2.4:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                   t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic             -13.46241     0.0000
--------------------------------------------------------------------------
Test critical values:         1% level             -3.467205
                              5% level             -2.877636
                              10% level            -2.575430
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/28/17   Time: 14:16
```

Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-1.014658	0.075370	-13.46241	0.0000
C	-0.000428	0.000264	-1.618080	**0.1074**

R-squared	0.507329	Mean dependent var	0.000000
Adjusted R-squared	0.504530	S.D. dependent var	0.004972
S.E. of regression	0.003500	Akaike info criterion	-8.461197
Sum squared resid	0.002155	Schwarz criterion	-8.425447
Log likelihood	755.0465	Hannan-Quinn criter.	-8.446699
F-statistic	181.2364	Durbin-Watson stat	2.000436
Prob(F-statistic)	0.000000		

Table C2.5:

Null Hypothesis: DI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.49713	0.0000
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/28/17 Time: 14:16
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-1.020257	0.075591	-13.49713	0.0000
C	2.62E-05	0.000531	0.049342	**0.9607**
@TREND("2002M01")	-5.04E-06	5.12E-06	-0.984377	**0.3263**

R-squared	0.510042	Mean dependent var	0.000000
Adjusted R-squared	0.504442	S.D. dependent var	0.004972
S.E. of regression	0.003500	Akaike info criterion	-8.455483
Sum squared resid	0.002144	Schwarz criterion	-8.401857
Log likelihood	755.5380	Hannan-Quinn criter.	-8.433736
F-statistic	91.08672	Durbin-Watson stat	2.000487
Prob(F-statistic)	0.000000		

Table C2.6:

Null Hypothesis: DI has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.30413	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/28/17 Time: 14:17
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-1.000000	0.075165	-13.30413	0.0000

R-squared	0.500000	Mean dependent var	0.000000
Adjusted R-squared	0.500000	S.D. dependent var	0.004972
S.E. of regression	0.003516	Akaike info criterion	-8.457666
Sum squared resid	0.002188	Schwarz criterion	-8.439791
Log likelihood	753.7323	Hannan-Quinn criter.	-8.450418
Durbin-Watson stat	2.000000		

(Stationary in first difference)

Table C2.7:

Null Hypothesis: DIP has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.460117	0.0000
Test critical values:	1% level	-3.467851	
	5% level	-2.877919	
	10% level	-2.575581	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/28/17 Time: 14:17
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.878725	0.198594	-9.460117	0.0000
D(DIP(-1))	0.536068	0.168731	3.177061	0.0018
D(DIP(-2))	0.453518	0.128231	3.536742	0.0005
D(DIP(-3))	0.329578	0.075557	4.362004	0.0000
C	0.000781	0.000711	1.098020	**0.2737**

R-squared	0.685020	Mean dependent var	0.000101
Adjusted R-squared	0.677608	S.D. dependent var	0.016506
S.E. of regression	0.009372	Akaike info criterion	-6.473972
Sum squared resid	0.014933	Schwarz criterion	-6.383550
Log likelihood	571.4726	Hannan-Quinn criter.	-6.437294
F-statistic	92.42900	Durbin-Watson stat	1.863170
Prob(F-statistic)	0.000000		

Table C2.8:

Null Hypothesis: DIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.421774	0.0000
Test critical values:	1% level	-4.011352	
	5% level	-3.435708	
	10% level	-3.141907	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/28/17 Time: 14:17
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.888469	0.200437	-9.421774	0.0000
D(DIP(-1))	0.544185	0.170252	3.196357	0.0017
D(DIP(-2))	0.458911	0.129188	3.552274	0.0005
D(DIP(-3))	0.331946	0.075952	4.370476	0.0000
C	0.001329	0.001491	0.891121	**0.3741**
@TREND("2002M01")	-5.92E-06	1.42E-05	-0.418224	**0.6763**

R-squared	0.685345	Mean dependent var	0.000101
Adjusted R-squared	0.676036	S.D. dependent var	0.016506
S.E. of regression	0.009395	Akaike info criterion	-6.463578
Sum squared resid	0.014917	Schwarz criterion	-6.355071
Log likelihood	571.5631	Hannan-Quinn criter.	-6.419565
F-statistic	73.61930	Durbin-Watson stat	1.861778
Prob(F-statistic)	0.000000		

Table C2.9:

```
Null Hypothesis: DIP has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=13)
================================================================
                                          t-Statistic   Prob.*
================================================================
Augmented Dickey-Fuller test statistic     -9.394576    0.0000
Test critical values:      1% level        -2.578243
                           5% level        -1.942655
                          10% level        -1.615495
================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/28/17   Time: 14:17
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments
================================================================
     Variable       Coefficient   Std. Error   t-Statistic   Prob.
================================================================
     DIP(-1)         -1.859747     0.197960    -9.394576    0.0000
    D(DIP(-1))        0.522014     0.168346     3.100845    0.0023
    D(DIP(-2))        0.445391     0.128094     3.477075    0.0006
    D(DIP(-3))        0.326598     0.075553     4.322751    0.0000
================================================================
R-squared             0.682786   Mean dependent var      0.000101
Adjusted R-squared    0.677221   S.D. dependent var      0.016506
S.E. of regression    0.009378   Akaike info criterion  -6.478334
Sum squared resid     0.015039   Schwarz criterion      -6.405996
Log likelihood        570.8542   Hannan-Quinn criter.   -6.448991
Durbin-Watson stat    1.859760
================================================================
```

(Stationary in first difference)

Table C2.10:

```
Null Hypothesis: DREER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
================================================================
                                          t-Statistic   Prob.*
================================================================
Augmented Dickey-Fuller test statistic     -12.52939    0.0000
Test critical values:      1% level        -3.467205
                           5% level        -2.877636
                          10% level        -2.575430
================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/28/17   Time: 14:18
```

Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.946585	0.075549	-12.52939	0.0000
C	2.84E-05	0.000212	0.134045	**0.8935**

R-squared	0.471449	Mean dependent var	-2.07E-05
Adjusted R-squared	0.468446	S.D. dependent var	0.003882
S.E. of regression	0.002830	Akaike info criterion	-8.885876
Sum squared resid	0.001410	Schwarz criterion	-8.850126
Log likelihood	792.8430	Hannan-Quinn criter.	-8.871379
F-statistic	156.9856	Durbin-Watson stat	1.977469
Prob(F-statistic)	0.000000		

Table C2.11:

Null Hypothesis: DREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.68184	0.0000
Test critical values:	1% level	-4.010740	
	5% level	-3.435413	
	10% level	-3.141734	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/28/17 Time: 14:18
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-1.116230	0.104498	-10.68184	0.0000
D(DREER(-1))	0.155051	0.075323	2.058486	0.0410
C	0.000890	0.000435	2.042730	**0.0426**
@TREND("2002M01")	-9.33E-06	4.18E-06	-2.230460	**0.0270**

R-squared	0.495048	Mean dependent var	-1.43E-05
Adjusted R-squared	0.486292	S.D. dependent var	0.003892
S.E. of regression	0.002789	Akaike info criterion	-8.903679
Sum squared resid	0.001346	Schwarz criterion	-8.831901
Log likelihood	791.9755	Hannan-Quinn criter.	-8.874568
F-statistic	56.53564	Durbin-Watson stat	2.003751
Prob(F-statistic)	0.000000		

Table C2.12:
Null Hypothesis: DREER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.56396	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/28/17 Time: 14:18
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.946398	0.075326	-12.56396	0.0000

R-squared	0.471395	Mean dependent var	-2.07E-05
Adjusted R-squared	0.471395	S.D. dependent var	0.003882
S.E. of regression	0.002822	Akaike info criterion	-8.897010
Sum squared resid	0.001410	Schwarz criterion	-8.879135
Log likelihood	792.8339	Hannan-Quinn criter.	-8.889761
Durbin-Watson stat	1.977588		

(Stationary in first difference)

Table C2.13: Group unit root test summary
Series: DFS, DI, DIP, DREER
Date: 08/28/17 Time: 14:19
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 1 to 6
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-14.2801	0.0000	3	524
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	217.157	0.0000	3	524
PP - Fisher Chi-square	274.268	0.0000	3	534

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C2.14:

Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/28/17   Time: 14:19
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-16.5429	0.0000	3	528
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	269.917	0.0000	3	528
PP - Fisher Chi-square	274.268	0.0000	3	534

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C2.15:

Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/28/17   Time: 14:19
Sample: 2002M01 2016M12
Exogenous variables: **Individual effects**
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-16.2916	0.0000	3	528
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-18.8488	0.0000	3	528
ADF - Fisher Chi-square	232.415	0.0000	3	528
PP - Fisher Chi-square	219.411	0.0000	3	534

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Part D: On stability and on lag length

Figure D1: The unit circle

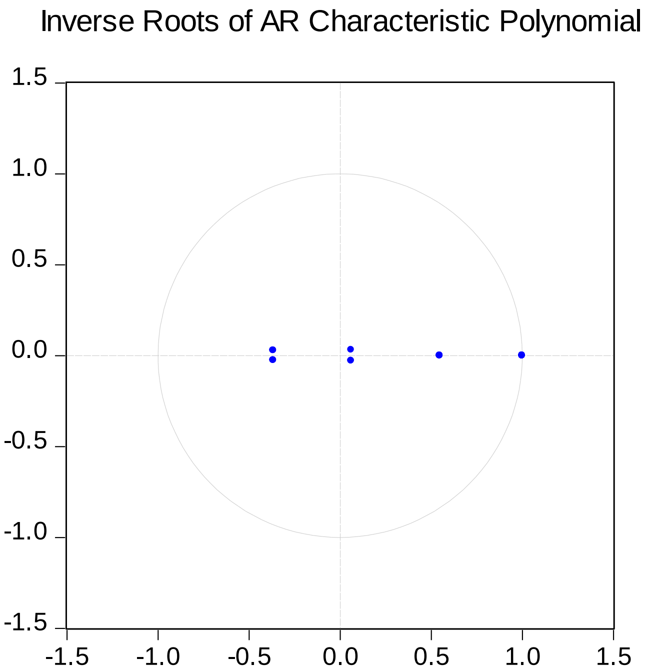


Table D1:

Roots of Characteristic Polynomial
Endogenous variables: IP REER FS I
Exogenous variables: DEUR DEUREER
Lag specification: 1 1
Date: 11/07/17 Time: 12:53

Root	Modulus
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
0.555209	0.555209
-0.390328 - 0.026395i	0.391219
-0.390328 + 0.026395i	0.391219
0.003547 - 0.046215i	0.046351
0.003547 + 0.046215i	0.046351

VEC specification imposes 3 unit root(s).

Table D2:

Roots of Characteristic Polynomial
Endogenous variables: IP REER FS I
Exogenous variables:
Lag specification: 1 1
Date: 11/07/17 Time: 12:52

Root	Modulus
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
0.547626	0.547626
-0.366202 - 0.027621i	0.367243
-0.366202 + 0.027621i	0.367243
0.061451 - 0.030662i	0.068676
0.061451 + 0.030662i	0.068676

VEC specification imposes 3 unit root(s).

Table D3:

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/07/17 Time: 12:48
Sample: 2002M01 2016M12
Included observations: 178

Lags	LM-Stat	Prob
1	22.02680	0.1423

Probs from chi-square with 16 df.

Table D4:

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/07/17 Time: 12:55
Sample: 2002M01 2016M12
Included observations: 178

Component	Skewness	Chi-sq	df	Prob.
1	-0.062163	0.114639	1	0.7349
2	0.215921	1.383121	1	0.2396
3	-8.649205	2219.326	1	0.0000
4	-4.769108	674.7503	1	0.0000
Joint		2895.574	4	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	3.291928	0.632062	1	0.4266
2	3.813941	4.913541	1	0.0266
3	106.6575	79691.20	1	0.0000
4	36.75673	8451.419	1	0.0000
Joint		88148.17	4	0.0000

Component	Jarque-Bera	df	Prob.
1	0.746701	2	0.6884
2	6.296662	2	0.0429
3	81910.53	2	0.0000
4	9126.169	2	0.0000
Joint	91043.74	8	0.0000

Table D5:VECM lag order selection criteria

Endogenous variables: DIP DREER DFS DI
Exogenous variables: C ECT
Date: 11/07/17 Time: 13:06
Sample: 2002M01 2016M12
Included observations: 171

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2198.563	NA	8.77e-17	-25.62062	-25.47364*	-25.56098*
1	2218.711	38.88185	8.36e-17*	**-25.66913***	-25.22819	-25.49022
2	2231.773	24.59690	8.66e-17	-25.63477	-24.89988	-25.33658
3	2238.869	13.03038	9.61e-17	-25.53063	-24.50178	-25.11317
4	2256.487	31.52672*	9.45e-17	-25.54955	-24.22675	-25.01282
5	2268.147	20.32068	9.97e-17	-25.49880	-23.88204	-24.84279
6	2277.570	15.97927	1.08e-16	-25.42187	-23.51115	-24.64658
7	2282.558	8.226465	1.24e-16	-25.29308	-23.08840	-24.39851
8	2286.522	6.352238	1.43e-16	-25.15231	-22.65368	-24.13847

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Part E: The VECM and the GIRFs

Table E1: The VECM (without the Global variables)

Vector Error Correction Estimates
Date: 11/07/17 Time: 13:10
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
IP(-1)	1.000000
REER(-1)	-5.621093 (1.11864) [-5.02496]
FS(-1)	1.193591

	(0.17934)
	[6.65532]
I(-1)	6.682372
	(1.19376)
	[5.59773]
C	3.912470

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.001193	0.001872	-0.412493	-0.007424
	(0.00789)	(0.00234)	(0.07167)	(0.00285)
	[-0.15129]	[0.80046]	[-5.75582]	[-2.60536]
D(IP(-1))	-0.318705	0.007369	0.607325	0.023708
	(0.07225)	(0.02142)	(0.65643)	(0.02610)
	[-4.41113]	[0.34406]	[0.92520]	[0.90834]
D(REER(-1))	0.367864	0.048593	-1.639355	-0.013664
	(0.25976)	(0.07701)	(2.36001)	(0.09384)
	[1.41619]	[0.63102]	[-0.69464]	[-0.14561]
D(FS(-1))	0.000298	-0.001616	-0.233278	0.004013
	(0.00825)	(0.00245)	(0.07498)	(0.00298)
	[0.03609]	[-0.66075]	[-3.11138]	[1.34609]
D(I(-1))	0.545105	0.067955	1.005271	-0.004814
	(0.20784)	(0.06161)	(1.88831)	(0.07508)
	[2.62275]	[1.10290]	[0.53237]	[-0.06412]
C	0.000877	5.84E-05	0.003027	-0.000440
	(0.00073)	(0.00022)	(0.00659)	(0.00026)
	[1.20878]	[0.27177]	[0.45926]	[-1.67960]
R-squared	0.142150	0.015189	0.357285	0.041171
Adj. R-squared	0.117212	-0.013439	0.338601	0.013298
Sum sq. resids	0.015840	0.001392	1.307551	0.002067
S.E. equation	0.009597	0.002845	0.087190	0.003467
F-statistic	5.700234	0.530555	19.12291	1.477107
Log likelihood	577.5307	793.9528	184.7418	758.7692
Akaike AIC	-6.421694	-8.853402	-2.008335	-8.458081
Schwarz SC	-6.314442	-8.746151	-1.901084	-8.350830
Mean dependent	0.000556	3.12E-05	0.002197	-0.000421
S.D. dependent	0.010214	0.002826	0.107210	0.003490

Determinant resid covariance (dof adj.)	6.64E-17
Determinant resid covariance	5.79E-17
Log likelihood	2317.259
Akaike information criterion	-25.72201
Schwarz criterion	-25.22151

Table E2: THE VECM regressions (both PRF and SRF).

```
Estimation Proc:
===============================
EC(C,1) 1 1 IP REER FS I

VAR Model:
===============================
D(IP) = A(1,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(1,1)*D(IP(-1)) +
C(1,2)*D(REER(-1)) + C(1,3)*D(FS(-1)) + C(1,4)*D(I(-1)) + C(1,5)

D(REER) = A(2,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(2,1)*D(IP(-1)) +
C(2,2)*D(REER(-1)) + C(2,3)*D(FS(-1)) + C(2,4)*D(I(-1)) + C(2,5)

D(FS) = A(3,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(3,1)*D(IP(-1)) +
C(3,2)*D(REER(-1)) + C(3,3)*D(FS(-1)) + C(3,4)*D(I(-1)) + C(3,5)

D(I) = A(4,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(4,1)*D(IP(-1)) +
C(4,2)*D(REER(-1)) + C(4,3)*D(FS(-1)) + C(4,4)*D(I(-1)) + C(4,5)

VAR Model - Substituted Coefficients:
===============================
D(IP) =  - 0.0011933865461*( IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) +
3.91246963035 ) - 0.318705034491*D(IP(-1)) + 0.367864095663*D(REER(-1)) + 0.000297808275458*D(FS(-1)) +
0.54510492028*D(I(-1)) + 0.000876859190207

D(REER) = 0.00187180511496*( IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) +
3.91246963035 ) + 0.00736949229396*D(IP(-1)) + 0.0485926436524*D(REER(-1)) - 0.00161648778864*D(FS(-1)) +
0.0679551204342*D(I(-1)) + 5.84440361716e-05

D(FS) =  - 0.412493074342*( IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) +
3.91246963035 ) + 0.607324817941*D(IP(-1)) - 1.63935494478*D(REER(-1)) - 0.233278195464*D(FS(-1)) +
1.00527107202*D(I(-1)) + 0.00302682726413

D(I) =  - 0.00742390216533*( IP(-1) - 5.62109303547*REER(-1) + 1.19359120012*FS(-1) + 6.68237242357*I(-1) +
3.91246963035 ) + 0.0237079161266*D(IP(-1)) - 0.013663502101*D(REER(-1)) + 0.00401282730306*D(FS(-1)) -
0.00481393357803*D(I(-1)) - 0.000440141586353
```

Table E3: The VECM regressions (both PRF and SRF). Plus Dummy variable (dum=1, since 2008M9)

```
 Vector Error Correction Estimates
 Sample (adjusted): 2002M03 2016M12
 Included observations: 178 after adjustments
 Standard errors in ( ) & t-statistics in [ ]
==========================================
    Cointegrating Eq:        CointEq1
==========================================
           IP(-1)            1.000000

         REER(-1)            0.637124
                            (0.77303)
                            [ 0.82419]

           FS(-1)           -1.038086
                            (0.13391)
                            [-7.75202]

            I(-1)           -3.269303
                            (0.79422)
```

	[-4.11637]
C	1.108294

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.007930	-0.001660	0.666830	0.005974
	(0.01059)	(0.00278)	(0.09455)	(0.00393)
	[-0.74891]	[-0.59609]	[7.05283]	[1.51999]
D(IP(-1))	-0.352881	0.019573	0.078794	0.019556
	(0.07219)	(0.01898)	(0.64456)	(0.02680)
	[-4.88853]	[1.03101]	[0.12224]	[0.72983]
D(REER(-1))	0.351024	-0.088916	-0.082327	-0.032895
	(0.26442)	(0.06954)	(2.36109)	(0.09815)
	[1.32751]	[-1.27859]	[-0.03487]	[-0.33513]
D(FS(-1))	-0.005111	-0.001262	-0.135403	0.002666
	(0.00864)	(0.00227)	(0.07711)	(0.00321)
	[-0.59181]	[-0.55556]	[-1.75602]	[0.83170]
D(I(-1))	0.495218	0.057386	0.881728	-0.015333
	(0.20538)	(0.05401)	(1.83385)	(0.07624)
	[2.41128]	[1.06243]	[0.48081]	[-0.20113]
C	0.002141	0.000552	-0.049756	-0.000707
	(0.00139)	(0.00037)	(0.01246)	(0.00052)
	[1.53465]	[1.50373]	[-3.99478]	[-1.36491]
DUM	-0.001841	-0.000880	**0.096358**	0.000495
	(0.00216)	(0.00057)	**(0.01928)**	(0.00080)
	[-0.85219]	[-1.54868]	**[4.99654]**	[0.61680]
R-squared	0.182572	0.261466	0.408456	0.035286
Adj. R-squared	0.143877	0.226505	0.380454	-0.010381
Sum sq. resids	0.015094	0.001044	1.203447	0.002080
S.E. equation	0.009451	0.002485	0.084386	0.003508
F-statistic	4.718260	7.478948	14.58663	0.772673
Log likelihood	581.8265	819.5654	192.1258	758.2246
Akaike AIC	-6.436253	-9.107476	-2.057593	-8.418254
Schwarz SC	-6.275376	-8.946599	-1.896716	-8.257377
Mean dependent	0.000556	3.12E-05	0.002197	-0.000421
S.D. dependent	0.010214	0.002826	0.107210	0.003490

Determinant resid covariance (dof adj.)	4.73E-17
Determinant resid covariance	3.84E-17
Log likelihood	2353.683
Akaike information criterion	-25.99644
Schwarz criterion	-25.28144

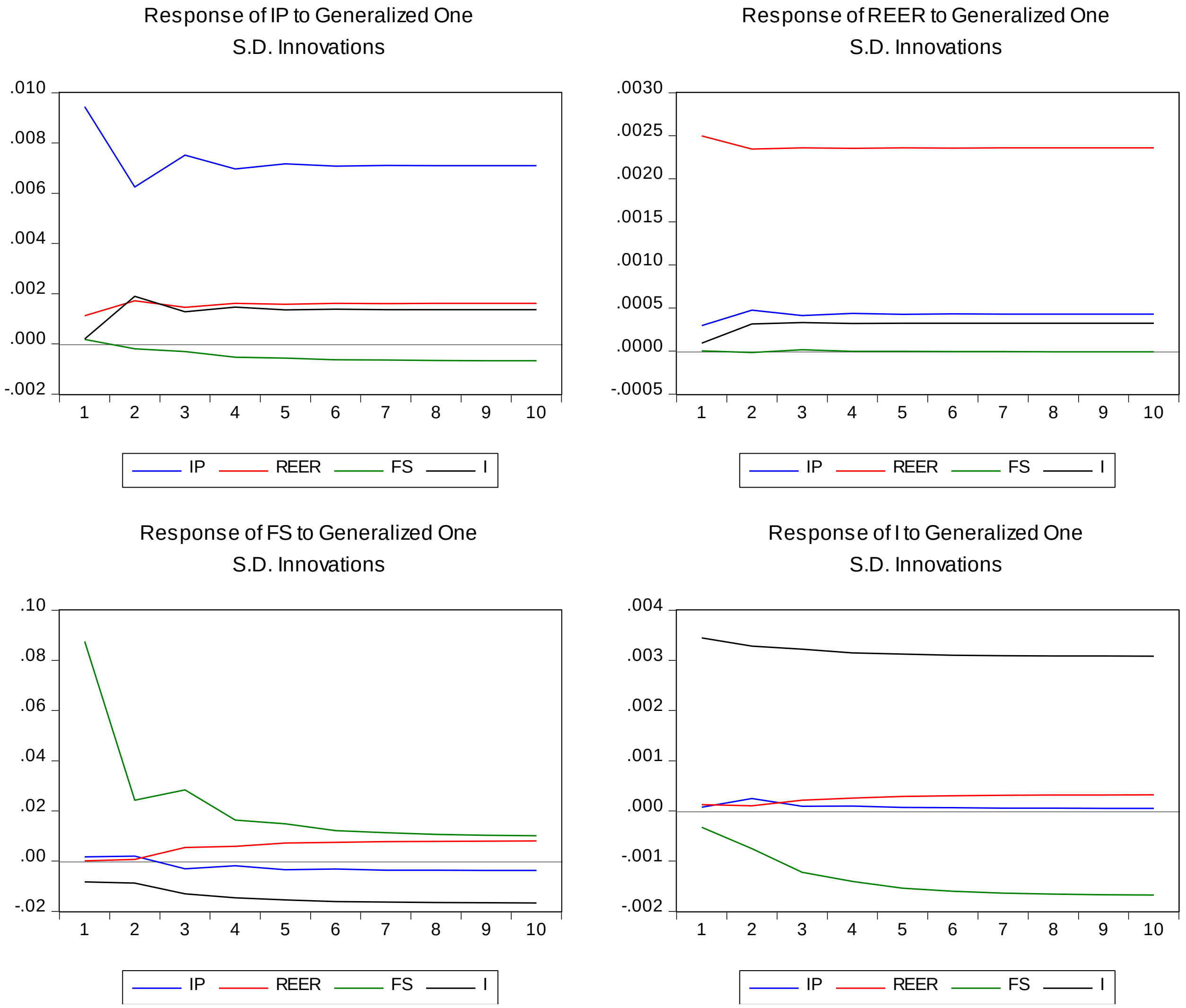


Figure E1: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=10)

Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

Figure E2: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=40)

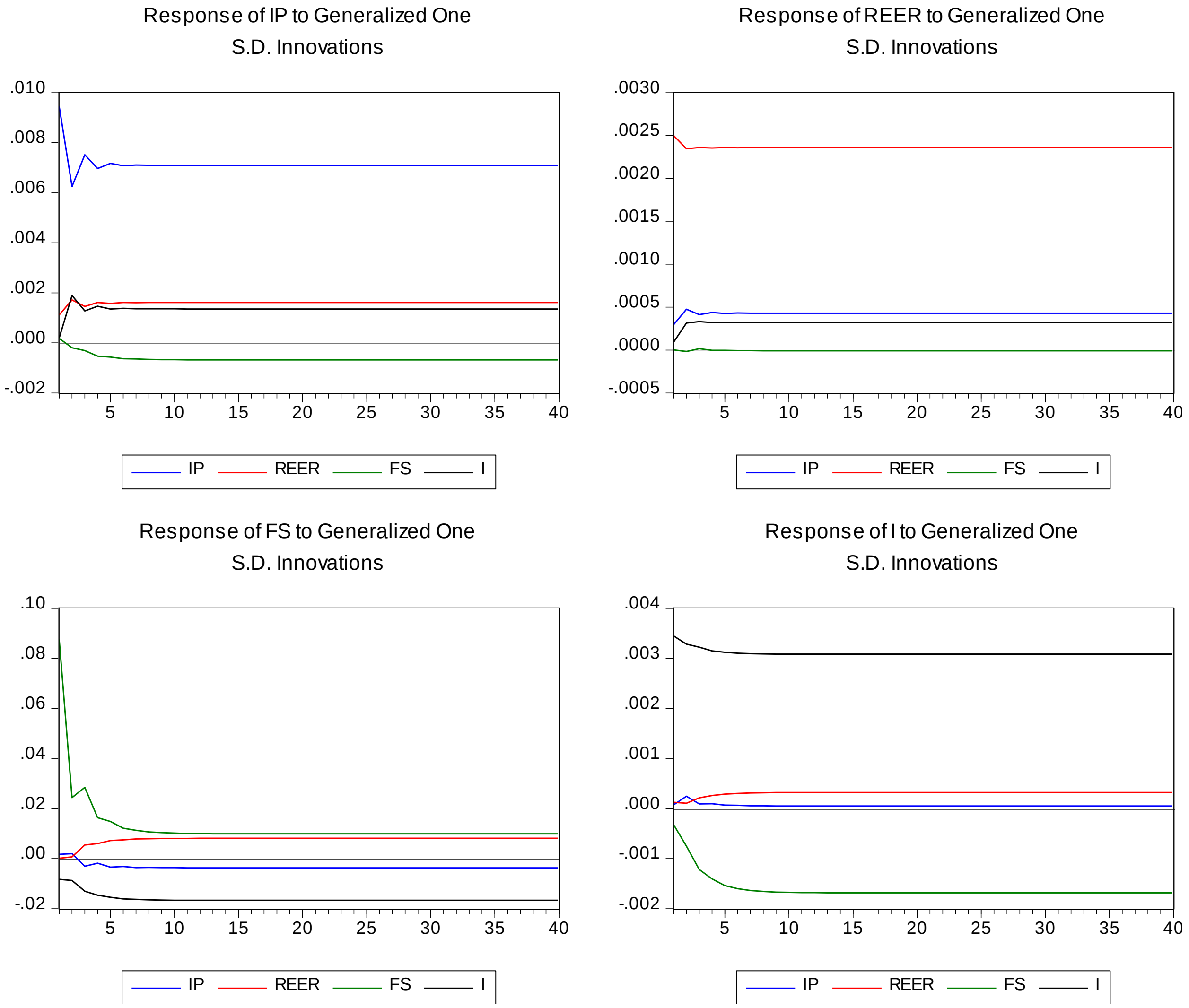


Figure E3: Generalized Impulse Response Functions (GIRFs)

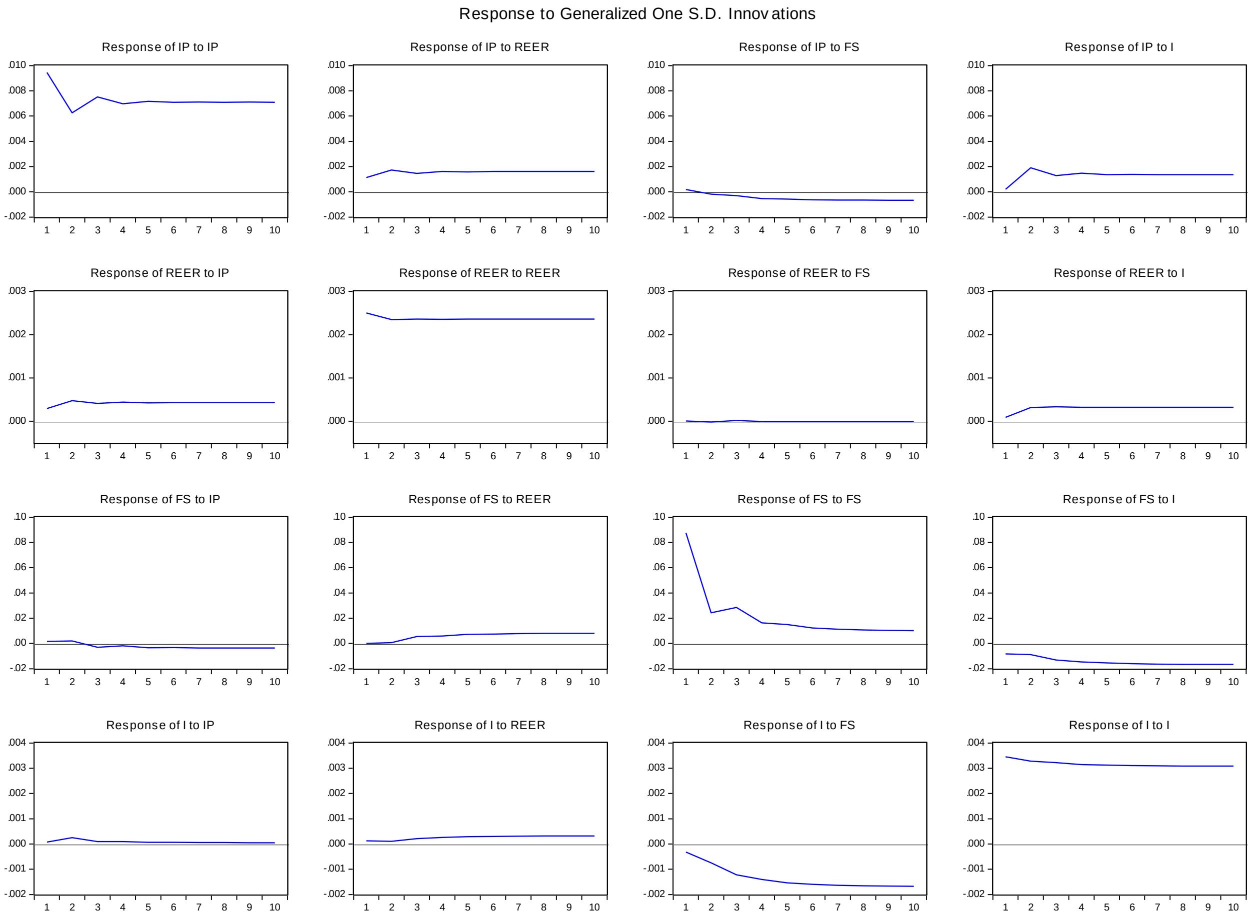
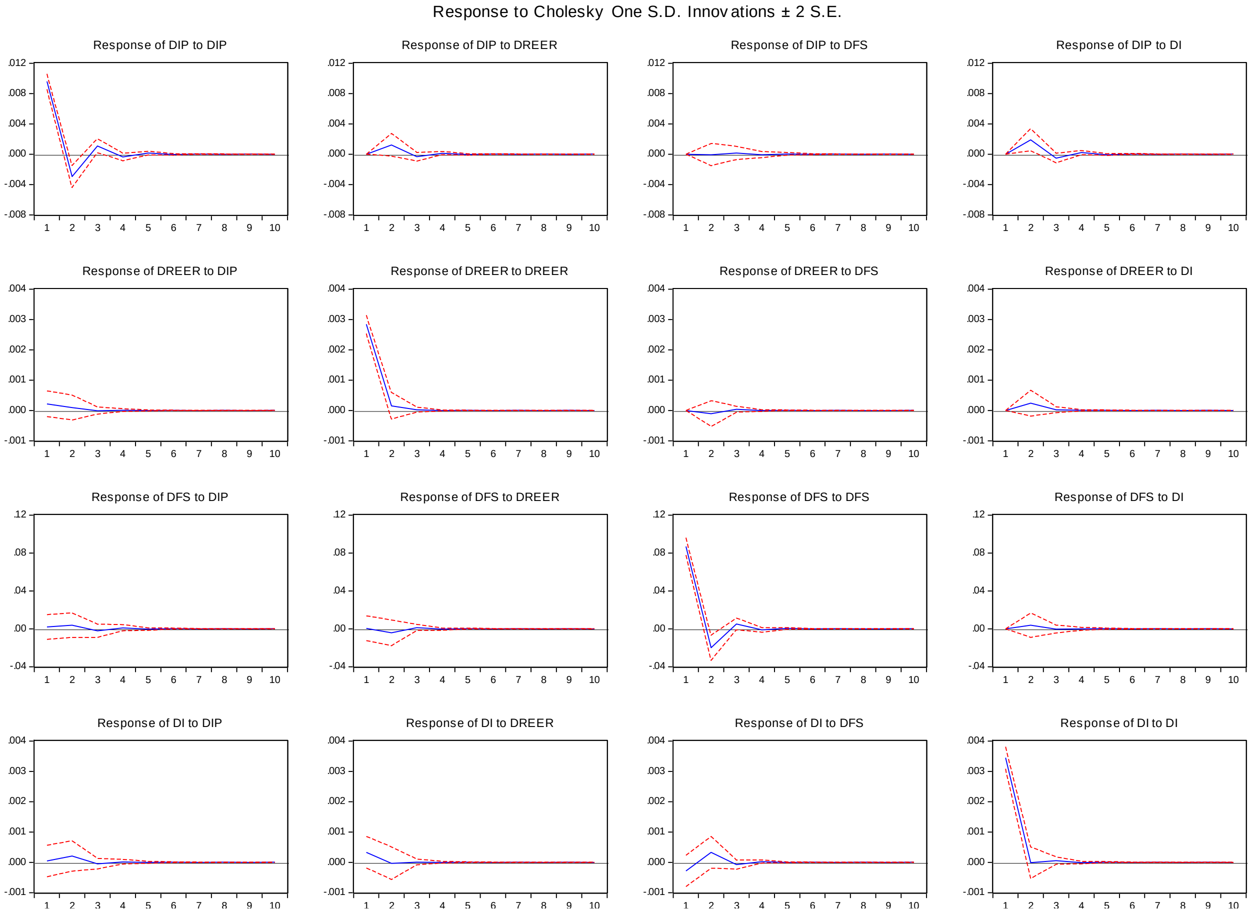


Figure E4: Cholesky decomposed Impulse Response Functions with specific ordering



APPENDIX C

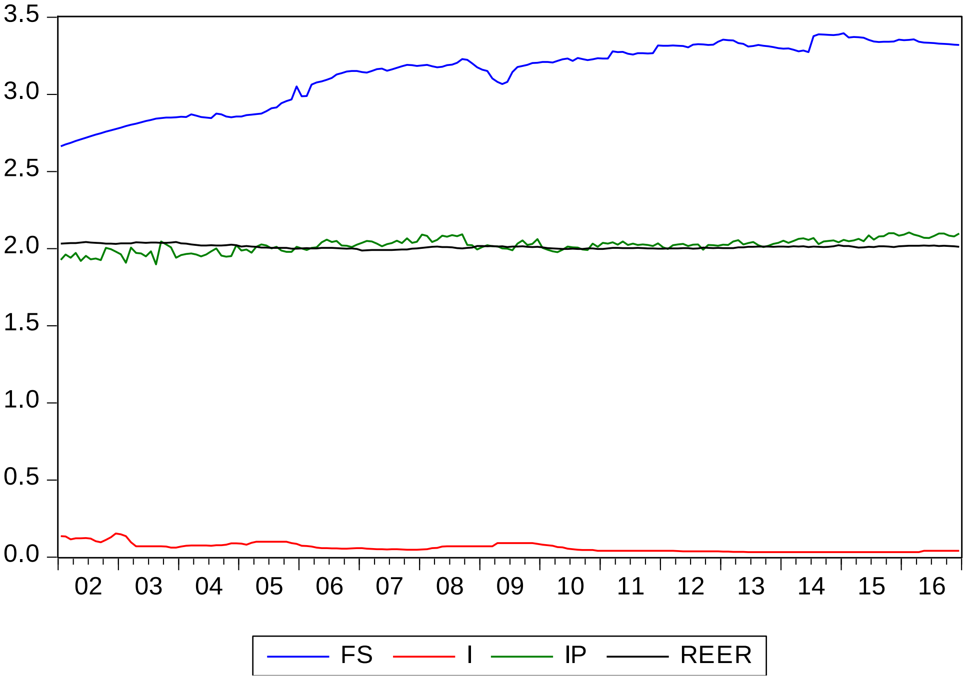
Determining the Relationship between the investigated variables. The case of FYROM

Part A: Statistical measures and level graphs

Table A1: STATISTICAL TABLES FOR ALL FOUR VARIABLES

	FS	I	IP	REER
Mean	3.138276	0.060462	2.021385	2.011536
Median	3.196726	0.053300	2.023664	2.010404
Maximum	3.395098	0.152100	2.104828	2.042714
Minimum	2.663341	0.032100	1.897627	1.987592
Std. Dev.	0.206613	0.027837	0.042511	0.012731
Skewness	-0.745350	1.039002	-0.380008	0.704456
Kurtosis	2.206837	3.531157	2.958066	2.863783
Jarque-Bera	21.38471	34.50171	4.345370	15.02690
Probability	0.000023	0.000000	0.113871	0.000546
Sum	564.8896	10.88310	363.8493	362.0764
Sum Sq. Dev.	7.641342	0.138706	0.323479	0.029013
Observations	180	180	180	180

Figure A1: All four variables from 1/1/2002 to 31/12/2016



Part B: On cointegration

Table B1: Cointegration (all four variables in level)

Date: 08/29/17 Time: 12:11
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments
Trend assumption: Linear deterministic trend
Series: FS I IP REER
Lags interval (in first differences): **1 to 2**

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.122072	53.00421	47.85613	0.0152
At most 1 *	0.088454	29.96044	29.79707	0.0479
At most 2	0.045551	13.56785	15.49471	0.0956
At most 3 *	0.029587	5.315972	3.841466	0.0211

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.122072	23.04377	27.58434	0.1716
At most 1	0.088454	16.39259	21.13162	0.2028
At most 2	0.045551	8.251877	14.26460	0.3537
At most 3 *	0.029587	5.315972	3.841466	0.0211

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

FS	I	IP	REER
8.114557	8.147365	-44.06937	12.58443
6.021673	72.11504	1.985155	-22.25710
8.574256	24.41421	2.657193	49.37620
2.132032	14.00453	1.937216	87.39516

Unrestricted Adjustment Coefficients (alpha):

D(FS)	-0.001133	0.001748	-0.003287	-0.000440
D(I)	-0.000568	-0.001247	-0.000275	3.68E-05
D(IP)	0.007339	-0.001559	-0.001862	-0.000789
D(REER)	-0.000220	7.88E-05	0.000161	-0.000440

1 Cointegrating Equation(s):	Log likelihood	2387.143

```
Normalized cointegrating coefficients (standard error in parentheses)
         FS                 I                  IP                 REER
     1.000000          1.004043          -5.430902          1.550846
                      (1.40620)          (0.95449)          (2.40949)

Adjustment coefficients (standard error in parentheses)
       D(FS)          -0.009193
                      (0.01065)
        D(I)          -0.004607
                      (0.00292)
       D(IP)           0.059556
                      (0.01421)
     D(REER)          -0.001782
                      (0.00172)
==========================================================================

2 Cointegrating Equation(s):        Log likelihood          2395.340
==========================================================================
Normalized cointegrating coefficients (standard error in parentheses)
         FS                 I                  IP                 REER
     1.000000          0.000000          -5.958056          2.031004
                                         (0.85855)          (2.54863)
     0.000000          1.000000           0.525031         -0.478224
                                         (0.13483)          (0.40025)

Adjustment coefficients (standard error in parentheses)
       D(FS)           0.001330           0.116796
                      (0.01319)          (0.09472)
        D(I)          -0.012118          -0.094578
                      (0.00350)          (0.02515)
       D(IP)           0.050169          -0.052624
                      (0.01765)          (0.12678)
     D(REER)          -0.001307           0.003896
                      (0.00215)          (0.01541)
==========================================================================

3 Cointegrating Equation(s):        Log likelihood          2399.466
==========================================================================
Normalized cointegrating coefficients (standard error in parentheses)
         FS                 I                  IP                 REER
     1.000000          0.000000           0.000000          8.383951
                                                            (4.24342)
     0.000000          1.000000           0.000000         -1.038053
                                                            (0.51270)
     0.000000          0.000000           1.000000          1.066279
                                                            (0.78719)

Adjustment coefficients (standard error in parentheses)
       D(FS)          -0.026856           0.036540           0.044660
                      (0.01696)          (0.09802)          (0.05657)
        D(I)          -0.014480          -0.101302           0.021814
                      (0.00458)          (0.02649)          (0.01529)
       D(IP)           0.034202          -0.098087          -0.331485
                      (0.02307)          (0.13330)          (0.07694)
     D(REER)           7.10E-05           0.007821           0.010262
                      (0.00281)          (0.01624)          (0.00937)
==========================================================================
```

Table B2:

```
Date: 11/07/17   Time: 15:16
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)
==========================================================================
 Hypothesized                    Trace           0.05
 No. of CE(s)    Eigenvalue    Statistic    Critical Value      Prob.**
==========================================================================
   None *         0.140339     61.88505       47.85613          0.0014
  At most 1 *     0.118721     34.96841       29.79707          0.0116
  At most 2       0.043820     12.47260       15.49471          0.1356
  At most 3 *     0.024945     4.496568       3.841466          0.0340
==========================================================================
 Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)
==========================================================================
 Hypothesized                  Max-Eigen         0.05
 No. of CE(s)    Eigenvalue    Statistic    Critical Value      Prob.**
==========================================================================
   None           0.140339     26.91664       27.58434          0.0607
  At most 1 *     0.118721     22.49581       21.13162          0.0320
  At most 2       0.043820     7.976030       14.26460          0.3812
  At most 3 *     0.024945     4.496568       3.841466          0.0340
==========================================================================
 Max-eigenvalue test indicates no cointegration at the 0.05 level
 * denotes rejection of the hypothesis at the 0.05 level
 **MacKinnon-Haug-Michelis (1999) p-values

 Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):
==========================================================================
      IP           REER           FS            I
  -34.84072      19.86051      10.41633      39.41114
  -20.23895      9.875370     -2.450633     -59.95974
   6.689047      56.90772      6.772980      13.95019
  -3.554415     -81.36786      0.414730      1.699649
==========================================================================

 Unrestricted Adjustment Coefficients (alpha):
==========================================================================
    D(IP)        0.005761      0.005341     -0.001996      0.000486
   D(REER)      -0.000194     -0.000113      9.59E-05      0.000419
    D(FS)       -0.000907     -0.001670     -0.003368      0.000178
    D(I)        -0.001364      0.001138     -0.000100     -0.000134
==========================================================================

1 Cointegrating Equation(s):      Log likelihood      2387.849
==========================================================================
Normalized cointegrating coefficients (standard error in parentheses)
      IP            REER            FS             I
```

```
 1.000000       -0.570037       -0.298970       -1.131180
                (0.55030)       (0.05868)       (0.39592)

Adjustment coefficients (standard error in parentheses)
D(IP)           -0.200728
                (0.06196)
D(REER)          0.006775
                (0.00731)
D(FS)            0.031594
                (0.04513)
D(I)             0.047528
                (0.01281)
=================================================================

2 Cointegrating Equation(s):    Log likelihood    2399.096
=================================================================
Normalized cointegrating coefficients (standard error in parentheses)
   IP             REER            FS               I
 1.000000        0.000000        2.617615        27.29328
                                (0.75516)       (5.67987)
 0.000000        1.000000        5.116482        49.86421
                                (1.36509)       (10.2674)

Adjustment coefficients (standard error in parentheses)
D(IP)           -0.308831        0.167170
                (0.06975)       (0.03840)
D(REER)          0.009052       -0.004973
                (0.00845)       (0.00465)
D(FS)            0.065393       -0.034502
                (0.05194)       (0.02859)
D(I)             0.024493       -0.015853
                (0.01440)       (0.00793)
=================================================================

3 Cointegrating Equation(s):    Log likelihood    2403.084
=================================================================
Normalized cointegrating coefficients (standard error in parentheses)
   IP             REER            FS               I
 1.000000        0.000000        0.000000        1.227780
                                                (0.24922)
 0.000000        1.000000        0.000000       -1.084316
                                                (0.26866)
 0.000000        0.000000        1.000000        9.957727
                                                (1.06499)

Adjustment coefficients (standard error in parentheses)
D(IP)           -0.322181        0.053592        0.033404
                (0.07043)       (0.10532)       (0.02184)
D(REER)          0.009694        0.000484       -0.001100
                (0.00856)       (0.01280)       (0.00265)
D(FS)            0.042866       -0.226151       -0.028163
                (0.05160)       (0.07716)       (0.01600)
D(I)             0.023822       -0.021561       -0.017678
                (0.01459)       (0.02182)       (0.00452)
=================================================================
```

Table B3: Group cointegration summary
Date: 08/29/17 Time: 12:13
Sample: 2002M01 2016M12
Included observations: 177
Series: FS I IP REER
Lags interval: 1 to 2

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	3	2	2	0	1
Max-Eig	0	0	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2372.274	2372.274	2375.621	2375.621	2378.150
1	2383.571	2383.818	2387.143	2387.348	2389.871
2	2392.491	2393.032	2395.340	2396.236	2398.000
3	2398.376	2399.459	2399.466	2403.479	2404.679
4	2398.693	2402.124	2402.124	2406.270	2406.270
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-26.44377	-26.44377	-26.43640	-26.43640	-26.41977
1	-26.48103	-26.47252	-26.47620	-26.46721	-26.46182
2	-26.49142*	-26.47494	-26.47841	-26.46594	-26.46328
3	-26.46753	-26.44587	-26.43464	-26.44609	-26.44835
4	-26.38071	-26.37428	-26.37428	-26.37593	-26.37593
	Schwarz Criteria by Rank (rows)				

	and Model (columns)				
0	-25.86956*	-25.86956*	-25.79040	-25.79040	-25.70200
1	-25.76325	-25.73680	-25.68665	-25.65971	-25.60049
2	-25.63009	-25.57772	-25.54531	-25.49694	-25.45840
3	-25.46265	-25.38715	-25.35798	-25.31560	-25.29991
4	-25.23227	-25.15406	-25.15406	-25.08394	-25.08394

Table B4: Group cointegration summary

Date: 08/29/17 Time: 12:14
Sample: 2002M01 2016M12
Included observations: 178
Series: FS I IP REER
Lags interval: 1 to 1

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	2	2	2	2
Max-Eig	2	0	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2371.331	2371.331	2374.390	2374.390	2376.629
1	2384.805	2384.807	2387.849	2387.867	2390.104
2	2396.193	2396.260	2399.096	2399.254	2401.109
3	2401.781	2403.075	2403.084	2407.087	2407.790
4	2402.122	2405.333	2405.333	2409.368	2409.368

	Akaike Information Criteria by Rank (rows) and Model (columns)				

0	-26.46439	-26.46439	-26.45382	-26.45382	-26.43403
1	-26.52590	-26.51468	-26.51515	-26.50412	-26.49555
2	-26.56396*	-26.54224	-26.55165	-26.53095	-26.52932
3	-26.53687	-26.51770	-26.50657	-26.51784	-26.51450
4	-26.45081	-26.44194	-26.44194	-26.44233	-26.44233

	Schwarz Criteria by Rank (rows) and Model (columns)				
0	-26.17839*	-26.17839*	-26.09632	-26.09632	-26.00502
1	-26.09689	-26.06780	-26.01465	-25.98574	-25.92355
2	-25.99196	-25.93449	-25.90814	-25.85169	-25.81431
3	-25.82186	-25.74907	-25.72006	-25.67770	-25.65649
4	-25.59280	-25.51243	-25.51243	-25.44132	-25.44132

Part C: On unit root tests

Part C1: Unit root tests in level variables

Table C1.1: Unit roots in level variables
Null Hypothesis: FS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.636683	0.0875
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 12:16
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.016220	0.006152	-2.636683	0.0091
C	0.054551	0.019341	2.820500	**0.0053**

R-squared	0.037793	Mean dependent var	0.003665
Adjusted R-squared	0.032357	S.D. dependent var	0.017249
S.E. of regression	0.016968	Akaike info criterion	-5.303856
Sum squared resid	0.050961	Schwarz criterion	-5.268243
Log likelihood	476.6951	Hannan-Quinn criter.	-5.289415
F-statistic	6.952100	Durbin-Watson stat	1.869554
Prob(F-statistic)	0.009116		

Table C1.2:

Null Hypothesis: FS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.484903	0.8314
Test critical values:	1% level	-4.010143	
	5% level	-3.435125	
	10% level	-3.141565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 12:16
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.025679	0.017293	-1.484903	0.1394
C	0.080591	0.048518	1.661030	**0.0985**
@TREND("2002M01")	4.04E-05	6.90E-05	0.585416	**0.5590**

R-squared	0.039663	Mean dependent var	0.003665
Adjusted R-squared	0.028750	S.D. dependent var	0.017249
S.E. of regression	0.017000	Akaike info criterion	-5.294628
Sum squared resid	0.050862	Schwarz criterion	-5.241209
Log likelihood	476.8692	Hannan-Quinn criter.	-5.272967
F-statistic	3.634498	Durbin-Watson stat	1.855595
Prob(F-statistic)	0.028398		

Table C1.3:

Null Hypothesis: FS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.659152	0.9982
Test critical values:	1% level	-2.577945	
	5% level	-1.942614	
	10% level	-1.615522	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 12:16
Sample (adjusted): 2002M02 2016M12

Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	0.001093	0.000411	2.659152	0.0085

R-squared	-0.005453	Mean dependent var	0.003665
Adjusted R-squared	-0.005453	S.D. dependent var	0.017249
S.E. of regression	0.017296	Akaike info criterion	-5.271065
Sum squared resid	0.053251	Schwarz criterion	-5.253259
Log likelihood	472.7604	Hannan-Quinn criter.	-5.263845
Durbin-Watson stat	1.820392		

(Not stationary in level)

Table C1.4:

Null Hypothesis: I has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.030670	0.0340
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 12:17
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.041967	0.013847	-3.030670	0.0028
D(I(-1))	0.457449	0.065579	6.975580	0.0000
C	0.002249	0.000916	2.455954	**0.0150**

R-squared	0.246829	Mean dependent var	-0.000521
Adjusted R-squared	0.238222	S.D. dependent var	0.005777
S.E. of regression	0.005042	Akaike info criterion	-7.725208
Sum squared resid	0.004449	Schwarz criterion	-7.671583
Log likelihood	690.5435	Hannan-Quinn criter.	-7.703462
F-statistic	28.67551	Durbin-Watson stat	1.798876
Prob(F-statistic)	0.000000		

Table C1.5:

Null Hypothesis: I has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.283644	0.0042
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 12:17
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.099370	0.023198	-4.283644	0.0000
D(I(-1))	0.491796	0.065064	7.558617	0.0000
C	0.009132	0.002430	3.757903	**0.0002**
@TREND("2002M01")	-3.77E-05	1.24E-05	-3.046472	**0.0027**

R-squared	0.284968	Mean dependent var	-0.000521
Adjusted R-squared	0.272640	S.D. dependent var	0.005777
S.E. of regression	0.004927	Akaike info criterion	-7.765937
Sum squared resid	0.004224	Schwarz criterion	-7.694437
Log likelihood	695.1684	Hannan-Quinn criter.	-7.736942
F-statistic	23.11529	Durbin-Watson stat	1.837286
Prob(F-statistic)	0.000000		

Table C1.6:
Null Hypothesis: I has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.892651	0.0559
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 12:17
Sample (adjusted): 2002M03 2016M12

Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.011017	0.005821	-1.892651	0.0600
D(I(-1))	0.449513	0.066429	6.766858	0.0000

R-squared	0.220870	Mean dependent var	-0.000521
Adjusted R-squared	0.216443	S.D. dependent var	0.005777
S.E. of regression	0.005114	Akaike info criterion	-7.702558
Sum squared resid	0.004603	Schwarz criterion	-7.666808
Log likelihood	687.5277	Hannan-Quinn criter.	-7.688060
Durbin-Watson stat	1.787405		

(Stationary in level)

Table C1.7:

Null Hypothesis: IP has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.931581	0.3172
Test critical values:	1% level	-3.467633	
	5% level	-2.877823	
	10% level	-2.575530	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17 Time: 12:19
Sample (adjusted): 2002M05 2016M12
Included observations: 176 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.088459	0.045796	-1.931581	0.0551
D(IP(-1))	-0.399487	0.077192	-5.175255	0.0000
D(IP(-2))	-0.205422	0.080228	-2.560491	0.0113
D(IP(-3))	-0.305114	0.072351	-4.217136	0.0000
C	0.180360	0.092577	1.948218	**0.0530**

R-squared	0.267885	Mean dependent var	0.000714
Adjusted R-squared	0.250760	S.D. dependent var	0.026273
S.E. of regression	0.022742	Akaike info criterion	-4.701225
Sum squared resid	0.088440	Schwarz criterion	-4.611155
Log likelihood	418.7078	Hannan-Quinn criter.	-4.664693
F-statistic	15.64250	Durbin-Watson stat	2.002514
Prob(F-statistic)	0.000000		

Table C1.8:
Null Hypothesis: IP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.153165	0.0975
Test critical values:	1% level	-4.011044	
	5% level	-3.435560	
	10% level	-3.141820	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17 Time: 12:19
Sample (adjusted): 2002M05 2016M12
Included observations: 176 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.226221	0.071744	-3.153165	0.0019
D(IP(-1))	-0.306422	0.084886	-3.609807	0.0004
D(IP(-2))	-0.136095	0.083892	-1.622273	0.1066
D(IP(-3))	-0.259925	0.073605	-3.531342	0.0005
C	0.446844	0.141286	3.162683	**0.0019**
@TREND("2002M01")	0.000131	5.29E-05	2.470028	**0.0145**

R-squared	0.293250	Mean dependent var	0.000714
Adjusted R-squared	0.272463	S.D. dependent var	0.026273
S.E. of regression	0.022410	Akaike info criterion	-4.725121
Sum squared resid	0.085376	Schwarz criterion	-4.617036
Log likelihood	421.8106	Hannan-Quinn criter.	-4.681282
F-statistic	14.10751	Durbin-Watson stat	1.980418
Prob(F-statistic)	0.000000		

Table C1.9:
Null Hypothesis: IP has a unit root
Exogenous: None
Lag Length: 3 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.870767	0.8964
Test critical values:	1% level	-2.578167	
	5% level	-1.942645	
	10% level	-1.615502	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)

```
Method: Least Squares
Date: 08/29/17   Time: 12:19
Sample (adjusted): 2002M05 2016M12
Included observations: 176 after adjustments
============================================================
        Variable      Coefficient   Std. Error  t-Statistic   Prob.
============================================================
          IP(-1)         0.000747     0.000857     0.870767   0.3851
        D(IP(-1))       -0.457685     0.071754    -6.378578   0.0000
        D(IP(-2))       -0.248967     0.077675    -3.205255   0.0016
        D(IP(-3))       -0.332891     0.071506    -4.655408   0.0000
============================================================
R-squared                0.251635   Mean dependent var       0.000714
Adjusted R-squared       0.238582   S.D. dependent var       0.026273
S.E. of regression       0.022926   Akaike info criterion   -4.690635
Sum squared resid        0.090403   Schwarz criterion       -4.618579
Log likelihood           416.7759   Hannan-Quinn criter.    -4.661410
Durbin-Watson stat       2.023450
============================================================
```

(Not stationary in level)

Table C1.10:

```
Null Hypothesis: REER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
============================================================
                                            t-Statistic   Prob.*
============================================================
Augmented Dickey-Fuller test statistic      -1.910071    0.3271
Test critical values:       1% level        -3.466994
                            5% level        -2.877544
                            10% level       -2.575381
============================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17   Time: 12:20
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
============================================================
        Variable      Coefficient   Std. Error  t-Statistic   Prob.
============================================================
         REER(-1)       -0.031049     0.016255    -1.910071   0.0577
            C            0.062338     0.032699     1.906426   0.0582
============================================================
R-squared                0.020196   Mean dependent var      -0.000118
Adjusted R-squared       0.014660   S.D. dependent var       0.002789
S.E. of regression       0.002769   Akaike info criterion   -8.929707
Sum squared resid        0.001357   Schwarz criterion       -8.894094
Log likelihood           801.2088   Hannan-Quinn criter.    -8.915266
F-statistic              3.648370   Durbin-Watson stat       1.822119
Prob(F-statistic)        0.057741
============================================================
```

Table C1.11:

Null Hypothesis: REER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.680562	0.7560
Test critical values:	1% level	-4.010143	
	5% level	-3.435125	
	10% level	-3.141565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17 Time: 12:20
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-0.029647	0.017641	-1.680562	0.0946
C	0.059437	0.035638	1.667802	**0.0971**
@TREND("2002M01")	9.03E-07	4.35E-06	0.207664	**0.8357**

R-squared	0.020436	Mean dependent var	-0.000118
Adjusted R-squared	0.009305	S.D. dependent var	0.002789
S.E. of regression	0.002776	Akaike info criterion	-8.918779
Sum squared resid	0.001357	Schwarz criterion	-8.865359
Log likelihood	801.2307	Hannan-Quinn criter.	-8.897118
F-statistic	1.835886	Durbin-Watson stat	1.825108
Prob(F-statistic)	0.162513		

Table C1.12:

Null Hypothesis: REER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.577672	0.4659
Test critical values:	1% level	-2.577945	
	5% level	-1.942614	
	10% level	-1.615522	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17 Time: 12:21
Sample (adjusted): 2002M02 2016M12

Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-5.99E-05	0.000104	-0.577672	0.5642

R-squared	0.000077	Mean dependent var	-0.000118
Adjusted R-squared	0.000077	S.D. dependent var	0.002789
S.E. of regression	0.002789	Akaike info criterion	-8.920555
Sum squared resid	0.001385	Schwarz criterion	-8.902748
Log likelihood	799.3897	Hannan-Quinn criter.	-8.913334
Durbin-Watson stat	1.841227		

(Not stationary in level)

Table C1.13: Group unit root test summary
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 12:21
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 12
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.22253	0.5881	4	695
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	9.24659	0.3219	4	695
PP - Fisher Chi-square	8.53827	0.3827	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C1.14:
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 12:21
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.15828	0.5629	4	712
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	7.51762	0.4819	4	712
PP - Fisher Chi-square	8.53827	0.3827	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi

-square distribution. All other tests assume asymptotic normality.

Table C1.15:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 12:22
Sample: 2002M01 2016M12
Exogenous variables: **Individual effects**
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-3.20587	0.0007	4	712
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.97263	0.0243	4	712
ADF - Fisher Chi-square	16.1652	0.0401	4	712
PP - Fisher Chi-square	25.8203	0.0011	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

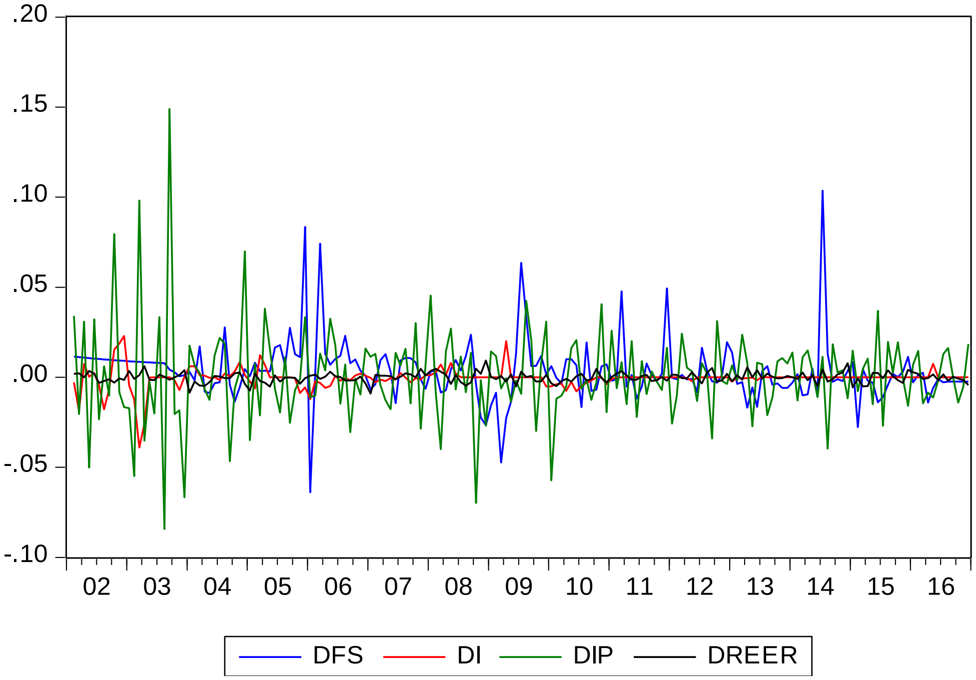
Table C1.16:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 12:22
Sample: 2002M01 2016M12
Exogenous variables: **Individual effects, individual linear trends**
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 3
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.84706	0.1985	4	712
Breitung t-stat	0.09419	0.5375	4	708
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.22760	0.1098	4	712
ADF - Fisher Chi-square	16.5424	0.0352	4	712
PP - Fisher Chi-square	41.7423	0.0000	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure C1: All four variables from 1/1/2002 to 31/12/2016 in first difference



Part C2: Unit root tests in first difference

Table C2.1:
Null Hypothesis: DFS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.18601	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17 Time: 12:24
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-0.915021	0.075088	-12.18601	0.0000
C	0.003307	0.001324	2.497008	0.0134

```
R-squared               0.457625   Mean dependent var     -7.82E-05
Adjusted R-squared      0.454544   S.D. dependent var      0.023390
S.E. of regression      0.017274   Akaike info criterion  -5.268017
Sum squared resid       0.052519   Schwarz criterion      -5.232267
Log likelihood          470.8535   Hannan-Quinn criter.   -5.253519
F-statistic             148.4990   Durbin-Watson stat      1.994265
Prob(F-statistic)       0.000000
====================================================================
```

Table C2.2:

```
Null Hypothesis: DFS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
====================================================================
                                              t-Statistic   Prob.*
====================================================================
Augmented Dickey-Fuller test statistic        -12.46110    0.0000
--------------------------------------------------------------------
Test critical values:         1% level        -4.010440
                              5% level        -3.435269
                              10% level       -3.141649
====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17   Time: 12:24
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
====================================================================
        Variable         Coefficient   Std. Error   t-Statistic   Prob.
====================================================================
         DFS(-1)          -0.940220    0.075452    -12.46110    0.0000
            C              0.008060    0.002681     3.006533    0.0030
   @TREND("2002M01")      -5.15E-05    2.53E-05    -2.033489    0.0435
====================================================================
R-squared               0.470145   Mean dependent var     -7.82E-05
Adjusted R-squared      0.464090   S.D. dependent var      0.023390
S.E. of regression      0.017123   Akaike info criterion  -5.280135
Sum squared resid       0.051307   Schwarz criterion      -5.226510
Log likelihood          472.9320   Hannan-Quinn criter.   -5.258389
F-statistic             77.63962   Durbin-Watson stat      1.992845
Prob(F-statistic)       0.000000
====================================================================
```

Table C2.3:

```
Null Hypothesis: DFS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
====================================================================
                                              t-Statistic   Prob.*
====================================================================
Augmented Dickey-Fuller test statistic        -11.75503    0.0000
--------------------------------------------------------------------
Test critical values:         1% level        -2.578018
                              5% level        -1.942624
                              10% level       -1.615515
```

```
=====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17   Time: 12:25
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=====================================================================
        Variable        Coefficient    Std. Error    t-Statistic    Prob.
=====================================================================
         DFS(-1)          -0.875694      0.074495      -11.75503   0.0000
=====================================================================
R-squared                  0.438411   Mean dependent var      -7.82E-05
Adjusted R-squared         0.438411   S.D. dependent var       0.023390
S.E. of regression         0.017528   Akaike info criterion   -5.244440
Sum squared resid          0.054379   Schwarz criterion       -5.226564
Log likelihood             467.7551   Hannan-Quinn criter.    -5.237191
Durbin-Watson stat         2.002004
=====================================================================
```

(Stationary in first difference)

Table C2.4:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                                t-Statistic   Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic          -8.123037    0.0000
Test critical values:          1% level         -3.467205
                               5% level         -2.877636
                              10% level         -2.575430
=====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17   Time: 12:25
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=====================================================================
        Variable        Coefficient    Std. Error    t-Statistic    Prob.
=====================================================================
          DI(-1)          -0.544905      0.067081      -8.123037   0.0000
             C            -0.000277      0.000388      -0.712516   0.4771
=====================================================================
R-squared                  0.272678   Mean dependent var       1.63E-05
Adjusted R-squared         0.268546   S.D. dependent var       0.006031
S.E. of regression         0.005158   Akaike info criterion   -7.685290
Sum squared resid          0.004683   Schwarz criterion       -7.649539
Log likelihood             685.9908   Hannan-Quinn criter.    -7.670792
F-statistic                65.98373   Durbin-Watson stat       1.787995
```

```
Prob(F-statistic)          0.000000
========================================================================
```

Table C2.5:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
========================================================================
                                                 t-Statistic    Prob.*
========================================================================
Augmented Dickey-Fuller test statistic           -8.142229      0.0000
------------------------------------------------------------------------
Test critical values:        1% level            -4.010440
                             5% level            -3.435269
                             10% level           -3.141649
========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17   Time: 12:25
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
========================================================================
        Variable          Coefficient    Std. Error    t-Statistic   Prob.
========================================================================
          DI(-1)           -0.549329      0.067467     -8.142229     0.0000
            C              -0.000764      0.000790     -0.966427     0.3352
   @TREND("2002M01")        5.36E-06      7.57E-06      0.708010     0.4799
========================================================================
R-squared                  0.274756   Mean dependent var        1.63E-05
Adjusted R-squared         0.266467   S.D. dependent var        0.006031
S.E. of regression         0.005166   Akaike info criterion    -7.676914
Sum squared resid          0.004669   Schwarz criterion        -7.623288
Log likelihood             686.2454   Hannan-Quinn criter.     -7.655167
F-statistic                33.14902   Durbin-Watson stat        1.785789
Prob(F-statistic)          0.000000
========================================================================
```

Table C2.6:

```
Null Hypothesis: DI has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
========================================================================
                                                 t-Statistic    Prob.*
========================================================================
Augmented Dickey-Fuller test statistic           -8.103114      0.0000
------------------------------------------------------------------------
Test critical values:        1% level            -2.578018
                             5% level            -1.942624
                             10% level           -1.615515
========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
```

```
Date: 08/29/17   Time: 12:25
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
==============================================================================
         DI(-1)            -0.540466     0.066698      -8.103114     0.0000
==============================================================================
R-squared                  0.270580   Mean dependent var         1.63E-05
Adjusted R-squared         0.270580   S.D. dependent var         0.006031
S.E. of regression         0.005151   Akaike info criterion     -7.693645
Sum squared resid          0.004696   Schwarz criterion         -7.675770
Log likelihood             685.7344   Hannan-Quinn criter.      -7.686396
Durbin-Watson stat         1.790179
==============================================================================
```

(Stationary in first difference)

Table C2.7:

```
Null Hypothesis: DIP has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=13)
==============================================================================
                                                    t-Statistic    Prob.*
==============================================================================
Augmented Dickey-Fuller test statistic              -12.63076     0.0000
------------------------------------------------------------------------------
Test critical values:        1% level               -3.467633
                             5% level               -2.877823
                            10% level               -2.575530
==============================================================================

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 12:26
Sample (adjusted): 2002M05 2016M12
Included observations: 176 after adjustments
==============================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
==============================================================================
         DIP(-1)           -2.038892     0.161423      -12.63076     0.0000
        D(DIP(-1))          0.581569     0.124674       4.664714     0.0000
        D(DIP(-2))          0.332800     0.071478       4.656004     0.0000
            C               0.001571     0.001733       0.906671     0.3658
==============================================================================
R-squared                  0.730567   Mean dependent var        -7.00E-05
Adjusted R-squared         0.725867   S.D. dependent var         0.043779
S.E. of regression         0.022922   Akaike info criterion     -4.691005
Sum squared resid          0.090369   Schwarz criterion         -4.618948
Log likelihood             416.8084   Hannan-Quinn criter.      -4.661779
F-statistic                155.4590   Durbin-Watson stat         2.023424
Prob(F-statistic)          0.000000
==============================================================================
```

Table C2.8:

```
Null Hypothesis: DIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=13)
=============================================================================
                                               t-Statistic     Prob.*
=============================================================================
Augmented Dickey-Fuller test statistic         -12.59292       0.0000
-----------------------------------------------------------------------------
Test critical values:        1% level          -4.011044
                             5% level          -3.435560
                             10% level         -3.141820
=============================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 12:26
Sample (adjusted): 2002M05 2016M12
Included observations: 176 after adjustments
=============================================================================
        Variable           Coefficient    Std. Error    t-Statistic    Prob.
=============================================================================
         DIP(-1)            -2.038839     0.161904      -12.59292      0.0000
       D(DIP(-1))            0.581539     0.125042       4.650755      0.0000
       D(DIP(-2))            0.332784     0.071688       4.642109      0.0000
            C                0.001480     0.003573       0.414196      0.6792
    @TREND("2002M01")        9.93E-07      3.41E-05      0.029109      0.9768
=============================================================================
R-squared                    0.730568   Mean dependent var          -7.00E-05
Adjusted R-squared           0.724266   S.D. dependent var           0.043779
S.E. of regression           0.022989   Akaike info criterion       -4.679646
Sum squared resid            0.090369   Schwarz criterion           -4.589575
Log likelihood               416.8088   Hannan-Quinn criter.        -4.643114
F-statistic                  115.9171   Durbin-Watson stat           2.023476
Prob(F-statistic)            0.000000
=============================================================================
```

Table C2.9:

```
Null Hypothesis: DIP has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=13)
=============================================================================
                                               t-Statistic     Prob.*
=============================================================================
Augmented Dickey-Fuller test statistic         -12.60474       0.0000
-----------------------------------------------------------------------------
Test critical values:        1% level          -2.578167
                             5% level          -1.942645
                             10% level         -1.615502
=============================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
```

```
Date: 08/29/17   Time: 12:26
Sample (adjusted): 2002M05 2016M12
Included observations: 176 after adjustments
=========================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
=========================================================================
         DIP(-1)           -2.027890      0.160883     -12.60474     0.0000
        D(DIP(-1))          0.573732      0.124310      4.615330     0.0000
        D(DIP(-2))          0.329188      0.071330      4.615011     0.0000
=========================================================================
R-squared                   0.729279   Mean dependent var        -7.00E-05
Adjusted R-squared          0.726149   S.D. dependent var         0.043779
S.E. of regression          0.022910   Akaike info criterion     -4.697600
Sum squared resid           0.090801   Schwarz criterion         -4.643558
Log likelihood              416.3888   Hannan-Quinn criter.      -4.675681
Durbin-Watson stat          2.019484
=========================================================================
```

(Stationary in first difference)

Table C2.10:

```
Null Hypothesis: DREER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=========================================================================
                                                 t-Statistic     Prob.*
=========================================================================
Augmented Dickey-Fuller test statistic           -12.27537      0.0000
-------------------------------------------------------------------------
Test critical values:         1% level            -3.467205
                              5% level            -2.877636
                             10% level            -2.575430
=========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 12:27
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=========================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
=========================================================================
        DREER(-1)          -0.927504      0.075558     -12.27537     0.0000
            C              -0.000122      0.000210     -0.584399     0.5597
=========================================================================
R-squared                   0.461254   Mean dependent var        -3.50E-05
Adjusted R-squared          0.458193   S.D. dependent var         0.003795
S.E. of regression          0.002794   Akaike info criterion     -8.911759
Sum squared resid           0.001374   Schwarz criterion         -8.876009
Log likelihood              795.1465   Hannan-Quinn criter.      -8.897261
F-statistic                 150.6846   Durbin-Watson stat         1.995631
Prob(F-statistic)           0.000000
=========================================================================
```

Table C2.11:

```
Null Hypothesis: DREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==============================================================
                                          t-Statistic   Prob.*
==============================================================
Augmented Dickey-Fuller test statistic     -12.30667   0.0000
--------------------------------------------------------------
Test critical values:      1% level        -4.010440
                           5% level        -3.435269
                           10% level       -3.141649
==============================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 12:27
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================
      Variable         Coefficient  Std. Error  t-Statistic  Prob.
==============================================================
      DREER(-1)         -0.933527    0.075855   -12.30667   0.0000
          C             -0.000471    0.000426   -1.104786   0.2708
  @TREND("2002M01")      3.84E-06    4.09E-06    0.938850   0.3491
==============================================================
R-squared               0.463954  Mean dependent var    -3.50E-05
Adjusted R-squared      0.457828  S.D. dependent var     0.003795
S.E. of regression      0.002795  Akaike info criterion -8.905547
Sum squared resid       0.001367  Schwarz criterion     -8.851922
Log likelihood          795.5937  Hannan-Quinn criter.  -8.883801
F-statistic             75.73228  Durbin-Watson stat     1.993336
Prob(F-statistic)       0.000000
==============================================================
```

Table C2.12:

```
Null Hypothesis: DREER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==============================================================
                                          t-Statistic   Prob.*
==============================================================
Augmented Dickey-Fuller test statistic     -12.28546   0.0000
--------------------------------------------------------------
Test critical values:      1% level        -2.578018
                           5% level        -1.942624
                           10% level       -1.615515
==============================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 12:27
Sample (adjusted): 2002M03 2016M12
```

```
Included observations: 178 after adjustments
==========================================================================
        Variable        Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
       DREER(-1)          -0.926003     0.075374     -12.28546     0.0000
==========================================================================
R-squared                 0.460209   Mean dependent var         -3.50E-05
Adjusted R-squared        0.460209   S.D. dependent var          0.003795
S.E. of regression        0.002788   Akaike info criterion      -8.921056
Sum squared resid         0.001376   Schwarz criterion          -8.903181
Log likelihood            794.9740   Hannan-Quinn criter.       -8.913807
Durbin-Watson stat        1.994852
==========================================================================
```

(Stationary in first difference)

Table C2.13: Group unit root test summary

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17   Time: 12:27
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 13
Newey-West automatic bandwidth selection and Bartlett kernel
==========================================================================
                                                       Cross-
Method                          Statistic    Prob.**  sections      Obs
--------------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
--------------------------------------------------------------------------
Levin, Lin & Chu t*             -17.2888     0.0000       4          687

Null: Unit root (assumes individual unit root process)
--------------------------------------------------------------------------
ADF - Fisher Chi-square          246.698     0.0000       4          687
PP - Fisher Chi-square           337.403     0.0000       4          712
==========================================================================
** Probabilities for Fisher tests are computed using an asymptotic Chi
      -square distribution. All other tests assume asymptotic normality.
```

Table C2.14:

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17   Time: 12:28
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel
==========================================================================
                                                       Cross-
Method                          Statistic    Prob.**  sections      Obs
--------------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
--------------------------------------------------------------------------
Levin, Lin & Chu t*             -19.8870     0.0000       4          710

Null: Unit root (assumes individual unit root process)
--------------------------------------------------------------------------
ADF - Fisher Chi-square          370.501     0.0000       4          710
PP - Fisher Chi-square           337.403     0.0000       4          712
==========================================================================
** Probabilities for Fisher tests are computed using an asymptotic Chi
```

-square distribution. All other tests assume asymptotic normality.

Table C2.15:

Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 12:28
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-19.7560	0.0000	4	710
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-22.7333	0.0000	4	710
ADF - Fisher Chi-square	320.014	0.0000	4	710
PP - Fisher Chi-square	240.004	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C2.16:

Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 12:28
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-22.8808	0.0000	4	710
Breitung t-stat	-16.6954	0.0000	4	706
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-23.7435	0.0000	4	710
ADF - Fisher Chi-square	307.456	0.0000	4	710
PP - Fisher Chi-square	236.946	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Part D: On stability and on lag length

Figure D1: The unit circle

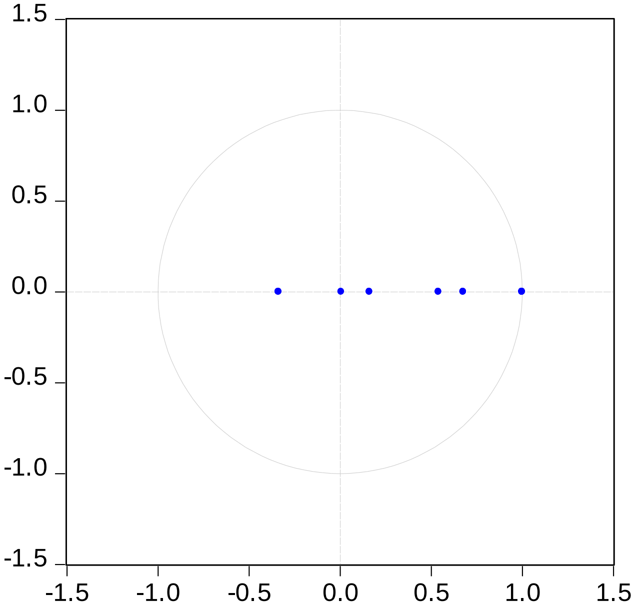

Inverse Roots of AR Characteristic Polynomial

Table D1:

Roots of Characteristic Polynomial
Endogenous variables: IP REER FS I
Exogenous variables:
Lag specification: 1 1
Date: 11/07/17 Time: 15:33

Root	Modulus
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
0.678179	0.678179
0.541284	0.541284
-0.337518	0.337518
0.162978	0.162978
0.007953	0.007953

VEC specification imposes 3 unit root(s).

Table D2:

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/07/17 Time: 15:31
Sample: 2002M01 2016M12
Included observations: 178

Lags	LM-Stat	Prob
1	23.78649	0.0943

Probs from chi-square with 16 df.
VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/07/17   Time: 15:32
Sample: 2002M01 2016M12
Included observations: 178

Component	Skewness	Chi-sq	df	Prob.
1	0.495713	7.290038	1	0.0069
2	-0.123620	0.453363	1	0.5007
3	1.647478	80.52077	1	0.0000
4	-0.353683	3.711053	1	0.0541
Joint		91.97522	4	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	6.467517	89.17558	1	0.0000
2	3.786964	4.593231	1	0.0321
3	13.76993	860.2687	1	0.0000
4	13.45495	810.6856	1	0.0000
Joint		1764.723	4	0.0000

Component	Jarque-Bera	df	Prob.
1	96.46562	2	0.0000
2	5.046594	2	0.0802
3	940.7895	2	0.0000
4	814.3967	2	0.0000
Joint	1856.698	8	0.0000

Table D3: VECM lag order selection criteria
Endogenous variables: DIP DREER DFS DI
Exogenous variables: C **ECT**
Date: 11/07/17   Time: 15:15
Sample: 2002M01 2016M12
Included observations: 171

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2252.742	NA	4.66e-17	-26.25430	-26.10732	-26.19466
1	2300.253	91.68650	3.22e-17*	-26.62284*	-26.18190*	-26.44392*
2	2311.433	21.05274	3.41e-17	-26.56646	-25.83157	-26.26828
3	2330.724	35.42448	3.28e-17	-26.60496	-25.57611	-26.18750
4	2344.021	23.79363	3.39e-17	-26.57334	-25.25054	-26.03660
5	2353.171	15.94530	3.69e-17	-26.49322	-24.87646	-25.83721
6	2373.698	34.81200*	3.51e-17	-26.54617	-24.63545	-25.77088
7	2384.373	17.60534	3.76e-17	-26.48390	-24.27922	-25.58933

8	2395.663	18.08980	4.00e-17	-26.42881	-23.93017	-25.41497

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Part E: The VECM and the GIRFs

Table E1: The VECM

Vector Error Correction Estimates
Date: 11/07/17 Time: 15:35
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1			
IP(-1)	1.000000			
REER(-1)	-0.570037			
	(0.55030)			
	[-1.03586]			
FS(-1)	-0.298970			
	(0.05868)			
	[-5.09530]			
I(-1)	-1.131180			
	(0.39592)			
	[-2.85709]			
C	0.131879			
Error Correction:	**D(IP)**	**D(REER)**	**D(FS)**	**D(I)**
CointEq1	-0.200728	0.006775	0.031594	0.047528
	(0.06196)	(0.00731)	(0.04513)	(0.01281)
	[-3.23958]	[0.92644]	[0.70004]	[3.70932]
D(IP(-1))	-0.281604	0.004362	-0.047895	-0.023529
	(0.07664)	(0.00905)	(0.05582)	(0.01585)
	[-3.67443]	[0.48217]	[-0.85798]	[-1.48461]
D(REER(-1))	-0.419669	0.068895	-0.751012	0.210642
	(0.65476)	(0.07728)	(0.47692)	(0.13540)
	[-0.64095]	[0.89148]	[-1.57470]	[1.55568]
D(FS(-1))	-0.115068	-0.006074	0.084795	-0.044149
	(0.10443)	(0.01233)	(0.07607)	(0.02160)
	[-1.10188]	[-0.49277]	[1.11477]	[-2.04437]
D(I(-1))	-0.084136	-0.039991	-0.253829	0.448590
	(0.31248)	(0.03688)	(0.22761)	(0.06462)

	[-0.26925]	[-1.08429]	[-1.11520]	[6.94200]
C	0.001345	-0.000126	0.003141	-7.69E-05
	(0.00183)	(0.00022)	(0.00133)	(0.00038)
	[0.73700]	[-0.58257]	[2.36193]	[-0.20380]
R-squared	0.207302	0.023077	0.028872	0.299040
Adj. R-squared	0.184258	-0.005322	0.000642	0.278663
Sum sq. resids	0.096830	0.001349	0.051374	0.004141
S.E. equation	0.023727	0.002800	0.017282	0.004907
F-statistic	8.996079	0.812613	1.022742	14.67556
Log likelihood	416.4047	796.7602	472.8157	696.9374
Akaike AIC	-4.611289	-8.884946	-5.245120	-7.763342
Schwarz SC	-4.504037	-8.777695	-5.137869	-7.656091
Mean dependent	0.000765	-0.000129	0.003621	-0.000521
S.D. dependent	0.026270	0.002793	0.017288	0.005777
Determinant resid covariance (dof adj.)	3.00E-17			
Determinant resid covariance	2.62E-17			
Log likelihood	2387.849			
Akaike information criterion	-26.51515			
Schwarz criterion	-26.01465			

Table E2: THE VECM regressions (both PRF and SRF).

```
Estimation Proc:
===============================
EC(C,1) 1 1 IP REER FS I

VAR Model:
===============================
D(IP) = A(1,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(1,1)*D(IP(-1)) +
C(1,2)*D(REER(-1)) + C(1,3)*D(FS(-1)) + C(1,4)*D(I(-1)) + C(1,5)

D(REER) = A(2,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(2,1)*D(IP(-1)) +
C(2,2)*D(REER(-1)) + C(2,3)*D(FS(-1)) + C(2,4)*D(I(-1)) + C(2,5)

D(FS) = A(3,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(3,1)*D(IP(-1)) +
C(3,2)*D(REER(-1)) + C(3,3)*D(FS(-1)) + C(3,4)*D(I(-1)) + C(3,5)

D(I) = A(4,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(4,1)*D(IP(-1)) +
C(4,2)*D(REER(-1)) + C(4,3)*D(FS(-1)) + C(4,4)*D(I(-1)) + C(4,5)

VAR Model - Substituted Coefficients:
===============================
D(IP) =  - 0.200727700381*( IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) - 1.13118037887*I(-1) +
0.131879290596 ) - 0.281604496176*D(IP(-1)) - 0.419669293202*D(REER(-1)) - 0.11506812231*D(FS(-1)) -
0.0841359689681*D(I(-1)) + 0.00134548856412

D(REER) = 0.00677520637859*( IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) - 1.13118037887*I(-1) +
0.131879290596 ) + 0.00436151231883*D(IP(-1)) + 0.0688945181134*D(REER(-1)) - 0.00607367580266*D(FS(-1)) -
0.0399905541668*D(I(-1)) - 0.000125531378158

D(FS) = 0.031594210468*( IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) - 1.13118037887*I(-1) +
0.131879290596 ) - 0.0478951840958*D(IP(-1)) - 0.751012400875*D(REER(-1)) + 0.0847950338967*D(FS(-1)) -
0.253829330975*D(I(-1)) + 0.00314084187224
```

D(I) = 0.0475283504616*(IP(-1) - 0.57003721181*REER(-1) - 0.298969975261*FS(-1) - 1.13118037887*I(-1) + 0.131879290596) - 0.0235290320971*D(IP(-1)) + 0.210642022712*D(REER(-1)) - 0.0441488592378*D(FS(-1)) + 0.448590245605*D(I(-1)) - 7.69398908126e-05

Table E3: The VECM regressions (both PRF and SRF). Plus Dummy variable (dum=1, since 2008M9)

Vector Error Correction Estimates
Date: 11/10/17 Time: 11:49
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1	CointEq2
IP(-1)	1.000000	0.000000
REER(-1)	0.000000	1.000000
FS(-1)	0.505364	0.625175
	(0.33603)	(0.22509)
	[1.50394]	[2.77748]
I(-1)	8.250700	6.106272
	(1.89770)	(1.27117)
	[4.34775]	[4.80367]
C	-4.104616	-4.341746

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.436955	0.017329	0.101827	0.044001
	(0.07764)	(0.00814)	(0.05803)	(0.01638)
	[-5.62784]	[2.12801]	[1.75461]	[2.68583]
CointEq2	0.611803	-0.026265	-0.127661	-0.083359
	(0.11373)	(0.01193)	(0.08501)	(0.02400)
	[5.37939]	[-2.20187]	[-1.50174]	[-3.47367]
D(IP(-1))	-0.179614	-0.001238	-0.084129	-0.022791
	(0.07610)	(0.00798)	(0.05688)	(0.01606)
	[-2.36015]	[-0.15513]	[-1.47898]	[-1.41934]
D(REER(-1))	-0.670895	-0.050562	-0.360171	0.221243
	(0.64588)	(0.06774)	(0.48277)	(0.13628)
	[-1.03873]	[-0.74640]	[-0.74606]	[1.62343]
D(FS(-1))	-0.145050	0.004373	0.034618	-0.025264
	(0.10348)	(0.01085)	(0.07735)	(0.02183)
	[-1.40174]	[0.40297]	[0.44757]	[-1.15707]
D(I(-1))	0.029582	-0.040450	-0.260828	0.485404
	(0.30093)	(0.03156)	(0.22493)	(0.06350)
	[0.09830]	[-1.28158]	[-1.15958]	[7.64457]
C	0.018596	-0.001381	0.002758	-0.001603
	(0.00387)	(0.00041)	(0.00289)	(0.00082)
	[4.80553]	[-3.40294]	[0.95349]	[-1.96345]

DUM	-0.030419 (0.00609) [-4.99866]	0.002080 (0.00064) [3.25939]	0.001768 (0.00455) [0.38879]	0.002548 (0.00128) [1.98418]
R-squared	0.299418	0.318226	0.096205	0.355041
Adj. R-squared	0.261887	0.281703	0.047788	0.320490
Sum sq. resids	0.085578	0.000941	0.047812	0.003810
S.E. equation	0.022570	0.002367	0.016870	0.004762
F-statistic	7.977853	8.712898	1.986990	10.27575
Log likelihood	427.3990	828.7744	479.2108	704.3479
Akaike AIC	-4.689876	-9.199712	-5.272031	-7.801662
Schwarz SC	-4.511124	-9.020960	-5.093279	-7.622910
Mean dependent	0.000765	-0.000129	0.003621	-0.000521
S.D. dependent	0.026270	0.002793	0.017288	0.005777

Determinant resid covariance (dof adj.)	1.71E-17
Determinant resid covariance	1.36E-17
Log likelihood	2446.451
Akaike information criterion	-26.94889
Schwarz criterion	-26.09088

Figure E1: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=10). With one CE.

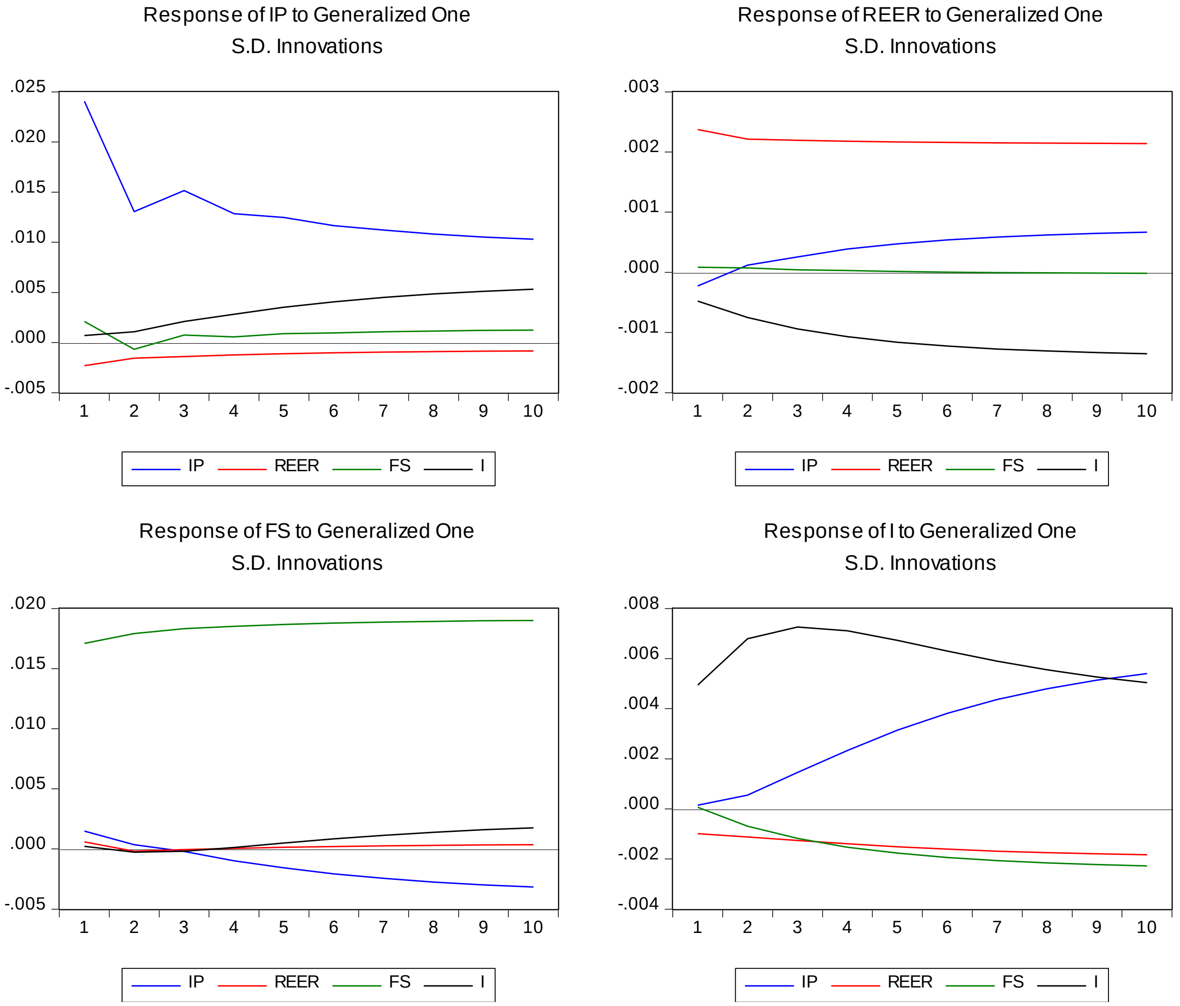
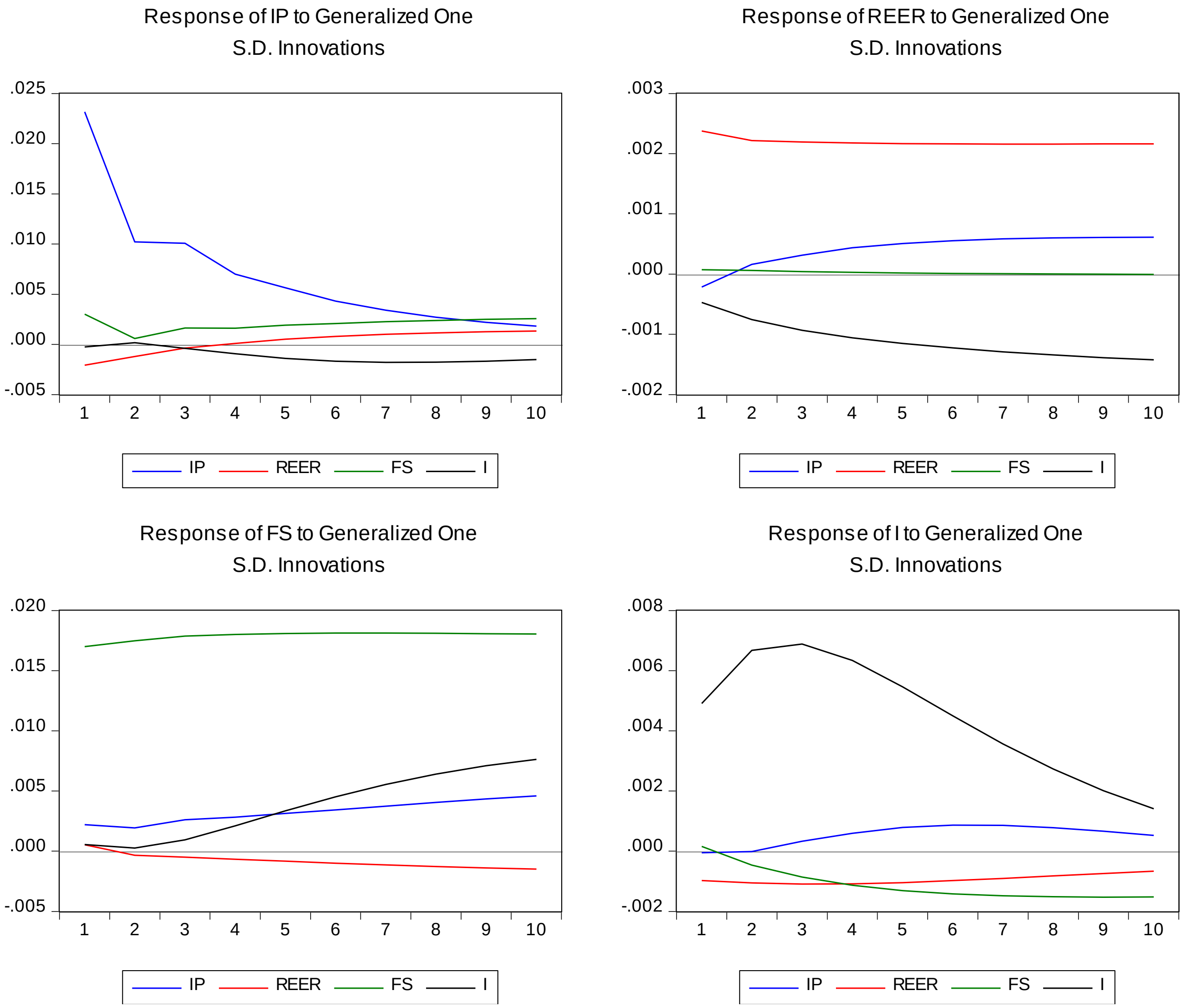


Figure E2: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=10). With two CEs



Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

Figure E3: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=40). With two CEs

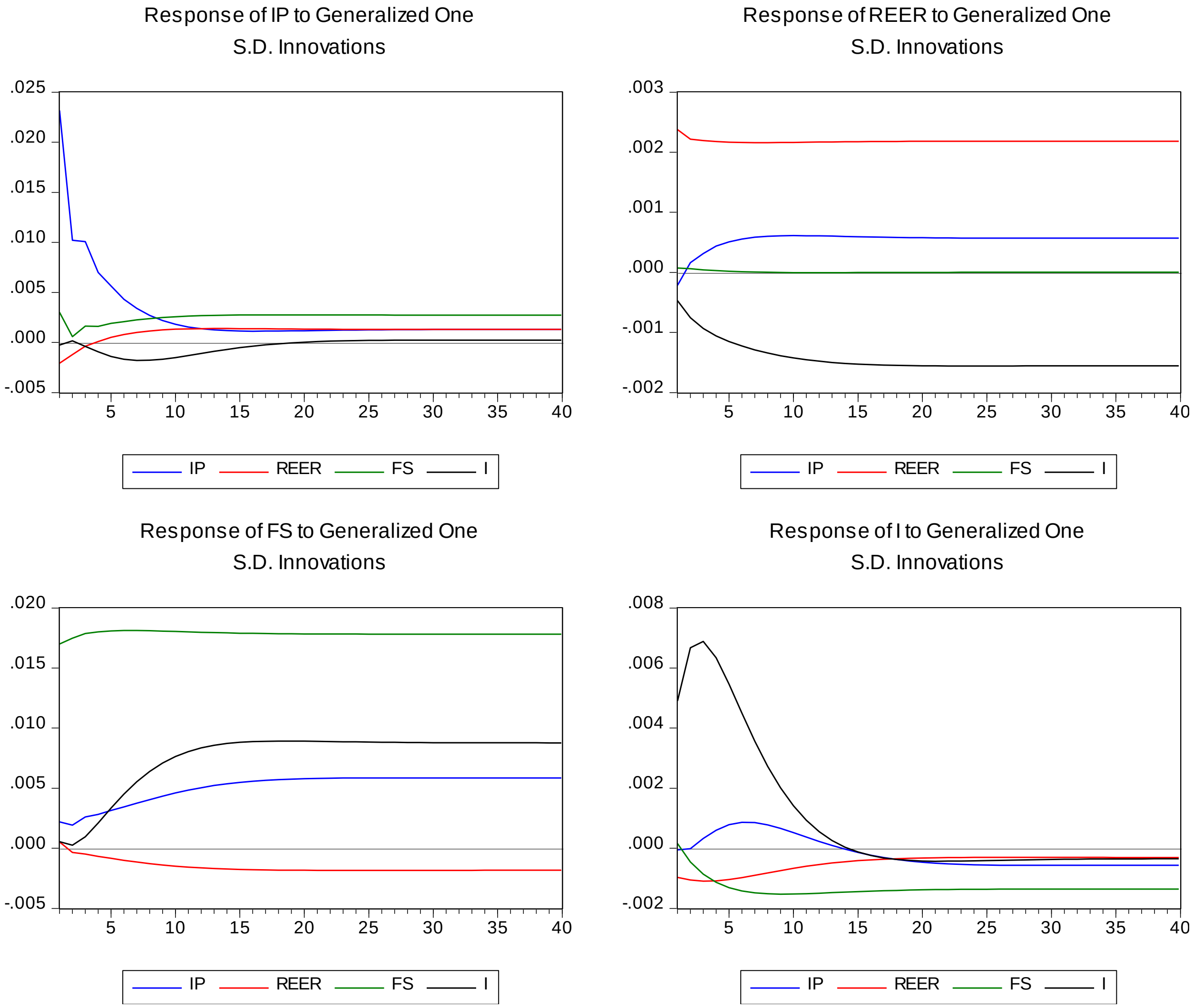


Figure E4: Generalized Impulse Response Functions (GIRFs). With two CEs

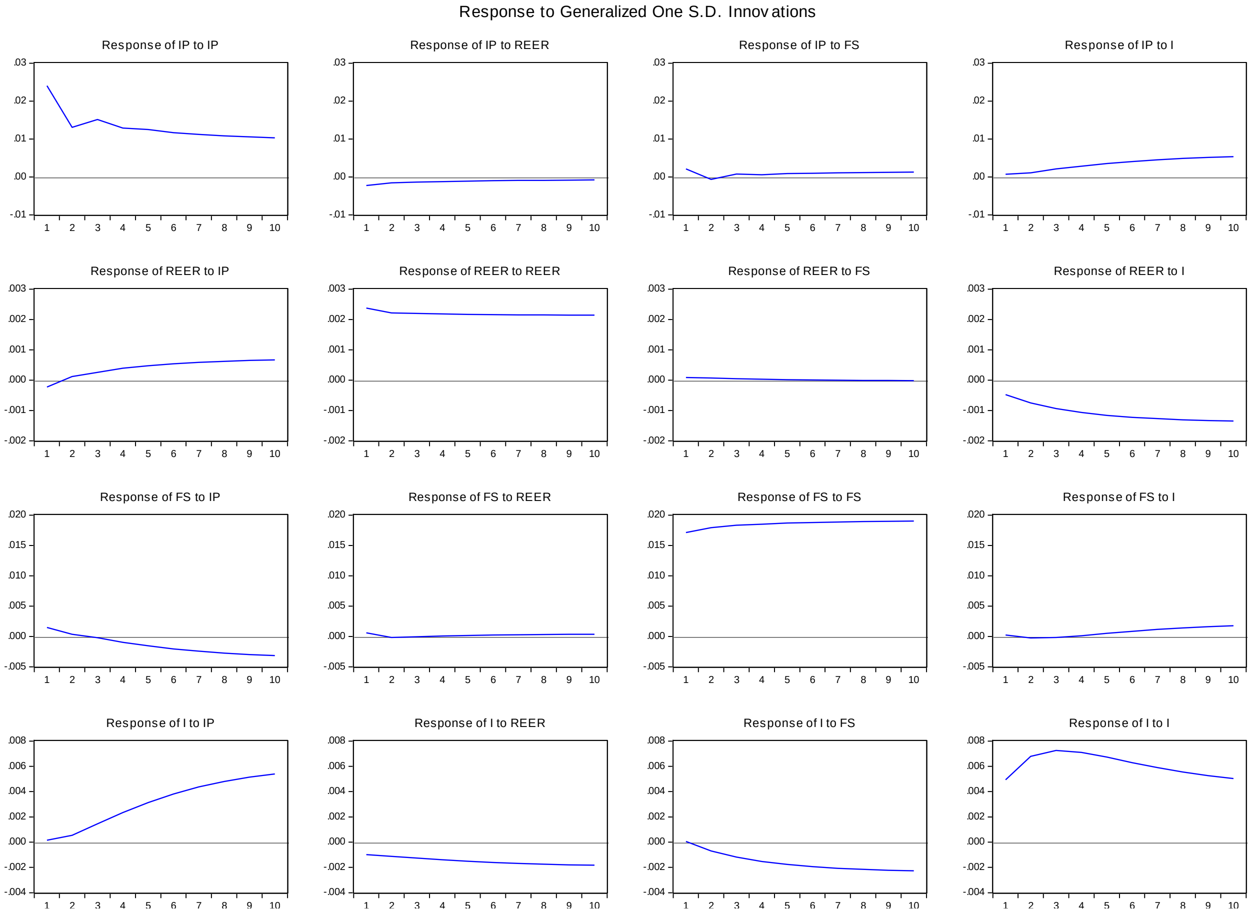
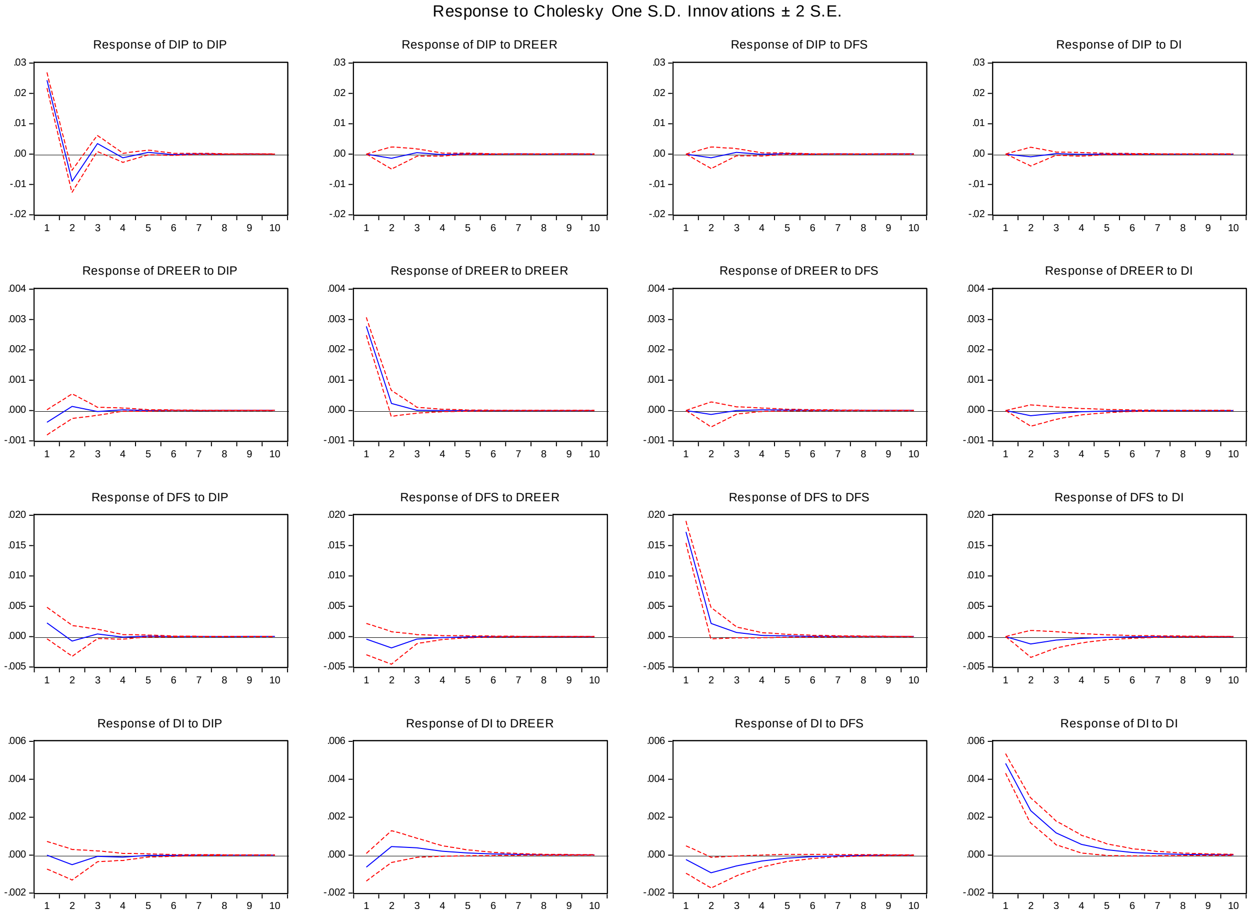


Figure E5: Cholesky decomposed Impulse Response Functions with specific ordering



APPENDIX D

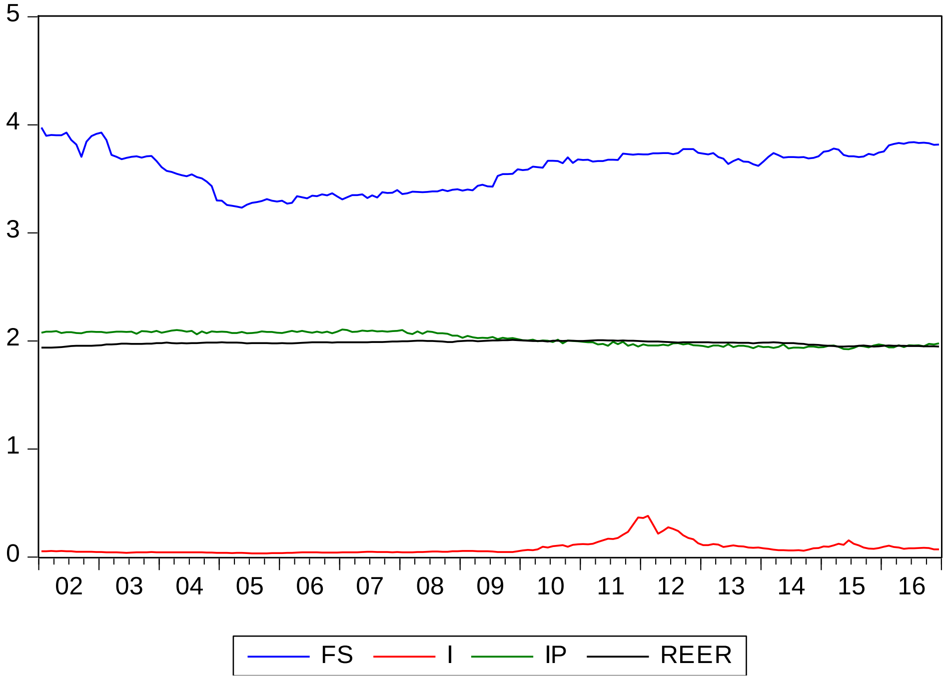
Determining the Relationship between the investigated variables. The case of Greece

Part A: Statistical measures and level graphs

Table A1: STATISTICAL TABLES FOR ALL FOUR VARIABLES

	FS	I	IP	REER
Mean	3.594985	0.082289	2.022064	1.980225
Median	3.664312	0.054000	2.027349	1.983603
Maximum	3.974512	0.380000	2.104487	2.007768
Minimum	3.232996	0.033000	1.923244	1.936127
Std. Dev.	0.192068	0.064707	0.060301	0.018214
Skewness	-0.300483	2.488967	-0.145160	-0.620476
Kurtosis	1.860661	9.671180	1.320591	2.448028
Jarque-Bera	12.44441	519.6335	21.78526	13.83475
Probability	0.001985	0.000000	0.000019	0.000990
Sum	647.0973	14.81200	363.9715	356.4405
Sum Sq. Dev.	6.603321	0.749463	0.650878	0.059384
Observations	180	180	180	180

Figure A1: All four variables from 1/1/2002 to 31/12/2016



Part B: On cointegration

Table B1: Cointegration (all four variables in level)

Date: 11/08/17 Time: 12:44
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.167957	55.78110	47.85613	0.0076
At most 1	0.094933	23.60366	29.79707	0.2177
At most 2	0.020873	6.148052	15.49471	0.6780
At most 3	0.013939	2.456552	3.841466	0.1170

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.167957	32.17744	27.58434	0.0119
At most 1	0.094933	17.45561	21.13162	0.1516
At most 2	0.020873	3.691500	14.26460	0.8904
At most 3	0.013939	2.456552	3.841466	0.1170

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

IP	REER	FS	I
23.30937	-26.11058	3.889561	1.293172
6.013982	73.41877	5.282010	-15.68096
14.47695	22.54932	1.954199	16.32283
3.628715	-19.25860	-6.234772	6.311017

Unrestricted Adjustment Coefficients (alpha):

D(IP)	0.000598	-0.002339	-0.000956	-0.000278
D(REER)	0.000809	0.000102	-3.47E-05	0.000141
D(FS)	-0.006648	-0.000102	-0.001299	0.002713
D(I)	-0.000335	0.003030	-0.001277	-0.000456

1 Cointegrating Equation(s):	Log likelihood	2247.905

```
Normalized cointegrating coefficients (standard error in parentheses)
      IP              REER             FS              I
   1.000000        -1.120175        0.166867        0.055479
                   (0.63492)       (0.06157)       (0.17149)

Adjustment coefficients (standard error in parentheses)
    D(IP)          0.013949
                   (0.01940)
   D(REER)         0.018847
                   (0.00409)
    D(FS)         -0.154967
                   (0.05353)
     D(I)         -0.007806
                   (0.02567)


2 Cointegrating Equation(s):        Log likelihood        2256.633


Normalized cointegrating coefficients (standard error in parentheses)
      IP              REER             FS              I
   1.000000         0.000000        0.226659       -0.168326
                                   (0.04790)       (0.15044)
   0.000000         1.000000        0.053377       -0.199794
                                   (0.01924)       (0.06044)

Adjustment coefficients (standard error in parentheses)
    D(IP)         -0.000116       -0.187338
                   (0.01952)       (0.06319)
   D(REER)         0.019458       -0.013648
                   (0.00422)       (0.01365)
    D(FS)         -0.155578        0.166138
                   (0.05528)       (0.17893)
     D(I)          0.010417        0.231210
                   (0.02586)       (0.08371)


3 Cointegrating Equation(s):        Log likelihood        2258.479


Normalized cointegrating coefficients (standard error in parentheses)
      IP              REER             FS              I
   1.000000         0.000000        0.000000        1.915324
                                                   (0.84369)
   0.000000         1.000000        0.000000        0.290897
                                                   (0.20107)
   0.000000         0.000000        1.000000       -9.192899
                                                   (3.81473)

Adjustment coefficients (standard error in parentheses)
    D(IP)         -0.013953       -0.208891       -0.011894
                   (0.02268)       (0.06549)       (0.00553)
   D(REER)         0.018956       -0.014431        0.003614
                   (0.00492)       (0.01421)       (0.00120)
    D(FS)         -0.174380        0.136852       -0.028933
                   (0.06444)       (0.18609)       (0.01570)
     D(I)         -0.008073        0.202409        0.012207
                   (0.03004)       (0.08675)       (0.00732)
```

Table B2: Group cointegration summary

Date: 11/08/17 Time: 12:50
Sample: 2002M01 2016M12
Included observations: 175
Series: IP REER FS I
Lags interval: 1 to 4

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	1	1	0	0
Max-Eig	1	1	1	1	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2230.088	2230.088	2231.817	2231.817	2241.073
1	2246.196	2246.205	2247.905	2248.251	2252.485
2	2249.643	2255.853	2256.633	2257.262	2257.802
3	2252.071	2258.450	2258.479	2259.696	2260.161
4	2252.610	2259.707	2259.707	2261.027	2261.027
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-24.75529	-24.75529	-24.72933	-24.72933	-24.78940
1	-24.84796*	-24.83662	-24.82177	-24.81430	-24.82840
2	-24.79592	-24.84403	-24.83009	-24.81442	-24.79774
3	-24.73223	-24.77086	-24.75976	-24.73939	-24.73327
4	-24.64697	-24.68237	-24.68237	-24.65174	-24.65174
	Schwarz				

	Criteria by Rank (rows) and Model (columns)				
0	-23.59789*	-23.59789*	-23.49959	-23.49959	-23.48732
1	-23.54587	-23.51646	-23.44735	-23.42179	-23.38164
2	-23.34916	-23.36110	-23.31100	-23.25916	-23.20630
3	-23.14080	-23.12517	-23.09599	-23.02136	-22.99716
4	-22.91086	-22.87392	-22.87392	-22.77095	-22.77095

Part C: On unit root tests

Part C1: Unit root tests in level variables

Table C1.1: Unit roots in level variables
Null Hypothesis: FS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.701240	0.4289
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 12:48
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.020920	0.012297	-1.701240	0.0907
C	0.074292	0.044254	1.678761	0.0950

R-squared	0.016088	Mean dependent var	-0.000888
Adjusted R-squared	0.010530	S.D. dependent var	0.031649
S.E. of regression	0.031481	Akaike info criterion	-4.067725
Sum squared resid	0.175422	Schwarz criterion	-4.032112
Log likelihood	366.0614	Hannan-Quinn criter.	-4.053285
F-statistic	2.894217	Durbin-Watson stat	1.771299
Prob(F-statistic)	0.090654		

Table C1.2:
Null Hypothesis: FS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.797487	0.2002
Test critical values:	1% level	-4.010143	
	5% level	-3.435125	
	10% level	-3.141565	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 12:48
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.035611	0.012730	-2.797487	0.0057
C	0.112842	0.044527	2.534214	0.0121
@TREND("2002M01")	0.000158	4.71E-05	3.358347	0.0010

R-squared	0.075343	Mean dependent var	-0.000888
Adjusted R-squared	0.064835	S.D. dependent var	0.031649
S.E. of regression	0.030605	Akaike info criterion	-4.118665
Sum squared resid	0.164857	Schwarz criterion	-4.065245
Log likelihood	371.6205	Hannan-Quinn criter.	-4.097004
F-statistic	7.170391	Durbin-Watson stat	1.856779
Prob(F-statistic)	0.001015		

Table C1.3:
Null Hypothesis: FS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.465054	0.5127
Test critical values:	1% level	-2.577945	
	5% level	-1.942614	
	10% level	-1.615522	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 12:48
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.000306	0.000657	-0.465054	0.6425

R-squared	0.000422	Mean dependent var	-0.000888
Adjusted R-squared	0.000422	S.D. dependent var	0.031649
S.E. of regression	0.031642	Akaike info criterion	-4.063102
Sum squared resid	0.178215	Schwarz criterion	-4.045295
Log likelihood	364.6476	Hannan-Quinn criter.	-4.055881
Durbin-Watson stat	1.780502		

(Not stationary in level)

Table C1.4:

Null Hypothesis: I has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.235390	0.1946
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 12:48
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.036507	0.016331	-2.235390	0.0267
D(I(-1))	0.355116	0.070626	5.028093	0.0000
C	0.003067	0.001709	1.794358	0.0745

R-squared	0.138317	Mean dependent var	8.99E-05
Adjusted R-squared	0.128470	S.D. dependent var	0.015036
S.E. of regression	0.014037	Akaike info criterion	-5.677579
Sum squared resid	0.034480	Schwarz criterion	-5.623953
Log likelihood	508.3045	Hannan-Quinn criter.	-5.655832
F-statistic	14.04552	Durbin-Watson stat	1.955200
Prob(F-statistic)	0.000002		

Table C1.5:

Null Hypothesis: I has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.391495	0.3827
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	

```
                    10% level                    -3.141649
==========================================================================

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17   Time: 12:49
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
        Variable           Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
          I(-1)             -0.044310      0.018528     -2.391495     0.0178
        D(I(-1))             0.360926      0.070966      5.085929     0.0000
            C                0.001831      0.002199      0.832656     0.4062
   @TREND("2002M01")         2.08E-05      2.32E-05      0.893486     0.3728
==========================================================================
R-squared                    0.142253   Mean dependent var          8.99E-05
Adjusted R-squared           0.127464   S.D. dependent var          0.015036
S.E. of regression           0.014045   Akaike info criterion      -5.670920
Sum squared resid            0.034322   Schwarz criterion          -5.599420
Log likelihood               508.7119   Hannan-Quinn criter.       -5.641925
F-statistic                  9.618993   Durbin-Watson stat          1.959475
Prob(F-statistic)            0.000007
==========================================================================
```

Table C1.6:

```
Null Hypothesis: I has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                 t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic           -1.325855      0.1707
--------------------------------------------------------------------------
Test critical values:       1% level             -2.578018
                            5% level             -1.942624
                           10% level             -1.615515
==========================================================================

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17   Time: 12:49
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
        Variable           Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
          I(-1)             -0.013412      0.010116     -1.325855     0.1866
        D(I(-1))             0.344314      0.070812      4.862394     0.0000
==========================================================================
R-squared                    0.122464   Mean dependent var          8.99E-05
Adjusted R-squared           0.117478   S.D. dependent var          0.015036
```

```
S.E. of regression       0.014125   Akaike info criterion     -5.670584
Sum squared resid        0.035114   Schwarz criterion         -5.634833
Log likelihood           506.6819   Hannan-Quinn criter.      -5.656086
Durbin-Watson stat       1.945780
```

(Non stationary in level)

Table C1.7:

```
Null Hypothesis: IP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

                                                  t-Statistic     Prob.*

Augmented Dickey-Fuller test statistic            -0.908065      0.7840
Test critical values:          1% level           -3.467205
                               5% level           -2.877636
                               10% level          -2.575430

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17   Time: 12:49
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

        Variable         Coefficient     Std. Error     t-Statistic     Prob.

          IP(-1)          -0.012687       0.013971      -0.908065      0.3651
        D(IP(-1))         -0.535573       0.063792      -8.395597      0.0000
            C              0.024713       0.028267       0.874271      0.3832

R-squared                0.296914   Mean dependent var        -0.000611
Adjusted R-squared       0.288878   S.D. dependent var         0.013235
S.E. of regression       0.011160   Akaike info criterion     -6.136175
Sum squared resid        0.021797   Schwarz criterion         -6.082550
Log likelihood           549.1196   Hannan-Quinn criter.      -6.114429
F-statistic              36.95128   Durbin-Watson stat         2.115040
Prob(F-statistic)        0.000000
```

Table C1.8:

```
Null Hypothesis: IP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

                                                  t-Statistic     Prob.*

Augmented Dickey-Fuller test statistic            -1.869866      0.6659
Test critical values:          1% level           -4.010440
                               5% level           -3.435269
                               10% level          -3.141649

*MacKinnon (1996) one-sided p-values.
```

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17 Time: 12:49
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.067950	0.036340	-1.869866	0.0632
D(IP(-1))	-0.508244	0.065618	-7.745492	0.0000
C	0.142781	0.077050	1.853108	0.0656
@TREND("2002M01")	-6.97E-05	4.23E-05	-1.645985	0.1016

R-squared	0.307693	Mean dependent var	-0.000611
Adjusted R-squared	0.295757	S.D. dependent var	0.013235
S.E. of regression	0.011106	Akaike info criterion	-6.140390
Sum squared resid	0.021463	Schwarz criterion	-6.068889
Log likelihood	550.4947	Hannan-Quinn criter.	-6.111394
F-statistic	25.77789	Durbin-Watson stat	2.086368
Prob(F-statistic)	0.000000		

Table C1.9:
Null Hypothesis: IP has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.154465	0.2259
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17 Time: 12:49
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.000478	0.000414	-1.154465	0.2499
D(IP(-1))	-0.541818	0.063349	-8.552967	0.0000

R-squared	0.293843	Mean dependent var	-0.000611
Adjusted R-squared	0.289831	S.D. dependent var	0.013235
S.E. of regression	0.011153	Akaike info criterion	-6.143053
Sum squared resid	0.021892	Schwarz criterion	-6.107303
Log likelihood	548.7317	Hannan-Quinn criter.	-6.128555

```
Durbin-Watson stat          2.119092
====================================================================
```

(Not stationary in level)

Table C1.10:

```
Null Hypothesis: REER has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
====================================================================
                                              t-Statistic    Prob.*
====================================================================
Augmented Dickey-Fuller test statistic         -1.767678    0.3956
Test critical values:         1% level         -3.467205
                              5% level         -2.877636
                             10% level         -2.575430
====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17   Time: 12:50
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
====================================================================
       Variable        Coefficient    Std. Error   t-Statistic   Prob.
====================================================================
       REER(-1)         -0.018011      0.010189    -1.767678    0.0789
     D(REER(-1))         0.242869      0.072740     3.338845    0.0010
          C              0.035721      0.020182     1.769951    0.0785
====================================================================
R-squared               0.074824   Mean dependent var        6.40E-05
Adjusted R-squared      0.064251   S.D. dependent var        0.002500
S.E. of regression      0.002418   Akaike info criterion    -9.194686
Sum squared resid       0.001024   Schwarz criterion        -9.141060
Log likelihood          821.3271   Hannan-Quinn criter.     -9.172939
F-statistic             7.076646   Durbin-Watson stat        2.005695
Prob(F-statistic)       0.001108
====================================================================
```

Table C1.11:

```
Null Hypothesis: REER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
====================================================================
                                              t-Statistic    Prob.*
====================================================================
Augmented Dickey-Fuller test statistic         -1.815708    0.6932
Test critical values:         1% level         -4.010143
                              5% level         -3.435125
                             10% level         -3.141565
====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
```

```
Method: Least Squares
Date: 08/29/17   Time: 12:50
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
=============================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
=============================================================================
        REER(-1)          -0.017818      0.009813      -1.815708      0.0711
            C              0.036662      0.019443       1.885578      0.0610
   @TREND("2002M01")      -1.46E-05      3.43E-06      -4.247122      0.0000
=============================================================================
R-squared                  0.106903    Mean dependent var        6.41E-05
Adjusted R-squared         0.096754    S.D. dependent var        0.002493
S.E. of regression         0.002369    Akaike info criterion    -9.235765
Sum squared resid          0.000988    Schwarz criterion        -9.182345
Log likelihood             829.6010    Hannan-Quinn criter.     -9.214104
F-statistic                10.53355    Durbin-Watson stat        1.668171
Prob(F-statistic)          0.000048
=============================================================================
```

Table C1.12:

```
Null Hypothesis: REER has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
=============================================================================
                                                   t-Statistic     Prob.*
=============================================================================
Augmented Dickey-Fuller test statistic              0.243578      0.7558
-----------------------------------------------------------------------------
Test critical values:        1% level              -2.578018
                             5% level              -1.942624
                             10% level             -1.615515
=============================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17   Time: 12:50
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=============================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
=============================================================================
        REER(-1)           2.24E-05      9.21E-05       0.243578      0.8078
       D(REER(-1))         0.241584      0.073176       3.301402      0.0012
=============================================================================
R-squared                  0.058263    Mean dependent var        6.40E-05
Adjusted R-squared         0.052912    S.D. dependent var        0.002500
S.E. of regression         0.002433    Akaike info criterion    -9.188179
Sum squared resid          0.001042    Schwarz criterion        -9.152429
Log likelihood             819.7479    Hannan-Quinn criter.     -9.173681
Durbin-Watson stat         2.003565
=============================================================================
```

(Not stationary in level)

Table C1.13: Group unit root test summary

```
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17   Time: 12:52
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 1 to 11
Newey-West automatic bandwidth selection and Bartlett kernel
=================================================================
                                                  Cross-
Method                       Statistic   Prob.**  sections   Obs
-----------------------------------------------------------------
Null: Unit root (assumes common unit root process)
-----------------------------------------------------------------
Levin, Lin & Chu t*          -0.04060    0.4838      4       688

Null: Unit root (assumes individual unit root process)
-----------------------------------------------------------------
ADF - Fisher Chi-square       7.61445    0.4720      4       688
PP - Fisher Chi-square        7.61146    0.4723      4       716
=================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
      -square distribution. All other tests assume asymptotic normality.
```

Table C1.14:

```
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17   Time: 12:53
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
=================================================================
                                                  Cross-
Method                       Statistic   Prob.**  sections   Obs
-----------------------------------------------------------------
Null: Unit root (assumes common unit root process)
-----------------------------------------------------------------
Levin, Lin & Chu t*          -0.08743    0.4652      4       713

Null: Unit root (assumes individual unit root process)
-----------------------------------------------------------------
ADF - Fisher Chi-square       8.40724    0.3947      4       713
PP - Fisher Chi-square        7.61146    0.4723      4       716
=================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
      -square distribution. All other tests assume asymptotic normality.
```

Table C1.15:

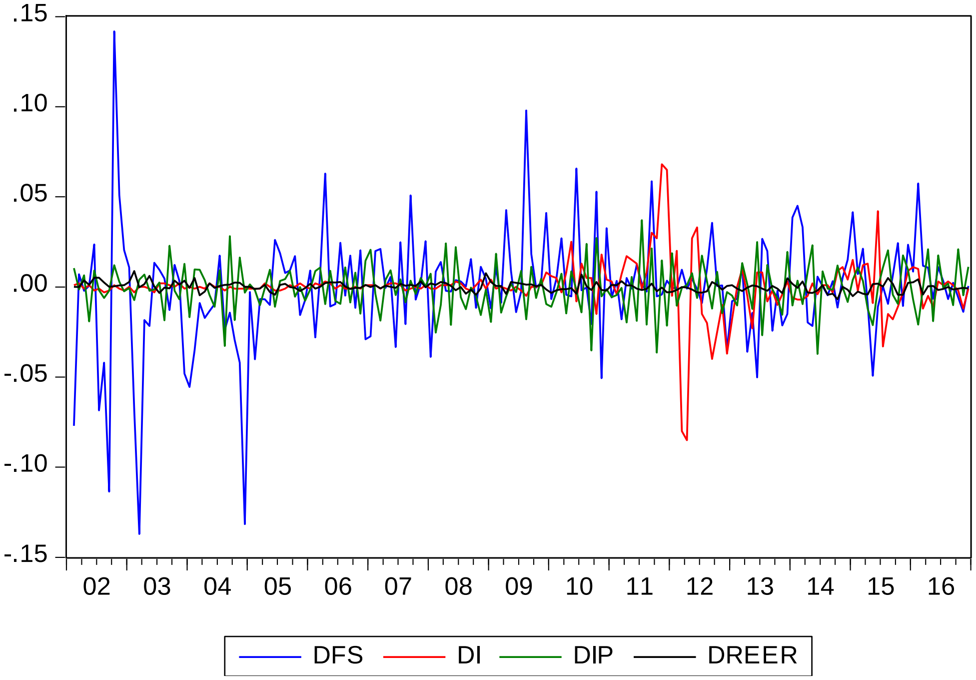
```
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17   Time: 12:53
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
=================================================================
                                                  Cross-
Method                       Statistic   Prob.**  sections   Obs
-----------------------------------------------------------------
Null: Unit root (assumes common unit root process)
-----------------------------------------------------------------
```

```
Levin, Lin & Chu t*              -1.04416     0.1482       4         713

Null: Unit root (assumes individual unit root process)
----------------------------------------------------------------------------
Im, Pesaran and Shin W-stat      -0.28454     0.3880       4         713
ADF - Fisher Chi-square           7.30763     0.5038       4         713
PP - Fisher Chi-square            6.39088     0.6035       4         716
============================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

Table C1.16:

```
Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17   Time: 12:53
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel
============================================================================

                                                          Cross-
Method                           Statistic    Prob.**    sections      Obs
----------------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
----------------------------------------------------------------------------
Levin, Lin & Chu t*              -2.18075     0.0146       4         714
Breitung t-stat                   2.09591     0.9820       4         710

Null: Unit root (assumes individual unit root process)
----------------------------------------------------------------------------
Im, Pesaran and Shin W-stat      -0.10484     0.4583       4         714
ADF - Fisher Chi-square           6.68368     0.5711       4         714
PP - Fisher Chi-square            9.05202     0.3379       4         716
============================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

Figure C1: All four variables from 1/1/2002 to 31/12/2016 in first difference



Part C2: Unit root tests in first difference

Table C2.1:
Null Hypothesis: DFS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.28295	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17 Time: 12:53
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-0.906444	0.073797	-12.28295	0.0000
C	-0.000376	0.002336	-0.161028	0.8723

R-squared	0.461561	Mean dependent var	0.000436

```
Adjusted R-squared      0.458502   S.D. dependent var       0.042345
S.E. of regression      0.031160   Akaike info criterion   -4.088182
Sum squared resid       0.170888   Schwarz criterion       -4.052431
Log likelihood          365.8482   Hannan-Quinn criter.    -4.073684
F-statistic             150.8708   Durbin-Watson stat       1.997872
Prob(F-statistic)       0.000000
====================================================================
```

Table C2.2:

```
Null Hypothesis: DFS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
====================================================================
                                              t-Statistic   Prob.*
====================================================================
Augmented Dickey-Fuller test statistic        -12.55124     0.0000
--------------------------------------------------------------------
Test critical values:        1% level         -4.010440
                             5% level         -3.435269
                             10% level        -3.141649
====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17   Time: 12:53
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
====================================================================
        Variable          Coefficient   Std. Error   t-Statistic   Prob.
====================================================================
         DFS(-1)           -0.934515     0.074456     -12.55124    0.0000
            C              -0.008808     0.004764     -1.848987    0.0661
   @TREND("2002M01")        9.29E-05     4.59E-05      2.025548    0.0443
====================================================================
R-squared               0.473895   Mean dependent var       0.000436
Adjusted R-squared      0.467883   S.D. dependent var       0.042345
S.E. of regression      0.030889   Akaike info criterion   -4.100120
Sum squared resid       0.166973   Schwarz criterion       -4.046495
Log likelihood          367.9107   Hannan-Quinn criter.    -4.078373
F-statistic             78.81673   Durbin-Watson stat       1.985381
Prob(F-statistic)       0.000000
====================================================================
```

Table C2.3:

```
Null Hypothesis: DFS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
====================================================================
                                              t-Statistic   Prob.*
====================================================================
Augmented Dickey-Fuller test statistic        -12.31725     0.0000
--------------------------------------------------------------------
Test critical values:        1% level         -2.578018
                             5% level         -1.942624
                             10% level        -1.615515
====================================================================
```

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17 Time: 12:54
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-0.906107	0.073564	-12.31725	0.0000

R-squared	0.461482	Mean dependent var	0.000436
Adjusted R-squared	0.461482	S.D. dependent var	0.042345
S.E. of regression	0.031074	Akaike info criterion	-4.099270
Sum squared resid	0.170913	Schwarz criterion	-4.081395
Log likelihood	365.8351	Hannan-Quinn criter.	-4.092022
Durbin-Watson stat	1.998290		

(Stationary in first difference)

Table C2.4:
Null Hypothesis: DI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.339846	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17 Time: 12:54
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-0.662785	0.070963	-9.339846	0.0000
C	5.58E-05	0.001064	0.052432	0.9582

R-squared	0.331390	Mean dependent var	-1.12E-05
Adjusted R-squared	0.327591	S.D. dependent var	0.017311
S.E. of regression	0.014195	Akaike info criterion	-5.660661
Sum squared resid	0.035464	Schwarz criterion	-5.624910
Log likelihood	505.7988	Hannan-Quinn criter.	-5.646163
F-statistic	87.23272	Durbin-Watson stat	1.940326
Prob(F-statistic)	0.000000		

Table C2.5:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

                                            t-Statistic   Prob.*

Augmented Dickey-Fuller test statistic      -9.318768     0.0000
Test critical values:       1% level        -4.010440
                            5% level        -3.435269
                            10% level       -3.141649

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17   Time: 12:54
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

       Variable          Coefficient   Std. Error   t-Statistic   Prob.

        DI(-1)           -0.663304     0.071179     -9.318768     0.0000
          C               0.000548     0.002161      0.253326     0.8003
  @TREND("2002M01")      -5.43E-06     2.08E-05     -0.261600     0.7939

R-squared                 0.331651   Mean dependent var      -1.12E-05
Adjusted R-squared        0.324013   S.D. dependent var       0.017311
S.E. of regression        0.014233   Akaike info criterion   -5.649816
Sum squared resid         0.035451   Schwarz criterion       -5.596190
Log likelihood            505.8336   Hannan-Quinn criter.    -5.628069
F-statistic               43.41972   Durbin-Watson stat       1.940139
Prob(F-statistic)         0.000000
```

Table C2.6:

```
Null Hypothesis: DI has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

                                            t-Statistic   Prob.*

Augmented Dickey-Fuller test statistic      -9.366127     0.0000
Test critical values:       1% level        -2.578018
                            5% level        -1.942624
                            10% level       -1.615515

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17   Time: 12:54
```

Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-0.662760	0.070761	-9.366127	0.0000

R-squared	0.331380	Mean dependent var	-1.12E-05
Adjusted R-squared	0.331380	S.D. dependent var	0.017311
S.E. of regression	0.014155	Akaike info criterion	-5.671881
Sum squared resid	0.035465	Schwarz criterion	-5.654006
Log likelihood	505.7974	Hannan-Quinn criter.	-5.664632
Durbin-Watson stat	1.940341		

(Stationary in first difference)

Table C2.7:

Null Hypothesis: DIP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-24.33347	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17 Time: 12:55
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.541983	0.063369	-24.33347	0.0000
C	-0.000944	0.000837	-1.127847	0.2609

R-squared	0.770868	Mean dependent var	3.75E-06
Adjusted R-squared	0.769567	S.D. dependent var	0.023238
S.E. of regression	0.011155	Akaike info criterion	-6.142711
Sum squared resid	0.021900	Schwarz criterion	-6.106960
Log likelihood	548.7012	Hannan-Quinn criter.	-6.128213
F-statistic	592.1176	Durbin-Watson stat	2.119027
Prob(F-statistic)	0.000000		

Table C2.8:

```
Null Hypothesis: DIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                            t-Statistic    Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic      -24.26683     0.0000
---------------------------------------------------------------------
Test critical values:       1% level        -4.010440
                            5% level        -3.435269
                            10% level       -3.141649
=====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 12:56
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=====================================================================
      Variable          Coefficient   Std. Error   t-Statistic   Prob.
=====================================================================
      DIP(-1)           -1.541953     0.063542     -24.26683    0.0000
         C              -0.001257     0.001698     -0.739966    0.4603
  @TREND("2002M01")      3.46E-06      1.63E-05     0.211806    0.8325
=====================================================================
R-squared               0.770927   Mean dependent var       3.75E-06
Adjusted R-squared      0.768309   S.D. dependent var       0.023238
S.E. of regression      0.011185   Akaike info criterion   -6.131731
Sum squared resid       0.021894   Schwarz criterion       -6.078105
Log likelihood          548.7240   Hannan-Quinn criter.    -6.109984
F-statistic             294.4745   Durbin-Watson stat       2.119620
Prob(F-statistic)       0.000000
=====================================================================
```

Table C2.9:

```
Null Hypothesis: DIP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                            t-Statistic    Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic      -24.28866     0.0000
---------------------------------------------------------------------
Test critical values:       1% level        -2.578018
                            5% level        -1.942624
                            10% level       -1.615515
=====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 12:56
Sample (adjusted): 2002M03 2016M12
```

```
Included observations: 178 after adjustments
==========================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
        DIP(-1)            -1.538657      0.063349     -24.28866     0.0000
==========================================================================
R-squared                  0.769212   Mean dependent var        3.75E-06
Adjusted R-squared         0.769212   S.D. dependent var        0.023238
S.E. of regression         0.011163   Akaike info criterion    -6.146745
Sum squared resid          0.022058   Schwarz criterion        -6.128870
Log likelihood             548.0603   Hannan-Quinn criter.     -6.139496
Durbin-Watson stat         2.109719
==========================================================================
```

(Stationary in first difference)

Table C2.10:

```
Null Hypothesis: DREER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                   t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic              -10.36492    0.0000
--------------------------------------------------------------------------
Test critical values:         1% level              -3.467205
                              5% level              -2.877636
                              10% level             -2.575430
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 12:56
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
        DREER(-1)          -0.758446      0.073174     -10.36492     0.0000
            C               4.73E-05      0.000182      0.259382     0.7956
==========================================================================
R-squared                  0.379039   Mean dependent var       -5.14E-06
Adjusted R-squared         0.375511   S.D. dependent var        0.003079
S.E. of regression         0.002433   Akaike info criterion    -9.188224
Sum squared resid          0.001042   Schwarz criterion        -9.152474
Log likelihood             819.7519   Hannan-Quinn criter.     -9.173726
F-statistic                107.4315   Durbin-Watson stat        2.003549
Prob(F-statistic)          0.000000
==========================================================================
```

Table C2.11:

Null Hypothesis: DREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.19975	0.0000
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17 Time: 12:56
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.834273	0.074490	-11.19975	0.0000
C	0.001164	0.000373	3.119159	0.0021
@TREND("2002M01")	-1.23E-05	3.61E-06	-3.399934	0.0008

R-squared	0.417515	Mean dependent var	-5.14E-06
Adjusted R-squared	0.410858	S.D. dependent var	0.003079
S.E. of regression	0.002363	Akaike info criterion	-9.240953
Sum squared resid	0.000977	Schwarz criterion	-9.187327
Log likelihood	825.4448	Hannan-Quinn criter.	-9.219206
F-statistic	62.71836	Durbin-Watson stat	1.982762
Prob(F-statistic)	0.000000		

Table C2.12:

Null Hypothesis: DREER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.38912	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17 Time: 12:56
Sample (adjusted): 2002M03 2016M12

```
Included observations: 178 after adjustments
==============================================================================
        Variable        Coefficient     Std. Error     t-Statistic      Prob.
==============================================================================
       DREER(-1)         -0.757920       0.072953      -10.38912       0.0000
==============================================================================
R-squared                0.378801   Mean dependent var        -5.14E-06
Adjusted R-squared       0.378801   S.D. dependent var         0.003079
S.E. of regression       0.002427   Akaike info criterion     -9.199078
Sum squared resid        0.001042   Schwarz criterion         -9.181203
Log likelihood           819.7179   Hannan-Quinn criter.      -9.191829
Durbin-Watson stat       2.003845
==============================================================================
```

(Stationary in first difference)

Table C2.13: Group unit root test summary

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17   Time: 12:57
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 11
Newey-West automatic bandwidth selection and Bartlett kernel
==============================================================================
                                                           Cross-
Method                               Statistic   Prob.**   sections      Obs
------------------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
------------------------------------------------------------------------------
Levin, Lin & Chu t*                  -14.5533    0.0000       4          696

Null: Unit root (assumes individual unit root process)
------------------------------------------------------------------------------
ADF - Fisher Chi-square               184.894    0.0000       4          696
PP - Fisher Chi-square                401.629    0.0000       4          712
==============================================================================
** Probabilities for Fisher tests are computed using an asymptotic Chi
        -square distribution. All other tests assume asymptotic normality.
```

Table C2.14:

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17   Time: 12:57
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test
==============================================================================
                                                           Cross-
Method                               Statistic   Prob.**   sections      Obs
------------------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
------------------------------------------------------------------------------
Levin, Lin & Chu t*                  -26.8337    0.0000       4          712

Null: Unit root (assumes individual unit root process)
------------------------------------------------------------------------------
ADF - Fisher Chi-square               415.578    0.0000       4          712
PP - Fisher Chi-square                401.629    0.0000       4          712
==============================================================================
```

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C2.15:

Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 12:57
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-31.8228	0.0000	4	712
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-29.2733	0.0000	4	712
ADF - Fisher Chi-square	298.751	0.0000	4	712
PP - Fisher Chi-square	265.268	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C2.16:

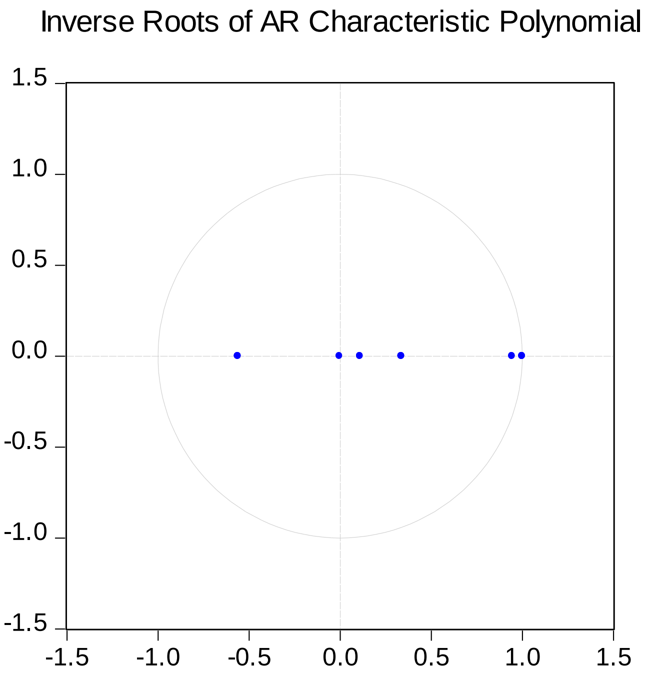
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 12:57
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-38.0513	0.0000	4	712
Breitung t-stat	-16.4463	0.0000	4	708
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-31.4684	0.0000	4	712
ADF - Fisher Chi-square	296.209	0.0000	4	712
PP - Fisher Chi-square	262.176	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Part D: On stability and on lag length

Figure D1: The unit circle



Roots of Characteristic Polynomial
Endogenous variables: IP REER FS I
Exogenous variables: DEUR DEUREER
Lag specification: 1 1
Date: 11/08/17 Time: 12:56

Root	Modulus
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
0.944987	0.944987
-0.560624	0.560624
0.337262	0.337262
0.110172	0.110172
-0.002463	0.002463

VEC specification imposes 3 unit root(s).

Table D1:
VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/08/17 Time: 12:56
Sample: 2002M01 2016M12
Included observations: 178

Lags	LM-Stat	Prob

1	27.33856	0.0379

Probs from chi-square with 16 df.

Table D2:

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/08/17 Time: 12:56
Sample: 2002M01 2016M12
Included observations: 178

Component	Skewness	Chi-sq	df	Prob.
1	-0.050177	0.074692	1	0.7846
2	-0.053547	0.085064	1	0.7705
3	0.289175	2.480798	1	0.1152
4	-0.061162	0.110978	1	0.7390
Joint		2.751532	4	0.6002

Component	Kurtosis	Chi-sq	df	Prob.
1	2.850537	0.165682	1	0.6840
2	3.727051	3.920471	1	0.0477
3	8.713192	242.0841	1	0.0000
4	14.00098	897.5765	1	0.0000
Joint		1143.747	4	0.0000

Component	Jarque-Bera	df	Prob.
1	0.240375	2	0.8868
2	4.005535	2	0.1350
3	244.5649	2	0.0000
4	897.6875	2	0.0000
Joint	1146.498	8	0.0000

Table D3:

VECM lag order selection criteria
Endogenous variables: DIP DREER DFS DI
Exogenous variables**: ECT**
Date: 11/08/17 Time: 12:43
Sample: 2002M01 2016M12
Included observations: 171

Lag	LogL	LR	FPE	AIC	SC	HQ

0	2115.058	NA	2.22e-16	-24.69073	-24.61724	-24.66091
1	2164.139	95.29343*	1.51e-16*	**-25.07765***	-24.71021*	-24.92856*
2	2172.580	15.99293	1.65e-16	-24.98924	-24.32784	-24.72087
3	2178.920	11.71572	1.85e-16	-24.87626	-23.92090	-24.48861
4	2187.135	14.79576	2.03e-16	-24.78520	-23.53588	-24.27828
5	2196.940	17.20260	2.19e-16	-24.71275	-23.16948	-24.08655
6	2204.602	13.08293	2.42e-16	-24.61522	-22.77799	-23.86975
7	2208.941	7.206786	2.79e-16	-24.47884	-22.34765	-23.61410
8	2220.408	18.50896	2.96e-16	-24.42583	-22.00069	-23.44181

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Part E: The VECM and the GIRFs

Table E1: The VECM

Vector Error Correction Estimates
Date: 11/08/17 Time: 12:53
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
IP(-1)	1.000000
REER(-1)	-0.582548
	(0.76059)
	[-0.76592]
FS(-1)	0.178382
	(0.07687)
	[2.32047]
I(-1)	0.044099
	(0.20304)
	[0.21719]
C	-1.512506

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.000816	0.015368	-0.100366	-0.005255
	(0.01743)	(0.00362)	(0.04770)	(0.02243)
	[-0.04683]	[4.25049]	[-2.10423]	[-0.23433]
D(IP(-1))	-0.545999	-0.027029	-0.041259	0.022410
	(0.06430)	(0.01334)	(0.17599)	(0.08275)
	[-8.49203]	[-2.02611]	[-0.23443]	[0.27083]
D(REER(-1))	-0.455288	0.140853	-1.600825	0.028946

	(0.35351)	(0.07335)	(0.96765)	(0.45496)
	[-1.28792]	[1.92035]	[-1.65435]	[0.06362]
D(FS(-1))	-0.021673	0.002372	0.058727	-0.001674
	(0.02673)	(0.00555)	(0.07316)	(0.03440)
	[-0.81087]	[0.42771]	[0.80271]	[-0.04866]
D(I(-1))	-0.078966	-0.020447	0.113698	0.338379
	(0.05605)	(0.01163)	(0.15342)	(0.07213)
	[-1.40890]	[-1.75823]	[0.74109]	[4.69105]
C	-0.000926	4.19E-05	-0.000334	6.59E-05
	(0.00084)	(0.00017)	(0.00229)	(0.00108)
	[-1.10605]	[0.24089]	[-0.14550]	[0.06117]
R-squared	0.309802	0.167358	0.070306	0.114287
Adj. R-squared	0.289739	0.143153	0.043280	0.088540
Sum sq. resids	0.021398	0.000921	0.160324	0.035441
S.E. equation	0.011154	0.002314	0.030531	0.014355
F-statistic	15.44080	6.914259	2.601413	4.438782
Log likelihood	550.7663	830.7058	371.5272	505.8565
Akaike AIC	-6.120969	-9.266357	-4.107047	-5.616365
Schwarz SC	-6.013718	-9.159106	-3.999796	-5.509114
Mean dependent	-0.000611	6.40E-05	-0.000460	8.99E-05
S.D. dependent	0.013235	0.002500	0.031214	0.015036
Determinant resid covariance (dof adj.)	1.27E-16			
Determinant resid covariance	1.11E-16			
Log likelihood	2259.612			
Akaike information criterion	-25.07429			
Schwarz criterion	-24.57379			

Table E2: THE VECM regressions (both PRF and SRF).
D(IP) = A(1,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(1,1)*D(IP(-1)) + C(1,2)*D(REER(-1)) + C(1,3)*D(FS(-1)) + C(1,4)*D(I(-1)) + C(1,5)

D(REER) = A(2,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(2,1)*D(IP(-1)) + C(2,2)*D(REER(-1)) + C(2,3)*D(FS(-1)) + C(2,4)*D(I(-1)) + C(2,5)

D(FS) = A(3,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(3,1)*D(IP(-1)) + C(3,2)*D(REER(-1)) + C(3,3)*D(FS(-1)) + C(3,4)*D(I(-1)) + C(3,5)

D(I) = A(4,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(4,1)*D(IP(-1)) + C(4,2)*D(REER(-1)) + C(4,3)*D(FS(-1)) + C(4,4)*D(I(-1)) + C(4,5)

```
VAR Model - Substituted Coefficients:
===============================
D(IP) =  - 0.000815996881302*( IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062 ) - 0.545998888562*D(IP(-1)) - 0.455288360679*D(REER(-1)) - 0.0216726830675*D(FS(-1)) - 0.0789659874634*D(I(-1)) - 0.000926423906999

D(REER) = 0.0153675286372*( IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062 ) - 0.0270290082488*D(IP(-1)) + 0.14085299776*D(REER(-1)) + 0.00237189717783*D(FS(-1)) - 0.0204467078975*D(I(-1)) + 4.18645184042e-05
```

D(FS) = - 0.100366398386*(IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062) - 0.0412588972321*D(IP(-1)) - 1.60082509277*D(REER(-1)) + 0.0587266516288*D(FS(-1)) + 0.113697668392*D(I(-1)) - 0.000333589918264

D(I) = - 0.00525510665477*(IP(-1) - 0.58254783033*REER(-1) + 0.178381780193*FS(-1) + 0.0440993924205*I(-1) - 1.51250629062) + 0.0224103635422*D(IP(-1)) + 0.0289462742508*D(REER(-1)) - 0.00167387995283*D(FS(-1)) + 0.338379343657*D(I(-1)) + 6.59414274503e-05

Table E3: The VECM regressions (both PRF and SRF). Plus Dummy variable (dum=1, since 2008M9)

Vector Error Correction Estimates
Date: 11/10/17 Time: 12:14
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
IP(-1)	1.000000
REER(-1)	-0.341850
	(0.36320)
	[-0.94122]
FS(-1)	-0.015033
	(0.03874)
	[-0.38806]
I(-1)	0.009457
	(0.09143)
	[0.10343]
C	-1.291715

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.119557	0.014391	0.182676	0.038885
	(0.03498)	(0.00457)	(0.09925)	(0.04668)
	[-3.41836]	[3.15115]	[1.84056]	[0.83293]
D(IP(-1))	-0.512388	-0.014944	-0.164861	-0.001191
	(0.06277)	(0.00820)	(0.17813)	(0.08378)
	[-8.16289]	[-1.82333]	[-0.92553]	[-0.01421]
D(REER(-1))	-0.392917	0.029415	-1.759522	0.090279
	(0.34438)	(0.04497)	(0.97727)	(0.45967)
	[-1.14094]	[0.65414]	[-1.80045]	[0.19640]
D(FS(-1))	-0.007330	-0.001600	0.046702	-0.002692
	(0.02618)	(0.00342)	(0.07429)	(0.03494)
	[-0.27998]	[-0.46799]	[0.62863]	[-0.07704]
D(I(-1))	-0.080289	-7.68E-05	0.086993	0.324918
	(0.05520)	(0.00721)	(0.15664)	(0.07368)
	[-1.45451]	[-0.01066]	[0.55535]	[4.40984]
C	0.007867	-0.000572	-0.016188	-0.002405
	(0.00258)	(0.00034)	(0.00732)	(0.00344)

	[3.04843]	[-1.69842]	[-2.21047]	[-0.69819]
DUM	**-0.015642**	0.001072	**0.028730**	0.004587
	(0.00442)	(0.00058)	**(0.01255)**	(0.00590)
	[-3.53657]	[1.85660]	**[2.28897]**	[0.77691]
R-squared	0.366724	0.697433	0.083204	0.125850
Adj. R-squared	0.336747	0.683110	0.039806	0.084470
Sum sq. resids	0.019633	0.000335	0.158100	0.034979
S.E. equation	0.010778	0.001407	0.030586	0.014387
F-statistic	12.23330	48.69421	1.917213	3.041332
Log likelihood	558.4267	920.8006	372.7706	507.0260
Akaike AIC	-6.173333	-10.24495	-4.087310	-5.595798
Schwarz SC	-6.012457	-10.08407	-3.926434	-5.434921
Mean dependent	-0.000611	6.40E-05	-0.000460	8.99E-05
S.D. dependent	0.013235	0.002500	0.031214	0.015036

Determinant resid covariance (dof adj.)	4.38E-17
Determinant resid covariance	3.56E-17
Log likelihood	2360.525
Akaike information criterion	-26.07331
Schwarz criterion	-25.35830

Table E4: The VECM regressions (both PRF and SRF). Plus Dummy variable (dum=1, since 2008M9). Plus another Dummy variable (dum08=1, since 2008M9), (dum11=1, since 2011M06)

Vector Error Correction Estimates
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
IP(-1)	1.000000
REER(-1)	-1.811057
	(0.68591)
	[-2.64038]
FS(-1)	-0.161234
	(0.06064)
	[-2.65884]
I(-1)	0.479565
	(0.16808)
	[2.85325]
C	2.104574

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.048969	0.002045	0.193720	-0.103572
	(0.03039)	(0.00386)	(0.08408)	(0.03903)
	[-1.61157]	[0.52922]	[2.30397]	[-2.65380]
D(IP(-1))	-0.541109	-0.008445	-0.174982	0.069902
	(0.06451)	(0.00820)	(0.17850)	(0.08285)

	[-8.38838]	[-1.02946]	[-0.98031]	[0.84369]
D(REER(-1))	-0.479885	0.016682	-1.364503	-0.229890
	(0.36229)	(0.04607)	(1.00249)	(0.46533)
	[-1.32459]	[0.36208]	[-1.36111]	[-0.49404]
D(FS(-1))	-0.012085	-0.001551	0.053125	-0.003480
	(0.02662)	(0.00339)	(0.07367)	(0.03420)
	[-0.45392]	[-0.45811]	[0.72110]	[-0.10178]
D(I(-1))	-0.069574	-0.002249	0.055178	0.328970
	(0.05656)	(0.00719)	(0.15651)	(0.07265)
	[-1.23005]	[-0.31266]	[0.35254]	[4.52826]
C	0.003412	0.000220	-0.017213	0.006931
	(0.00239)	(0.00030)	(0.00661)	(0.00307)
	[1.42824]	[0.72462]	[-2.60407]	[2.25901]
DUM08	-0.010112	0.000378	0.033821	-0.008451
	(0.00407)	(0.00052)	(0.01127)	(0.00523)
	[-2.48330]	[0.73091]	[3.00160]	[-1.61593]
DUM11	0.003731	-0.001091	-0.004818	-0.005646
	(0.00246)	(0.00031)	(0.00680)	(0.00315)
	[1.51914]	[-3.49419]	[-0.70890]	[-1.78976]
R-squared	0.346924	0.704024	0.101036	0.165292
Adj. R-squared	0.311938	0.688168	0.052877	0.120575
Sum sq. resids	0.020247	0.000327	0.155025	0.033400
S.E. equation	0.010978	0.001396	0.030377	0.014100
F-statistic	9.916032	44.40146	2.097971	3.696432
Log likelihood	555.6866	922.7607	374.5187	511.1351
Akaike AIC	-6.131310	-10.25574	-4.095716	-5.630732
Schwarz SC	-5.952558	-10.07699	-3.916964	-5.451980
Mean dependent	-0.000611	6.40E-05	-0.000460	8.99E-05
S.D. dependent	0.013235	0.002500	0.031214	0.015036
Determinant resid covariance (dof adj.)		4.25E-17		
Determinant resid covariance		3.37E-17		
Log likelihood		2365.371		
Akaike information criterion		-26.08281		
Schwarz criterion		-25.29631		

Figure E1: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=10)

GENERALIZED IMPULSE RESPONSE FUNCTIONS (GIRFs)

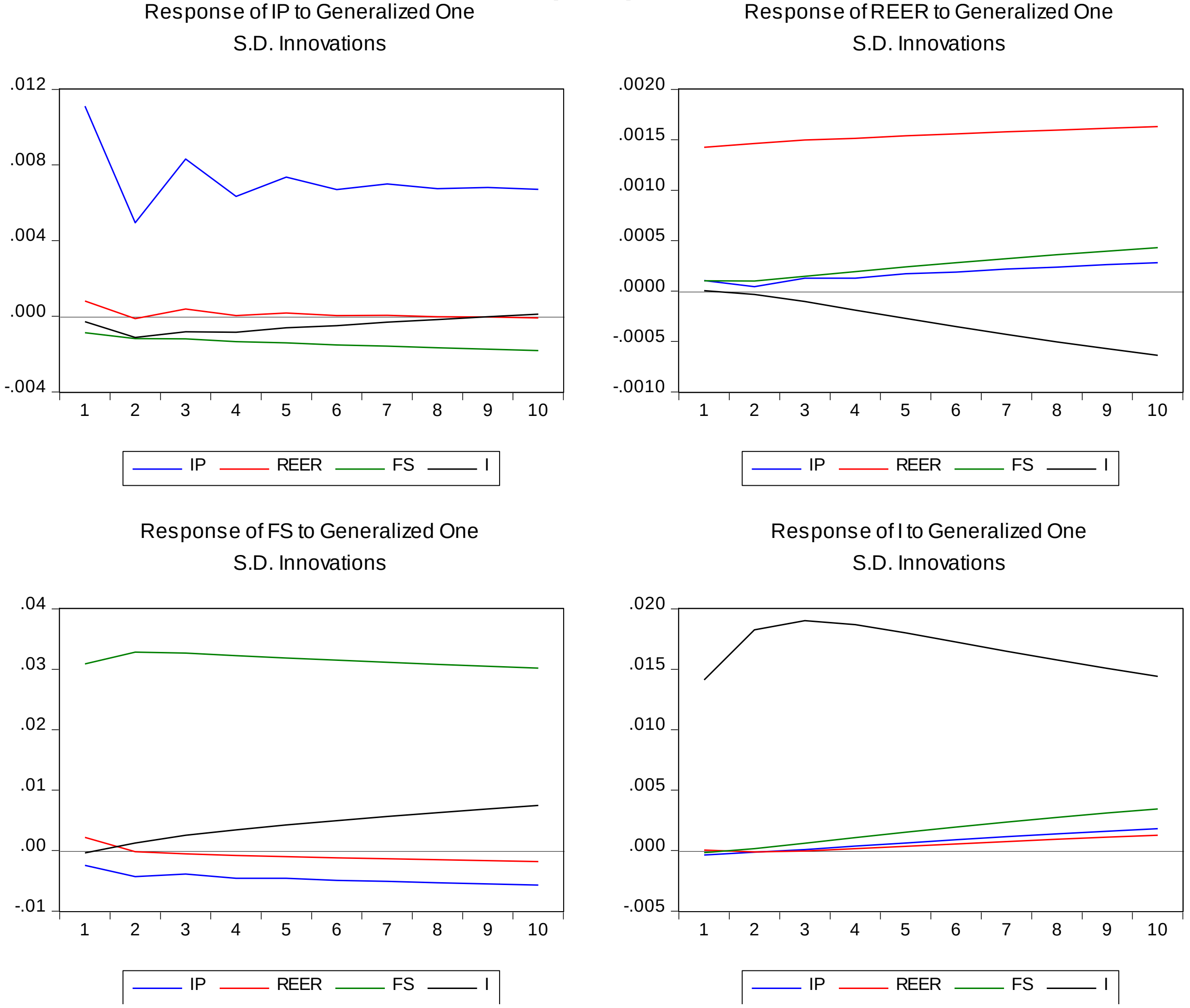
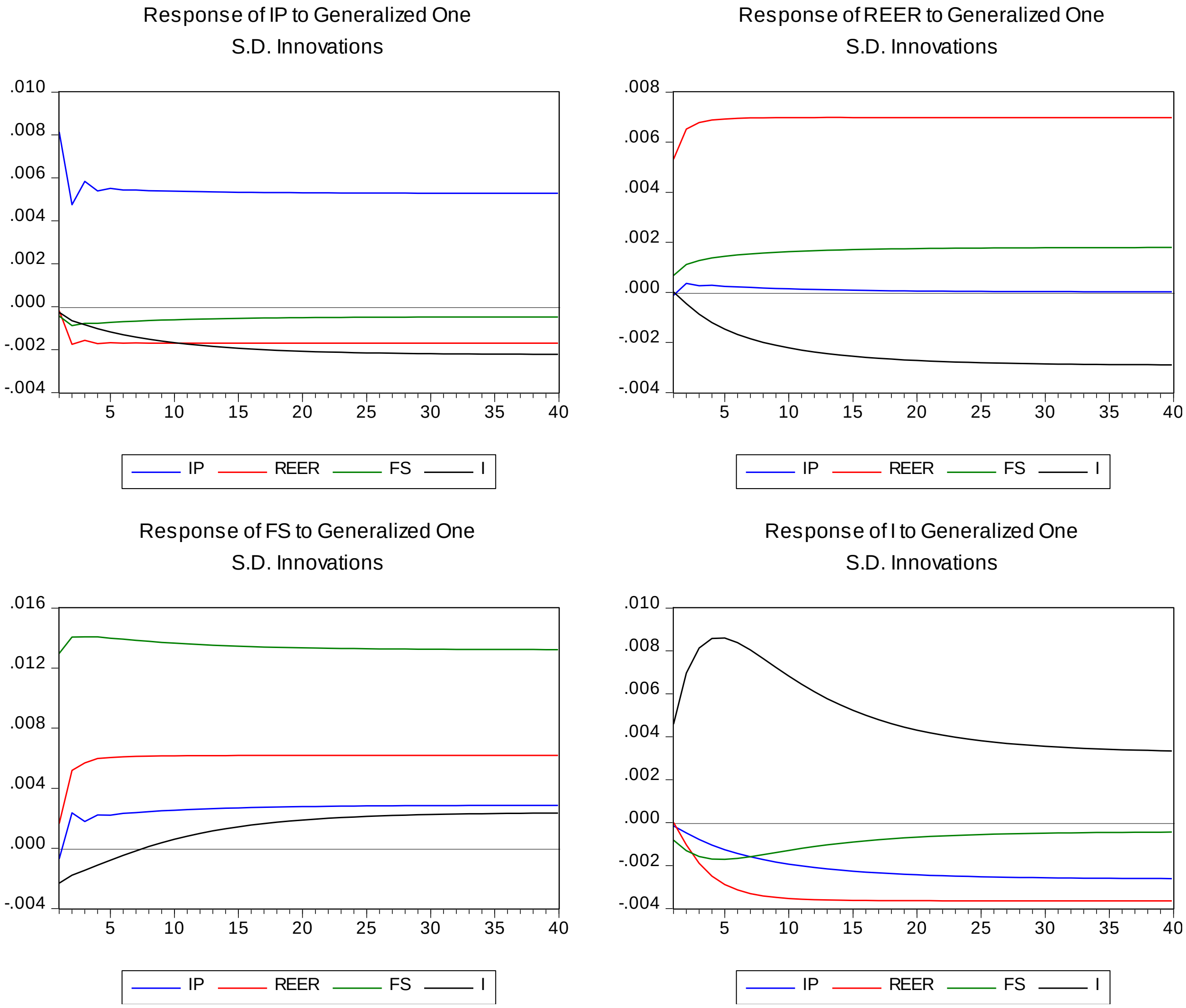


Figure E2: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=40)



Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

Figure E3: Generalized Impulse Response Functions (GIRFs)

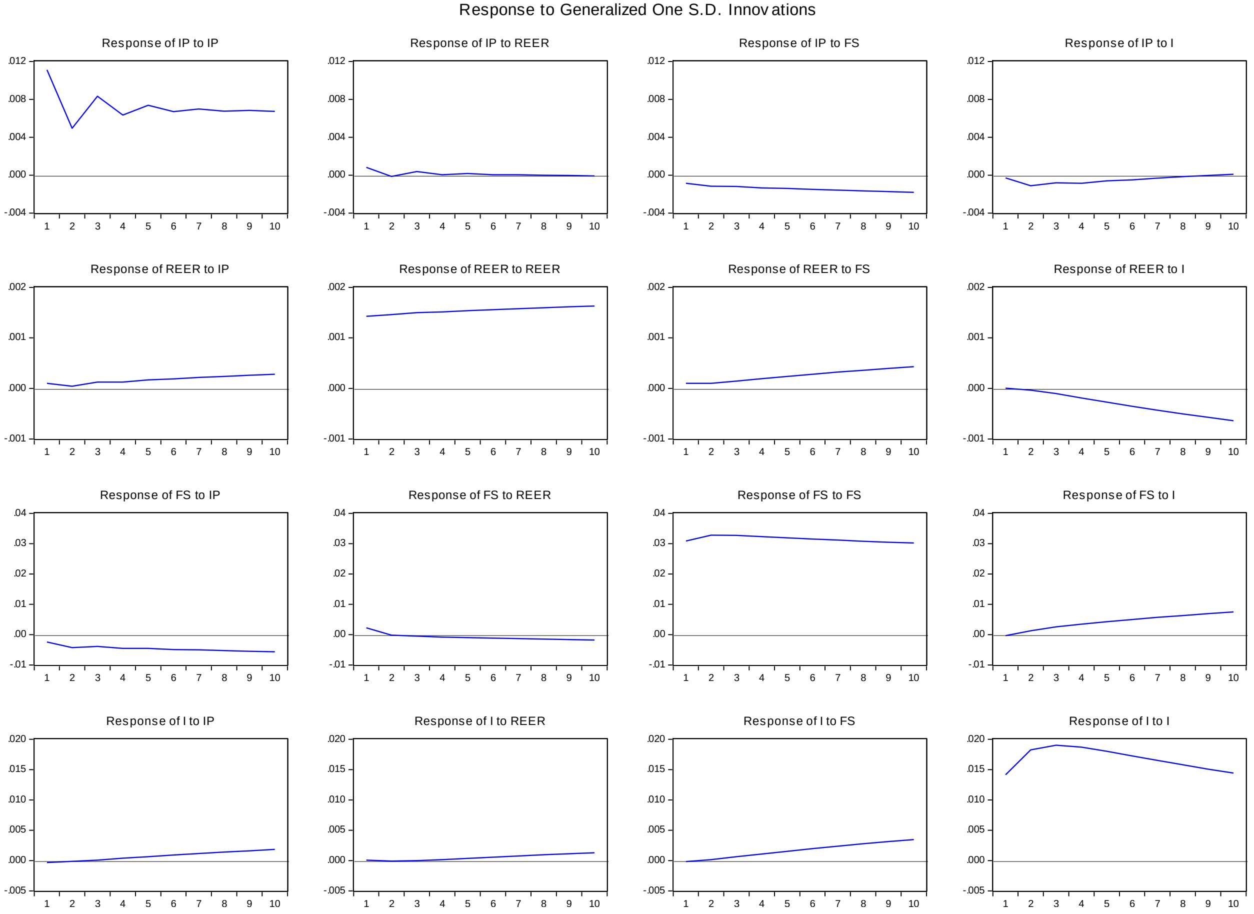
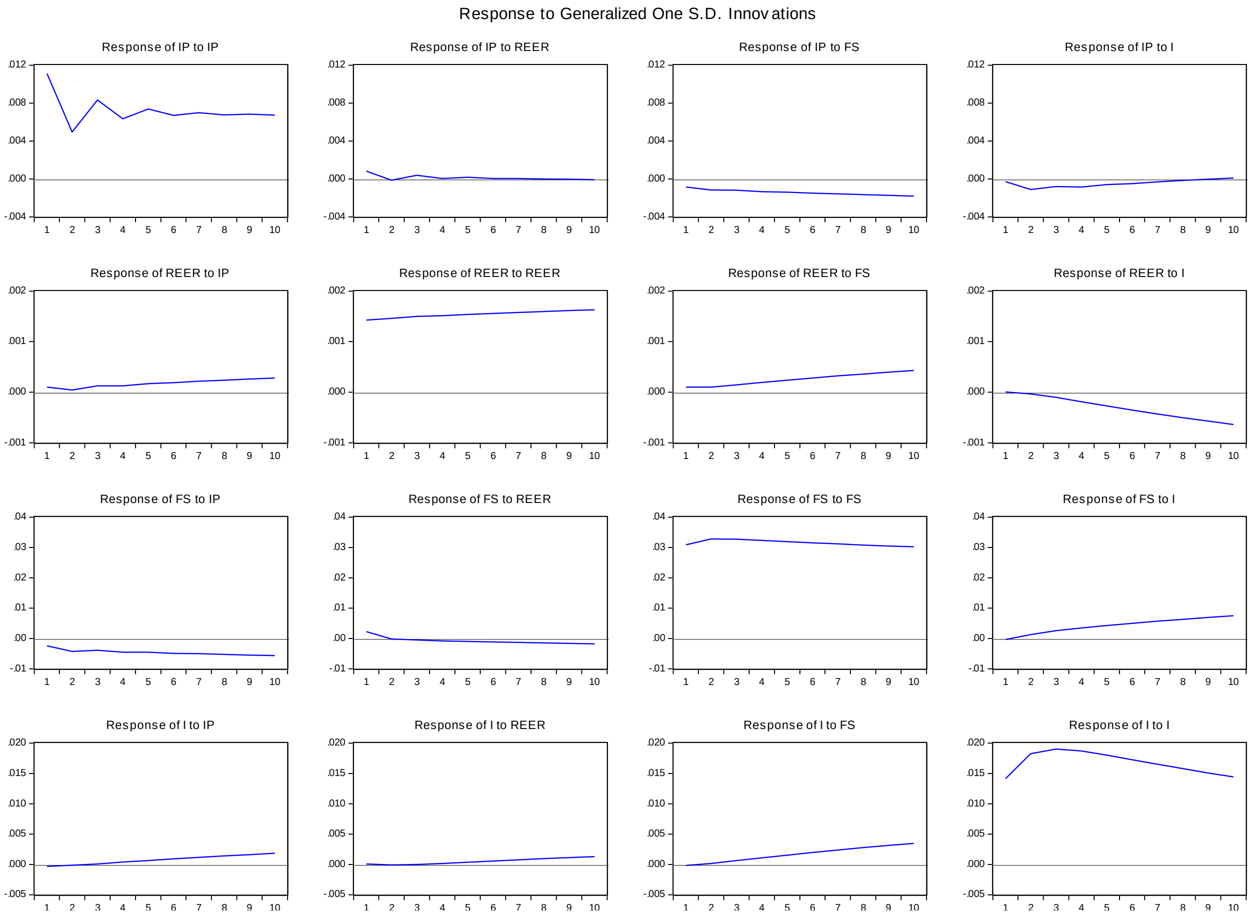


Figure E4: Cholesky decomposed Impulse Response Functions with specific ordering



APPENDIX E

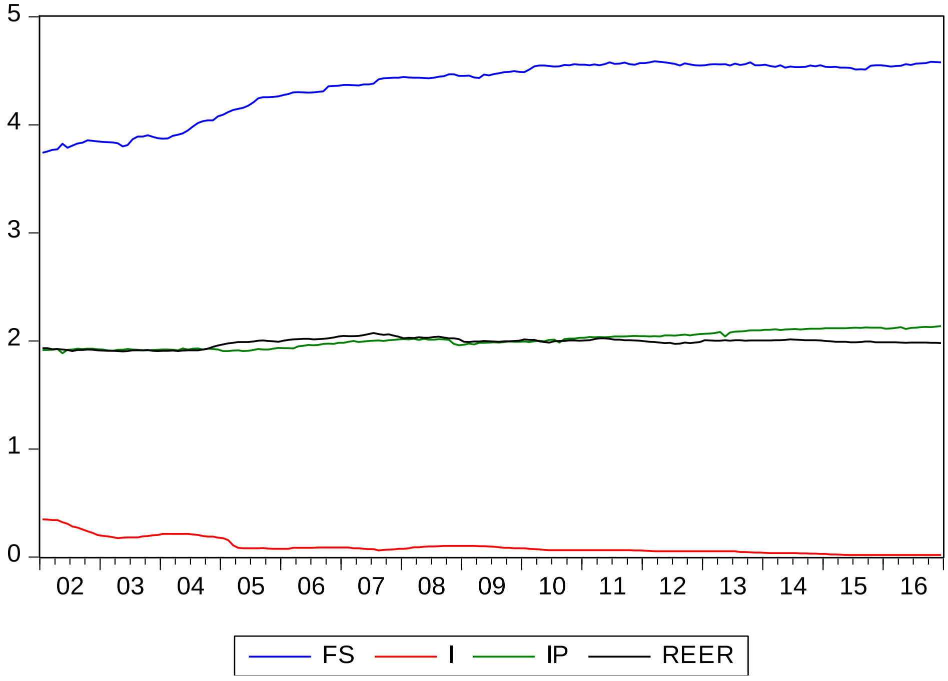
Determining the Relationship between the investigated variables. The case of Romania

Part A: Statistical measures and level graphs

Table A1: STATISTICAL TABLES FOR ALL FOUR VARIABLES

	FS	I	IP	REER
Mean	4.353161	0.094954	2.009265	1.987379
Median	4.468940	0.075000	2.007748	1.996397
Maximum	4.588351	0.348000	2.137671	2.073401
Minimum	3.740094	0.017500	1.885361	1.902751
Std. Dev.	0.263720	0.075146	0.073479	0.040686
Skewness	-1.108973	1.523094	0.160250	-0.734663
Kurtosis	2.720152	4.881186	1.740636	2.832486
Jarque-Bera	37.48198	96.13593	12.66539	16.40234
Probability	0.000000	0.000000	0.001777	0.000274
Sum	783.5690	17.09180	361.6677	357.7282
Sum Sq. Dev.	12.44912	1.010790	0.966458	0.296310
Observations	180	180	180	180

Figure A1: All four variables from 1/1/2002 to 31/12/2016



Part B: On cointegration

Table B1: Cointegration (all four variables in level)
Date: 11/09/17 Time: 10:02
Sample (adjusted): 2002M04 2016M12
Included observations: 177 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.158269	52.95078	47.85613	0.0154
At most 1	0.085459	22.45453	29.79707	0.2739
At most 2	0.029893	6.642632	15.49471	0.6195
At most 3	0.007155	1.270904	3.841466	0.2596

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.158269	30.49626	27.58434	0.0205
At most 1	0.085459	15.81190	21.13162	0.2360
At most 2	0.029893	5.371729	14.26460	0.6944
At most 3	0.007155	1.270904	3.841466	0.2596

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

IP	REER	FS	I
14.25709	10.00280	3.178892	35.35660
-12.35173	-7.775990	-2.031403	-7.113401
-12.84485	-42.01025	10.17253	5.831924
-16.68777	11.22519	6.474150	12.34686

Unrestricted Adjustment Coefficients (alpha):

D(IP)	-0.001344	0.000205	0.000375	0.000620
D(REER)	-0.000440	0.000868	0.000693	-0.000130
D(FS)	0.001223	0.003197	-0.001043	2.48E-05
D(I)	-0.001713	-0.000161	-0.000188	-0.000116

1 Cointegrating Equation(s):	Log likelihood	2510.180

```
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS               I
   1.000000       0.701602       0.222969        2.479931
                 (0.50294)      (0.13949)       (0.46264)

Adjustment coefficients (standard error in parentheses)
D(IP)            -0.019164
                 (0.00913)
D(REER)          -0.006269
                 (0.00587)
D(FS)             0.017431
                 (0.01413)
D(I)             -0.024424
                 (0.00480)
===========================================================

2 Cointegrating Equation(s):      Log likelihood      2518.086
===========================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS               I
   1.000000       0.000000      -0.346703       -16.05951
                                (2.31535)       (8.40070)
   0.000000       1.000000       0.811959        26.42444
                                (3.39106)       (12.3037)

Adjustment coefficients (standard error in parentheses)
D(IP)            -0.021699      -0.015042
                 (0.01208)      (0.00811)
D(REER)          -0.016990      -0.011148
                 (0.00766)      (0.00514)
D(FS)            -0.022057      -0.012630
                 (0.01810)      (0.01216)
D(I)             -0.022437      -0.015885
                 (0.00635)      (0.00427)
===========================================================

3 Cointegrating Equation(s):      Log likelihood      2520.772
===========================================================
Normalized cointegrating coefficients (standard error in parentheses)
       IP            REER            FS               I
   1.000000       0.000000       0.000000       -8.141381
                                                (2.06805)
   0.000000       1.000000       0.000000        7.880619
                                                (1.69592)
   0.000000       0.000000       1.000000        22.83837
                                                (4.38128)

Adjustment coefficients (standard error in parentheses)
D(IP)            -0.026512      -0.030781       -0.000879
                 (0.01460)      (0.02806)       (0.00694)
D(REER)          -0.025891      -0.040259        0.003888
                 (0.00919)      (0.01766)       (0.00437)
D(FS)            -0.008656       0.031199       -0.013221
                 (0.02182)      (0.04196)       (0.01038)
D(I)             -0.020028      -0.008006       -0.007027
                 (0.00768)      (0.01476)       (0.00365)
===========================================================
```

Table B2: Group cointegration summary
Date: 11/09/17 Time: 10:07
Sample: 2002M01 2016M12
Included observations: 177
Series: IP REER FS I
Lags interval: 1 to 2

Selected (0.05 level*) Number of Cointegrating Relations by Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	2	1	1	1
Max-Eig	2	2	1	1	1

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model					
Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2484.846	2484.846	2494.932	2494.932	2501.000
1	2499.745	2500.098	2510.180	2516.524	2521.051
2	2509.657	2514.905	2518.086	2527.450	2530.165
3	2512.523	2519.006	2520.772	2532.077	2533.223
4	2512.616	2521.408	2521.408	2534.270	2534.270
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-27.71577	-27.71577	-27.78454	-27.78454	-27.80791
1	-27.79373	-27.78642	-27.86644	-27.92683	-27.94408
2	-27.81534	-27.85203	-27.86538	-27.94859	-27.95666*
3	-27.75732	-27.79668	-27.80534	-27.89917	-27.90083
4	-27.66798	-27.72212	-27.72212	-27.82226	-27.82226
	Schwarz Criteria by Rank (rows)				

	and Model (columns)				
0	-27.14155*	-27.14155*	-27.13855	-27.13855	-27.09014
1	-27.07595	-27.05070	-27.07689	-27.11933	-27.08275
2	-26.95401	-26.95482	-26.93228	-26.97960	-26.95178
3	-26.75244	-26.73796	-26.72867	-26.76868	-26.75239
4	-26.51954	-26.50190	-26.50190	-26.53026	-26.53026

Part C: On unit root tests

Part C1: Unit root tests in level variables

Table C1.1: Unit roots in level variables
Null Hypothesis: FS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.817900	0.0033
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 13:38
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.014576	0.003818	-3.817900	0.0002
C	0.068117	0.016645	4.092404	**0.0001**

R-squared	0.076086	Mean dependent var	0.004685
Adjusted R-squared	0.070867	S.D. dependent var	0.013946
S.E. of regression	0.013443	Akaike info criterion	-5.769676
Sum squared resid	0.031984	Schwarz criterion	-5.734063
Log likelihood	518.3860	Hannan-Quinn criter.	-5.755235
F-statistic	14.57636	Durbin-Watson stat	1.891250
Prob(F-statistic)	0.000186		

Table C1.2:
Null Hypothesis: FS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

	t-Statistic	Prob.*

```
Augmented Dickey-Fuller test statistic          -1.098883     0.9255
Test critical values:       1% level            -4.010143
                            5% level            -3.435125
                           10% level            -3.141565

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17   Time: 13:38
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

        Variable         Coefficient    Std. Error    t-Statistic    Prob.

          FS(-1)          -0.008701      0.007918      -1.098883     0.2733
            C              0.045626      0.031345       1.455600     0.1473
  @TREND("2002M01")       -3.42E-05      4.03E-05      -0.847057     0.3981

R-squared                  0.079838    Mean dependent var        0.004685
Adjusted R-squared         0.069381    S.D. dependent var        0.013946
S.E. of regression         0.013453    Akaike info criterion    -5.762572
Sum squared resid          0.031854    Schwarz criterion        -5.709152
Log likelihood             518.7502    Hannan-Quinn criter.     -5.740910
F-statistic                7.635303    Durbin-Watson stat        1.910132
Prob(F-statistic)          0.000661
```

Table C1.3:

```
Null Hypothesis: FS has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

                                                t-Statistic   Prob.*

Augmented Dickey-Fuller test statistic           3.501648     0.9999
Test critical values:       1% level            -2.578018
                            5% level            -1.942624
                           10% level            -1.615515

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17   Time: 13:38
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

        Variable         Coefficient    Std. Error    t-Statistic    Prob.

          FS(-1)           0.000884      0.000253       3.501648     0.0006
        D(FS(-1))          0.121054      0.074877       1.616703     0.1077
```

R-squared	0.003852	Mean dependent var	0.004641
Adjusted R-squared	-0.001808	S.D. dependent var	0.013973
S.E. of regression	0.013985	Akaike info criterion	-5.690423
Sum squared resid	0.034424	Schwarz criterion	-5.654672
Log likelihood	508.4476	Hannan-Quinn criter.	-5.675925
Durbin-Watson stat	2.019816		

(Stationary in level)

Table C1.4:
Null Hypothesis: I has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.852804	0.0029
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 13:39
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.019637	0.005097	-3.852804	0.0002
D(I(-1))	0.548661	0.059977	9.147899	0.0000
C	0.001018	0.000575	1.770993	**0.0783**

R-squared	0.435547	Mean dependent var	-0.001846
Adjusted R-squared	0.429096	S.D. dependent var	0.006196
S.E. of regression	0.004682	Akaike info criterion	-7.873571
Sum squared resid	0.003836	Schwarz criterion	-7.819945
Log likelihood	703.7478	Hannan-Quinn criter.	-7.851824
F-statistic	67.51733	Durbin-Watson stat	2.107823
Prob(F-statistic)	0.000000		

Table C1.5:
Null Hypothesis: I has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.093960	0.0077
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	

		t-Statistic	Prob.*
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 13:40
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.037684	0.009205	-4.093960	0.0001
D(I(-1))	0.549734	0.059225	9.282169	0.0000
C	0.005436	0.001970	2.759171	**0.0064**
@TREND("2002M01")	-3.01E-05	1.28E-05	-2.341626	**0.0203**

R-squared	0.452791	Mean dependent var	-0.001846
Adjusted R-squared	0.443356	S.D. dependent var	0.006196
S.E. of regression	0.004623	Akaike info criterion	-7.893361
Sum squared resid	0.003719	Schwarz criterion	-7.821860
Log likelihood	706.5091	Hannan-Quinn criter.	-7.864366
F-statistic	47.99242	Durbin-Watson stat	2.140004
Prob(F-statistic)	0.000000		

Table C1.6:
Null Hypothesis: I has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.880993	0.0001
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 13:39
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.012680	0.003267	-3.880993	0.0001
D(I(-1))	0.556468	0.060176	9.247278	0.0000

R-squared	0.425431	Mean dependent var	-0.001846

```
Adjusted R-squared        0.422166  S.D. dependent var       0.006196
S.E. of regression        0.004710  Akaike info criterion   -7.867043
Sum squared resid         0.003905  Schwarz criterion       -7.831293
Log likelihood            702.1668  Hannan-Quinn criter.    -7.852545
Durbin-Watson stat        2.101378
=====================================================================
```

(Stationary in level)

Table C1.7:

```
Null Hypothesis: IP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                             t-Statistic    Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic       -0.045788     0.9522
---------------------------------------------------------------------
Test critical values:       1% level         -3.467205
                            5% level         -2.877636
                           10% level         -2.575430
=====================================================================

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17   Time: 13:40
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=====================================================================
        Variable        Coefficient   Std. Error   t-Statistic   Prob.
=====================================================================
         IP(-1)          -0.000411     0.008986    -0.045788    0.9635
        D(IP(-1))        -0.318016     0.072027    -4.415247    0.0000
            C             0.002467     0.018058     0.136606    0.8915
=====================================================================
R-squared                 0.101122  Mean dependent var       0.001255
Adjusted R-squared        0.090849  S.D. dependent var       0.009106
S.E. of regression        0.008683  Akaike info criterion   -6.638240
Sum squared resid         0.013193  Schwarz criterion       -6.584614
Log likelihood            593.8033  Hannan-Quinn criter.    -6.616493
F-statistic               9.843542  Durbin-Watson stat       2.079661
Prob(F-statistic)         0.000089
=====================================================================
```

Table C1.8:

```
Null Hypothesis: IP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                             t-Statistic    Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic       -2.720440     0.2297
---------------------------------------------------------------------
Test critical values:       1% level         -4.010440
                            5% level         -3.435269
                           10% level         -3.141649
=====================================================================
```

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.098344	0.036150	-2.720440	0.0072
D(IP(-1))	-0.273164	0.072467	-3.769464	0.0002
C	0.186279	0.068145	2.733547	0.0069
@TREND("2002M01")	0.000142	5.10E-05	2.793404	0.0058

R-squared	0.139702	Mean dependent var	0.001255
Adjusted R-squared	0.124869	S.D. dependent var	0.009106
S.E. of regression	0.008519	Akaike info criterion	-6.670873
Sum squared resid	0.012627	Schwarz criterion	-6.599372
Log likelihood	597.7077	Hannan-Quinn criter.	-6.641877
F-statistic	9.418508	Durbin-Watson stat	2.054002
Prob(F-statistic)	0.000008		

Table C1.9:
Null Hypothesis: IP has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.502228	0.9971
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17 Time: 13:40
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	0.000815	0.000326	2.502228	0.0133
D(IP(-1))	-0.318841	0.071573	-4.454756	0.0000

R-squared	0.101026	Mean dependent var	0.001255
Adjusted R-squared	0.095918	S.D. dependent var	0.009106
S.E. of regression	0.008659	Akaike info criterion	-6.649369
Sum squared resid	0.013195	Schwarz criterion	-6.613619
Log likelihood	593.7939	Hannan-Quinn criter.	-6.634871

Durbin-Watson stat	2.080455

(Not stationary in level)

Table C1.10:

Null Hypothesis: REER has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.650028	0.4549
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17 Time: 13:41
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-0.016675	0.010106	-1.650028	0.1007
D(REER(-1))	0.298827	0.071757	4.164432	0.0000
C	0.033330	0.020092	1.658897	0.0989

R-squared	0.100804	Mean dependent var	0.000266
Adjusted R-squared	0.090528	S.D. dependent var	0.005735
S.E. of regression	0.005469	Akaike info criterion	-7.562706
Sum squared resid	0.005234	Schwarz criterion	-7.509080
Log likelihood	676.0808	Hannan-Quinn criter.	-7.540959
F-statistic	9.809200	Durbin-Watson stat	2.020010
Prob(F-statistic)	0.000092		

Table C1.11:

Null Hypothesis: REER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.258565	0.8944
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)

```
Method: Least Squares
Date: 08/29/17   Time: 13:41
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================================
         Variable          Coefficient    Std. Error    t-Statistic    Prob.
==============================================================================
         REER(-1)           -0.014468     0.011496      -1.258565      0.2099
       D(REER(-1))           0.294793     0.072611       4.059897      0.0001
            C                0.029279     0.022473       1.302821      0.1944
   @TREND("2002M01")        -3.71E-06      9.12E-06     -0.406310      0.6850
==============================================================================
R-squared                    0.101657   Mean dependent var           0.000266
Adjusted R-squared           0.086168   S.D. dependent var           0.005735
S.E. of regression           0.005482   Akaike info criterion       -7.552418
Sum squared resid            0.005229   Schwarz criterion           -7.480917
Log likelihood               676.1652   Hannan-Quinn criter.        -7.523423
F-statistic                  6.563297   Durbin-Watson stat           2.017909
Prob(F-statistic)            0.000314
==============================================================================
```

Table C1.12:

```
Null Hypothesis: REER has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
==============================================================================
                                                  t-Statistic      Prob.*
==============================================================================
Augmented Dickey-Fuller test statistic             0.415216        0.8018
------------------------------------------------------------------------------
Test critical values:          1% level           -2.578018
                               5% level           -1.942624
                              10% level           -1.615515
==============================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17   Time: 13:41
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================================
         Variable          Coefficient    Std. Error    t-Statistic    Prob.
==============================================================================
         REER(-1)            8.61E-05     0.000207       0.415216      0.6785
       D(REER(-1))           0.294876     0.072074       4.091326      0.0001
==============================================================================
R-squared                    0.086664   Mean dependent var           0.000266
Adjusted R-squared           0.081475   S.D. dependent var           0.005735
S.E. of regression           0.005496   Akaike info criterion       -7.558339
Sum squared resid            0.005317   Schwarz criterion           -7.522588
Log likelihood               674.6921   Hannan-Quinn criter.        -7.543841
Durbin-Watson stat           2.013842
==============================================================================
```

(Not stationary in level)

Table C1.13: Group unit root test summary

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 13:42
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 1 to 6
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	2.46131	0.9931	4	706
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	18.8851	0.0155	4	706
PP - Fisher Chi-square	20.5713	0.0084	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C1.14:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 13:42
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 1
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	3.16944	0.9992	4	712
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	18.8683	0.0156	4	712
PP - Fisher Chi-square	20.5713	0.0084	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C1.15:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 13:42
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs

Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-5.07395	0.0000	4	713
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-1.88266	0.0299	4	713
ADF - Fisher Chi-square	24.7591	0.0017	4	713
PP - Fisher Chi-square	23.0011	0.0034	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

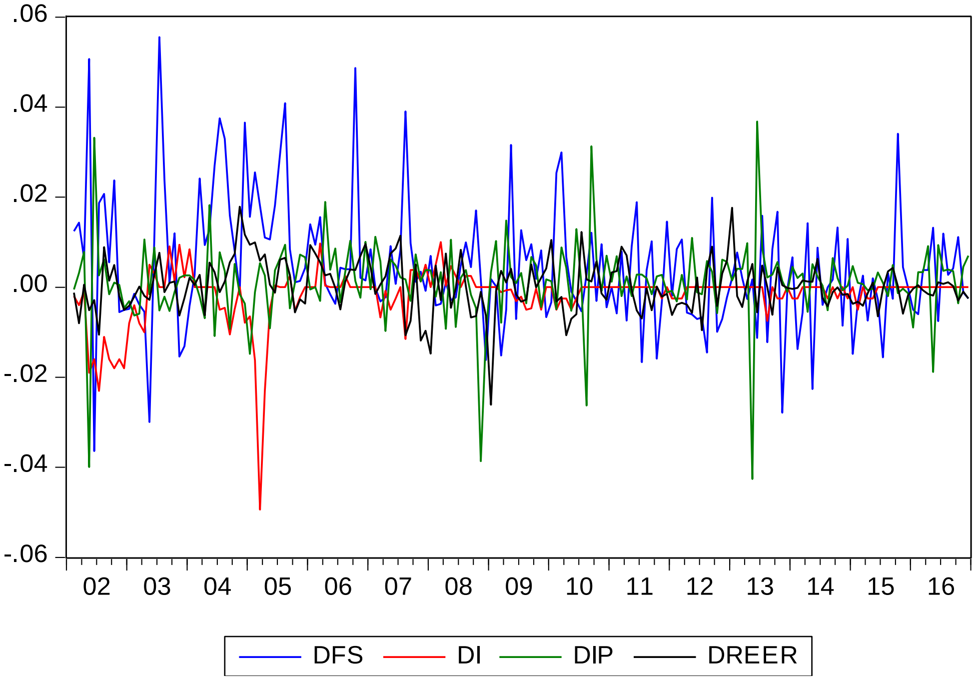
Table C1.16:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 13:42
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.88208	0.0299	4	713
Breitung t-stat	1.18764	0.8825	4	709
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-0.29480	0.3841	4	713
ADF - Fisher Chi-square	13.0508	0.1101	4	713
PP - Fisher Chi-square	12.4781	0.1311	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure C1: All four variables from 1/1/2002 to 31/12/2016 in first difference



Part C2: Unit root tests in first difference

Table C2.1:
Null Hypothesis: DFS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.85613	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17 Time: 13:44
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-0.887949	0.074894	-11.85613	0.0000
C	0.004112	0.001102	3.731151	0.0003
R-squared	0.444037	Mean dependent var		-8.40E-05

```
Adjusted R-squared      0.440878   S.D. dependent var       0.018622
S.E. of regression      0.013924   Akaike info criterion   -5.699201
Sum squared resid       0.034124   Schwarz criterion       -5.663451
Log likelihood          509.2289   Hannan-Quinn criter.    -5.684703
F-statistic             140.5678   Durbin-Watson stat       2.016380
Prob(F-statistic)       0.000000
=====================================================================
```

Table C2.2:

```
Null Hypothesis: DFS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                             t-Statistic    Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic       -12.67029      0.0000
---------------------------------------------------------------------
Test critical values:        1% level         -4.010440
                             5% level         -3.435269
                             10% level        -3.141649
=====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17   Time: 13:45
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=====================================================================
        Variable         Coefficient   Std. Error   t-Statistic   Prob.
=====================================================================
         DFS(-1)          -0.956876    0.075521     -12.67029    0.0000
            C              0.010736    0.002224      4.827306    0.0000
   @TREND("2002M01")      -6.96E-05    2.05E-05     -3.397913    0.0008
=====================================================================
R-squared               0.478447   Mean dependent var      -8.40E-05
Adjusted R-squared      0.472486   S.D. dependent var       0.018622
S.E. of regression      0.013525   Akaike info criterion   -5.751856
Sum squared resid       0.032012   Schwarz criterion       -5.698230
Log likelihood          514.9152   Hannan-Quinn criter.    -5.730109
F-statistic             80.26819   Durbin-Watson stat       2.000874
Prob(F-statistic)       0.000000
=====================================================================
```

Table C2.3:

```
Null Hypothesis: DFS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                             t-Statistic    Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic       -10.86443      0.0000
---------------------------------------------------------------------
Test critical values:        1% level         -2.578018
                             5% level         -1.942624
                             10% level        -1.615515
=====================================================================
```

```
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17   Time: 13:45
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

       Variable          Coefficient     Std. Error    t-Statistic      Prob.

        DFS(-1)            -0.798213      0.073470      -10.86443      0.0000

R-squared                   0.400061   Mean dependent var        -8.40E-05
Adjusted R-squared          0.400061   S.D. dependent var         0.018622
S.E. of regression          0.014424   Akaike info criterion     -5.634310
Sum squared resid           0.036823   Schwarz criterion         -5.616435
Log likelihood              502.4536   Hannan-Quinn criter.      -5.627061
Durbin-Watson stat          2.060375
```

(Stationary in first difference)

Table C2.4:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

                                                   t-Statistic     Prob.*

Augmented Dickey-Fuller test statistic              -6.393547      0.0000
Test critical values:          1% level             -3.467205
                               5% level             -2.877636
                               10% level            -2.575430

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17   Time: 13:45
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

       Variable          Coefficient     Std. Error    t-Statistic      Prob.

         DI(-1)            -0.377214      0.058999      -6.393547      0.0000
            C              -0.000689      0.000381      -1.810886      0.0719

R-squared                   0.188482   Mean dependent var         1.12E-05
Adjusted R-squared          0.183871   S.D. dependent var         0.005382
S.E. of regression          0.004862   Akaike info criterion     -7.803389
Sum squared resid           0.004161   Schwarz criterion         -7.767639
Log likelihood              696.5016   Hannan-Quinn criter.      -7.788892
F-statistic                 40.87744   Durbin-Watson stat         2.137860
Prob(F-statistic)           0.000000
```

Table C2.5:

Null Hypothesis: DI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.716031	0.0000
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17 Time: 13:45
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DI(-1)	-0.409313	0.060946	-6.716031	0.0000
C	-0.002011	0.000791	-2.543343	0.0118
@TREND("2002M01")	1.39E-05	7.33E-06	1.902887	0.0587

R-squared	0.204933	Mean dependent var	1.12E-05
Adjusted R-squared	0.195846	S.D. dependent var	0.005382
S.E. of regression	0.004827	Akaike info criterion	-7.812634
Sum squared resid	0.004077	Schwarz criterion	-7.759008
Log likelihood	698.3244	Hannan-Quinn criter.	-7.790887
F-statistic	22.55358	Durbin-Watson stat	2.110544
Prob(F-statistic)	0.000000		

Table C2.6:

Null Hypothesis: DI has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.092705	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17 Time: 13:45

```
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================================
        Variable         Coefficient     Std. Error    t-Statistic      Prob.
==============================================================================
          DI(-1)           -0.346459      0.056865      -6.092705      0.0000
==============================================================================
R-squared                   0.173361   Mean dependent var           1.12E-05
Adjusted R-squared          0.173361   S.D. dependent var           0.005382
S.E. of regression          0.004894   Akaike info criterion       -7.796164
Sum squared resid           0.004239   Schwarz criterion           -7.778289
Log likelihood              694.8586   Hannan-Quinn criter.        -7.788915
Durbin-Watson stat          2.167019
==============================================================================
```

(Stationary in first difference)

Table C2.7:

```
Null Hypothesis: DIP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==============================================================================
                                                   t-Statistic      Prob.*
==============================================================================
Augmented Dickey-Fuller test statistic              -18.42770      0.0000
------------------------------------------------------------------------------
Test critical values:        1% level                -3.467205
                             5% level                -2.877636
                            10% level                -2.575430
==============================================================================

*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 13:46
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================================
        Variable         Coefficient     Std. Error    t-Statistic      Prob.
==============================================================================
         DIP(-1)           -1.318308      0.071539      -18.42770      0.0000
            C               0.001641      0.000655       2.505673      0.0131
==============================================================================
R-squared                   0.658637   Mean dependent var           4.24E-05
Adjusted R-squared          0.656697   S.D. dependent var           0.014777
S.E. of regression          0.008658   Akaike info criterion       -6.649464
Sum squared resid           0.013194   Schwarz criterion           -6.613713
Log likelihood              593.8023   Hannan-Quinn criter.        -6.634966
F-statistic                 339.5802   Durbin-Watson stat           2.079949
Prob(F-statistic)           0.000000
==============================================================================
```

Table C2.8:

```
Null Hypothesis: DIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                  t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -18.40626      0.0000
Test critical values:        1% level             -4.010440
                             5% level             -3.435269
                             10% level            -3.141649
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 13:46
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
        Variable          Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
        DIP(-1)            -1.319682      0.071697     -18.40626     0.0000
           C                0.000927      0.001318      0.703229     0.4828
  @TREND("2002M01")         7.91E-06      1.27E-05      0.624673     0.5330
==========================================================================
R-squared                  0.659397    Mean dependent var         4.24E-05
Adjusted R-squared         0.655504    S.D. dependent var         0.014777
S.E. of regression         0.008673    Akaike info criterion     -6.640455
Sum squared resid          0.013164    Schwarz criterion         -6.586830
Log likelihood             594.0005    Hannan-Quinn criter.      -6.618709
F-statistic                169.3970    Durbin-Watson stat         2.082200
Prob(F-statistic)          0.000000
==========================================================================
```

Table C2.9:

```
Null Hypothesis: DIP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                  t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -17.99039      0.0000
Test critical values:        1% level             -2.578018
                             5% level             -1.942624
                             10% level            -1.615515
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 13:46
Sample (adjusted): 2002M03 2016M12
```

Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.294564	0.071959	-17.99039	0.0000

R-squared	0.646460	Mean dependent var	4.24E-05
Adjusted R-squared	0.646460	S.D. dependent var	0.014777
S.E. of regression	0.008786	Akaike info criterion	-6.625649
Sum squared resid	0.013664	Schwarz criterion	-6.607773
Log likelihood	590.6827	Hannan-Quinn criter.	-6.618400
Durbin-Watson stat	2.049639		

(Stationary in first difference)

Table C2.10:

Null Hypothesis: DREER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.785839	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17 Time: 13:46
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.705219	0.072065	-9.785839	0.0000
C	0.000185	0.000412	0.448883	0.6541

R-squared	0.352376	Mean dependent var	-7.23E-06
Adjusted R-squared	0.348696	S.D. dependent var	0.006810
S.E. of regression	0.005496	Akaike info criterion	-7.558504
Sum squared resid	0.005316	Schwarz criterion	-7.522753
Log likelihood	674.7068	Hannan-Quinn criter.	-7.544006
F-statistic	95.76265	Durbin-Watson stat	2.013805
Prob(F-statistic)	0.000000		

Table C2.11:

Null Hypothesis: DREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.858749	0.0000
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 13:46
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.713840	0.072407	-9.858749	0.0000
C	0.001014	0.000839	1.208643	0.2284
@TREND("2002M01")	-9.14E-06	8.05E-06	-1.134201	0.2583

R-squared	0.357102	Mean dependent var	-7.23E-06
Adjusted R-squared	0.349755	S.D. dependent var	0.006810
S.E. of regression	0.005491	Akaike info criterion	-7.554592
Sum squared resid	0.005277	Schwarz criterion	-7.500966
Log likelihood	675.3587	Hannan-Quinn criter.	-7.532845
F-statistic	48.60245	Durbin-Watson stat	2.010700
Prob(F-statistic)	0.000000		

Table C2.12:

Null Hypothesis: DREER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.797679	0.0000
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 13:46

Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.703677	0.071821	-9.797679	0.0000

R-squared	0.351635	Mean dependent var	-7.23E-06
Adjusted R-squared	0.351635	S.D. dependent var	0.006810
S.E. of regression	0.005483	Akaike info criterion	-7.568596
Sum squared resid	0.005322	Schwarz criterion	-7.550720
Log likelihood	674.6050	Hannan-Quinn criter.	-7.561347
Durbin-Watson stat	2.014706		

(Stationary in first difference)

Table C2.13: Group unit root test: Summary

Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 13:47
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 11
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-17.0187	0.0000	4	701
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	269.187	0.0000	4	701
PP - Fisher Chi-square	358.014	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C2.14:
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 13:48
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-20.1219	0.0000	4	712
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	354.352	0.0000	4	712
PP - Fisher Chi-square	358.014	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Table C2.15:

Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 13:48
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-24.3955	0.0000	4	712
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-23.5240	0.0000	4	712
ADF - Fisher Chi-square	295.392	0.0000	4	712
PP - Fisher Chi-square	296.049	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Table C2.16:

Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 13:48
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-29.4959	0.0000	4	712
Breitung t-stat	-18.2969	0.0000	4	708
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	-25.2009	0.0000	4	712
ADF - Fisher Chi-square	292.137	0.0000	4	712
PP - Fisher Chi-square	292.588	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi
-square distribution. All other tests assume asymptotic normality.

Part D: On stability and on lag length

Figure D1: The unit circle

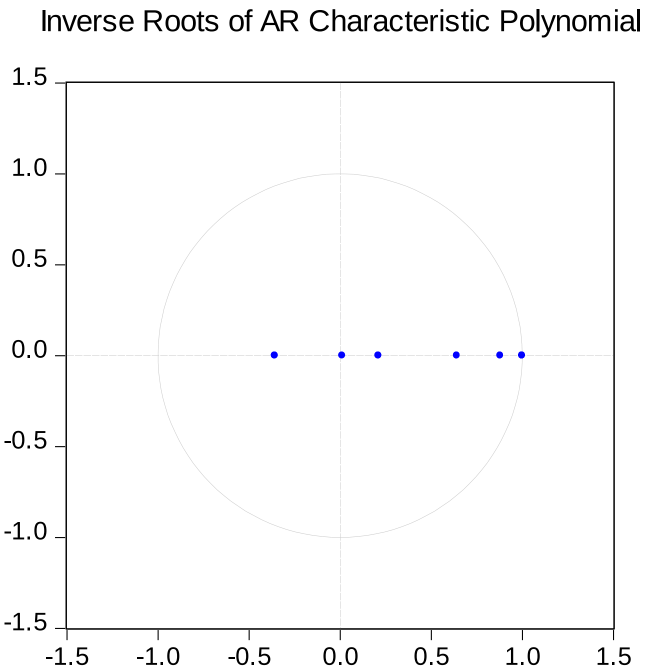


Table D1:
Roots of Characteristic Polynomial
Endogenous variables: IP REER FS I
Exogenous variables: DEUR DEUREER
Lag specification: 1 1
Date: 11/09/17 Time: 10:15

Root	Modulus
1.000000 - 3.85e-16i	1.000000
1.000000 + 3.85e-16i	1.000000
1.000000	1.000000
0.880358	0.880358
0.641874	0.641874
-0.357359	0.357359
0.211983	0.211983
0.011857	0.011857

VEC specification imposes 3 unit root(s).

Table D2:
VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/09/17 Time: 10:15
Sample: 2002M01 2016M12
Included observations: 178

Lags	LM-Stat	Prob
1	16.84153	0.3959

Probs from chi-square with 16 df.

Table D3:

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/09/17 Time: 10:15
Sample: 2002M01 2016M12
Included observations: 178

Component	Skewness	Chi-sq	df	Prob.
1	-1.297228	49.92309	1	0.0000
2	-0.064037	0.121657	1	0.7272
3	0.482439	6.904836	1	0.0086
4	-3.081864	281.7707	1	0.0000
Joint		338.7203	4	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	8.413441	217.3479	1	0.0000
2	3.838575	5.215455	1	0.0224
3	4.105629	9.066241	1	0.0026
4	29.29408	5127.726	1	0.0000
Joint		5359.356	4	0.0000

Component	Jarque-Bera	df	Prob.
1	267.2710	2	0.0000
2	5.337111	2	0.0694
3	15.97108	2	0.0003
4	5409.497	2	0.0000
Joint	5698.076	8	0.0000

Table D4: VECM lag order selection
criteriaEndogenous variables: DIP DREER DFS DI
Exogenous variables: C **ECT**
Date: 11/09/17 Time: 10:01
Sample: 2002M01 2016M12
Included observations: 171

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2364.277	NA	1.26e-17	-27.55880	-27.41182	-27.49916
1	2432.400	131.4658*	6.87e-18*	**-28.16843***	-27.72749*	-27.98951*
2	2441.730	17.56802	7.43e-18	-28.09041	-27.35552	-27.79222
3	2452.468	19.71751	7.91e-18	-28.02886	-27.00001	-27.61140
4	2465.360	23.07107	8.21e-18	-27.99252	-26.66971	-27.45578
5	2472.766	12.90566	9.10e-18	-27.89200	-26.27524	-27.23599
6	2483.520	18.23715	9.72e-18	-27.83064	-25.91992	-27.05535
7	2492.191	14.29975	1.06e-17	-27.74492	-25.54025	-26.85036
8	2499.440	11.61545	1.19e-17	-27.64257	-25.14394	-26.62873

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Part E: The VECM and the GIRFs

Table E1: The VECM
Vector Error Correction Estimates
Date: 11/09/17 Time: 10:08
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1			
IP(-1)	1.000000			
REER(-1)	0.887605 (0.67139) [1.32204]			
FS(-1)	0.206512 (0.18269) [1.13039]			
I(-1)	2.860588 (0.59573) [4.80185]			
C	-4.941634			
Error Correction:	D(IP)	D(REER)	D(FS)	D(I)
CointEq1	-0.013334	-0.005803	0.018951	-0.017989

	(0.00691)	(0.00438)	(0.01059)	(0.00364)
	[-1.92917]	[-1.32499]	[1.78948]	[-4.94860]
D(IP(-1))	-0.328502	0.092282	0.363005	-0.005159
	(0.07240)	(0.04588)	(0.11093)	(0.03808)
	[-4.53743]	[2.01147]	[3.27247]	[-0.13548]
D(REER(-1))	-0.146940	0.283415	0.570119	-0.169931
	(0.11480)	(0.07274)	(0.17589)	(0.06038)
	[-1.28002]	[3.89602]	[3.24139]	[-2.81457]
D(FS(-1))	-0.024231	0.012195	0.110822	0.005560
	(0.04886)	(0.03096)	(0.07486)	(0.02570)
	[-0.49595]	[0.39389]	[1.48044]	[0.21638]
D(I(-1))	-0.075806	-0.062361	0.077415	0.562588
	(0.10877)	(0.06893)	(0.16665)	(0.05721)
	[-0.69694]	[-0.90475]	[0.46453]	[9.83443]
C	0.001667	-9.71E-05	0.003666	-0.000775
	(0.00071)	(0.00045)	(0.00109)	(0.00037)
	[2.34007]	[-0.21506]	[3.35920]	[-2.06782]
R-squared	0.130005	0.119124	0.132548	0.480233
Adj. R-squared	0.104714	0.093517	0.107331	0.465123
Sum sq. resids	0.012769	0.005128	0.029977	0.003532
S.E. equation	0.008616	0.005460	0.013202	0.004532
F-statistic	5.140453	4.652050	5.256371	31.78344
Log likelihood	596.7101	677.9128	520.7595	711.0881
Akaike AIC	-6.637192	-7.549582	-5.783814	-7.922338
Schwarz SC	-6.529941	-7.442331	-5.676563	-7.815087
Mean dependent	0.001255	0.000266	0.004641	-0.001846
S.D. dependent	0.009106	0.005735	0.013973	0.006196
Determinant resid covariance (dof adj.)	7.50E-18			
Determinant resid covariance	6.54E-18			
Log likelihood	2511.286			
Akaike information criterion	-27.90209			
Schwarz criterion	-27.40159			

Table E2: THE VECM regressions (both PRF and SRF).

```
Estimation Proc:
===============================
EC(C,1) 1 1 IP REER FS I

VAR Model:
===============================
D(IP) = A(1,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(1,1)*D(IP(-1)) +
C(1,2)*D(REER(-1)) + C(1,3)*D(FS(-1)) + C(1,4)*D(I(-1)) + C(1,5)

D(REER) = A(2,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(2,1)*D(IP(-1)) +
C(2,2)*D(REER(-1)) + C(2,3)*D(FS(-1)) + C(2,4)*D(I(-1)) + C(2,5)

D(FS) = A(3,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(3,1)*D(IP(-1)) +
C(3,2)*D(REER(-1)) + C(3,3)*D(FS(-1)) + C(3,4)*D(I(-1)) + C(3,5)
```

```
D(I) = A(4,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(4,1)*D(IP(-1)) +
C(4,2)*D(REER(-1)) + C(4,3)*D(FS(-1)) + C(4,4)*D(I(-1)) + C(4,5)

VAR Model - Substituted Coefficients:
===============================
D(IP) =  - 0.013334110585*( IP(-1) + 0.887604965154*REER(-1) + 0.206512424895*FS(-1) + 2.86058790697*I(-1) -
4.94163372169 ) - 0.328502418771*D(IP(-1)) - 0.146940326627*D(REER(-1)) - 0.0242305729543*D(FS(-1)) -
0.0758058562917*D(I(-1)) + 0.00166670261504

D(REER) =  - 0.00580342119502*( IP(-1) + 0.887604965154*REER(-1) + 0.206512424895*FS(-1) +
2.86058790697*I(-1) - 4.94163372169 ) + 0.0922823134375*D(IP(-1)) + 0.283415021758*D(REER(-1)) +
0.012194894437*D(FS(-1)) - 0.0623608136643*D(I(-1)) - 9.70665085245e-05

D(FS) = 0.0189508283782*( IP(-1) + 0.887604965154*REER(-1) + 0.206512424895*FS(-1) + 2.86058790697*I(-1) -
4.94163372169 ) + 0.363004843758*D(IP(-1)) + 0.57011856967*D(REER(-1)) + 0.11082177564*D(FS(-1)) +
0.077415043453*D(I(-1)) + 0.003665846975

D(I) =  - 0.0179890797924*( IP(-1) + 0.887604965154*REER(-1) + 0.206512424895*FS(-1) + 2.86058790697*I(-1) -
4.94163372169 ) - 0.0051587509844*D(IP(-1)) - 0.169930510406*D(REER(-1)) + 0.00555992055375*D(FS(-1)) +
0.562587666802*D(I(-1)) - 0.000774597066047
```

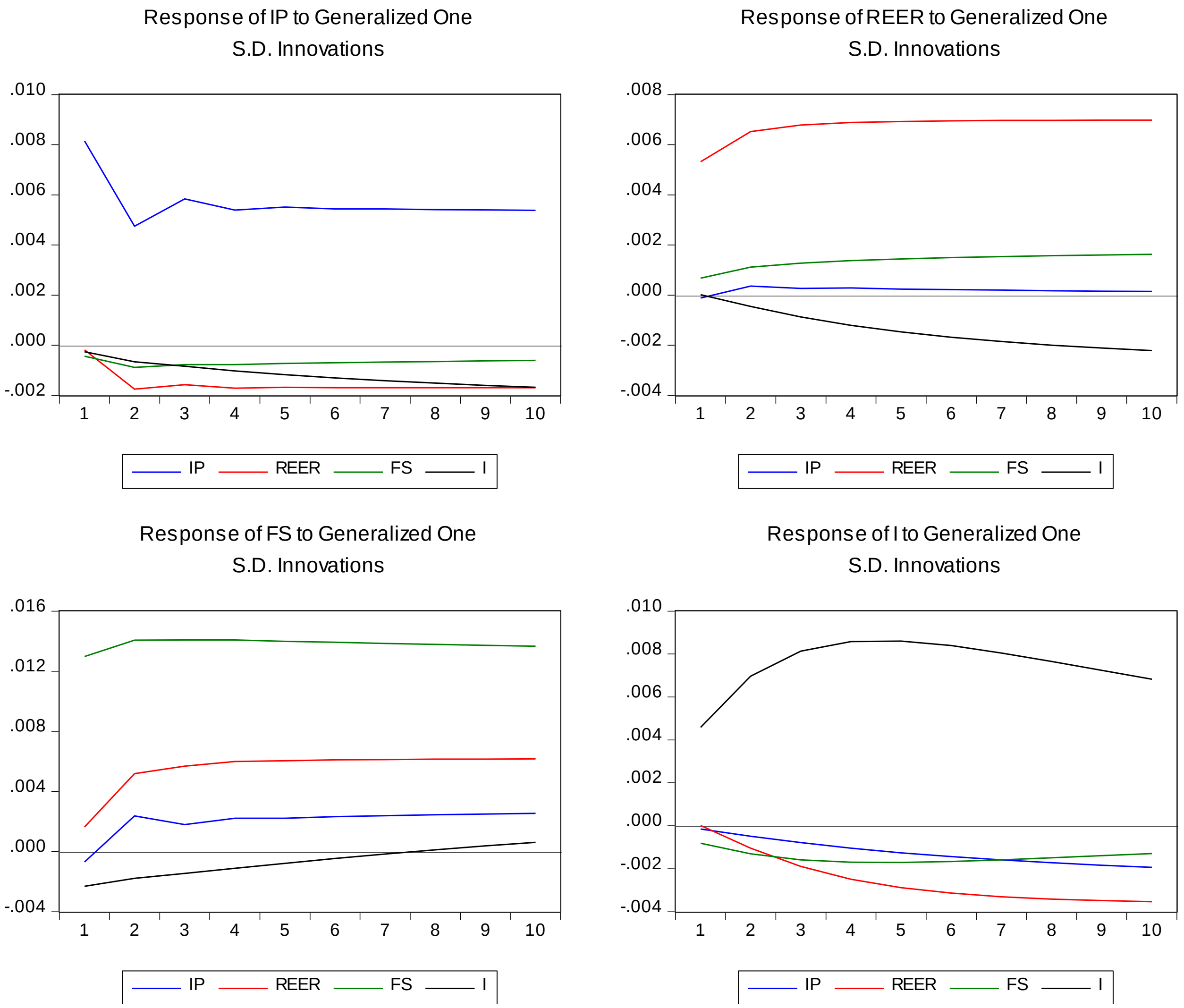
Table E3: The VECM regressions (both PRF and SRF). Plus Dummy variable (dum=1, since 2008M9)

Vector Error Correction Estimates
Date: 11/10/17   Time: 13:51
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1			
IP(-1)	1.000000			
REER(-1)	2.202724			
	(0.86731)			
	[2.53973]			
FS(-1)	-0.228288			
	(0.23399)			
	[-0.97565]			
I(-1)	2.096242			
	(0.47178)			
	[4.44326]			
C	-5.590214			
Error Correction:	**D(IP)**	**D(REER)**	**D(FS)**	**D(I)**
CointEq1	-0.016348	-0.013802	0.020025	-0.020080
	(0.00805)	(0.00520)	(0.01252)	(0.00452)
	[-2.03083]	[-2.65523]	[1.59911]	[-4.44711]
D(IP(-1))	-0.411761	0.069864	0.351147	-0.016952
	(0.07150)	(0.04617)	(0.11123)	(0.04011)
	[-5.75890]	[1.51319]	[3.15697]	[-0.42268]

D(REER(-1))	-0.268291	0.233055	0.564228	-0.170863
	(0.11260)	(0.07271)	(0.17517)	(0.06316)
	[-2.38260]	[3.20516]	[3.22097]	[-2.70513]
D(FS(-1))	-0.049410	0.007714	0.031327	-0.006416
	(0.04900)	(0.03164)	(0.07622)	(0.02748)
	[-1.00846]	[0.24381]	[0.41101]	[-0.23345]
D(I(-1))	-0.094707	-0.072822	0.113284	0.558198
	(0.10395)	(0.06712)	(0.16171)	(0.05831)
	[-0.91110]	[-1.08491]	[0.70055]	[9.57343]
C	0.002924	0.001073	0.006649	0.000287
	(0.00111)	(0.00072)	(0.00172)	(0.00062)
	[2.63986]	[1.50047]	[3.85849]	[0.46219]
DUM	-0.001293	-0.002019	**-0.005128**	**-0.001870**
	(0.00163)	(0.00105)	**(0.00253)**	**(0.00091)**
	[-0.79330]	[-1.91859]	**[-2.02303]**	**[-2.04610]**
R-squared	0.229442	0.189872	0.207968	0.476351
Adj. R-squared	0.192966	0.151523	0.170475	0.451563
Sum sq. resids	0.011310	0.004716	0.027371	0.003559
S.E. equation	0.008181	0.005282	0.012726	0.004589
F-statistic	6.290187	4.951140	5.546905	19.21691
Log likelihood	607.5122	685.3643	528.8548	710.4260
Akaike AIC	-6.724856	-7.599599	-5.841065	-7.881190
Schwarz SC	-6.563980	-7.438722	-5.680188	-7.720314
Mean dependent	0.001255	0.000266	0.004641	-0.001846
S.D. dependent	0.009106	0.005735	0.013973	0.006196
Determinant resid covariance (dof adj.)		6.00E-18		
Determinant resid covariance		4.87E-18		
Log likelihood		2537.505		
Akaike information criterion		-28.06186		
Schwarz criterion		-27.34685		

Figure E1: Generalized Imse Response Functions (GIRFs) (Combined graphs with t=10)

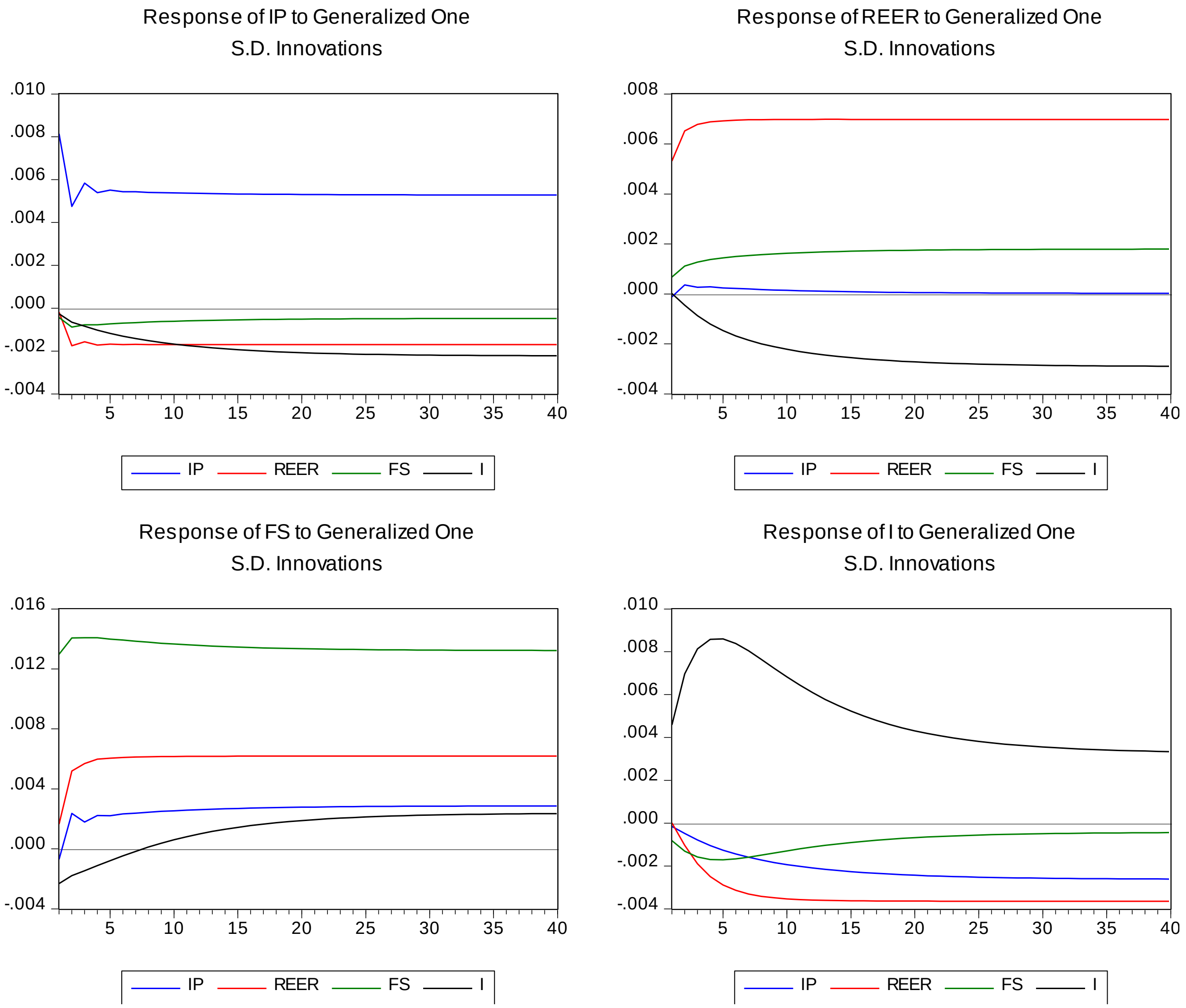

Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

Figure E2: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=40)



Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

Figure E3: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=40)

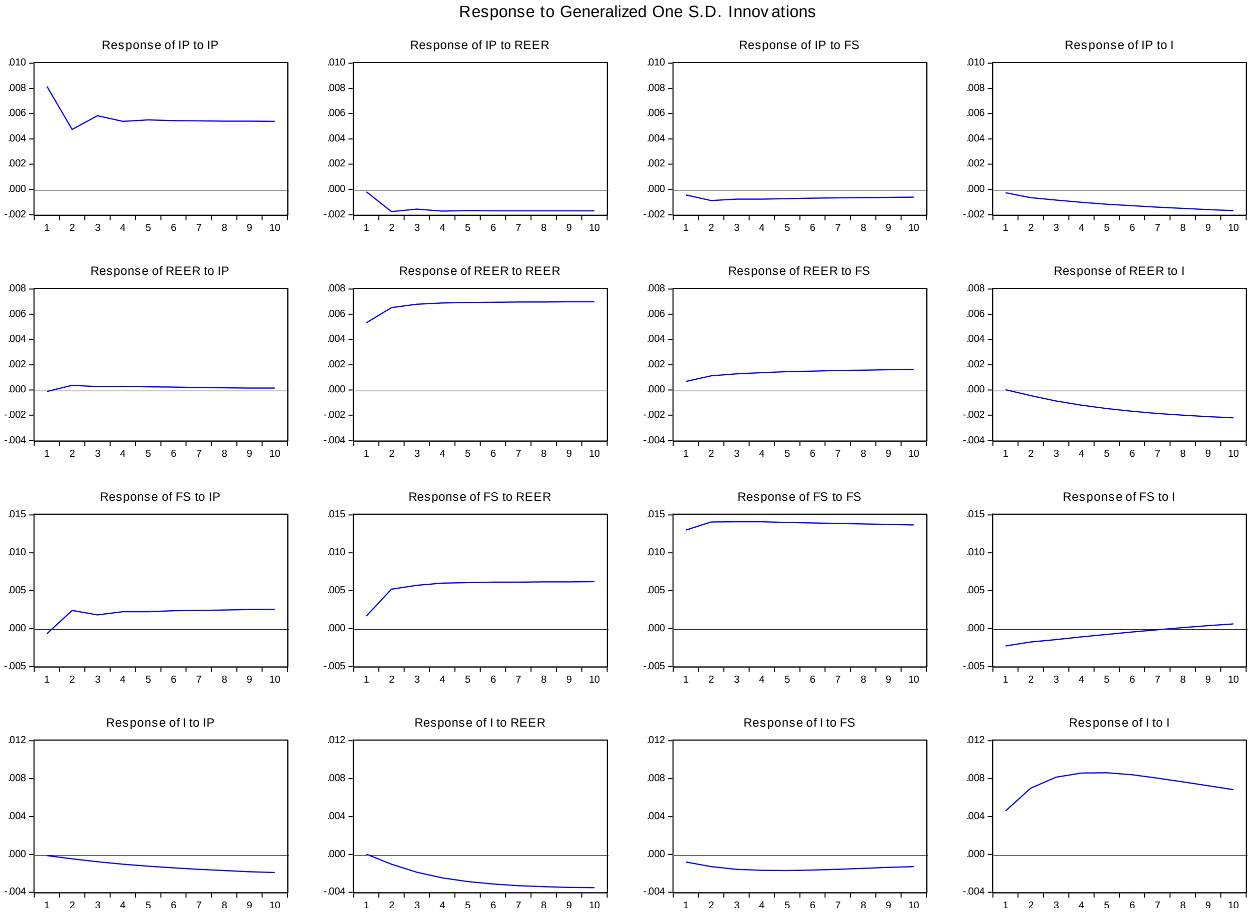
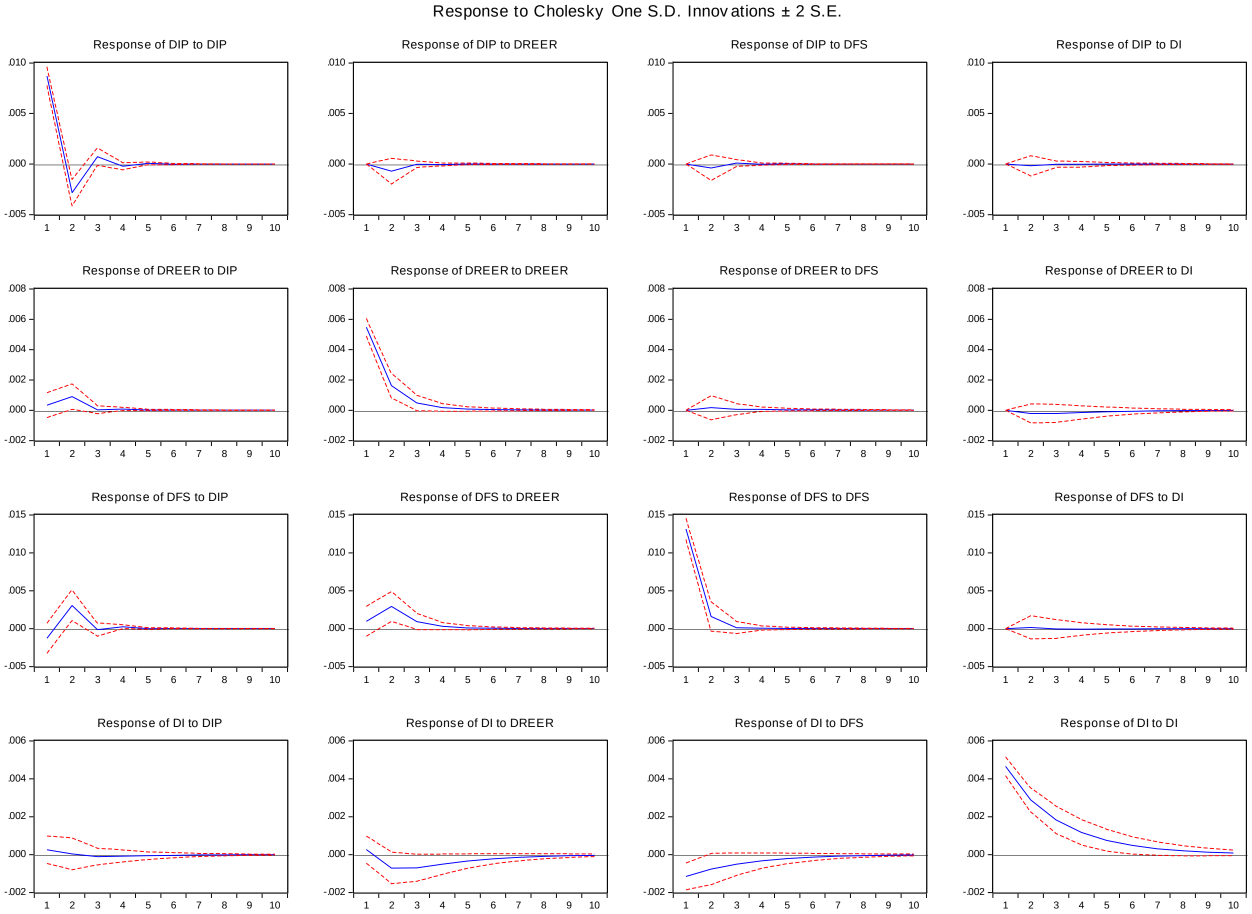


Figure E4: Cholesky decomposed Impulse Response Functions with specific ordering



APPENDIX F

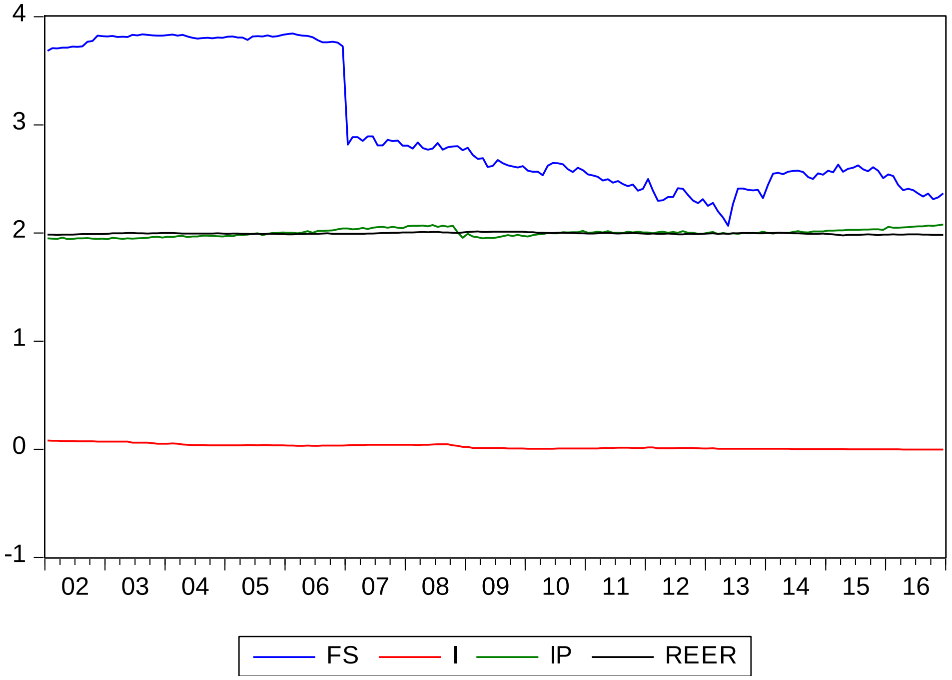
Determining the Relationship between the investigated variables. The case of Slovenia

Part A: Statistical measures and level graphs

Table A1: STATISTICAL TABLES FOR ALL FOUR VARIABLES

	FS	I	IP	REER
Mean	2.967551	0.024487	2.001820	1.994434
Median	2.645416	0.013000	2.001084	1.994056
Maximum	3.844639	0.079872	2.077004	2.013107
Minimum	2.064458	-0.003200	1.943000	1.977132
Std. Dev.	0.606910	0.023517	0.035207	0.007479
Skewness	0.525025	0.688831	0.182885	0.351472
Kurtosis	1.520397	2.395518	2.221031	2.901253
Jarque-Bera	24.68871	16.97513	5.554356	3.779102
Probability	0.000004	0.000206	0.062214	0.151140
Sum	534.1592	4.407665	360.3275	358.9981
Sum Sq. Dev.	65.93274	0.098992	0.221881	0.010013
Observations	180	180	180	180

Figure A1: All four variables from 1/1/2002 to 31/12/2016



Part B: On cointegration

Table B1: Cointegration (all four variables in level)

Date: 11/10/17 Time: 14:27
Sample (adjusted): 2002M06 2016M12
Included observations: 175 after adjustments
Trend assumption: Linear deterministic trend
Series: IP REER FS I
Lags interval (in first differences): 1 to 4

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.123138	48.38596	47.85613	0.0445
At most 1	0.073296	25.39006	29.79707	0.1480
At most 2	0.040517	12.06888	15.49471	0.1537
At most 3 *	0.027227	4.830800	3.841466	0.0279

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.123138	22.99590	27.58434	0.1737
At most 1	0.073296	13.32118	21.13162	0.4231
At most 2	0.040517	7.238081	14.26460	0.4614
At most 3 *	0.027227	4.830800	3.841466	0.0279

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

IP	REER	FS	I
12.63939	-34.01987	-2.037956	82.67401
26.40554	78.01021	-0.107277	-6.664078
-25.27967	-9.630469	-2.770245	30.62038
6.005485	-131.7966	-0.630464	-4.804453

Unrestricted Adjustment Coefficients (alpha):

D(IP)	-0.002078	-0.001830	-0.000254	-1.87E-05
D(REER)	0.000386	-0.000281	-7.87E-05	0.000183
D(FS)	0.002648	-0.006548	0.014981	-0.000377
D(I)	-0.000343	8.70E-05	5.36E-05	0.000246

1 Cointegrating Equation(s): Log likelihood 2488.006

```
Normalized cointegrating coefficients (standard error in parentheses)
        IP            REER            FS              I
     1.000000      -2.691575      -0.161238       6.540981
                   (2.60721)      (0.05667)      (1.49168)

Adjustment coefficients (standard error in parentheses)
     D(IP)         -0.026263
                   (0.00891)
     D(REER)        0.004883
                   (0.00189)
     D(FS)          0.033472
                   (0.07929)
     D(I)          -0.004332
                   (0.00181)
================================================================

2 Cointegrating Equation(s):      Log likelihood      2494.666
================================================================
Normalized cointegrating coefficients (standard error in parentheses)
        IP            REER            FS              I
     1.000000       0.000000      -0.086308       3.302372
                                  (0.03295)      (0.88024)
     0.000000       1.000000       0.027839      -1.203240
                                  (0.01144)      (0.30555)

Adjustment coefficients (standard error in parentheses)
     D(IP)         -0.074572      -0.072032
                   (0.02019)      (0.05869)
     D(REER)       -0.002532      -0.035047
                   (0.00433)      (0.01259)
     D(FS)         -0.139439      -0.600926
                   (0.18302)      (0.53205)
     D(I)          -0.002035       0.018445
                   (0.00419)      (0.01220)
================================================================

3 Cointegrating Equation(s):      Log likelihood      2498.285
================================================================
Normalized cointegrating coefficients (standard error in parentheses)
        IP            REER            FS              I
     1.000000       0.000000       0.000000       1.413403
                                                 (0.43658)
     0.000000       1.000000       0.000000      -0.593944
                                                 (0.19254)
     0.000000       0.000000       1.000000      -21.88644
                                                 (4.65304)

Adjustment coefficients (standard error in parentheses)
     D(IP)         -0.068160      -0.069589       0.005134
                   (0.02666)      (0.05904)      (0.00237)
     D(REER)       -0.000542      -0.034289      -0.000539
                   (0.00572)      (0.01266)      (0.00051)
     D(FS)         -0.518142      -0.745195      -0.046194
                   (0.23735)      (0.52557)      (0.02111)
     D(I)          -0.003390       0.017929       0.000541
                   (0.00554)      (0.01227)      (0.00049)
================================================================
```

Table B2: Group cointegration summary
Date: 11/10/17 Time: 14:33
Sample: 2002M01 2016M12
Included observations: 175
Series: IP REER FS I
Lags interval: 1 to 4

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	2	2	1	1	1
Max-Eig	2	0	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2467.536	2467.536	2476.508	2476.508	2480.524
1	2481.154	2481.303	2488.006	2489.096	2492.914
2	2492.446	2492.788	2494.666	2498.953	2501.587
3	2495.973	2497.651	2498.285	2505.449	2506.797
4	2496.426	2500.701	2500.701	2509.065	2509.065
	Akaike Information Criteria by Rank (rows) and Model (columns)				
0	-27.46898	-27.46898	-27.52580	-27.52580	-27.52598
1	-27.53318	-27.52346	-27.56578	-27.56682	-27.57616
2	-27.57081	-27.55186	-27.55047	-27.57660	-27.58385*
3	-27.51969	-27.50458	-27.50040	-27.54798	-27.55196
4	-27.43344	-27.43658	-27.43658	-27.48646	-27.48646
	Schwarz Criteria by Rank (rows)				

	and Model (columns)				
0	-26.31158*	-26.31158*	-26.29606	-26.29606	-26.22390
1	-26.23110	-26.20329	-26.19136	-26.17431	-26.12940
2	-26.12405	-26.06893	-26.03137	-26.02134	-25.99241
3	-25.92826	-25.85890	-25.83663	-25.82996	-25.81585
4	-25.69733	-25.62813	-25.62813	-25.60567	-25.60567

Table B3: Group cointegration summary

Date: 11/10/17 Time: 14:34
Sample: 2002M01 2016M12
Included observations: 177
Series: IP REER FS I
Lags interval: 1 to 2

Selected (0.05 level*) Number of Cointegrating Relations by Model

Data Trend:	None	None	Linear	Linear	Quadratic
Test Type	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
Trace	1	1	0	0	1
Max-Eig	1	1	0	0	0

*Critical values based on MacKinnon-Haug-Michelis (1999)

Information Criteria by Rank and Model

Data Trend:	None	None	Linear	Linear	Quadratic
Rank or No. of CEs	No Intercept No Trend	Intercept No Trend	Intercept No Trend	Intercept Trend	Intercept Trend
	Log Likelihood by Rank (rows) and Model (columns)				
0	2475.904	2475.904	2485.125	2485.125	2487.602
1	2491.534	2491.539	2495.526	2499.186	2501.658
2	2499.033	2500.010	2501.682	2507.256	2509.166
3	2502.672	2503.989	2504.850	2512.920	2514.258
4	2502.907	2507.004	2507.004	2515.677	2515.677
	Akaike Information Criteria by Rank (rows) and Model (columns)				

0	-27.61473	-27.61473	-27.67373	-27.67373	-27.65652
1	-27.70095	-27.68971	-27.70085	-27.73091*	-27.72495
2	-27.69529	-27.68372	-27.68002	-27.72041	-27.71939
3	-27.64601	-27.62700	-27.62543	-27.68272	-27.68653
4	-27.55827	-27.55936	-27.55936	-27.61217	-27.61217
	Schwarz Criteria by Rank (rows) and Model (columns)				
0	-27.04052*	-27.04052*	-27.02774	-27.02774	-26.93875
1	-26.98318	-26.95399	-26.91130	-26.92342	-26.86362
2	-26.83396	-26.78651	-26.74692	-26.75142	-26.71451
3	-26.64113	-26.56828	-26.54876	-26.55222	-26.53809
4	-26.40983	-26.33915	-26.33915	-26.32018	-26.32018

Part C: On unit root tests

Part C1: Unit root tests in level variables

Table C1.1: Unit roots in level variables
Null Hypothesis: FS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.986356	0.7578
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17 Time: 14:15
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.009618	0.009751	-0.986356	0.3253
C	0.021203	0.029565	0.717161	0.4742

R-squared	0.005467	Mean dependent var	-0.007372
Adjusted R-squared	-0.000152	S.D. dependent var	0.078953
S.E. of regression	0.078959	Akaike info criterion	-2.228655
Sum squared resid	1.103522	Schwarz criterion	-2.193042
Log likelihood	201.4646	Hannan-Quinn criter.	-2.214214
F-statistic	0.972899	Durbin-Watson stat	2.059345
Prob(F-statistic)	0.325305		

Table C1.2:

```
Null Hypothesis: FS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                  t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -1.735569      0.7314
--------------------------------------------------------------------------
Test critical values:        1% level             -4.010143
                             5% level             -3.435125
                             10% level            -3.141565
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
Date: 08/29/17   Time: 14:15
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
==========================================================================
        Variable         Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
          FS(-1)          -0.035588     0.020505      -1.735569     0.0844
            C              0.129449     0.080818       1.601726     0.1110
   @TREND("2002M01")      -0.000345     0.000240      -1.438459     0.1521
==========================================================================
R-squared                  0.017023   Mean dependent var          -0.007372
Adjusted R-squared         0.005853   S.D. dependent var           0.078953
S.E. of regression         0.078722   Akaike info criterion       -2.229170
Sum squared resid          1.090699   Schwarz criterion           -2.175750
Log likelihood             202.5107   Hannan-Quinn criter.        -2.207509
F-statistic                1.523970   Durbin-Watson stat           2.030146
Prob(F-statistic)          0.220706
==========================================================================
```

Table C1.3:

```
Null Hypothesis: FS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                  t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -1.422809      0.1439
--------------------------------------------------------------------------
Test critical values:        1% level             -2.577945
                             5% level             -1.942614
                             10% level            -1.615522
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(FS)
Method: Least Squares
```

Date: 08/29/17 Time: 14:15
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
FS(-1)	-0.002766	0.001944	-1.422809	0.1565

R-squared	0.002577	Mean dependent var	-0.007372
Adjusted R-squared	0.002577	S.D. dependent var	0.078953
S.E. of regression	0.078852	Akaike info criterion	-2.236927
Sum squared resid	1.106729	Schwarz criterion	-2.219120
Log likelihood	201.2050	Hannan-Quinn criter.	-2.229706
Durbin-Watson stat	2.067494		

(Not stationary in level)

Table C1.4:
Null Hypothesis: I has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.191179	0.2103
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17 Time: 14:16
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
I(-1)	-0.013816	0.006305	-2.191179	0.0298
D(I(-1))	0.190259	0.073300	2.595610	0.0102
C	-3.49E-05	0.000212	-0.164918	**0.8692**

R-squared	0.067975	Mean dependent var	-0.000460
Adjusted R-squared	0.057324	S.D. dependent var	0.001994
S.E. of regression	0.001936	Akaike info criterion	-9.639926
Sum squared resid	0.000656	Schwarz criterion	-9.586300
Log likelihood	860.9534	Hannan-Quinn criter.	-9.618179
F-statistic	6.381645	Durbin-Watson stat	2.036870
Prob(F-statistic)	0.002113		

Table C1.5:

```
Null Hypothesis: I has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                 t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic           -2.196033      0.4885
--------------------------------------------------------------------------
Test critical values:         1% level           -4.010440
                              5% level           -3.435269
                              10% level          -3.141649
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17   Time: 14:16
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
       Variable          Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
         I(-1)            -0.035675      0.016245     -2.196033     0.0294
       D(I(-1))            0.203024      0.073587      2.758976     0.0064
           C               0.001473      0.001054      1.396661     0.1643
  @TREND("2002M01")       -1.07E-05      7.34E-06     -1.459213     0.1463
==========================================================================
R-squared                  0.079243   Mean dependent var        -0.000460
Adjusted R-squared         0.063368   S.D. dependent var         0.001994
S.E. of regression         0.001930   Akaike info criterion     -9.640853
Sum squared resid          0.000648   Schwarz criterion         -9.569352
Log likelihood             862.0359   Hannan-Quinn criter.      -9.611858
F-statistic                4.991652   Durbin-Watson stat         2.046209
Prob(F-statistic)          0.002401
==========================================================================
```

Table C1.6:

```
Null Hypothesis: I has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                 t-Statistic    Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic           -3.285164      0.0011
--------------------------------------------------------------------------
Test critical values:         1% level           -2.578018
                              5% level           -1.942624
                              10% level          -1.615515
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(I)
Method: Least Squares
Date: 08/29/17   Time: 14:16
```

```
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
        Variable         Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
          I(-1)           -0.014554      0.004430     -3.285164     0.0012
        D(I(-1))           0.191360      0.072793      2.628816     0.0093
==========================================================================
R-squared                  0.067831   Mean dependent var          -0.000460
Adjusted R-squared         0.062534   S.D. dependent var           0.001994
S.E. of regression         0.001930   Akaike info criterion       -9.651007
Sum squared resid          0.000656   Schwarz criterion           -9.615256
Log likelihood             860.9396   Hannan-Quinn criter.        -9.636509
Durbin-Watson stat         2.037495
==========================================================================
```

(Stationary in level)

Table C1.7:

```
Null Hypothesis: IP has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                  t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic            -1.227035      0.6625
--------------------------------------------------------------------------
Test critical values:        1% level             -3.467205
                             5% level             -2.877636
                            10% level             -2.575430
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17   Time: 14:18
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
        Variable         Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
          IP(-1)          -0.026917      0.021937     -1.227035     0.2215
        D(IP(-1))         -0.217345      0.074290     -2.925619     0.0039
            C              0.054751      0.043908      1.246945     0.2141
==========================================================================
R-squared                  0.061886   Mean dependent var           0.000725
Adjusted R-squared         0.051165   S.D. dependent var           0.010266
S.E. of regression         0.009999   Akaike info criterion       -6.355855
Sum squared resid          0.017498   Schwarz criterion           -6.302230
Log likelihood             568.6711   Hannan-Quinn criter.        -6.334109
F-statistic                5.772248   Durbin-Watson stat           2.016480
Prob(F-statistic)          0.003736
==========================================================================
```

Table C1.8:

Null Hypothesis: IP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.707971	0.7439
Test critical values:	1% level	-4.010440	
	5% level	-3.435269	
	10% level	-3.141649	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17 Time: 14:19
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	-0.045332	0.026542	-1.707971	0.0894
D(IP(-1))	-0.208860	0.074503	-2.803373	0.0056
C	0.089645	0.052239	1.716064	0.0879
@TREND("2002M01")	2.17E-05	1.77E-05	1.228671	0.2209

R-squared	0.069955	Mean dependent var	0.000725
Adjusted R-squared	0.053920	S.D. dependent var	0.010266
S.E. of regression	0.009985	Akaike info criterion	-6.353258
Sum squared resid	0.017348	Schwarz criterion	-6.281757
Log likelihood	569.4400	Hannan-Quinn criter.	-6.324262
F-statistic	4.362583	Durbin-Watson stat	2.013338
Prob(F-statistic)	0.005446		

Table C1.9:
Null Hypothesis: IP has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.151380	0.9354
Test critical values:	1% level	-2.578018	
	5% level	-1.942624	
	10% level	-1.615515	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(IP)
Method: Least Squares
Date: 08/29/17 Time: 14:19

Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
IP(-1)	0.000433	0.000376	1.151380	0.2511
D(IP(-1))	-0.232362	0.073423	-3.164690	0.0018

R-squared	0.053551	Mean dependent var	0.000725
Adjusted R-squared	0.048173	S.D. dependent var	0.010266
S.E. of regression	0.010015	Akaike info criterion	-6.358245
Sum squared resid	0.017654	Schwarz criterion	-6.322495
Log likelihood	567.8838	Hannan-Quinn criter.	-6.343748
Durbin-Watson stat	2.024750		

(Not stationary in level)

Table C1.10:

Null Hypothesis: REER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.602424	0.4793
Test critical values:	1% level	-3.466994	
	5% level	-2.877544	
	10% level	-2.575381	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17 Time: 14:19
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-0.033471	0.020888	-1.602424	0.1108
C	0.066732	0.041661	1.601778	0.1110

R-squared	0.014300	Mean dependent var	-2.65E-05
Adjusted R-squared	0.008731	S.D. dependent var	0.002078
S.E. of regression	0.002069	Akaike info criterion	-9.512263
Sum squared resid	0.000758	Schwarz criterion	-9.476650
Log likelihood	853.3475	Hannan-Quinn criter.	-9.497822
F-statistic	2.567764	Durbin-Watson stat	1.724893
Prob(F-statistic)	0.110845		

Table C1.11:

```
Null Hypothesis: REER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                   t-Statistic   Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic             -1.837225     0.6825
--------------------------------------------------------------------------
Test critical values:        1% level              -4.010143
                             5% level              -3.435125
                             10% level             -3.141565
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17   Time: 14:19
Sample (adjusted): 2002M02 2016M12
Included observations: 179 after adjustments
==========================================================================
        Variable           Coefficient    Std. Error    t-Statistic   Prob.
==========================================================================
        REER(-1)           -0.038540      0.020977      -1.837225     0.0679
            C               0.077309      0.041878       1.846055     0.0666
   @TREND("2002M01")       -5.20E-06      3.01E-06      -1.729091     0.0855
==========================================================================
R-squared                   0.030764   Mean dependent var       -2.65E-05
Adjusted R-squared          0.019750   S.D. dependent var        0.002078
S.E. of regression          0.002058   Akaike info criterion    -9.517934
Sum squared resid           0.000745   Schwarz criterion        -9.464514
Log likelihood              854.8551   Hannan-Quinn criter.     -9.496273
F-statistic                 2.793192   Durbin-Watson stat        1.745385
Prob(F-statistic)           0.063942
==========================================================================
```

Table C1.12:

```
Null Hypothesis: REER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                   t-Statistic   Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic             -0.176210     0.6214
--------------------------------------------------------------------------
Test critical values:        1% level              -2.577945
                             5% level              -1.942614
                             10% level             -1.615522
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(REER)
Method: Least Squares
Date: 08/29/17   Time: 14:19
Sample (adjusted): 2002M02 2016M12
```

Included observations: 179 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
REER(-1)	-1.37E-05	7.79E-05	-0.176210	0.8603

R-squared	0.000012	Mean dependent var	-2.65E-05
Adjusted R-squared	0.000012	S.D. dependent var	0.002078
S.E. of regression	0.002078	Akaike info criterion	-9.509045
Sum squared resid	0.000769	Schwarz criterion	-9.491238
Log likelihood	852.0595	Hannan-Quinn criter.	-9.501824
Durbin-Watson stat	1.757889		

(Not stationary in level)

Table C1.13: Group unit root test summary

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 14:20
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 2
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.02763	0.5110	4	712
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	18.4467	0.0181	4	712
PP - Fisher Chi-square	18.9895	0.0149	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C1.14:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 14:20
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-0.04974	0.4802	4	714
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	18.5354	0.0176	4	714
PP - Fisher Chi-square	18.9895	0.0149	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi

-square distribution. All other tests assume asymptotic normality.

Table C1.15:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 14:21
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-1.35169	0.0882	4	714
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.06801	0.5271	4	714
ADF - Fisher Chi-square	5.96770	0.6509	4	714
PP - Fisher Chi-square	6.60089	0.5802	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

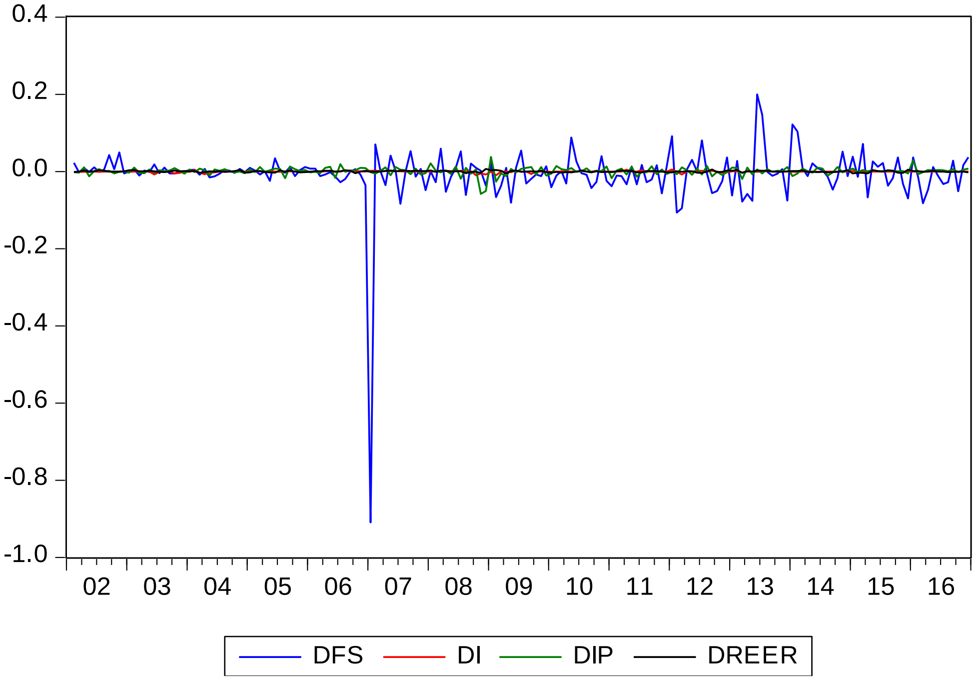
Table C1.16:

Group unit root test: Summary
Series: FS, I, IP, REER
Date: 08/29/17 Time: 14:21
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	0.36767	0.6434	4	714
Breitung t-stat	0.17194	0.5683	4	710
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	0.79666	0.7872	4	714
ADF - Fisher Chi-square	3.41415	0.9057	4	714
PP - Fisher Chi-square	4.49230	0.8102	4	716

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Figure C1: All four variables from 1/1/2002 to 31/12/2016 in first difference



Part C2: Unit root tests in first difference

Table C2.1:
Null Hypothesis: DFS has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-13.73656	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17 Time: 14:22
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DFS(-1)	-1.035293	0.075368	-13.73656	0.0000
C	-0.007808	0.005973	-1.307279	0.1928

R-squared	0.517402	Mean dependent var	8.16E-05

```
Adjusted R-squared      0.514660   S.D. dependent var       0.113856
S.E. of regression      0.079319   Akaike info criterion   -2.219496
Sum squared resid       1.107315   Schwarz criterion       -2.183746
Log likelihood          199.5352   Hannan-Quinn criter.    -2.204998
F-statistic             188.6930   Durbin-Watson stat       2.002182
Prob(F-statistic)       0.000000
=====================================================================
```

Table C2.2:

```
Null Hypothesis: DFS has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                              t-Statistic   Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic        -13.70136     0.0000
---------------------------------------------------------------------
Test critical values:        1% level         -4.010440
                             5% level         -3.435269
                             10% level        -3.141649
=====================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17   Time: 14:22
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=====================================================================
        Variable          Coefficient   Std. Error   t-Statistic   Prob.
=====================================================================
          DFS(-1)          -1.035453    0.075573     -13.70136     0.0000
             C             -0.010347    0.012092     -0.855728     0.3933
   @TREND("2002M01")        2.80E-05    0.000116      0.241722     0.8093
=====================================================================
R-squared               0.517563   Mean dependent var       8.16E-05
Adjusted R-squared      0.512050   S.D. dependent var       0.113856
S.E. of regression      0.079532   Akaike info criterion   -2.208594
Sum squared resid       1.106946   Schwarz criterion       -2.154968
Log likelihood          199.5649   Hannan-Quinn criter.    -2.186847
F-statistic             93.87097   Durbin-Watson stat       2.002545
Prob(F-statistic)       0.000000
=====================================================================
```

Table C2.3:

```
Null Hypothesis: DFS has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=====================================================================
                                              t-Statistic   Prob.*
=====================================================================
Augmented Dickey-Fuller test statistic        -13.64691     0.0000
---------------------------------------------------------------------
Test critical values:        1% level         -2.578018
                             5% level         -1.942624
                             10% level        -1.615515
=====================================================================
```

```
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DFS)
Method: Least Squares
Date: 08/29/17   Time: 14:22
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================================
        Variable          Coefficient    Std. Error    t-Statistic     Prob.
==============================================================================
        DFS(-1)            -1.025819      0.075169     -13.64691      0.0000
==============================================================================
R-squared                   0.512716   Mean dependent var          8.16E-05
Adjusted R-squared          0.512716   S.D. dependent var          0.113856
S.E. of regression          0.079478   Akaike info criterion      -2.221069
Sum squared resid           1.118067   Schwarz criterion          -2.203194
Log likelihood              198.6751   Hannan-Quinn criter.       -2.213820
Durbin-Watson stat          2.000875
==============================================================================
```

(Stationary in first difference)

Table C2.4:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==============================================================================
                                                   t-Statistic     Prob.*
==============================================================================
Augmented Dickey-Fuller test statistic              -10.76989     0.0000
------------------------------------------------------------------------------
Test critical values:         1% level              -3.467205
                              5% level              -2.877636
                             10% level              -2.575430
==============================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17   Time: 14:23
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==============================================================================
        Variable          Coefficient    Std. Error    t-Statistic     Prob.
==============================================================================
         DI(-1)            -0.794146      0.073738     -10.76989      0.0000
           C               -0.000364      0.000151     -2.415080      0.0168
==============================================================================
R-squared                   0.397241   Mean dependent var          6.41E-06
Adjusted R-squared          0.393816   S.D. dependent var          0.002513
S.E. of regression          0.001957   Akaike info criterion      -9.624096
Sum squared resid           0.000674   Schwarz criterion          -9.588345
Log likelihood              858.5445   Hannan-Quinn criter.       -9.609598
F-statistic                 115.9906   Durbin-Watson stat          2.043635
Prob(F-statistic)           0.000000
```

Table C2.5:

```
Null Hypothesis: DI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=========================================================================
                                                 t-Statistic    Prob.*
=========================================================================
Augmented Dickey-Fuller test statistic           -10.89971      0.0000
Test critical values:        1% level            -4.010440
                             5% level            -3.435269
                             10% level           -3.141649
=========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
Date: 08/29/17   Time: 14:23
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
=========================================================================
       Variable          Coefficient    Std. Error    t-Statistic   Prob.
=========================================================================
        DI(-1)            -0.808663      0.074191     -10.89971     0.0000
          C               -0.000747      0.000304     -2.454084     0.0151
  @TREND("2002M01")        4.15E-06      2.87E-06      1.446813     0.1497
=========================================================================
R-squared                 0.404366   Mean dependent var         6.41E-06
Adjusted R-squared        0.397558   S.D. dependent var         0.002513
S.E. of regression        0.001951   Akaike info criterion     -9.624750
Sum squared resid         0.000666   Schwarz criterion         -9.571125
Log likelihood            859.6028   Hannan-Quinn criter.      -9.603004
F-statistic               59.40219   Durbin-Watson stat         2.035963
Prob(F-statistic)         0.000000
=========================================================================
```

Table C2.6:

```
Null Hypothesis: DI has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
=========================================================================
                                                 t-Statistic    Prob.*
=========================================================================
Augmented Dickey-Fuller test statistic           -10.35530      0.0000
Test critical values:        1% level            -2.578018
                             5% level            -1.942624
                             10% level           -1.615515
=========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DI)
Method: Least Squares
```

```
Date: 08/29/17   Time: 14:23
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==================================================================
        Variable        Coefficient    Std. Error    t-Statistic    Prob.
==================================================================
         DI(-1)          -0.753508      0.072765     -10.35530     0.0000
==================================================================
R-squared                 0.377266   Mean dependent var      6.41E-06
Adjusted R-squared        0.377266   S.D. dependent var      0.002513
S.E. of regression        0.001983   Akaike info criterion  -9.602729
Sum squared resid         0.000696   Schwarz criterion      -9.584854
Log likelihood            855.6429   Hannan-Quinn criter.   -9.595480
Durbin-Watson stat        2.067652
==================================================================
```

(Stationary in first difference)

Table C2.7:

```
Null Hypothesis: DIP has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==================================================================
                                                t-Statistic    Prob.*
==================================================================
Augmented Dickey-Fuller test statistic          -16.78804     0.0000
------------------------------------------------------------------
Test critical values:        1% level           -3.467205
                             5% level           -2.877636
                            10% level           -2.575430
==================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 14:23
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==================================================================
        Variable        Coefficient    Std. Error    t-Statistic    Prob.
==================================================================
         DIP(-1)         -1.232225      0.073399     -16.78804     0.0000
            C             0.000882      0.000752      1.172673     0.2425
==================================================================
R-squared                 0.615585   Mean dependent var      4.95E-05
Adjusted R-squared        0.613401   S.D. dependent var      0.016105
S.E. of regression        0.010014   Akaike info criterion  -6.358524
Sum squared resid         0.017649   Schwarz criterion      -6.322774
Log likelihood            567.9087   Hannan-Quinn criter.   -6.344027
F-statistic               281.8383   Durbin-Watson stat      2.024707
Prob(F-statistic)         0.000000
==================================================================
```

Table C2.8:

```
Null Hypothesis: DIP has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                 t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic           -16.74805       0.0000
--------------------------------------------------------------------------
Test critical values:          1% level          -4.010440
                               5% level          -3.435269
                               10% level         -3.141649
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 14:23
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
==========================================================================
        Variable           Coefficient    Std. Error    t-Statistic    Prob.
==========================================================================
         DIP(-1)            -1.232590      0.073596     -16.74805     0.0000
            C                0.000460      0.001524      0.301996     0.7630
   @TREND("2002M01")         4.66E-06      1.46E-05      0.318363     0.7506
==========================================================================
R-squared                    0.615807   Mean dependent var          4.95E-05
Adjusted R-squared           0.611417   S.D. dependent var          0.016105
S.E. of regression           0.010040   Akaike info criterion      -6.347868
Sum squared resid            0.017639   Schwarz criterion          -6.294242
Log likelihood               567.9602   Hannan-Quinn criter.       -6.326121
F-statistic                  140.2503   Durbin-Watson stat          2.025189
Prob(F-statistic)            0.000000
==========================================================================
```

Table C2.9:

```
Null Hypothesis: DIP has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
==========================================================================
                                                 t-Statistic     Prob.*
==========================================================================
Augmented Dickey-Fuller test statistic           -16.72944       0.0000
--------------------------------------------------------------------------
Test critical values:          1% level          -2.578018
                               5% level          -1.942624
                               10% level         -1.615515
==========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DIP)
Method: Least Squares
Date: 08/29/17   Time: 14:24
Sample (adjusted): 2002M03 2016M12
```

Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DIP(-1)	-1.226550	0.073317	-16.72944	0.0000

R-squared	0.612581	Mean dependent var	4.95E-05
Adjusted R-squared	0.612581	S.D. dependent var	0.016105
S.E. of regression	0.010024	Akaike info criterion	-6.361977
Sum squared resid	0.017787	Schwarz criterion	-6.344102
Log likelihood	567.2160	Hannan-Quinn criter.	-6.354729
Durbin-Watson stat	2.019673		

(Stationary in first difference)

Table C2.10:

Null Hypothesis: DREER has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=13)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.79647	0.0000
Test critical values:	1% level	-3.467205	
	5% level	-2.877636	
	10% level	-2.575430	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17 Time: 14:24
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.883992	0.074937	-11.79647	0.0000
C	-1.39E-05	0.000155	-0.089872	0.9285

R-squared	0.441547	Mean dependent var	-1.82E-06
Adjusted R-squared	0.438374	S.D. dependent var	0.002763
S.E. of regression	0.002071	Akaike info criterion	-9.510602
Sum squared resid	0.000755	Schwarz criterion	-9.474852
Log likelihood	848.4436	Hannan-Quinn criter.	-9.496105
F-statistic	139.1566	Durbin-Watson stat	1.966453
Prob(F-statistic)	0.000000		

Table C2.11:

```
Null Hypothesis: DREER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
========================================================================
                                                t-Statistic    Prob.*
========================================================================
Augmented Dickey-Fuller test statistic          -11.92292      0.0000
------------------------------------------------------------------------
Test critical values:        1% level           -4.010440
                             5% level           -3.435269
                             10% level          -3.141649
========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 14:24
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
========================================================================
      Variable           Coefficient    Std. Error    t-Statistic   Prob.
========================================================================
     DREER(-1)            -0.895120      0.075076     -11.92292    0.0000
         C                 0.000388      0.000314      1.234021    0.2188
  @TREND("2002M01")       -4.44E-06      3.03E-06     -1.468379    0.1438
========================================================================
R-squared                  0.448344   Mean dependent var       -1.82E-06
Adjusted R-squared         0.442040   S.D. dependent var        0.002763
S.E. of regression         0.002064   Akaike info criterion    -9.511612
Sum squared resid          0.000746   Schwarz criterion        -9.457986
Log likelihood             849.5335   Hannan-Quinn criter.     -9.489865
F-statistic                71.11343   Durbin-Watson stat        1.971227
Prob(F-statistic)          0.000000
========================================================================
```

Table C2.12:

```
Null Hypothesis: DREER has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=13)
========================================================================
                                                t-Statistic    Prob.*
========================================================================
Augmented Dickey-Fuller test statistic          -11.82932      0.0000
------------------------------------------------------------------------
Test critical values:        1% level           -2.578018
                             5% level           -1.942624
                             10% level          -1.615515
========================================================================
*MacKinnon (1996) one-sided p-values.


Augmented Dickey-Fuller Test Equation
Dependent Variable: D(DREER)
Method: Least Squares
Date: 08/29/17   Time: 14:24
Sample (adjusted): 2002M03 2016M12
```

Included observations: 178 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DREER(-1)	-0.883948	0.074725	-11.82932	0.0000

R-squared	0.441522	Mean dependent var	-1.82E-06
Adjusted R-squared	0.441522	S.D. dependent var	0.002763
S.E. of regression	0.002065	Akaike info criterion	-9.521792
Sum squared resid	0.000755	Schwarz criterion	-9.503917
Log likelihood	848.4395	Hannan-Quinn criter.	-9.514544
Durbin-Watson stat	1.966441		

(Stationary in first difference)

Table C2.13: Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 14:26
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on AIC: 0 to 1
Newey-West automatic bandwidth selection and Bartlett kernel

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-23.9365	0.0000	4	710
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	387.946	0.0000	4	710
PP - Fisher Chi-square	446.160	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi -square distribution. All other tests assume asymptotic normality.

Table C2.14:
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17 Time: 14:26
Sample: 2002M01 2016M12
Exogenous variables: None
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test

Method	Statistic	Prob.**	Cross-sections	Obs
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	-25.8550	0.0000	4	712
Null: Unit root (assumes individual unit root process)				
ADF - Fisher Chi-square	444.454	0.0000	4	712
PP - Fisher Chi-square	446.160	0.0000	4	712

** Probabilities for Fisher tests are computed using an asymptotic Chi

```
       -square distribution. All other tests assume asymptotic normality.
```

Table C2.15:

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17   Time: 14:27
Sample: 2002M01 2016M12
Exogenous variables: Individual effects
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test
================================================================================
                                                          Cross-
Method                              Statistic   Prob.**   sections     Obs
--------------------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
--------------------------------------------------------------------------------
Levin, Lin & Chu t*                  -30.3888    0.0000      4         712

Null: Unit root (assumes individual unit root process)
--------------------------------------------------------------------------------
Im, Pesaran and Shin W-stat          -27.3894    0.0000      4         712
ADF - Fisher Chi-square               370.865    0.0000      4         712
PP - Fisher Chi-square                372.026    0.0000      4         712
================================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
       -square distribution. All other tests assume asymptotic normality.
```

Table C2.16:

```
Group unit root test: Summary
Series: DFS, DI, DIP, DREER
Date: 08/29/17   Time: 14:27
Sample: 2002M01 2016M12
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0
Newey-West automatic bandwidth selection and Bartlett kernel
Balanced observations for each test
================================================================================
                                                          Cross-
Method                              Statistic   Prob.**   sections     Obs
--------------------------------------------------------------------------------
Null: Unit root (assumes common unit root process)
--------------------------------------------------------------------------------
Levin, Lin & Chu t*                  -35.5937    0.0000      4         712
Breitung t-stat                      -19.1187    0.0000      4         708

Null: Unit root (assumes individual unit root process)
--------------------------------------------------------------------------------
Im, Pesaran and Shin W-stat          -28.8381    0.0000      4         712
ADF - Fisher Chi-square               361.080    0.0000      4         712
PP - Fisher Chi-square                361.867    0.0000      4         712
================================================================================

** Probabilities for Fisher tests are computed using an asymptotic Chi
       -square distribution. All other tests assume asymptotic normality.
```

Part D: On stability and on lag length

Figure D1: The unit circle

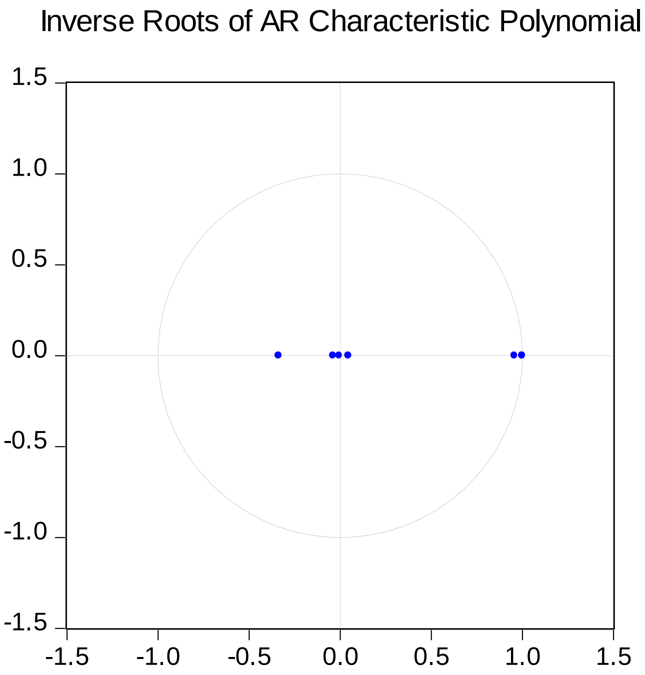


Table D1:
Roots of Characteristic Polynomial
Endogenous variables: IP REER FS I
Exogenous variables: DEUR DEUREER
Lag specification: 1 1
Date: 11/10/17   Time: 14:43

Root	Modulus
1.000000	1.000000
1.000000	1.000000
1.000000	1.000000
0.957699	0.957699
-0.336928	0.336928
0.045943	0.045943
-0.037715	0.037715
-0.003111	0.003111

VEC specification imposes 3 unit root(s).

Table D2:
VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/10/17   Time: 14:44
Sample: 2002M01 2016M12
Included observations: 178

Lags	LM-Stat	Prob

1	24.81246	0.0732

Probs from chi-square with 16 df.

Table D3:

VEC Residual Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 11/10/17 Time: 14:43
Sample: 2002M01 2016M12
Included observations: 178

Lags	LM-Stat	Prob
1	30.21243	0.0169

Probs from chi-square with 16 df.

Table D4:

VEC Residual Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 11/10/17 Time: 14:43
Sample: 2002M01 2016M12
Included observations: 178

Component	Skewness	Chi-sq	df	Prob.
1	-0.189814	1.068868	1	0.3012
2	0.171818	0.875805	1	0.3494
3	-8.060144	1927.322	1	0.0000
4	-2.064577	126.4535	1	0.0000
Joint		2055.720	4	0.0000

Component	Kurtosis	Chi-sq	df	Prob.
1	7.060685	122.2946	1	0.0000
2	3.256595	0.488322	1	0.4847
3	94.16056	61634.34	1	0.0000
4	13.10826	757.8124	1	0.0000
Joint		62514.94	4	0.0000

Component	Jarque-Bera	df	Prob.
1	123.3635	2	0.0000
2	1.364127	2	0.5056
3	63561.66	2	0.0000
4	884.2659	2	0.0000

Joint	64570.66	8	0.0000

Table D4: VECM lag order selection
Endogenous variables: DIP DREER DFS DI
Exogenous variables: C **ECT**
Date: 11/10/17 Time: 14:24
Sample: 2002M01 2016M12
Included observations: 171

Lag	LogL	LR	FPE	AIC	SC	HQ
0	2367.708	NA	1.21e-17	-27.59892	-27.45194*	-27.53928*
1	2385.115	33.59378	1.19e-17*	**-27.61538***	-27.17445	-27.43647
2	2399.154	26.43562	1.22e-17	-27.59245	-26.85755	-27.29426
3	2413.998	27.25790*	1.24e-17	-27.57893	-26.55008	-27.16147
4	2419.473	9.797358	1.40e-17	-27.45583	-26.13302	-26.91909
5	2428.558	15.83119	1.53e-17	-27.37494	-25.75818	-26.71893
6	2433.061	7.637136	1.75e-17	-27.24048	-25.32976	-26.46519
7	2442.203	15.07620	1.91e-17	-27.16027	-24.95559	-26.26571
8	2453.423	17.97829	2.03e-17	-27.10436	-24.60573	-26.09052

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Part E: The VECM and the GIRFs

Table E1: The VECM
Vector Error Correction Estimates
Date: 11/10/17 Time: 14:36
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
IP(-1)	1.000000
REER(-1)	4.108967
	(2.73156)
	[1.50426]
FS(-1)	0.194895
	(0.05751)
	[3.38917]
I(-1)	-5.497962
	(1.48543)
	[-3.70126]
C	-10.64176

Error Correction:	D(IP)	D(REER)	D(FS)	D(I)

CointEq1	0.009838	-0.005083	-0.156096	0.003933
	(0.00940)	(0.00196)	(0.07631)	(0.00188)
	[1.04690]	[-2.59213]	[-2.04546]	[2.09593]
D(IP(-1))	-0.306319	-0.016536	-0.100313	-0.008561
	(0.07445)	(0.01554)	(0.60462)	(0.01487)
	[-4.11435]	[-1.06436]	[-0.16591]	[-0.57575]
D(REER(-1))	0.361996	0.105808	-1.537266	0.062575
	(0.35556)	(0.07419)	(2.88751)	(0.07101)
	[1.01810]	[1.42609]	[-0.53239]	[0.88124]
D(FS(-1))	0.001324	-0.000233	-0.028169	-0.001729
	(0.00928)	(0.00194)	(0.07534)	(0.00185)
	[0.14272]	[-0.12033]	[-0.37389]	[-0.93346]
D(I(-1))	1.306898	-0.062345	-0.084282	0.212109
	(0.37819)	(0.07892)	(3.07125)	(0.07553)
	[3.45571]	[-0.79002]	[-0.02744]	[2.80838]
C	0.001556	-3.38E-05	-0.007747	-0.000367
	(0.00076)	(0.00016)	(0.00617)	(0.00015)
	[2.04866]	[-0.21291]	[-1.25559]	[-2.42146]
R-squared	0.123284	0.069190	0.027238	0.072996
Adj. R-squared	0.097798	0.042131	-0.001040	0.046048
Sum sq. resids	0.016353	0.000712	1.078497	0.000652
S.E. equation	0.009751	0.002035	0.079185	0.001947
F-statistic	4.837331	2.557055	0.963206	2.708782
Log likelihood	574.6954	853.6212	201.8821	861.4341
Akaike AIC	-6.389836	-9.523834	-2.200923	-9.611619
Schwarz SC	-6.282584	-9.416583	-2.093671	-9.504368
Mean dependent	0.000725	-1.55E-05	-0.007539	-0.000460
S.D. dependent	0.010266	0.002079	0.079144	0.001994

Determinant resid covariance (dof adj.)	8.97E-18
Determinant resid covariance	7.82E-18
Log likelihood	2495.411
Akaike information criterion	-27.72372
Schwarz criterion	-27.22321

Table E2: THE VECM regressions (both PRF and SRF).

```
Estimation Proc:
===============================
EC(C,1) 1 1 IP REER FS I

VAR Model:
===============================
D(IP) = A(1,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(1,1)*D(IP(-1)) +
C(1,2)*D(REER(-1)) + C(1,3)*D(FS(-1)) + C(1,4)*D(I(-1)) + C(1,5)

D(REER) = A(2,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(2,1)*D(IP(-1)) +
C(2,2)*D(REER(-1)) + C(2,3)*D(FS(-1)) + C(2,4)*D(I(-1)) + C(2,5)
```

```
D(FS) = A(3,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(3,1)*D(IP(-1)) +
C(3,2)*D(REER(-1)) + C(3,3)*D(FS(-1)) + C(3,4)*D(I(-1)) + C(3,5)

D(I) = A(4,1)*(B(1,1)*IP(-1) + B(1,2)*REER(-1) + B(1,3)*FS(-1) + B(1,4)*I(-1) + B(1,5)) + C(4,1)*D(IP(-1)) +
C(4,2)*D(REER(-1)) + C(4,3)*D(FS(-1)) + C(4,4)*D(I(-1)) + C(4,5)

VAR Model - Substituted Coefficients:
===============================
D(IP) = 0.00983774722316*( IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-1) -
10.6417607207 ) - 0.306319484981*D(IP(-1)) + 0.361995589907*D(REER(-1)) + 0.00132407392423*D(FS(-1)) +
1.30689762506*D(I(-1)) + 0.00155640370243

D(REER) =  - 0.00508286412507*( IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-
1) - 10.6417607207 ) - 0.0165357304447*D(IP(-1)) + 0.105808041973*D(REER(-1)) - 0.000232948310098*D(FS(-1))
- 0.062345132731*D(I(-1)) - 3.37523732508e-05

D(FS) =  - 0.1560960352*( IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-1) -
10.6417607207 ) - 0.100313108531*D(IP(-1)) - 1.5372656667*D(REER(-1)) - 0.0281685978801*D(FS(-1)) -
0.0842821176039*D(I(-1)) - 0.00774657159413

D(I) = 0.00393338985523*( IP(-1) + 4.10896694265*REER(-1) + 0.194895203817*FS(-1) - 5.49796229046*I(-1) -
10.6417607207 ) - 0.00856057060841*D(IP(-1)) + 0.0625752188328*D(REER(-1)) - 0.00172944910262*D(FS(-1)) +
0.212109124786*D(I(-1)) - 0.000367389696779
```

Table E3: The VECM regressions (both PRF and SRF). Plus Dummy variable (dum=1, since 2008M9)

Vector Error Correction Estimates
Date: 11/10/17   Time: 14:48
Sample (adjusted): 2002M03 2016M12
Included observations: 178 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1			
IP(-1)	1.000000			
REER(-1)	1.674815 (0.62277) [2.68930]			
FS(-1)	0.086432 (0.01596) [5.41683]			
I(-1)	2.068644 (0.40599) [5.09528]			
C	-5.648989			
Error Correction:	**D(IP)**	**D(REER)**	**D(FS)**	**D(I)**
CointEq1	-0.104813 (0.02504) [-4.18564]	-0.002680 (0.00390) [-0.68708]	-0.341426 (0.22537) [-1.51495]	-0.022352 (0.00506) [-4.42015]
D(IP(-1))	-0.332938 (0.07055)	-0.001333 (0.01099)	-0.197623 (0.63500)	-0.008292 (0.01425)

	[-4.71886]	[-0.12124]	[-0.31122]	[-0.58201]
D(REER(-1))	0.415935	0.012887	-0.904525	0.063397
	(0.33059)	(0.05150)	(2.97534)	(0.06676)
	[1.25815]	[0.25023]	[-0.30401]	[0.94962]
D(FS(-1))	0.005142	0.001155	-0.023284	-0.000682
	(0.00854)	(0.00133)	(0.07688)	(0.00173)
	[0.60191]	[0.86818]	[-0.30286]	[-0.39507]
D(I(-1))	0.553914	0.007798	-1.273162	0.058763
	(0.37659)	(0.05867)	(3.38937)	(0.07605)
	[1.47085]	[0.13292]	[-0.37563]	[0.77269]
C	0.011595	0.000203	0.018206	0.001542
	(0.00248)	(0.00039)	(0.02228)	(0.00050)
	[4.68469]	[0.52746]	[0.81729]	[3.08448]
DUM	-0.017900	-0.000411	-0.046794	-0.003401
	(0.00431)	(0.00067)	(0.03877)	(0.00087)
	[-4.15572]	[-0.61198]	[-1.20707]	[-3.91041]
R-squared	0.281363	0.574751	0.020679	0.223050
Adj. R-squared	0.247345	0.554621	-0.025680	0.186271
Sum sq. resids	0.013404	0.000325	1.085769	0.000547
S.E. equation	0.008906	0.001387	0.080154	0.001798
F-statistic	8.270919	28.55177	0.446061	6.064650
Log likelihood	592.3909	923.3420	201.2840	877.1499
Akaike AIC	-6.554954	-10.27351	-2.160495	-9.754493
Schwarz SC	-6.394078	-10.11263	-1.999618	-9.593617
Mean dependent	0.000725	-1.55E-05	-0.007539	-0.000460
S.D. dependent	0.010266	0.002079	0.079144	0.001994

Determinant resid covariance (dof adj.)	2.96E-18
Determinant resid covariance	2.40E-18
Log likelihood	2600.403
Akaike information criterion	-28.76857
Schwarz criterion	-28.05356

Figure E1: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=10)

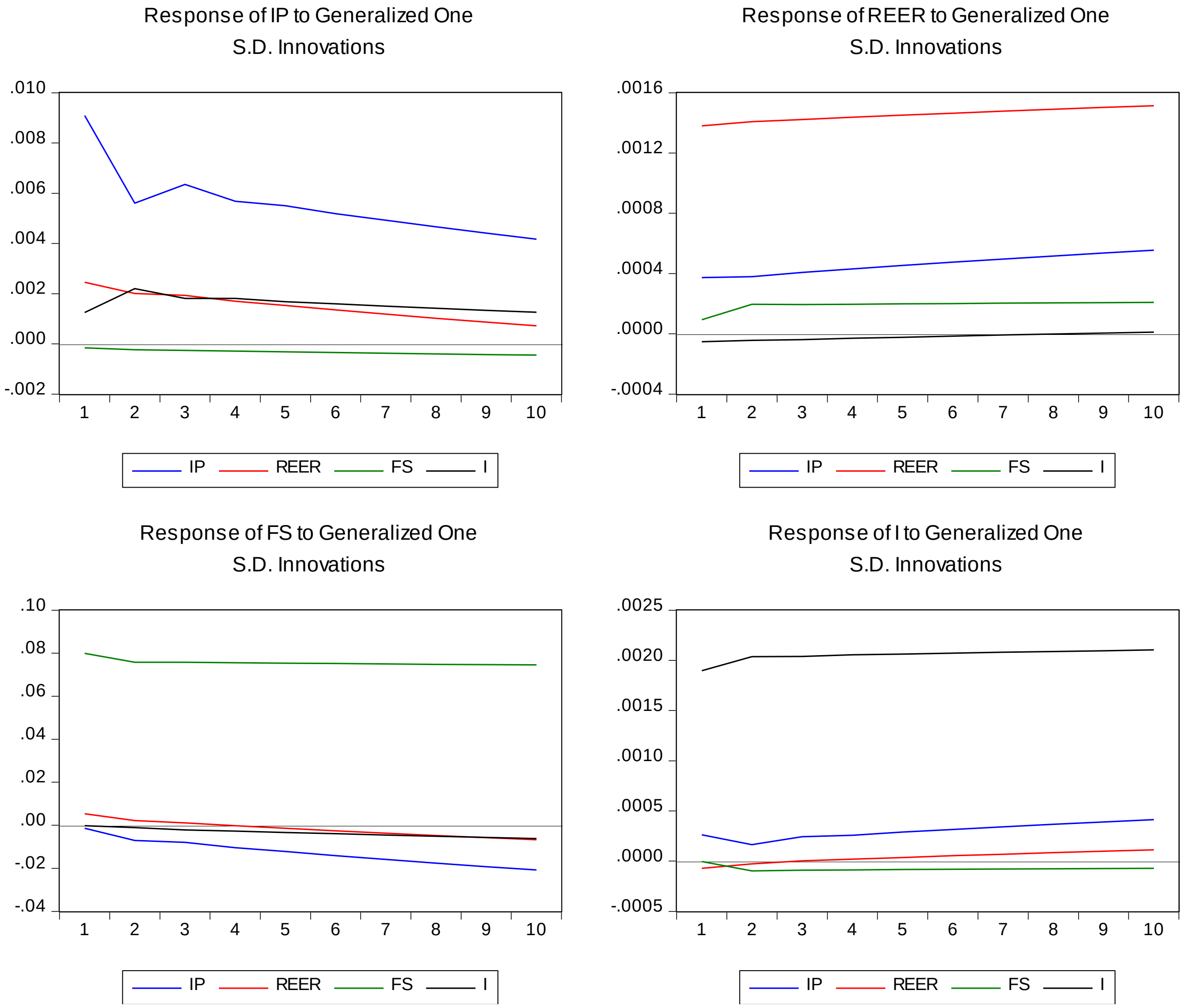
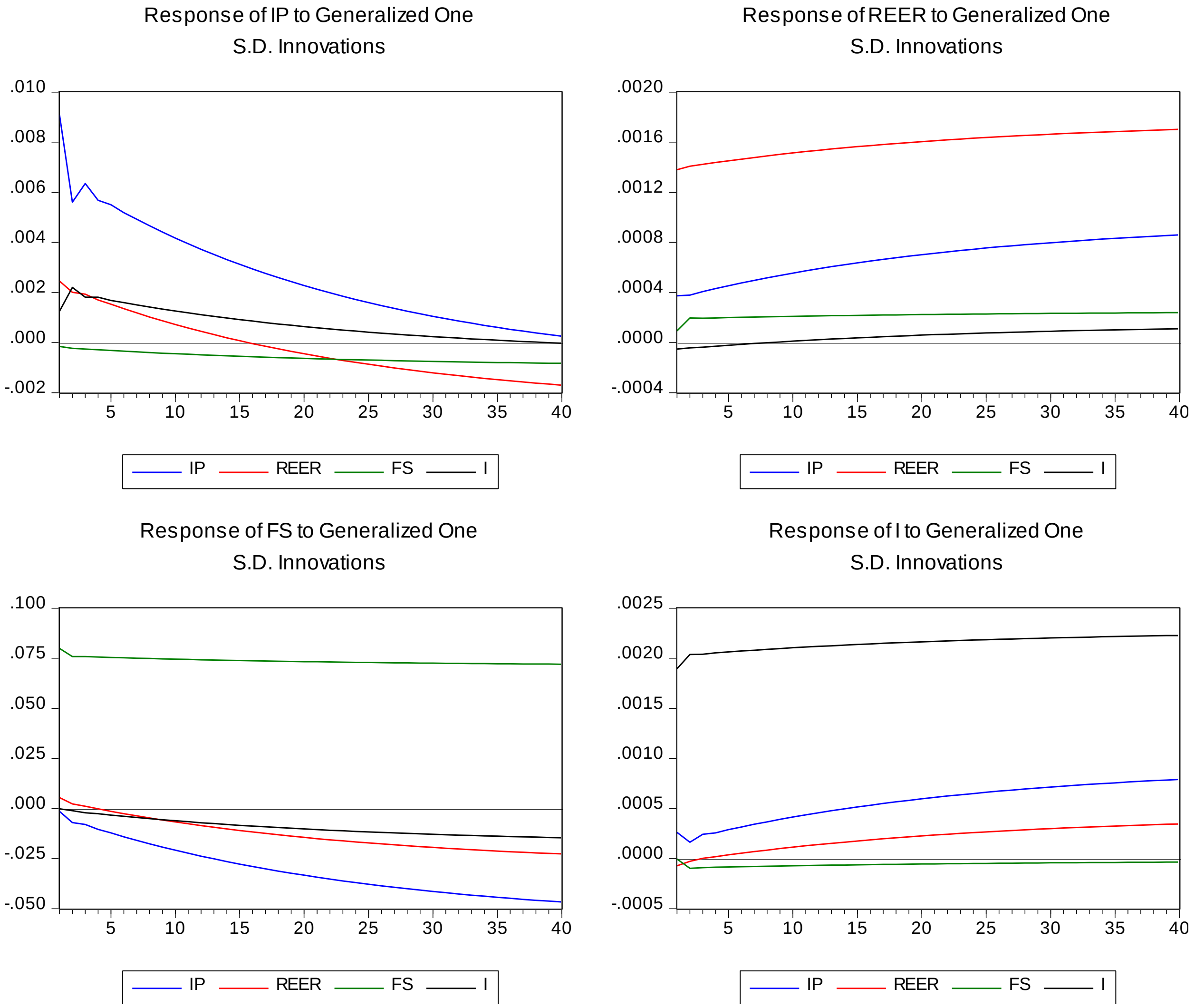


Figure E2: Generalized Impulse Response Functions (GIRFs) (Combined graphs with t=40)



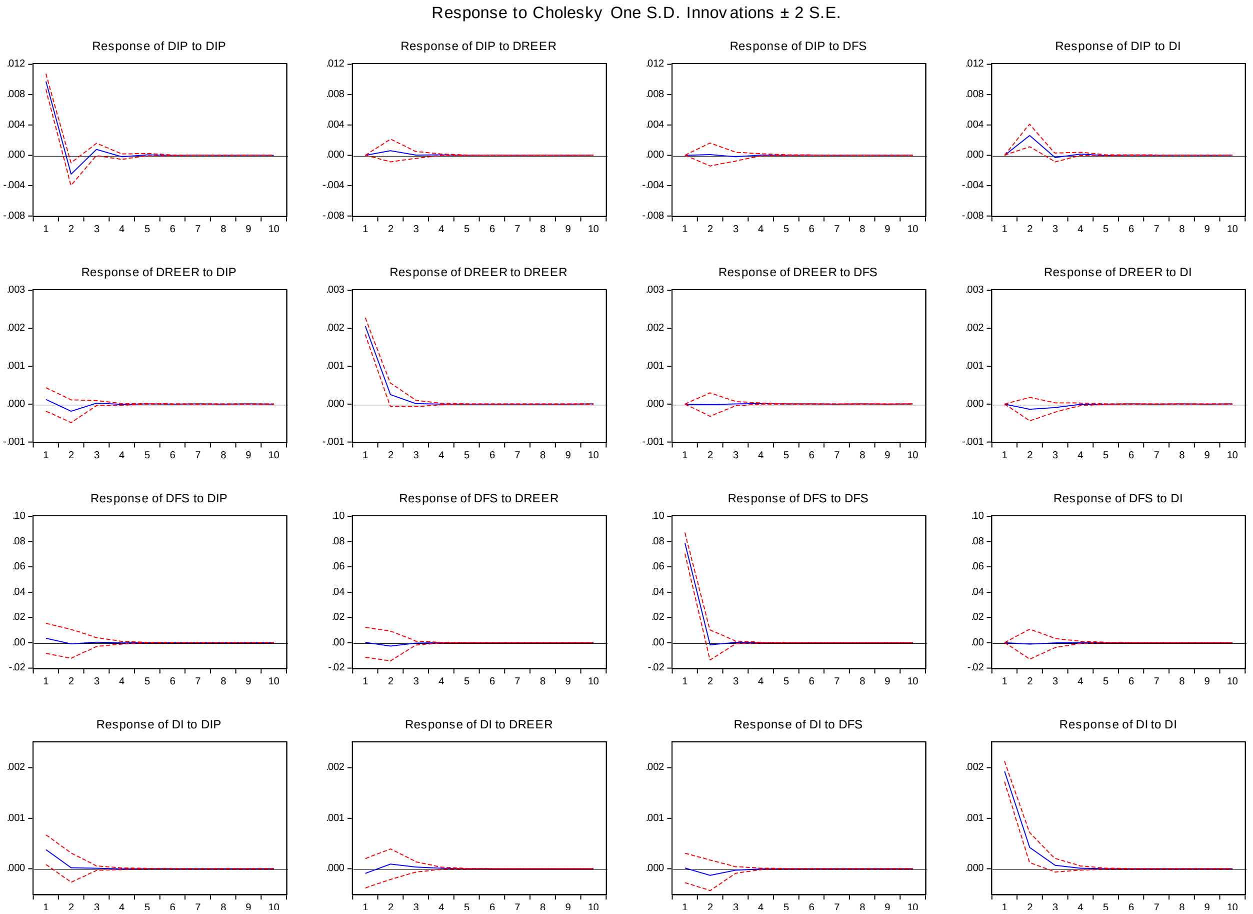
Response of IP to Generalized One S.D. Innovations

Response of REER to Generalized One S.D. Innovations

Response of FS to Generalized One S.D. Innovations

Response of I to Generalized One S.D. Innovations

Figure E3: Cholesky decomposed Impulse Response Functions with specific ordering



APPENDIX G

Determining the Relationships between the investigated variables. All six countries. The GVARs

A. Trade and Aggregation Weights

countries	bg	cr	fyr	gr	ro	sl
bg	0	0,032446	0,397504	0,471878	0,602283	0,069005
cr	0,021421	0	0,126021	0,021636	0,042882	0,682076
fyr	0,091421	0,070227	0	0,229697	0,043343	0,071756
gr	0,388301	0,054231	0,261439	0	0,228262	0,030161
ro	0,458074	0,065397	0,129938	0,220779	0	0,147002
sl	0,040782	0,777699	0,085097	0,056011	0,083231	0

	PPP_GDP
bg	1,19494E+11
cr	86766320650
fyr	25572005647
gr	2,62454E+11
rom	3,94372E+11
sl	58944719012

Long definition
PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. GDP is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. It is calculated without making deductions for depreciation of fabricated assets or for depletion and degradation of natural resources. Data are in constant 2011 international dollars.

Source:

World Bank, International Comparison Program database.

Direction of Trade Statistics

Bulgaria	Croatia	0,02142144
Bulgaria	Greece	0,38830065
Bulgaria	Macedonia, FYR	0,09142146
Bulgaria	Romania	0,45807415
Bulgaria	Slovenia	0,0407823
Croatia	Bulgaria	0,03244559
Croatia	Greece	0,05423147
Croatia	Macedonia, FYR	0,07022665

Croatia	Romania	0,06539746
Croatia	Slovenia	0,77769883
Greece	Bulgaria	0,47187831
Greece	Croatia	0,02163554
Greece	Macedonia, FYR	0,2296968
Greece	Romania	0,22077854
Greece	Slovenia	0,05601081
Macedonia, FYR	Bulgaria	0,39750395
Macedonia, FYR	Croatia	0,12602123
Macedonia, FYR	Greece	0,26143943
Macedonia, FYR	Romania	0,12993799
Macedonia, FYR	Slovenia	0,08509739
Romania	Bulgaria	0,602283
Romania	Croatia	0,04288172
Romania	Greece	0,22826171
Romania	Macedonia, FYR	0,04334301
Romania	Slovenia	0,08323056
Slovenia	Bulgaria	0,06900475
Slovenia	Croatia	0,68207591
Slovenia	Greece	0,0301609
Slovenia	Macedonia, FYR	0,07175607
Slovenia	Romania	0,14700236

Direction of Trade Statistics (DOTS). Analytically

		2012	2013	2014	2015	2016		Total			
Bulgaria	Croatia	101,28	66,57	123,29	106,09	123,50	104,14	4.861,70	Bulgaria	Croatia	0,02
	Greece	1.920,46	2.052,45	1.964,63	1.675,81	1.825,66	1.887,80			Greece	0,39
	Macedonia, FYR	504,87	467,10	455,61	397,15	397,58	444,46			Macedonia, FYR	0,09
	Romania	2.143,96	2.283,67	2.322,08	2.091,60	2.293,79	2.227,02			Romania	0,46
	Slovenia	238,99	165,54	163,30	204,23	219,29	198,27			Slovenia	0,04
Croatia	Bulgaria	38,94	50,12	59,50	75,17	77,03	60,15	1.853,93	Croatia	Bulgaria	0,03
	Greece	93,07	116,65	155,69	78,93	58,37	100,54			Greece	0,05
	Macedonia, FYR	124,80	126,65	138,81	125,06	135,66	130,20			Macedonia, FYR	0,07
	Romania	112,79	110,03	115,99	145,62	121,77	121,24			Romania	0,07
	Slovenia	1.064,20	1.308,80	1.562,97	1.570,04	1.702,98	1.441,80			Slovenia	0,78
Greece	Bulgaria	2.008,91	1.925,90	1.878,40	1.499,57	1.448,67	1.752,29	3.713,43	Greece	Bulgaria	0,47

	Croatia	50,71	72,15	96,36	91,24	91,24	80,34			Croatia	0,02
	Macedonia, FYR	1.061,06	987,54	939,53	649,99	626,70	852,96			Macedonia, FYR	0,23
	Romania	759,06	820,62	865,99	806,27	847,29	819,85			Romania	0,22
	Slovenia	284,59	222,86	126,02	172,97	233,52	207,99			Slovenia	0,06
Macedonia, FYR	Bulgaria	287,16	325,67	327,86	270,79	246,50	291,60	733,57	Macedonia, FYR	Bulgaria	0,40
	Croatia	98,50	100,42	94,00	80,03	89,28	92,45			Croatia	0,13
	Greece	188,49	213,67	227,73	165,70	163,33	191,78			Greece	0,26
	Romania	52,76	87,17	94,56	107,39	134,71	95,32			Romania	0,13
	Slovenia	74,27	59,47	56,77	55,73	65,88	62,42			Slovenia	0,09
Romania	Bulgaria	2.225,57	2.248,30	2.368,78	2.018,11	2.048,90	2.181,93	3.622,77	Romania	Bulgaria	0,60
	Croatia	152,54	89,33	177,78	180,37	176,73	155,35			Croatia	0,04
	Greece	699,72	805,02	979,91	799,10	850,94	826,94			Greece	0,23
	Macedonia, FYR	116,57	108,24	165,80	183,88	210,62	157,02			Macedonia, FYR	0,04
	Slovenia	221,31	251,27	334,79	355,40	344,85	301,52			Slovenia	0,08
Slovenia	Bulgaria	235,82	208,91	242,02	198,44	235,64	224,17	3.248,58	Slovenia	Bulgaria	0,07
	Croatia	1.998,06	2.116,88	2.400,11	2.148,21	2.415,63	2.215,78			Croatia	0,68
	Greece	78,37	85,36	109,26	95,05	121,86	97,98			Greece	0,03
	Macedonia, FYR	206,06	231,51	257,75	226,43	243,78	233,11			Macedonia, FYR	0,07
	Romania	429,11	463,88	522,44	466,93	505,38	477,55			Romania	0,15

year		GDP, PPP (constant 2011 international $) [NY.GDP.MKTP.PP.KD] - Bulgaria [BGR]	GDP, PPP (constant 2011 international $) [NY.GDP.MKTP.PP.KD] - Greece [GRC]	GDP, PPP (constant 2011 international $) [NY.GDP.MKTP.PP.KD] - Romania [ROU]	GDP, PPP (constant 2011 international $) [NY.GDP.MKTP.PP.KD] - Slovenia [SVN]	GDP, PPP (constant 2011 international $) [NY.GDP.MKTP.PP.KD] - Macedonia, FYR [MKD]	GDP, PPP (constant 2011 international $) [NY.GDP.MKTP.PP.KD] - Croatia [HRV]
2012	YR2012	1,15E+11	2,69E+11	3,67E+11	5,75E+10	2,4E+10	8,67E+10
2013	YR2013	1,16E+11	2,6E+11	3,8E+11	5,69E+10	2,47E+10	8,58E+10
2014	YR2014	1,18E+11	2,61E+11	3,92E+11	5,87E+10	2,55E+10	8,53E+10
2015	YR2015	1,22E+11	2,61E+11	4,07E+11	6E+10	2,65E+10	8,67E+10
2016	YR2016	1,26E+11	2,61E+11	4,27E+11	6,15E+10	2,72E+10	8,93E+10

Data from database: World Development Indicators
Last Updated: 08/02/2017

Code	Indicator Name
NY.GDP.MKTP.PP.KD	GDP, PPP (constant 2011 international $)

B. Unit Root Tests

Table (5.15): Unit Root Tests for the Domestic Variables at the 5% Significance Level

Domestic Variables	Statistic	Critical Value	BULGARIA	CROATIA	FYROM	GREECE	ROMANIA	SLOVENIA
ip (with trend)	ADF	-3.45	-2.3917	-1.8826	-1.83221	-1.86987	-2.56137	-1.70797
ip (with trend)	WS	-3.24	-1.09289	-0.8044	-2.00334	-1.56105	-2.36779	-1.87683
ip (no trend)	ADF	-2.89	-2.68941	-1.54308	-0.98141	-0.70211	-0.08102	-1.22704
ip (no trend)	WS	-2.55	0.047323	-0.87041	0.093005	-0.67998	0.381066	-0.80557
Dip	ADF	-2.89	**-3.06979**	**-9.46012**	**-4.95508**	**-9.23951**	**-5.43961**	**-10.9825**
Dip	WS	-2.55	**-3.22418**	**-9.64993**	**-5.26204**	**-9.42567**	**-5.63333**	**-11.1058**
DDip	ADF	-2.89	-6.1847	-7.60649	-6.10422	-9.04698	-8.71442	-9.58609
DDip	WS	-2.55	-6.07086	-7.42247	-6.38242	-9.44226	-8.92724	-9.83182
fs (with trend)	ADF	-3.45	-2.84125	-8.19056	-1.57818	-4.29992	-1.11583	-1.65705
fs (with trend)	WS	-3.24	-2.42238	-8.30574	-0.82612	-1.59466	-0.42897	-1.83551
fs (no trend)	ADF	-2.89	-1.36851	-1.52404	-2.47455	-2.40018	-2.8266	-0.99299
fs (no trend)	WS	-2.55	0.419007	-0.60399	0.985714	-1.63944	0.913562	-0.73303
Dfs	ADF	-2.89	-2.38966	**-9.87943**	**-6.63654**	-2.07766	**-4.11139**	**-9.99545**
Dfs	WS	-2.55	**-2.68708**	**-10.075**	**-6.73888**	-2.22268	**-4.21511**	**-10.1225**
DDfs	ADF	-2.89	-10.8955	-7.888	-11.4276	-6.14157	-7.76684	-10.2486
DDfs	WS	-2.55	-11.2797	-8.3027	-11.639	-6.10663	-8.00209	-10.5104
i (with trend)	ADF	-3.45	-2.75873	-1.61459	-5.53934	-2.39149	-2.29796	-2.19603
i (with trend)	WS	-3.24	-2.39347	-1.82756	-3.17002	-2.58632	-0.71969	-1.38384
i (no trend)	ADF	-2.89	-1.26244	-0.07131	-3.3564	-2.23539	-2.47558	-2.19118
i (no trend)	WS	-2.55	-1.61136	0.035871	-0.6364	-2.42897	1.439483	0.994641
Di	ADF	-2.89	-2.55684	**-9.53753**	**-3.32239**	**-5.34897**	**-5.6287**	**-7.49592**
Di	WS	-2.55	**-2.7462**	**-9.66875**	**-3.6043**	**-5.51922**	**-5.09802**	**-7.60405**
DDi	ADF	-2.89	-7.54622	-10.0568	-7.35154	-9.1383	-7.27267	-7.91613
DDi	WS	-2.55	-7.02074	-10.2372	-6.03394	-9.41178	-7.24525	-8.19146
reer (with trend)	ADF	-3.45	-0.65737	-1.4298	-1.869	-1.96759	-1.39817	-2.21296
reer (with trend)	WS	-3.24	-0.45952	-0.69331	-1.80507	0.409126	-1.54589	-1.78681
reer (no trend)	ADF	-2.89	-2.43595	-1.49986	-2.09426	-1.76768	-1.85408	-1.96878
reer (no trend)	WS	-2.55	0.273444	-0.90901	-1.50905	0.391876	-1.37298	-1.74546
Dreer	ADF	-2.89	**-4.26446**	**-10.3302**	**-8.65549**	**-4.54149**	**-7.59939**	**-9.89682**
Dreer	WS	-2.55	**-4.11533**	**-10.4661**	**-8.69413**	**-4.27696**	**-7.63238**	**-9.9813**
DDreer	ADF	-2.89	-8.47904	-5.63492	-7.81443	-9.1677	-6.27475	-9.21655
DDreer	WS	-2.55	-8.65158	-5.52879	-7.95694	-9.41905	-6.63348	-9.47225

Table (5.16): Unit Root Tests for the Foreign Variables at the 5% Significance Level

Foreign Variables	Statistic	Critical Value	BULGARIA	CROATIA	FYROM	GREECE	ROMANIA	SLOVENIA
ips (with trend)	ADF	-3.45	-1.76582	-1.64214	-1.87771	-2.2792	-2.09619	-1.8948

ips (with trend)	WS	-3.24	-2.01561	-1.77951	-1.30203	-1.66405	-1.17592	-1.15319
ips (no trend)	ADF	-2.89	-1.04648	-1.13455	-1.9045	-1.91042	-2.18499	-1.87678
ips (no trend)	WS	-2.55	-0.6268	-0.54147	-0.82558	0.411259	-0.7983	-0.2418
Dips	ADF	-2.89	**-7.41513**	**-5.72593**	**-6.24171**	**-6.36632**	**-6.37913**	**-5.67663**
Dips	WS	-2.55	**-7.43895**	**-5.86913**	**-6.37442**	**-6.52064**	**-6.50353**	**-5.76856**
DDips	ADF	-2.89	-6.26844	-9.42122	-6.0849	-5.52342	-5.80244	-7.08203
DDips	WS	-2.55	-6.54626	-9.66745	-6.19662	-5.70241	-5.93278	-7.07588
fss (with trend)	ADF	-3.45	-2.65324	-1.76103	-4.11677	-2.28773	-2.8474	-4.57196
fss (with trend)	WS	-3.24	-2.10667	-1.92001	-4.0628	-1.07846	-2.943	-4.59877
fss (no trend)	ADF	-2.89	-0.13923	-1.04084	0.808791	-2.25345	0.687065	-1.50339
fss (no trend)	WS	-2.55	-0.21769	-0.87274	1.118472	0.750068	0.786957	0.45176
Dfss	ADF	-2.89	**-2.84367**	**-10.0202**	**-6.9074**	-2.476	**-3.56025**	**-9.72596**
Dfss	WS	-2.55	**-3.10576**	**-10.1486**	**-7.18894**	**-2.56272**	**-3.8098**	**-9.91866**
DDfss	ADF	-2.89	-6.92357	-10.2422	-7.89183	-10.6944	-10.5948	-8.04946
DDfss	WS	-2.55	-6.93885	-10.5039	-8.10996	-11.0814	-10.9475	-8.46537
is (with trend)	ADF	-3.45	-3.02531	-3.03217	-2.36254	-3.656	-2.13612	-2.16448
is (with trend)	WS	-3.24	-1.65866	-0.96247	-2.284	-2.42058	-2.41424	-1.48665
is (no trend)	ADF	-2.89	-3.05104	-2.76696	-2.12018	-1.34216	-1.96722	-1.29992
is (no trend)	WS	-2.55	-0.55554	1.519152	-1.49803	0.830359	-2.18086	1.629402
Dis	ADF	-2.89	**-4.82588**	**-7.54975**	**-8.09085**	**-4.04998**	**-5.17158**	**-8.68327**
Dis	WS	-2.55	**-4.94627**	**-7.61965**	**-8.21796**	**-3.51139**	**-5.31638**	**-8.80916**
DDis	ADF	-2.89	-8.79951	-8.31538	-8.95191	-4.23553	-8.82474	-9.27658
DDis	WS	-2.55	-8.94909	-8.6058	-9.20045	-4.20189	-9.09163	-9.39457
reers (with trend)	ADF	-3.45	-1.07908	-1.64066	-0.60278	-0.64755	-0.56699	-1.06755
reers (with trend)	WS	-3.24	-0.76274	-1.01546	-0.03971	-0.4895	-0.2102	-0.44981
reers (no trend)	ADF	-2.89	-1.78666	-2.02538	-2.25603	-2.18066	-2.17733	-1.78612
reers (no trend)	WS	-2.55	-0.66215	-1.27889	0.322117	0.124976	0.345938	-0.33002
Dreers	ADF	-2.89	**-8.23604**	**-9.75294**	**-4.11889**	**-9.26141**	**-4.34103**	**-10.1169**
Dreers	WS	-2.55	**-8.29729**	**-9.84978**	**-4.18135**	**-9.35741**	**-4.12924**	**-10.2488**
DDreers	ADF	-2.89	-6.44954	-8.94078	-8.71825	-5.83146	-8.39114	-6.0689
DDreers	WS	-2.55	-6.81538	-9.20553	-8.98083	-6.13959	-8.6069	-6.15406

Table (5.17): Unit Root Tests for the Global Variables at the 5% Significance level

Global Variables	Test	Critical Value	Statistic
eur (with trend)	ADF	-3.45	-2.36571
eur (with trend)	WS	-3.24	-2.57543
eur (no trend)	ADF	-2.89	-1.51442

eur (no trend)	WS	-2.55	-1.49366
Deur	ADF	-2.89	-5.40382
Deur	WS	-2.55	-5.52986
DDeur	ADF	-2.89	-7.2095
Deur	WS	-2.55	-7.46044
eureer (with trend)	ADF	-3.45	-3.61609
eureer (with trend)	WS	-3.24	-0.70208
eureer (no trend)	ADF	-2.89	-1.91662
eureer (no trend)	WS	-2.55	-0.98686
Deureer	ADF	-2.89	-8.31891
Deureer	WS	-2.55	-8.44795
DDeureer	ADF	-2.89	-8.19876
Deureer	WS	-2.55	-8.47714

C. Specification and Estimation of the Country-Specific Models

Table (5.18): Lags on VARX*

Lags on VARX*
Cointegrating vectors in each model
Domestic and foreign (star) variables
Deterministic i.e. time trend or not

VARX* Order of Individual Models (p: lag order of domestic variables, q: lag order of foreign variables)

	p	q
BULGARIA	1	1
CROATIA	1	1
FYROM	1	1
GREECE	1	1
ROMANIA	2	1
SLOVENIA	1	1

Cointegrating Relationships for

the Individual VARX* Models

Country	# Cointegrating relations
BULGARIA	3
CROATIA	1
FYROM	2
GREECE	3
ROMANIA	1
SLOVENIA	1

D. Testing Weak Exogeneity

Table (5.19): Order of Weak Exogeneity

Order of Weak Exogeneity Regression Equations
(p*: lag order of domestic variables, q*: lag order of foreign variables)

	p*	q*
BULGARIA	1	1
CROATIA	1	1
FYROM	1	1
GREECE	1	1
ROMANIA	1	1
SLOVENIA	1	1

Test for Weak Exogeneity at the 5% Significance Level

Country	F test	Fcrit_0.05	ips	fss	is	reers	eur	eureer
BULGARIA	F(3,153)	2.663715	1.645342	0.770173	0.806829	0.997864	0.56636	1.312676
CROATIA	F(1,155)	3.902154	0.323088	0.784859	0.006404	2.033963	0.186908	3.120333
FYROM	F(2,154)	3.054771	0.521125	1.622045	0.018076	0.225526	2.913183	0.225858
GREECE	F(3,153)	2.663715	3.714682	2.93132	2.024071	0.818919		
ROMANIA	F(1,155)	3.902154	0.881084	0.195475	0.101898	0.791101	0.10914	1.098002
SLOVENIA	F(1,155)	3.902154	3.904657	1.247881	2.086936	0.00104	2.716999	0.836414

Table (5.20): The F critical values for the Weak Exogeneity Test

Fcrit_0.05	ips
2.663715	1.645342
3.902154	0.323088
3.054771	0.521125
2.663715	3.714682

3.902154 0.881084
3.902154 3.904657

E. Testing Structural stability

Table *Error! No text of specified style in document.**-1: Structural Stability Tests: Statistics***

Variables	ip	fs	i	reer	eur	eureer
PK sup						
BULGARIA	0,581497	0,649607	0,755418	0,613752		
CROATIA	0,513555	0,461564	0,756513	0,919734		
FYROM	0,597786	0,991199	0,591386	1,503911		
GREECE	0,625713	1,152639	1,714066	1,079697	0,673623	1,081798
ROMANIA	0,64225	1,397814	0,522438	1,260439		
SLOVENIA	0,475415	0,631769	1,008941	0,741964		
PK msq						
BULGARIA	0,028866	0,093552	0,064637	0,031626		
CROATIA	0,051099	0,027187	0,102634	0,132245		
FYROM	0,048797	0,405463	0,080597	0,650992		
GREECE	0,123577	0,384506	0,182713	0,256697	0,024241	0,337065
ROMANIA	0,067818	0,742036	0,084622	0,437959		
SLOVENIA	0,036888	0,086367	0,365331	0,118068		
Nyblom						
BULGARIA	0,741483	1,016797	2,639992	1,286843		
CROATIA	0,85716	0,291752	0,711461	1,80414		
FYROM	1,145948	1,242606	1,542794	1,851952		
GREECE	1,017945	1,291368	0,649623	1,9286	0,945584	2,070052
ROMANIA	1,501877	3,345207	2,043232	2,635994		
SLOVENIA	0,884177	0,359316	1,151988	1,059904		
Robust Nyblom						
BULGARIA	0,693682	0,996286	2,003124	1,496413		
CROATIA	0,847567	1,459585	1,252514	1,875971		
FYROM	0,728885	1,315193	2,097315	1,813443		
GREECE	1,191096	0,985062	1,432135	1,851931	0,665154	1,696587
ROMANIA	1,691794	3,068667	2,029303	2,574191		
SLOVENIA	0,906198	0,657244	1,178896	1,325838		
QLR						
BULGARIA	16,36429	14,85604	44,0164	20,22205		

CROATIA	21,74976	12,69832	19,86591	33,19837		
FYROM	14,56956	24,24036	41,99726	32,85562		
GREECE	20,32829	22,9231	32,92479	19,23583	42,86615	45,47885
ROMANIA	19,18478	43,1442	87,602	42,96781		
SLOVENIA	19,58255	24,42947	26,68154	24,54433		
Robust QLR						
BULGARIA	13,0904	11,62193	19,58125	20,37826		
CROATIA	16,28126	28,53776	4,90418	28,23051		
FYROM	10,81859	18,47097	18,44143	17,83733		
GREECE	12,53635	13,42761	16,03711	15,9293	20,48204	22,28867
ROMANIA	19,07493	30,34628	22,9505	33,65866		
SLOVENIA	12,66063	9,01075	14,81146	15,85779		
MW						
BULGARIA	6,621449	9,00342	21,08958	10,33923		
CROATIA	12,00009	3,612216	8,229758	13,64608		
FYROM	6,764624	12,19661	16,67304	16,29003		
GREECE	6,884592	9,893373	5,860853	13,00622	9,297932	15,97933
ROMANIA	10,57238	27,0881	22,7123	21,11165		
SLOVENIA	7,063053	4,607523	8,944513	9,687557		
Robust MW						
BULGARIA	8,356922	8,155041	11,72817	9,422437		
CROATIA	9,922718	19,16106	3,951685	13,61573		
FYROM	6,467655	12,91639	13,1935	11,6964		
GREECE	7,195542	8,257257	7,218021	11,87485	11,91203	13,3502
ROMANIA	12,35539	21,30645	14,52464	21,03546		
SLOVENIA	7,502312	4,979964	7,625043	9,899736		
APW						
BULGARIA	4,883664	5,489076	18,45876	7,12883		
CROATIA	8,659072	2,727608	7,527755	13,27238		
FYROM	4,254117	8,573943	17,18645	13,67791		
GREECE	6,261424	8,359713	11,68531	7,629916	16,65398	17,98526
ROMANIA	7,087971	18,33803	39,53009	17,20541		
SLOVENIA	7,228615	8,26723	9,35164	8,543215		
Robust APW						
BULGARIA	4,728663	4,434045	7,48255	7,455691		
CROATIA	5,910892	11,65575	2,045125	11,34066		

FYROM	3,788978	7,442402	7,785678	6,781999		
GREECE	4,400411	4,756677	5,189402	6,683566	7,814865	8,520267
ROMANIA	7,24488	12,30488	9,099885	14,33142		
SLOVENIA	4,435668	2,82472	4,35538	5,944759		

__Table__ Error! No text of specified style in document.__-2: Structural Stability Tests: Critical Values at 90%__

Critical Values	**ip_90%**	**fs_90%**	**i_90%**	**reer_90%**	**eur_90%**	**eureer_90%**
PK sup						
BULGARIA	0,608216	0,990458	0,516426	0,643103		
CROATIA	1,0614	0,571466	1,148771	1,040114		
FYROM	0,663005	1,059448	0,57798	1,002477		
GREECE	0,695062	1,048334	0,989954	0,790573	0,541806	0,839501927
ROMANIA	0,982278	0,97901	0,928544	1,030913		
SLOVENIA	0,677181	1,064713	1,094516	1,112997		
PK msq						
BULGARIA	0,050578	0,217896	0,037557	0,071124		
CROATIA	0,276685	0,049085	0,348395	0,272225		
FYROM	0,059315	0,256635	0,047789	0,238075		
GREECE	0,078788	0,283676	0,238928	0,117525	0,042135	0,137438833
ROMANIA	0,213505	0,251669	0,204984	0,277699		
SLOVENIA	0,083418	0,284276	0,294574	0,306196		
Nyblom						
BULGARIA	1,790308	2,108574	1,809792	1,988729		
CROATIA	1,769943	1,598575	1,829085	1,75173		
FYROM	1,739413	1,904836	1,825313	1,955921		
GREECE	1,571603	1,834056	1,688846	1,617159	1,562087	1,773021834
ROMANIA	2,577389	2,475313	2,273609	2,850763		
SLOVENIA	1,6005	1,763188	1,952856	1,865024		
Robust Nyblom						
BULGARIA	2,074806	2,189395	2,06167	2,134109		
CROATIA	1,746135	1,634652	1,842152	1,818576		
FYROM	1,85706	2,049413	1,861262	1,951122		
GREECE	1,659332	1,859452	1,753558	1,706421	1,688198	1,67787423
ROMANIA	2,52202	2,636434	2,479231	2,735814		

SLOVENIA	1,67661	1,782754	1,831243	1,8928		
QLR						
BULGARIA	29,15114	33,82086	24,89991	27,83991		
CROATIA	24,66806	23,28996	28,04912	25,03544		
FYROM	23,76254	28,721	25,60117	24,43356		
GREECE	24,7354	25,01649	25,53857	22,26576	22,89139	25,93565263
ROMANIA	33,65295	37,46093	29,44238	37,99378		
SLOVENIA	20,588	26,09049	26,35755	24,84766		
Robust QLR						
BULGARIA	20,04744	21,37122	19,28998	20,00026		
CROATIA	16,96269	16,95607	17,59318	17,94663		
FYROM	18,69534	20,02607	19,04526	19,09692		
GREECE	17,07178	18,10261	16,98771	16,93607	16,78254	17,57203622
ROMANIA	22,38188	24,55773	22,6147	24,21786		
SLOVENIA	17,12475	18,01707	18,7534	18,15805		
MW						
BULGARIA	12,90858	15,39567	12,75443	14,41603		
CROATIA	11,80809	10,81768	12,46468	11,96251		
FYROM	11,56203	13,2819	12,48833	13,06524		
GREECE	11,01078	12,64557	11,97535	11,60083	10,75826	12,80430626
ROMANIA	18,01815	17,13093	15,65858	20,47184		
SLOVENIA	10,65451	12,23211	13,30602	12,88025		
Robust MW						
BULGARIA	12,95547	13,82433	12,76796	12,65561		
CROATIA	10,29371	10,11074	10,73074	11,212		
FYROM	11,28024	12,55687	11,38742	11,96166		
GREECE	10,49451	11,28905	10,74078	10,39754	10,50036	10,37547724
ROMANIA	15,80025	15,98339	15,0226	16,44216		
SLOVENIA	10,46282	10,8355	11,32559	11,57933		
APW						
BULGARIA	11,07469	12,48345	9,517366	10,6778		
CROATIA	9,069649	8,942456	10,57461	9,28333		
FYROM	9,027577	11,34584	9,351748	9,201745		
GREECE	9,308636	9,375501	9,521665	8,272516	8,233044	9,807877196
ROMANIA	13,8484	15,29276	11,59474	15,79656		
SLOVENIA	7,291279	9,932758	9,731683	9,672337		

Robust APW						
BULGARIA	7,769723	8,118063	7,400691	7,701146		
CROATIA	6,131713	6,061217	6,435185	6,659433		
FYROM	6,946473	7,834777	6,968111	7,3698		
GREECE	6,318641	6,986291	6,396666	6,089915	6,250434	6,566258024
ROMANIA	9,004303	9,610833	8,981609	9,555412		
SLOVENIA	6,263522	6,756403	7,099775	6,89352		

Table *Error! No text of specified style in document.* ***-3: Structural Stability Tests: Critical Values at 95%***

Critical Values	**ip_95%**	**fs_95%**	**i_95%**	**reer_95%**	**eur_95%**	**eureer_95%**
PK sup						
BULGARIA	0,638295	1,122479	0,570808	0,69694		
CROATIA	1,183984	0,656235	1,237994	1,141449		
FYROM	0,696922	1,120492	0,628674	1,087484		
GREECE	0,751944	1,176054	1,107754	0,903241	0,5725	0,908247315
ROMANIA	1,028077	1,068306	1,054464	1,166241		
SLOVENIA	0,722617	1,190723	1,21334	1,20683		
PK msq						
BULGARIA	0,057232	0,298641	0,04803	0,104152		
CROATIA	0,318465	0,065172	0,479872	0,356188		
FYROM	0,073864	0,32388	0,060381	0,299535		
GREECE	0,099816	0,358743	0,309985	0,154907	0,05356	0,172966838
ROMANIA	0,299101	0,329522	0,261896	0,35001		
SLOVENIA	0,113192	0,363257	0,403583	0,406972		
Nyblom						
BULGARIA	2,04655	2,30789	1,983869	2,214943		
CROATIA	2,134122	1,845166	2,158164	2,024663		
FYROM	1,94142	2,190168	2,018326	2,095775		
GREECE	1,824748	2,01704	1,918558	1,783343	1,799818	2,194730342
ROMANIA	2,783914	2,750937	2,745416	3,249306		
SLOVENIA	1,780414	1,95341	2,244212	2,224971		
Robust Nyblom						
BULGARIA	2,343796	2,426869	2,189098	2,309673		

CROATIA	1,95539	1,877452	2,086544	2,024222		
FYROM	2,022619	2,243372	2,148836	2,113451		
GREECE	1,870155	2,018169	1,86225	1,859189	1,864677	1,85693571
ROMANIA	2,804776	2,793646	2,694533	2,939927		
SLOVENIA	1,964901	1,971812	2,023097	2,06311		
QLR						
BULGARIA	38,10164	39,99678	27,91667	34,60103		
CROATIA	27,54003	28,09472	33,85696	28,96922		
FYROM	29,76618	33,71958	28,02788	29,16531		
GREECE	29,81717	28,22982	30,99729	27,22439	28,98403	29,35876236
ROMANIA	40,91397	44,72759	43,65577	45,52579		
SLOVENIA	23,91491	32,33968	28,78488	33,72526		
Robust QLR						
BULGARIA	21,60542	23,1874	21,26534	21,49761		
CROATIA	17,69756	18,34425	18,42776	19,08347		
FYROM	19,57229	21,84638	20,02184	20,64773		
GREECE	18,92987	19,76055	18,0301	18,60235	18,44508	18,86780546
ROMANIA	24,18348	25,59542	23,79707	25,59574		
SLOVENIA	18,29003	19,34762	20,24146	19,68224		
MW						
BULGARIA	14,99449	17,03815	14,37525	15,53823		
CROATIA	14,74501	12,25275	14,62426	13,77462		
FYROM	13,38272	15,11859	14,86015	14,82678		
GREECE	13,36415	14,01041	13,55016	12,91951	12,37071	15,72640509
ROMANIA	19,65128	20,32751	18,4374	22,17962		
SLOVENIA	11,9623	14,21024	14,52741	14,75077		
Robust MW						
BULGARIA	14,02557	14,93131	13,73494	14,13276		
CROATIA	11,42426	11,08532	11,86302	12,10224		
FYROM	12,15072	14,31123	12,38705	12,88926		
GREECE	11,91374	12,2742	11,52386	11,53458	11,55412	12,05987895
ROMANIA	17,11124	17,06813	16,18751	17,53699		
SLOVENIA	11,78612	11,79795	12,26892	12,49014		
APW						
BULGARIA	14,82499	16,23581	10,41512	13,63196		
CROATIA	11,05747	10,19823	12,98265	11,44057		

FYROM	10,80834	12,63832	11,01142	11,00565		
GREECE	10,75399	10,26264	11,61273	10,12604	10,3799	11,5538881
ROMANIA	16,20654	18,73241	18,15614	18,68025		
SLOVENIA	8,457079	12,09576	11,119	13,14733		
Robust APW						
BULGARIA	8,367444	9,167052	8,303858	8,521319		
CROATIA	6,521933	6,727964	7,089341	7,028024		
FYROM	7,633497	8,735215	7,557931	7,808802		
GREECE	7,207466	7,683586	6,754376	7,196098	6,875719	7,078714456
ROMANIA	9,806909	10,39375	9,686342	10,47903		
SLOVENIA	7,098432	7,315317	7,869725	7,421809		

Table *Error! No text of specified style in document.* ***-4: Structural Stability Tests: Critical Values at 99%***

Critical Values	**ip_99%**	**fs_99%**	**i_99%**	**reer_99%**	**eur_99%**	**eureer_99%**
PK sup						
BULGARIA	0,695539	1,174324	0,619864	0,964142		
CROATIA	1,292482	0,740853	1,686489	1,344131		
FYROM	0,805262	1,285927	0,699324	1,203786		
GREECE	0,916814	1,447835	1,378516	1,015722	0,62584	1,187035
ROMANIA	1,251938	1,324548	1,327607	1,366121		
SLOVENIA	0,826693	1,410082	1,466134	1,408019		
PK msq						
BULGARIA	0,088932	0,427249	0,06663	0,178248		
CROATIA	0,444655	0,081956	0,79921	0,561991		
FYROM	0,104692	0,474232	0,079613	0,451193		
GREECE	0,151991	0,705977	0,484569	0,313596	0,062422	0,345036
ROMANIA	0,367293	0,518408	0,389182	0,491837		
SLOVENIA	0,138076	0,509318	0,629198	0,595008		
Nyblom						
BULGARIA	3,162428	2,700163	2,338597	2,473074		
CROATIA	2,808923	2,475329	2,704166	2,48988		
FYROM	2,76978	2,712906	2,602945	2,532458		
GREECE	2,349158	2,596645	2,268504	2,011949	2,249982	2,808085
ROMANIA	3,332187	3,524261	3,738231	3,723183		
SLOVENIA	2,101765	2,537305	2,940259	2,892451		

Robust Nyblom						
BULGARIA	2,757674	2,963109	2,408852	2,739162		
CROATIA	2,687182	2,169998	2,338562	2,320341		
FYROM	2,423518	2,709926	2,389823	2,458826		
GREECE	2,258763	2,469754	2,237101	2,2705	2,11304	2,242317
ROMANIA	3,659925	3,147783	3,254957	3,211502		
SLOVENIA	2,279738	2,189734	2,515941	2,483079		
QLR						
BULGARIA	57,52553	56,09462	38,21152	48,00789		
CROATIA	42,63916	42,76798	51,68228	48,22645		
FYROM	49,58275	54,71736	34,70417	37,17434		
GREECE	42,90511	42,47559	56,2629	38,71162	58,11924	36,0165
ROMANIA	59,25528	55,32661	59,09889	53,38853		
SLOVENIA	33,50679	39,56283	40,94009	48,79099		
Robust QLR						
BULGARIA	24,69034	27,4461	24,8467	24,29656		
CROATIA	21,39457	21,39984	21,133	23,73112		
FYROM	23,5468	23,76276	22,18614	22,20763		
GREECE	23,41881	23,24454	20,7236	21,8523	21,1481	20,3433
ROMANIA	27,01892	27,57646	26,77517	27,84069		
SLOVENIA	21,28029	21,65728	22,60971	21,71897		
MW						
BULGARIA	22,57226	20,22424	16,39107	18,56131		
CROATIA	18,82367	16,38898	18,05336	16,35467		
FYROM	21,15512	18,64875	19,66808	17,68025		
GREECE	17,58497	18,40953	17,33944	17,23047	16,78256	20,86432
ROMANIA	24,79823	23,20384	23,66379	26,02748		
SLOVENIA	14,10639	17,72363	21,27844	21,09934		
Robust MW						
BULGARIA	15,75165	16,98053	14,84319	15,91036		
CROATIA	14,71517	13,25349	13,07467	13,99052		
FYROM	15,54319	15,75396	14,35827	14,65668		
GREECE	14,68155	14,95442	13,99562	14,01663	12,79127	13,25982
ROMANIA	19,62545	19,63821	18,0592	18,71224		
SLOVENIA	13,42052	13,54302	13,42921	14,2572		

APW						
BULGARIA	24,53794	23,84735	15,97808	20,36699		
CROATIA	18,08085	18,2234	21,08612	20,16608		
FYROM	20,06915	23,35104	14,58217	15,82556		
GREECE	17,82509	16,54594	24,19772	15,45164	25,14544	15,16786
ROMANIA	25,78769	24,07244	25,93972	23,86784		
SLOVENIA	13,3606	16,29205	17,68602	20,43743		
Robust APW						
BULGARIA	9,913642	10,86845	9,430707	9,491565		
CROATIA	8,335658	8,376029	8,452583	9,136965		
FYROM	9,501165	9,497517	8,728728	9,127967		
GREECE	9,474178	9,213038	7,937803	8,407793	7,760878	7,99834
ROMANIA	11,22031	11,26055	11,20062	11,06883		
SLOVENIA	8,444203	8,58404	8,634555	8,406295		

Figure (5.13): Bootstrap Median estimates of persistent profiles

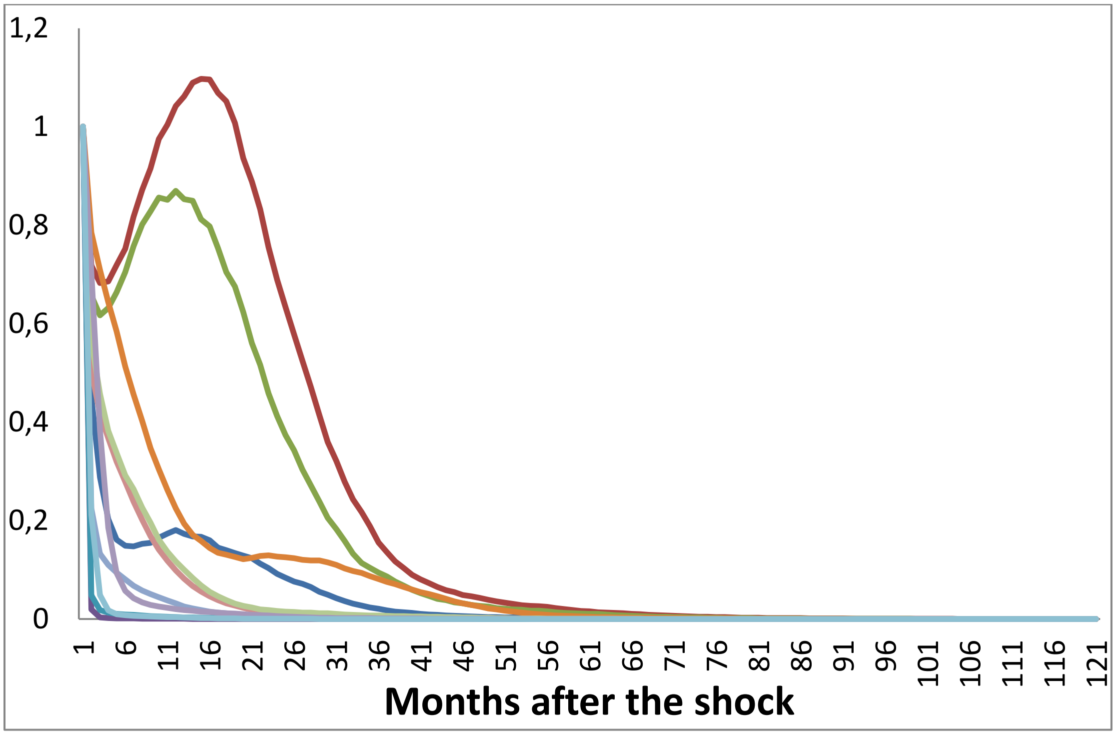


Table (5.24b)

Persistence Profile of the Effect of System-Wide Shocks to the Cointegrating Relations of the GVAR Model - Bootstrap Median estimates

	BULGARIA	BULGARIA	BULGARIA	CROATIA	FYROM	FYROM	GREECE	GREECE	GREECE	ROMANIA
Horizon	CV1	CV2	CV3	CV1	CV1	CV2	CV1	CV2	CV3	CV1
0	1	1	1	1	1	1	1	1	1	1
1	0,4512225	0,7181302	0,6569858	0,0196387	0,0483146	0,7849067	0,2251382	0,5051719	0,5651513	0,7052116
2	0,2879312	0,6822665	0,6165079	0,0033844	0,0178662	0,7090479	0,1326993	0,4163513	0,4575656	0,3834608
3	0,2028435	0,6859466	0,6316944	0,0021022	0,0129728	0,643371	0,1097465	0,3673575	0,382475	0,1849048
4	0,1613801	0,7187799	0,6634101	0,00156	0,0106394	0,5845304	0,0943319	0,3195698	0,3369966	0,0936936
5	0,1485633	0,7521772	0,7042159	0,0012366	0,0093412	0,5127166	0,0802763	0,2786449	0,2918847	0,0573843
6	0,1475113	0,8170305	0,7569244	0,0010211	0,0083307	0,4564321	0,0677387	0,2386967	0,2640867	0,0419823
7	0,1524939	0,8712796	0,8016462	0,000813	0,0071009	0,4024906	0,0576043	0,2014104	0,2262897	0,033542
8	0,1546341	0,9153565	0,8282373	0,0006766	0,0061248	0,3473112	0,0503627	0,1684991	0,1957511	0,028609
9	0,164771	0,9751112	0,8558009	0,0005527	0,0053982	0,3041429	0,0442001	0,1408941	0,1613282	0,0255732
10	0,1734701	1,0041229	0,8512327	0,0004636	0,0045622	0,2617083	0,0378216	0,1185058	0,1366438	0,0225091
11	0,180381	1,04157	0,8697064	0,0003772	0,0038459	0,2249368	0,0318989	0,0988246	0,1172512	0,0199753
12	0,1726844	1,0615672	0,8526522	0,0003299	0,0033844	0,1939547	0,0252859	0,0818425	0,1001427	0,0179333
13	0,167492	1,0895828	0,8492239	0,0002813	0,00308	0,1708974	0,0214964	0,0670358	0,0829306	0,0169313
14	0,1670585	1,097403	0,811862	0,0002402	0,0028137	0,1583709	0,0180139	0,0559469	0,0683216	0,0150237
15	0,1596526	1,0960595	0,7973241	0,0002071	0,0025122	0,1445005	0,0150899	0,0461932	0,0554081	0,0139627
16	0,1450967	1,0685643	0,7529935	0,0001816	0,0022969	0,1346283	0,0132002	0,0385371	0,0462125	0,0128375
17	0,1394083	1,0518932	0,7046372	0,0001615	0,002128	0,1308326	0,0114336	0,0318907	0,0384388	0,011607
18	0,1340472	1,0071172	0,6752661	0,0001536	0,0019895	0,1262854	0,0093613	0,0271942	0,0310317	0,0107167
19	0,1284697	0,9361719	0,6233446	0,0001422	0,0019455	0,121694	0,0078079	0,0226716	0,0267606	0,0099029
20	0,1233265	0,8884095	0,560432	0,0001395	0,0018426	0,124118	0,0065736	0,0189287	0,0232051	0,0086241
21	0,1122445	0,8319089	0,5158494	0,0001381	0,0018363	0,1277685	0,0054656	0,0165007	0,0197874	0,0077076
22	0,1030505	0,7553665	0,4584529	0,000136	0,0017651	0,1294334	0,0045417	0,013881	0,0180901	0,006816
23	0,0914333	0,688986	0,4118618	0,0001278	0,0017102	0,1269725	0,0040135	0,0123386	0,0165114	0,0058759
24	0,0840518	0,6336097	0,3735005	0,0001272	0,0016547	0,1254595	0,0035367	0,0110241	0,0146875	0,0050176
25	0,0758012	0,5778166	0,34239	0,0001208	0,0016067	0,1236641	0,0030887	0,0100478	0,0141947	0,0043797
26	0,0712786	0,5246647	0,3034484	0,0001169	0,0015267	0,1205121	0,002879	0,0093226	0,0132699	0,0038087
27	0,0646608	0,4717503	0,2719781	0,0001144	0,0015551	0,119074	0,0026196	0,0083694	0,0127821	0,0031609
28	0,0555422	0,4141033	0,238666	0,0001093	0,0015373	0,1186409	0,0024031	0,0075193	0,0119337	0,0027096
29	0,0494377	0,3592258	0,2055461	0,0001034	0,0014608	0,1147864	0,0022289	0,0072852	0,0114336	0,0024458
30	0,04224	0,3209396	0,1823071	0,0001004	0,0013719	0,1096834	0,0020017	0,0068551	0,0104623	0,0021866
31	0,0365507	0,2786423	0,158323	9,383E-05	0,0012513	0,1028242	0,0018286	0,0064498	0,0092382	0,0021001
32	0,0313989	0,2431695	0,1327485	8,812E-05	0,0011636	0,0974274	0,0017089	0,0061333	0,0085157	0,0018911
33	0,0273314	0,2170244	0,1139578	8,572E-05	0,001054	0,0934822	0,0016027	0,0058011	0,0077896	0,0017572
34	0,0231824	0,1884994	0,1042577	8,206E-05	0,0009805	0,0869476	0,0014739	0,0052873	0,0073857	0,0016229
35	0,0210374	0,1552759	0,0940061	7,842E-05	0,0008786	0,080978	0,0013635	0,0048534	0,0069251	0,0014958
36	0,0172875	0,1360928	0,0866343	7,126E-05	0,00083	0,0752503	0,0012716	0,0043221	0,0061946	0,0013059
37	0,014813	0,1166821	0,0760677	6,25E-05	0,0007801	0,0709313	0,0011671	0,0041587	0,0058483	0,0012222
38	0,0133826	0,1033704	0,0673191	5,799E-05	0,0006881	0,0652389	0,0010996	0,0038232	0,0056592	0,0011522
39	0,0120065	0,0895309	0,0592326	5,016E-05	0,0006123	0,0599782	0,0010112	0,0035919	0,005383	0,0010821

40	0,010281	0,0803515	0,0523977	4,651E-05	0,0005571	0,0543822	0,0009269	0,0032648	0,0049795	0,0009883
41	0,0091809	0,0724703	0,0466456	4,217E-05	0,0004957	0,0507698	0,0008618	0,0031118	0,0046429	0,0008669
42	0,0082571	0,0647078	0,0411548	3,885E-05	0,0004535	0,045926	0,0007745	0,0027367	0,0042261	0,0008095
43	0,0071613	0,0584499	0,0380075	3,536E-05	0,0004125	0,0406254	0,0007404	0,0024657	0,0039406	0,0007638
44	0,0063901	0,054246	0,0339055	3,091E-05	0,0003706	0,0354986	0,0006956	0,0023056	0,0036334	0,0007102
45	0,0058091	0,048447	0,0317458	2,644E-05	0,0003446	0,0318014	0,0006166	0,0020691	0,0032824	0,0006627
46	0,0051407	0,0460585	0,0286152	2,324E-05	0,0003117	0,0287531	0,0005692	0,001829	0,0029513	0,0006278
47	0,0046745	0,0429256	0,0264612	2,116E-05	0,0002948	0,0251288	0,0005428	0,0017171	0,0026512	0,0005963
48	0,0041298	0,0388112	0,0251688	1,816E-05	0,0002673	0,0215552	0,0004954	0,0014857	0,0022954	0,000535
49	0,0037748	0,0355127	0,0223873	1,567E-05	0,0002385	0,0193734	0,0004516	0,0014029	0,0019808	0,0004875
50	0,0034347	0,0331531	0,020622	1,361E-05	0,0002148	0,0169272	0,0004039	0,0012704	0,0017407	0,0004477
51	0,0031359	0,030267	0,0197091	1,23E-05	0,0001975	0,0146289	0,0003847	0,001136	0,0015585	0,0003849
52	0,0029459	0,0280662	0,0185295	1,109E-05	0,0001816	0,0126651	0,0003131	0,0010134	0,0013582	0,0003453
53	0,0027064	0,0265216	0,0171048	9,644E-06	0,0001573	0,010865	0,0002839	0,0008822	0,0012159	0,0003177
54	0,0024738	0,0257438	0,0167435	8,577E-06	0,0001367	0,0095255	0,000242	0,0007878	0,0010943	0,0002917
55	0,0023112	0,0248363	0,0153046	7,652E-06	0,0001237	0,0082584	0,000208	0,000715	0,0009443	0,0002709
56	0,0021599	0,0222798	0,0137918	6,721E-06	0,0001127	0,0073478	0,0001858	0,0006168	0,0008227	0,0002443
57	0,0019536	0,0203985	0,0125521	5,807E-06	9,743E-05	0,0067347	0,0001688	0,0005398	0,0007172	0,0002141
58	0,0018583	0,0182147	0,0116705	5,19E-06	9,181E-05	0,0060516	0,0001535	0,0005073	0,0006713	0,0001988
59	0,0017306	0,0162366	0,0111329	4,554E-06	8,609E-05	0,0052012	0,0001388	0,0004757	0,0006192	0,0001923
60	0,0015875	0,0155388	0,0105059	4,195E-06	7,869E-05	0,0046526	0,0001259	0,0004395	0,0005438	0,0001768
61	0,0014239	0,0139237	0,0100878	3,832E-06	7,45E-05	0,0041829	0,0001147	0,0003876	0,000469	0,0001599
62	0,0012775	0,0128629	0,0089008	3,594E-06	6,801E-05	0,0036816	0,0001041	0,0003561	0,0004473	0,000145
63	0,0012151	0,0124327	0,0080194	3,131E-06	6,32E-05	0,0035162	9,18E-05	0,0003205	0,0004181	0,0001354
64	0,0010758	0,0114138	0,0070396	2,908E-06	5,66E-05	0,0031843	8,147E-05	0,0002961	0,0003723	0,0001153
65	0,0009704	0,0104552	0,0064353	2,582E-06	5,07E-05	0,0027675	7,47E-05	0,0002614	0,0003513	0,0001025
66	0,0008944	0,0094476	0,0056153	2,193E-06	4,325E-05	0,0025506	7,031E-05	0,0002349	0,0003177	9,11E-05
67	0,0007953	0,0085505	0,0050651	1,988E-06	3,754E-05	0,0023949	6,327E-05	0,0002088	0,000294	7,897E-05
68	0,0007009	0,0075278	0,0046255	1,71E-06	3,283E-05	0,0021233	5,646E-05	0,0001826	0,000277	7,315E-05
69	0,000647	0,0069906	0,0043796	1,645E-06	2,962E-05	0,0019848	5,252E-05	0,0001618	0,0002544	6,395E-05
70	0,0006052	0,0063557	0,0041854	1,695E-06	2,666E-05	0,0017692	4,602E-05	0,0001487	0,0002263	5,788E-05
71	0,0005377	0,0059258	0,0037669	1,6E-06	2,232E-05	0,001673	4,036E-05	0,0001346	0,0002085	5,517E-05
72	0,0004999	0,0053535	0,0034518	1,504E-06	2,059E-05	0,0015928	3,693E-05	0,0001255	0,0001746	5,255E-05
73	0,0004526	0,0047616	0,0031251	1,39E-06	2,051E-05	0,0014649	3,471E-05	0,0001146	0,0001592	4,664E-05
74	0,0004219	0,0044552	0,002687	1,309E-06	1,859E-05	0,0013684	3,237E-05	0,0001112	0,000145	4,043E-05
75	0,0003858	0,0041177	0,002298	1,26E-06	1,797E-05	0,0012571	3,024E-05	0,0001039	0,0001255	3,602E-05
76	0,000344	0,0036838	0,002085	1,154E-06	1,596E-05	0,0011129	2,702E-05	9,315E-05	0,0001163	3,219E-05
77	0,0003133	0,0031998	0,0018526	1,083E-06	1,467E-05	0,0010296	2,363E-05	8,947E-05	0,0001084	2,793E-05
78	0,0002795	0,0027901	0,0018105	9,563E-07	1,366E-05	0,0009076	2,167E-05	8,127E-05	9,948E-05	2,532E-05
79	0,0002639	0,0025138	0,0016522	8,291E-07	1,298E-05	0,0009002	2,094E-05	7,62E-05	8,532E-05	2,291E-05
80	0,0002317	0,0023608	0,0014798	7,654E-07	1,119E-05	0,0008814	1,967E-05	7,384E-05	7,43E-05	2,238E-05
81	0,0002139	0,002181	0,0013249	7,146E-07	9,584E-06	0,0008341	1,87E-05	6,857E-05	6,159E-05	1,969E-05
82	0,0001953	0,0020253	0,0011711	6,511E-07	9,555E-06	0,0007828	1,66E-05	6,267E-05	5,705E-05	1,896E-05

83	0,0001787	0,0018583	0,001154	5,671E-07	8,317E-06	0,0007262	1,509E-05	5,683E-05	5,068E-05	1,74E-05
84	0,000169	0,0016343	0,001086	4,849E-07	7,023E-06	0,0006452	1,374E-05	5,22E-05	4,523E-05	1,599E-05
85	0,0001529	0,0016295	0,001014	4,466E-07	6,038E-06	0,0006089	1,204E-05	4,79E-05	4,203E-05	1,435E-05
86	0,0001403	0,0014476	0,0009336	4,051E-07	5,47E-06	0,0005587	1,063E-05	4,3E-05	4,226E-05	1,343E-05
87	0,0001287	0,0012593	0,0008952	3,27E-07	5,031E-06	0,0005011	9,893E-06	3,587E-05	4,127E-05	1,188E-05
88	0,0001161	0,0011701	0,0008282	2,642E-07	4,629E-06	0,0004462	8,902E-06	3,291E-05	3,892E-05	1,102E-05
89	0,000105	0,0011493	0,0007638	2,459E-07	3,874E-06	0,0003894	8,161E-06	2,667E-05	3,728E-05	1,028E-05
90	9,749E-05	0,0010483	0,0007169	2,249E-07	3,636E-06	0,0003364	7,538E-06	2,617E-05	3,466E-05	9,199E-06
91	9,375E-05	0,000937	0,0006528	2,095E-07	3,422E-06	0,0003111	6,985E-06	2,372E-05	3,076E-05	8,448E-06
92	8,566E-05	0,0008424	0,000594	1,898E-07	3,2E-06	0,0002713	6,131E-06	2,147E-05	2,766E-05	7,631E-06
93	7,768E-05	0,0007774	0,000547	1,88E-07	2,933E-06	0,0002542	5,585E-06	1,964E-05	2,558E-05	6,417E-06
94	6,817E-05	0,0007191	0,0004972	1,734E-07	2,79E-06	0,000226	5,176E-06	1,829E-05	2,457E-05	5,825E-06
95	6,072E-05	0,0006535	0,0004568	1,667E-07	2,568E-06	0,0002078	4,756E-06	1,68E-05	2,182E-05	5,943E-06
96	5,409E-05	0,0005889	0,0003963	1,464E-07	2,391E-06	0,0001892	4,544E-06	1,535E-05	2,006E-05	5,545E-06
97	4,761E-05	0,0005877	0,0003545	1,41E-07	2,141E-06	0,0001727	3,99E-06	1,36E-05	1,905E-05	5,185E-06
98	4,339E-05	0,000508	0,0003386	1,26E-07	1,912E-06	0,000159	3,719E-06	1,18E-05	1,758E-05	4,664E-06
99	3,963E-05	0,0004429	0,0002964	1,153E-07	1,806E-06	0,0001456	3,405E-06	1,074E-05	1,67E-05	4,297E-06
100	3,349E-05	0,0004145	0,0002585	1,073E-07	1,639E-06	0,000127	3,138E-06	9,45E-06	1,496E-05	4,057E-06
101	3,067E-05	0,0003671	0,0002311	9,429E-08	1,513E-06	0,000115	2,894E-06	8,571E-06	1,366E-05	3,818E-06
102	2,698E-05	0,0003452	0,0001993	8,935E-08	1,397E-06	0,0001029	2,629E-06	7,902E-06	1,275E-05	3,553E-06
103	2,485E-05	0,000304	0,0001769	7,888E-08	1,247E-06	9,345E-05	2,451E-06	7,529E-06	1,222E-05	3,218E-06
104	2,322E-05	0,0002486	0,0001632	7,166E-08	1,146E-06	8,359E-05	2,145E-06	7,164E-06	1,081E-05	2,816E-06
105	2,286E-05	0,0002219	0,0001439	6,456E-08	1,032E-06	7,203E-05	1,901E-06	6,439E-06	9,619E-06	2,57E-06
106	1,992E-05	0,000222	0,0001293	5,778E-08	9,333E-07	6,671E-05	1,776E-06	5,902E-06	8,719E-06	2,347E-06
107	1,825E-05	0,0002024	0,0001165	5,379E-08	8,389E-07	6,233E-05	1,596E-06	5,53E-06	8,793E-06	2,115E-06
108	1,69E-05	0,0001673	0,0001105	4,974E-08	7,947E-07	5,699E-05	1,566E-06	5,42E-06	7,565E-06	1,934E-06
109	1,567E-05	0,0001441	9,925E-05	4,257E-08	7,117E-07	5,341E-05	1,425E-06	5,161E-06	7,024E-06	1,723E-06
110	1,432E-05	0,0001283	8,458E-05	3,882E-08	6,279E-07	4,847E-05	1,291E-06	4,642E-06	6,219E-06	1,587E-06
111	1,292E-05	0,00011	7,489E-05	3,607E-08	5,722E-07	4,372E-05	1,238E-06	3,991E-06	5,093E-06	1,505E-06
112	1,151E-05	0,0001004	6,836E-05	3,218E-08	5,012E-07	4,034E-05	1,168E-06	3,373E-06	4,641E-06	1,409E-06
113	1,08E-05	9,283E-05	6,072E-05	2,822E-08	4,687E-07	3,63E-05	1,037E-06	3,055E-06	4,047E-06	1,276E-06
114	1,007E-05	8,994E-05	5,533E-05	2,526E-08	4,097E-07	3,63E-05	9,346E-07	2,741E-06	3,689E-06	1,066E-06
115	9,648E-06	8,158E-05	5,353E-05	2,182E-08	3,828E-07	3,269E-05	8,704E-07	2,274E-06	3,508E-06	9,37E-07
116	8,557E-06	7,465E-05	4,772E-05	2,01E-08	3,389E-07	2,9E-05	7,943E-07	2,042E-06	3,123E-06	8,403E-07
117	7,841E-06	6,886E-05	4,45E-05	1,973E-08	3,247E-07	2,73E-05	7,435E-07	1,838E-06	2,908E-06	8,017E-07
118	7,289E-06	6,279E-05	4,085E-05	1,906E-08	2,862E-07	2,55E-05	7,121E-07	1,694E-06	2,493E-06	7,356E-07
119	6,869E-06	5,758E-05	4,152E-05	1,709E-08	2,629E-07	2,368E-05	6,354E-07	1,661E-06	2,124E-06	6,771E-07
120	6,137E-06	5,13E-05	3,873E-05	1,547E-08	2,453E-07	2,13E-05	5,732E-07	1,597E-06	1,95E-06	6,193E-07

F. Contemporaneous Effects of Foreign Variables on their Domestic Counterparts

Table (5.25): Contemporaneous Effects of Foreign Variables on their Domestic Counterparts

		ip	fs	i	Reer
BULGARIA	Coefficient	0.473918	0.057516	0.030742	-0.09554
	t-ratio_White	5.378921	0.57585	1.346209	-1.0108
CROATIA	Coefficient	0.156609	-0.05275	-0.12815	0.247896
	t-ratio_White	1.55563	-2.65468	-0.64185	1.364644
FYROM	Coefficient	0.856777	0.130409	-0.05127	0.085023
	t-ratio_White	3.095901	2.780551	-1.34558	0.649204
GREECE	Coefficient	0.388569	0.045642	0.003717	0.526042
	t-ratio_White	4.581238	0.236358	0.016852	7.738245
ROMANIA	Coefficient	0.097308	-0.03193	0.025244	-0.51918
	t-ratio_White	0.996333	-0.52791	0.503303	-1.58058
SLOVENIA	Coefficient	0.344191	-0.03589	-0.00323	0.050871
	t-ratio_White	3.317337	-2.26184	-0.12871	0.929051

G. Pair-wise Cross-section correlations: Variables and residuals

Table (5.26): Average Pairwise Cross-Section Correlations: Variables and Residuals

		Levels	First Differences	VECMX* Residuals
ip	BULGARIA	0.501046	0.137809	-0.06436
ip	CROATIA	0.314406	0.077096	0.001385
ip	FYROM	0.38891	0.074274	-0.05537
ip	GREECE	-0.21411	0.070066	-0.07739
ip	ROMANIA	0.13226	0.089476	0.004424
ip	SLOVENIA	0.50385	0.071046	-0.01298
fs	BULGARIA	0.439491	0.070135	0.023232
fs	CROATIA	0.403192	-0.03722	-0.03152
fs	FYROM	0.447023	0.084994	0.026739
fs	GREECE	0.218276	0.007864	-0.00827
fs	ROMANIA	0.393831	0.004618	0.001149
fs	SLOVENIA	-0.78754	0.028245	0.038609
i	BULGARIA	0.422605	0.006263	-0.04009
i	CROATIA	0.516783	-0.01934	0.006107
i	FYROM	0.421463	0.008417	0.011643
i	GREECE	-0.3679	-0.00705	0.005209
i	ROMANIA	0.46864	0.003928	-0.00487
i	SLOVENIA	0.456334	0.013331	-0.00763
reer	BULGARIA	0.237112	0.411699	0.069875
reer	CROATIA	0.440875	0.355615	0.037295
reer	FYROM	-0.40873	0.306303	0.014204

reer	GREECE	0.369801	0.40117	-0.14474
reer	ROMANIA	0.145198	0.075206	-0.02553
reer	SLOVENIA	0.411066	0.445942	0.058092

H. Generalized Impulse Response Functions (GIRF). Shock to Euribor and Shock to Real effective exchange rate

(Transferred to main body)

K. The country data

K1 The country Data. Bulgaria

date	ip	fs	i	reer	ips	fss	is	reers	eur	eureer
2002M01	1,879096	3,86761	0,038	1,868392	1,980583	3,730365	0,197407	1,9457	0,033463	1,944135
2002M02	1,857935	3,867642	0,039	1,873409	1,987231	3,708132	0,196563	1,945285	0,033367	1,944397
2002M03	1,854306	3,857101	0,04	1,877683	1,986114	3,718569	0,193757	1,941771	0,033446	1,945522
2002M04	1,886491	3,870858	0,031	1,877851	1,995454	3,721888	0,193536	1,943602	0,033351	1,95067
2002M05	1,881385	3,877732	0,04	1,872502	1,964819	3,746384	0,185082	1,941987	0,033719	1,955653
2002M06	1,882525	3,898086	0,039	1,88387	1,986308	3,740289	0,177186	1,942921	0,033827	1,966754
2002M07	1,889862	3,904947	0,044	1,889642	1,985188	3,723349	0,1658	1,939907	0,03359	1,980764
2002M08	1,894316	3,915496	0,042	1,886969	1,986304	3,717785	0,157969	1,944807	0,033325	1,978532
2002M09	1,893207	3,929223	0,041	1,886639	1,984216	3,678812	0,149251	1,945466	0,033159	1,981641
2002M10	1,884795	3,942037	0,042	1,886714	1,996404	3,745791	0,142751	1,947587	0,033041	1,98101
2002M11	1,902003	3,950539	0,043	1,883337	1,997026	3,766	0,136692	1,94693	0,032281	1,983287
2002M12	1,893762	3,951701	0,034	1,883218	1,99216	3,771887	0,129764	1,944904	0,029754	1,983879
2003M01	1,935003	3,922373	0,028	1,886762	1,988568	3,774479	0,125628	1,944491	0,028524	1,992778
2003M02	1,917506	3,928029	0,027	1,88745	1,978505	3,748904	0,121488	1,946893	0,027724	2,002826
2003M03	1,933487	3,934635	0,029	1,890823	1,986116	3,693983	0,114227	1,946863	0,026008	2,005082
2003M04	1,928396	3,965359	0,031	1,895101	1,990428	3,685409	0,107279	1,947353	0,025767	2,009256
2003M05	1,909556	3,969216	0,04	1,896041	1,9889	3,663935	0,109164	1,948446	0,025232	2,020144
2003M06	1,925312	3,975493	0,039	1,896872	1,990407	3,675517	0,109039	1,949644	0,021748	2,021799
2003M07	1,933993	3,978532	0,034	1,895547	1,992118	3,705051	0,109763	1,951977	0,021286	2,019662
2003M08	1,936514	3,991212	0,032	1,897837	1,976414	3,719252	0,110551	1,951316	0,021205	2,01448
2003M09	1,943	3,994838	0,031	1,898072	1,99646	3,715095	0,115108	1,951299	0,021248	2,016378
2003M10	1,949878	4,01759	0,032	1,903252	1,993793	3,725391	0,115394	1,953352	0,020999	2,023222
2003M11	1,95376	4,023534	0,032	1,90858	1,990304	3,720194	0,119681	1,951046	0,020875	2,02325
2003M12	1,94939	4,016312	0,034	1,91388	1,990012	3,695635	0,12032	1,951686	0,021308	2,031098
2004M01	1,970347	3,993055	0,03	1,915915	1,98653	3,672705	0,124683	1,95172	0,020741	2,033302
2004M02	1,979093	4,004852	0,031	1,916418	1,991978	3,660317	0,125009	1,953722	0,020597	2,036905
2004M03	1,979548	4,020952	0,032	1,91301	1,995313	3,668463	0,125	1,95261	0,020417	2,027174
2004M04	1,977266	4,025513	0,0325	1,913089	1,993084	3,66604	0,124409	1,948166	0,020519	2,022827
2004M05	1,982723	4,047952	0,035	1,915336	1,997965	3,665251	0,125035	1,951307	0,020602	2,023705
2004M06	1,983175	4,077465	0,04	1,916057	1,990121	3,673116	0,124942	1,952733	0,020767	2,023009

2004M07	1,982271	4,042711	0,045	1,918897	1,99934	3,696494	0,122494	1,952478	0,020751	2,027727
2004M08	1,984977	4,06472	0,03125	1,917825	1,990297	3,705253	0,119765	1,953425	0,020777	2,027625
2004M09	1,999131	4,08504	0,03	1,920006	1,992687	3,706688	0,114981	1,95634	0,020771	2,030272
2004M10	1,985426	4,099555	0,03	1,918776	1,987124	3,697386	0,11262	1,960915	0,020859	2,033587
2004M11	1,994317	4,113805	0,032	1,920018	1,993124	3,680365	0,11302	1,970453	0,021099	2,03853
2004M12	1,999131	4,121943	0,031	1,921321	1,996551	3,646508	0,109079	1,975389	0,021656	2,040312
2005M01	1,996512	4,090876	0,0316	1,917856	1,987383	3,653169	0,105534	1,978952	0,021103	2,031927
2005M02	1,994317	4,106693	0,032	1,91663	1,986751	3,650112	0,097149	1,98334	0,021028	2,030967
2005M03	2,009026	4,120495	0,033	1,918906	1,983578	3,655921	0,075261	1,985646	0,021029	2,032811
2005M04	2,001734	4,130545	0,032	1,923828	1,988548	3,658717	0,066141	1,989094	0,021033	2,030377
2005M05	2,009876	4,14846	0,0316	1,918585	1,989634	3,659266	0,063916	1,987568	0,021041	2,023118
2005M06	2,014521	4,163672	0,0316	1,917198	1,986923	3,680753	0,063323	1,985272	0,02104	2,012025
2005M07	2,017868	4,132977	0,0318	1,913731	1,989487	3,703275	0,06251	1,988391	0,021078	2,014295
2005M08	2,009026	4,143399	0,0315	1,918456	1,99556	3,72548	0,062146	1,99195	0,021135	2,017462
2005M09	2,0187	4,154581	0,0316	1,918962	1,995526	3,735753	0,063684	1,993185	0,02115	2,01668
2005M10	2,030195	4,154099	0,0314	1,921041	1,993248	3,743729	0,061194	1,990559	0,021208	2,013372
2005M11	2,026533	4,170224	0,0314	1,920187	1,996881	3,739655	0,060147	1,987991	0,022245	2,008027
2005M12	2,033424	4,158816	0,0317	1,919411	2,000166	3,747153	0,059582	1,985991	0,024107	2,005738
2006M01	2,028978	4,129367	0,032	1,920145	1,998097	3,751761	0,057634	1,991055	0,023892	2,007188
2006M02	2,021603	4,12761	0,032	1,929723	2,000574	3,746121	0,058166	1,994359	0,024603	2,006211
2006M03	2,024075	4,137448	0,032	1,932179	2,003931	3,762413	0,062652	1,996828	0,026347	2,006167
2006M04	2,036629	4,156678	0,033	1,935534	2,009916	3,78821	0,063419	1,999021	0,026493	2,011265
2006M05	2,051924	4,183057	0,033	1,940632	2,018772	3,784162	0,063805	2,001754	0,026944	2,017505
2006M06	2,048053	4,187577	0,034	1,946691	2,020695	3,779454	0,063432	2,002708	0,028708	2,020526
2006M07	2,038223	4,211594	0,035	1,94068	2,015106	3,791147	0,063633	2,001491	0,029401	2,023117
2006M08	2,051538	4,201777	0,035	1,939643	2,021531	3,792128	0,06443	2,002052	0,030956	2,023175
2006M09	2,048442	4,218017	0,036	1,937175	2,020208	3,800794	0,063871	2,003168	0,031582	2,022404
2006M10	2,044148	4,22849	0,035	1,939892	2,024064	3,82016	0,063966	2,004408	0,033513	2,018977
2006M11	2,046495	4,244432	0,037	1,942135	2,016664	3,829527	0,063765	2,0075	0,034228	2,019572
2006M12	2,04454	4,242008	0,038	1,9446	2,028929	3,817316	0,064222	2,012045	0,036408	2,021805
2007M01	2,051924	4,224692	0,04	1,946038	2,037429	3,773291	0,064657	2,013156	0,036167	2,019306
2007M02	2,071145	4,222533	0,04	1,946891	2,042218	3,783791	0,064867	2,012944	0,036523	2,023335
2007M03	2,074451	4,244641	0,042	1,946419	2,037451	3,791387	0,061319	2,012946	0,038456	2,021014
2007M04	2,075547	4,253551	0,043	1,947848	2,033661	3,789858	0,061185	2,014444	0,038599	2,02394
2007M05	2,077731	4,245409	0,045	1,948157	2,038193	3,798157	0,059666	2,018047	0,039173	2,023701
2007M06	2,075547	4,272112	0,041	1,952776	2,040316	3,784015	0,059182	2,021663	0,040999	2,021166
2007M07	2,079904	4,284988	0,046	1,959139	2,043768	3,795102	0,059797	2,027655	0,041068	2,024899
2007M08	2,080266	4,305274	0,047	1,974864	2,042765	3,805733	0,053734	2,023392	0,043124	2,02482
2007M09	2,080987	4,359715	0,049	1,97656	2,041091	3,832591	0,054831	2,020681	0,04435	2,028533
2007M10	2,082426	4,363993	0,051	1,976083	2,046075	3,830832	0,056563	2,0233	0,042338	2,030517
2007M11	2,083144	4,371692	0,056	1,979641	2,045673	3,833443	0,056649	2,019558	0,042165	2,034723
2007M12	2,087781	4,368213	0,058	1,980514	2,047873	3,840539	0,05942	2,015277	0,047061	2,033525
2008M01	2,081347	4,358761	0,059	1,98372	2,057759	3,828976	0,059141	2,009762	0,041949	2,035478

2008M02	2,084219	4,357888	0,06	1,986361	2,046195	3,829956	0,06159	2,012769	0,041825	2,034782
2008M03	2,084934	4,374638	0,061	1,993815	2,040206	3,835403	0,067178	2,01299	0,043075	2,041934
2008M04	2,09482	4,403157	0,061	1,998808	2,046687	3,832301	0,067903	2,017446	0,043693	2,043695
2008M05	2,098298	4,399012	0,062	1,998464	2,045402	3,82995	0,071228	2,015214	0,043864	2,043762
2008M06	2,090611	4,413025	0,063	2,001655	2,050269	3,831526	0,073774	2,014539	0,044707	2,041144
2008M07	2,087071	4,426244	0,064	2,002851	2,048945	3,837292	0,074628	2,018102	0,044693	2,042799
2008M08	2,074816	4,449003	0,066	1,999926	2,045397	3,840548	0,075393	2,016145	0,044818	2,032488
2008M09	2,082426	4,459299	0,068	2,0005	2,045533	3,851535	0,075766	2,012184	0,046567	2,026426
2008M10	2,062582	4,443386	0,069	2,001008	2,035289	3,854424	0,075734	2,00784	0,048146	2,014408
2008M11	2,050766	4,447296	0,073	1,99943	2,008874	3,857822	0,077083	2,007103	0,038224	2,008586
2008M12	2,040602	4,395584	0,073	2,008288	1,998286	3,847688	0,076369	2,008354	0,029822	2,031774
2009M01	1,986772	4,374926	0,069	2,01308	1,994783	3,842858	0,077922	1,997597	0,021295	2,032575
2009M02	2,000434	4,370985	0,067	2,014275	2,006721	3,84361	0,077126	1,997433	0,0162	2,032684
2009M03	1,992995	4,363819	0,0575	2,016151	1,996721	3,827777	0,076622	1,999471	0,012628	2,034442
2009M04	1,992111	4,362914	0,06	2,015157	2,001263	3,840355	0,077742	1,997989	0,010019	2,028994
2009M05	1,985875	4,362567	0,055	2,016811	2,001649	3,853628	0,076675	2,001201	0,00878	2,034628
2009M06	1,992554	4,366709	0,05	2,022662	2,000532	3,846895	0,07532	2,001124	0,008917	2,03832
2009M07	1,993436	4,359935	0,055	2,0164	2,004835	3,859662	0,073581	2,000498	0,005696	2,038118
2009M08	1,992995	4,375148	0,045	2,016144	2,000367	3,902489	0,06935	1,999722	0,004627	2,039357
2009M09	1,981366	4,384498	0,045	2,015805	2,010116	3,913768	0,066927	2,002694	0,004065	2,042262
2009M10	1,994757	4,394012	0,0425	2,014582	2,007185	3,914939	0,06679	2,00269	0,003905	2,043363
2009M11	1,994317	4,402598	0,04	2,012051	2,007812	3,920824	0,064888	2,003912	0,004021	2,040435
2009M12	1,982723	4,402556	0,04	2,010648	2,006938	3,93463	0,067537	2,005224	0,00447	2,037808
2010M01	1,980912	4,389342	0,0375	2,005174	1,998393	3,9294	0,069369	2,008268	0,003991	2,028002
2010M02	1,957607	4,376688	0,034	2,002816	1,994351	3,941999	0,068664	2,005522	0,003849	2,018145
2010M03	1,993877	4,379076	0,034	1,999459	2,000455	3,9445	0,066034	2,003656	0,003732	2,009874
2010M04	1,986772	4,37161	0,033	2,000252	1,996406	3,966874	0,067312	1,99806	0,003685	2,002303
2010M05	1,991669	4,377386	0,032	1,997627	1,999099	3,969066	0,074492	1,994169	0,00389	1,992896
2010M06	2,007321	4,376083	0,032	1,996033	2,006202	3,994954	0,069527	1,989984	0,00408	1,982617
2010M07	1,998695	4,382958	0,032	1,998379	2,000405	3,990981	0,074183	1,998588	0,005333	1,99413
2010M08	2,0086	4,387355	0,032	1,998055	1,997993	3,993624	0,075832	1,999279	0,00581	1,991871
2010M09	2,0141	4,397324	0,031	1,999006	1,997717	3,988461	0,077609	1,998935	0,005755	1,991563
2010M10	2,012415	4,389104	0,03	2,002207	2,010557	4,005793	0,07185	2,003058	0,007379	2,00275
2010M11	2,013259	4,395044	0,03	2,001252	2,011881	3,992661	0,078839	2,001578	0,007888	1,995175
2010M12	2,01157	4,404494	0,03	1,998343	2,013144	4,002602	0,080036	1,999143	0,007391	1,988086
2011M01	2,025306	4,378535	0,03	1,998335	2,012963	3,998377	0,08108	2,001066	0,007334	1,98757
2011M02	2,027757	4,382269	0,03	2,005594	2,014193	3,996483	0,079526	2,00334	0,008462	1,994173
2011M03	2,028164	4,378004	0,0305	2,008101	2,014078	3,997813	0,082245	2,009166	0,008586	1,998063
2011M04	2,025306	4,369259	0,031	2,009048	2,00626	3,994434	0,089029	2,012877	0,010718	2,004034
2011M05	2,032619	4,379275	0,029	2,009998	2,009606	3,998912	0,094854	2,012765	0,011928	2,003826
2011M06	2,019116	4,382633	0,028	2,011751	2,000889	4,009942	0,099902	2,009735	0,012386	2,002157
2011M07	2,028978	4,388252	0,028	2,009301	2,017513	4,003046	0,099628	2,00581	0,013705	2,000512
2011M08	2,017451	4,407902	0,028	2,010834	2,008835	4,003328	0,102734	2,005434	0,013187	2,000393

2011M09	2,024486	4,406987	0,028	2,007918	2,017808	4,030121	0,114383	2,003596	0,012916	1,996836
2011M10	2,026942	4,411116	0,0275	2,007315	2,004099	4,021173	0,124785	2,002647	0,013035	1,996084
2011M11	2,020775	4,411838	0,027	2,006434	2,010478	4,016062	0,150045	2,001544	0,01167	1,993066
2011M12	2,011147	4,416771	0,0275	2,002528	2,002936	4,029102	0,174695	1,999275	0,010659	1,987508
2012M01	2,009451	4,404654	0,025	1,996788	2,006705	4,031565	0,171816	1,995243	0,007732	1,977936
2012M02	2,006894	4,398177	0,0225	1,99956	1,999931	4,031043	0,178397	1,992985	0,0056	1,981867
2012M03	2,023664	4,411628	0,022	2,00002	2,003524	4,035765	0,145873	1,991315	0,003992	1,980786
2012M04	2,021603	4,418051	0,02	1,999737	2,003523	4,033794	0,112827	1,98944	0,003561	1,979932
2012M05	2,03623	4,423205	0,02	2,000386	2,011645	4,033663	0,123111	1,986633	0,0034	1,978202
2012M06	2,031408	4,433275	0,018	1,99901	2,007916	4,028811	0,135947	1,98615	0,003276	1,973291
2012M07	2,025715	4,466362	0,0175	1,99954	2,014249	4,027026	0,130184	1,980012	0,001665	1,967644
2012M08	2,031812	4,468851	0,0125	1,999449	2,019141	4,024319	0,122418	1,981171	0,000838	1,9644
2012M09	2,019116	4,48185	0,011	2,006032	2,012108	4,04459	0,106947	1,987273	0,000728	1,974131
2012M10	2,011993	4,470141	0,01	2,003038	2,015511	4,037931	0,097236	1,985373	0,000603	1,973672
2012M11	2,018284	4,470205	0,01	2,001407	2,012074	4,034082	0,093238	1,985979	0,00055	1,970354
2012M12	2,036629	4,483131	0,01	2,003613	2,013234	4,022728	0,078782	1,9892	0,000532	1,977856
2013M01	2,032216	4,443312	0,01	2,004993	2,012968	4,019128	0,071585	1,997546	0,000538	1,983421
2013M02	2,016197	4,434811	0,009	2,006979	2,011039	4,020911	0,071588	1,996609	0,000556	1,98838
2013M03	2,013259	4,452476	0,008	2,002895	2,019301	4,023016	0,07531	1,993314	0,000583	1,98151
2013M04	2,0141	4,46332	0,008	2,001709	2,025469	4,004524	0,073332	1,994328	0,000608	1,980966
2013M05	2,006466	4,462812	0,008	2,002239	1,998338	3,996107	0,064392	1,996974	0,00058	1,984449
2013M06	2,016197	4,455397	0,0075	2,007406	2,025904	3,978084	0,067311	1,995138	0,000653	1,990304
2013M07	2,024075	4,465632	0,0075	2,002485	2,019698	4,001898	0,070454	1,996935	0,000757	1,992682
2013M08	2,028978	4,463798	0,007	2,002025	2,024139	4,004499	0,063953	1,996391	0,00081	1,993946
2013M09	2,028978	4,465606	0,007	2,002441	2,023311	3,997985	0,063177	1,993738	0,000855	1,993348
2013M10	2,03583	4,451248	0,0065	2,001434	2,024372	4,004179	0,058108	1,99523	0,000871	1,993536
2013M11	2,033826	4,446335	0,006	2,00132	2,020205	3,98378	0,055409	1,994061	0,001025	1,993009
2013M12	2,026942	4,450473	0,0065	2,004111	2,02833	3,974159	0,056574	1,99598	0,001856	2,000319
2014M01	2,036629	4,433413	0,0065	2,003228	2,027419	3,996856	0,052803	1,996526	0,002018	1,999943
2014M02	2,03623	4,424505	0,006	2,00317	2,028262	4,012124	0,048911	1,996215	0,001974	2,002167
2014M03	2,028164	4,436214	0,0055	2,006089	2,027169	4,021456	0,046193	1,998414	0,002079	2,006246
2014M04	2,03583	4,439364	0,006	2,005235	2,029424	4,018645	0,044251	1,997568	0,002248	2,003869
2014M05	2,028978	4,431805	0,006	2,001152	2,040754	4,002173	0,045028	1,9969	0,002359	2,000089
2014M06	2,020361	4,447351	0,006	1,999532	2,026927	4,007281	0,043434	1,998425	0,001335	1,994609
2014M07	2,026942	4,471303	0,006	1,998657	2,031727	4,015289	0,04381	1,998032	0,000857	1,994846
2014M08	2,023252	4,476888	0,005	1,996305	2,024899	4,014117	0,043037	1,994013	0,000773	1,987668
2014M09	2,032619	4,483457	0,005	1,993143	2,02895	4,013786	0,04186	1,991859	0,000107	1,981343
2014M10	2,034628	4,483911	0,0045	1,992932	2,035244	4,014989	0,044205	1,989217	4,16E-05	1,97636
2014M11	2,034227	4,497107	0,00425	1,992373	2,035313	4,014789	0,048477	1,988724	4,11E-05	1,977641
2014M12	2,033021	4,509713	0,0044	1,995276	2,031373	4,025587	0,048885	1,988265	0,000113	1,980919
2015M01	2,041787	4,485765	0,0042	1,987598	2,036128	4,036384	0,054746	1,983781	-6,5E-05	1,964082
2015M02	2,042182	4,526358	0,0043	1,984604	2,040375	4,03555	0,051636	1,981055	-7E-05	1,957007
2015M03	2,040207	4,569246	0,0037	1,982338	2,042661	4,049191	0,056298	1,977055	-0,00012	1,944617

2015M04	2,045323	4,580637	0,0035	1,98205	2,038528	4,039462	0,060188	1,97409	-0,00042	1,939586
2015M05	2,046495	4,578692	0,0035	1,984564	2,029128	4,021657	0,055544	1,975589	-0,00063	1,948459
2015M06	2,042576	4,575178	0,0035	1,986434	2,033618	4,015031	0,071853	1,973612	-0,00073	1,95202
2015M07	2,041787	4,584322	0,0036	1,981502	2,036059	4,008728	0,059035	1,973435	-0,00081	1,949525
2015M08	2,041787	4,591792	0,0034	1,98759	2,044626	4,004221	0,053206	1,977531	-0,00099	1,956592
2015M09	2,037028	4,59525	0,0034	1,991727	2,045858	4,004296	0,046213	1,980326	-0,00114	1,962697
2015M10	2,041393	4,598765	0,0034	1,987324	2,043548	4,031405	0,041937	1,978425	-0,00128	1,958727
2015M11	2,042969	4,60695	0,0032	1,981009	2,049981	4,028167	0,040221	1,973514	-0,0015	1,946323
2015M12	2,040207	4,598514	0,003	1,985061	2,051305	4,035166	0,043699	1,974161	-0,00193	1,954735
2016M01	2,049993	4,582875	0,002	1,988309	2,046409	4,037282	0,047962	1,975382	-0,00222	1,960899
2016M02	2,050766	4,586851	0,0005	1,989259	2,040857	4,055917	0,051833	1,97751	-0,00251	1,965005
2016M03	2,050766	4,620933	0,0004	1,985793	2,041079	4,059215	0,047153	1,975448	-0,0031	1,962647
2016M04	2,045323	4,626425	-0,00025	1,986226	2,052615	4,061923	0,045203	1,974918	-0,00342	1,964478
2016M05	2,045714	4,628762	-0,0005	1,986958	2,035572	4,06507	0,041614	1,974422	-0,00352	1,966527
2016M06	2,057286	4,6424	-0,00025	1,985943	2,046696	4,065398	0,042774	1,974033	-0,00357	1,962895
2016M07	2,052694	4,655024	-0,0005	1,986746	2,049439	4,071167	0,043154	1,974118	-0,00366	1,962771
2016M08	2,052694	4,658842	-0,0005	1,986067	2,053355	4,068581	0,044315	1,974277	-0,00371	1,959857
2016M09	2,057666	4,662282	-0,0005	1,984836	2,051566	4,071582	0,044704	1,973845	-0,00374	1,960646
2016M10	2,053078	4,65727	-0,0005	1,982411	2,05682	4,072044	0,043923	1,972034	-0,00378	1,957701
2016M11	2,057286	4,661751	-0,0005	1,983088	2,057057	4,067306	0,039263	1,971284	-0,00381	1,956905
2016M12	2,064458	4,669703	-0,00075	1,982448	2,067133	4,067343	0,038871	1,969263	-0,00382	1,954407

K2 The country Data. Croatia

date	ip	fs	i	reer	ips	fss	is	reers	eur	eureer
2002M01	1,955207	3,73785	0,1	1,958835	1,950075	3,638088	0,098457	1,978466	0,033463	1,944135
2002M02	1,944483	3,739774	0,1	1,959306	1,951177	3,65297	0,097244	1,977157	0,033367	1,944397
2002M03	1,943495	3,748687	0,1	1,958622	1,94746	3,653046	0,094853	1,976496	0,033446	1,945522
2002M04	1,944976	3,744668	0,1	1,960655	1,959854	3,661176	0,093996	1,978709	0,033351	1,95067
2002M05	1,953276	3,749807	0,095	1,960433	1,942651	3,664774	0,092148	1,977797	0,033719	1,955653
2002M06	1,942504	3,750636	0,095	1,964545	1,948379	3,67317	0,091123	1,978748	0,033827	1,966754
2002M07	1,955688	3,759373	0,095	1,964917	1,951628	3,670682	0,088446	1,980637	0,03359	1,980764
2002M08	1,961421	3,766859	0,095	1,965703	1,95227	3,674401	0,086249	1,982569	0,033325	1,978532
2002M09	1,976808	3,765845	0,095	1,969909	1,95281	3,702451	0,084591	1,982417	0,033159	1,981641
2002M10	1,977266	3,764486	0,095	1,968382	1,954658	3,717075	0,083617	1,982511	0,033041	1,98101
2002M11	1,980458	3,770375	0,095	1,968668	1,954061	3,758717	0,082897	1,982024	0,032281	1,983287
2002M12	1,967548	3,75215	0,095	1,970413	1,952578	3,756356	0,082927	1,981863	0,029754	1,983879
2003M01	1,958564	3,743433	0,095	1,968404	1,950165	3,755854	0,080922	1,984721	0,028524	1,992778
2003M02	1,969882	3,774553	0,095	1,964639	1,952928	3,756727	0,079587	1,987176	0,027724	2,002826
2003M03	1,96708	3,762097	0,095	1,958143	1,957146	3,741722	0,075796	1,987684	0,026008	2,005082
2003M04	1,97635	3,773759	0,095	1,966415	1,952138	3,7436	0,073388	1,988495	0,025767	2,009256

2003M05	1,978181	3,771634	0,095	1,966896	1,954956	3,739843	0,073805	1,990133	0,025232	2,020144
2003M06	1,977266	3,772987	0,095	1,966596	1,951896	3,756193	0,067428	1,990455	0,021748	2,021799
2003M07	1,97359	3,765198	0,095	1,968854	1,956984	3,757755	0,066364	1,989955	0,021286	2,019662
2003M08	1,980003	3,783261	0,095	1,969394	1,950764	3,768114	0,066641	1,988734	0,021205	2,01448
2003M09	1,974051	3,791086	0,095	1,96988	1,96421	3,763739	0,067257	1,988208	0,021248	2,016378
2003M10	1,981366	3,791634	0,095	1,970647	1,969521	3,76212	0,063451	1,99029	0,020999	2,023222
2003M11	1,971276	3,816496	0,095	1,969852	1,969598	3,760511	0,060876	1,990243	0,020875	2,02325
2003M12	1,964731	3,816513	0,095	1,969038	1,961203	3,756842	0,060896	1,991311	0,021308	2,031098
2004M01	1,965672	3,82283	0,095	1,971475	1,966443	3,756037	0,061115	1,991156	0,020741	2,033302
2004M02	1,985426	3,822596	0,095	1,972858	1,96635	3,758018	0,064328	1,991887	0,020597	2,036905
2004M03	1,989895	3,790884	0,095	1,974315	1,9724	3,754346	0,06219	1,988427	0,020417	2,027174
2004M04	1,985426	3,8095	0,095	1,971624	1,974154	3,75896	0,056771	1,986109	0,020519	2,022827
2004M05	1,979093	3,805711	0,095	1,974924	1,966004	3,747253	0,054607	1,986686	0,020602	2,023705
2004M06	1,982271	3,805463	0,095	1,976499	1,969602	3,739295	0,05298	1,98657	0,020767	2,023009
2004M07	1,983626	3,803872	0,095	1,976595	1,973206	3,736863	0,052321	1,987104	0,020751	2,027727
2004M08	1,987666	3,811726	0,095	1,978846	1,977756	3,743762	0,050913	1,986584	0,020777	2,027625
2004M09	1,986772	3,809683	0,095	1,975035	1,975503	3,745804	0,049832	1,986874	0,020771	2,030272
2004M10	1,982271	3,804315	0,095	1,974079	1,972151	3,741136	0,049293	1,988188	0,020859	2,033587
2004M11	1,985875	3,801029	0,095	1,975915	1,973102	3,743902	0,050283	1,992771	0,021099	2,03853
2004M12	1,991669	3,808628	0,095	1,97813	1,974482	3,73819	0,04876	1,990997	0,021656	2,040312
2005M01	1,992111	3,816669	0,095	1,97718	1,97577	3,745165	0,048909	1,988897	0,021103	2,031927
2005M02	1,98945	3,818367	0,095	1,979655	1,974618	3,747464	0,047366	1,990558	0,021028	2,030967
2005M03	1,979548	3,826105	0,095	1,983009	1,982327	3,743067	0,045055	1,991652	0,021029	2,032811
2005M04	2,008174	3,830715	0,095	1,985162	1,983839	3,743997	0,044267	1,990929	0,021033	2,030377
2005M05	2,0086	3,844516	0,095	1,981202	1,987595	3,725956	0,044323	1,988619	0,021041	2,023118
2005M06	2,0141	3,849153	0,095	1,978451	1,992502	3,7568	0,04424	1,986174	0,02104	2,012025
2005M07	2,007748	3,848902	0,095	1,978711	1,996974	3,761262	0,043438	1,988822	0,021078	2,014295
2005M08	1,996949	3,849067	0,095	1,977653	1,98445	3,762744	0,043841	1,988511	0,021135	2,017462
2005M09	2,015779	3,845017	0,095	1,973599	1,993285	3,774768	0,04414	1,990569	0,02115	2,01668
2005M10	2,004321	3,852996	0,095	1,982108	1,997365	3,767267	0,04344	1,990095	0,021208	2,013372
2005M11	2,020361	3,858559	0,095	1,98181	1,998672	3,77099	0,042405	1,98747	0,022245	2,008027
2005M12	2,020361	3,871477	0,095	1,981207	2,004289	3,785279	0,041011	1,98604	0,024107	2,005738
2006M01	2,012837	3,882402	0,075	1,984309	2,001571	3,786747	0,03965	1,985971	0,023892	2,007188
2006M02	2,015779	3,899491	0,075	1,987568	2,000084	3,791385	0,0386	1,987444	0,024603	2,006211
2006M03	1,997386	3,907868	0,075	1,985437	1,99773	3,788804	0,038053	1,988293	0,026347	2,006167
2006M04	2,010724	3,914076	0,075	1,987812	2,006558	3,787667	0,037931	1,989813	0,026493	2,011265
2006M05	2,017868	3,92953	0,075	1,989068	2,019624	3,786716	0,038784	1,991806	0,026944	2,017505
2006M06	2,020361	3,941688	0,075	1,99274	2,007983	3,776425	0,037878	1,991705	0,028708	2,020526
2006M07	2,027757	3,952997	0,075	1,990969	2,020755	3,758143	0,037747	1,99148	0,029401	2,023117
2006M08	2,032216	3,938124	0,075	1,990276	2,021517	3,744166	0,039454	1,993904	0,030956	2,023175
2006M09	2,033021	3,910346	0,075	1,983174	2,021097	3,746286	0,038853	1,995251	0,031582	2,022404
2006M10	2,036629	3,930252	0,075	1,984645	2,023989	3,75462	0,038969	1,992038	0,033513	2,018977
2006M11	2,034628	3,953456	0,075	1,98871	2,029703	3,750632	0,039198	1,992242	0,034228	2,019572

2006M12	2,043755	3,940781	0,075	1,987673	2,038714	3,721685	0,039263	1,993956	0,036408	2,021805
2007M01	2,031004	3,962491	0,075	1,986459	2,039608	3,012634	0,040761	1,992946	0,036167	2,019306
2007M02	2,039414	3,980704	0,075	1,987337	2,037017	3,067639	0,041947	1,992757	0,036523	2,023335
2007M03	2,047275	3,978626	0,075	1,986807	2,037744	3,070836	0,042121	1,992528	0,038456	2,021014
2007M04	2,040602	3,977194	0,075	1,986913	2,04476	3,04421	0,042708	1,993722	0,038599	2,02394
2007M05	2,047664	3,975501	0,075	1,988476	2,036818	3,077199	0,043297	1,995927	0,039173	2,023701
2007M06	2,046495	3,962386	0,075	1,986832	2,046657	3,076123	0,043247	1,996788	0,040999	2,021166
2007M07	2,049218	3,973687	0,075	1,987444	2,050932	3,013922	0,043936	1,999313	0,041068	2,024899
2007M08	2,045714	3,964873	0,075	1,990543	2,054091	3,015983	0,043094	2,000807	0,043124	2,02482
2007M09	2,044148	3,944242	0,075	1,994521	2,04739	3,063148	0,043157	2,001265	0,04435	2,028533
2007M10	2,048442	3,952975	0,075	1,995826	2,055517	3,05328	0,043286	2,002714	0,042338	2,030517
2007M11	2,049606	3,959626	0,075	1,99856	2,047587	3,058769	0,043161	2,003339	0,042165	2,034723
2007M12	2,042182	3,968827	0,075	2,002247	2,045157	3,021763	0,043529	2,003504	0,047061	2,033525
2008M01	2,056905	3,970011	0,075	2,004468	2,064908	3,020243	0,043592	2,004764	0,041949	2,035478
2008M02	2,05038	3,985736	0,09	2,004235	2,064952	2,998996	0,043846	2,005002	0,041825	2,034782
2008M03	2,055378	3,993069	0,09	2,006768	2,060104	3,045252	0,04469	2,007448	0,043075	2,041934
2008M04	2,051924	3,996885	0,09	2,008879	2,064745	3,004351	0,046035	2,00901	0,043693	2,043695
2008M05	2,046885	4,002219	0,09	2,00822	2,061053	2,993324	0,048002	2,00811	0,043864	2,043762
2008M06	2,06558	3,997439	0,09	2,010312	2,071072	3,00137	0,049512	2,008458	0,044707	2,041144
2008M07	2,048442	3,99073	0,09	2,011337	2,057034	3,043292	0,051131	2,009361	0,044693	2,042799
2008M08	2,043362	3,992987	0,09	2,010975	2,062993	2,998081	0,051461	2,005234	0,044818	2,032488
2008M09	2,045323	3,991613	0,09	2,012762	2,059664	3,016927	0,051658	2,003856	0,046567	2,026426
2008M10	2,04883	3,972548	0,09	2,00736	2,057635	3,023963	0,043735	2,002629	0,048146	2,014408
2008M11	2,043362	3,985964	0,09	2,008974	2,008287	3,024461	0,040193	1,99962	0,038224	2,008586
2008M12	2,019116	3,960039	0,09	2,010803	1,966082	2,991415	0,033917	2,005655	0,029822	2,031774
2009M01	2,006038	3,938253	0,09	2,009683	1,993542	3,005483	0,034004	2,006868	0,021295	2,032575
2009M02	2,012415	3,932361	0,09	2,0087	1,975571	2,953669	0,026108	2,009779	0,0162	2,032684
2009M03	2,0103	3,947902	0,09	2,008787	1,969553	2,919883	0,025728	2,01145	0,012628	2,034442
2009M04	2,026533	3,94866	0,09	2,009363	1,960798	2,92727	0,027114	2,007204	0,010019	2,028994
2009M05	2,012837	3,943916	0,09	2,012348	1,964781	2,865802	0,025644	2,008604	0,00878	2,034628
2009M06	2,005181	3,958567	0,09	2,017548	1,962901	2,873196	0,026523	2,010584	0,008917	2,03832
2009M07	2,003891	3,955731	0,09	2,013306	1,968206	2,920262	0,026439	2,009585	0,005696	2,038118
2009M08	2,000868	3,968119	0,09	2,013667	1,976933	2,904505	0,025517	2,009065	0,004627	2,039357
2009M09	2,000868	3,969304	0,09	2,0144	1,988008	2,891935	0,020077	2,009965	0,004065	2,042262
2009M10	2,015779	3,979588	0,09	2,018918	1,979534	2,886386	0,019976	2,009334	0,003905	2,043363
2009M11	2,002598	4,006273	0,09	2,018014	1,988933	2,87879	0,019622	2,010466	0,004021	2,040435
2009M12	1,985426	4,016022	0,09	2,014066	1,981775	2,89113	0,019705	2,009388	0,00447	2,037808
2010M01	2,012415	4,016784	0,09	2,012509	1,972832	2,858395	0,01882	2,006806	0,003991	2,028002
2010M02	2,005609	4,003527	0,09	2,009258	1,981912	2,851507	0,018377	2,005107	0,003849	2,018145
2010M03	2,002598	3,003508	0,09	2,006326	1,987904	2,85541	0,017805	2,002228	0,003732	2,009874
2010M04	2,000434	4,00065	0,09	2,002889	1,989936	2,831418	0,017742	2,000131	0,003685	2,002303
2010M05	1,995196	4,007601	0,09	1,998307	1,997867	2,90015	0,018556	1,997643	0,00389	1,992896
2010M06	1,994757	4,013055	0,09	1,997973	1,999901	2,924213	0,017411	1,996602	0,00408	1,982617

2010M07	1,996949	4,054039	0,09	2,000874	1,99844	2,919155	0,018337	1,999964	0,005333	1,99413
2010M08	2,002598	4,057986	0,09	1,998069	2,004645	2,913909	0,018384	1,99992	0,00581	1,991871
2010M09	2,01494	4,047445	0,09	1,995916	2,002742	2,879847	0,018496	1,997756	0,005755	1,991563
2010M10	1,997823	4,044419	0,09	1,995705	2,005715	2,860319	0,018895	1,999195	0,007379	2,00275
2010M11	1,996512	4,043135	0,09	1,992506	2,008925	2,889829	0,019871	1,997697	0,007888	1,995175
2010M12	1,988559	4,027769	0,09	1,988674	2,017731	2,873248	0,019814	1,996564	0,007391	1,988086
2011M01	1,980458	4,019373	0,09	1,989686	2,006242	2,841993	0,01951	1,995627	0,007334	1,98757
2011M02	1,993436	4,019698	0,09	1,993433	2,007785	2,833368	0,019293	1,996431	0,008462	1,994173
2011M03	1,98945	4,057812	0,09	1,994254	2,013875	2,826612	0,019689	1,99958	0,008586	1,998063
2011M04	2,009026	4,054471	0,09	1,994744	2,005512	2,799954	0,024127	2,000729	0,010718	2,004034
2011M05	1,998695	4,056692	0,09	1,991865	2,01659	2,810949	0,024876	2,001643	0,011928	2,003826
2011M06	1,993877	4,057752	0,09	1,989536	2,003489	2,785997	0,025548	1,999596	0,012386	2,002157
2011M07	2,003461	4,05049	0,09	1,986617	2,005618	2,797709	0,027672	1,99715	0,013705	2,000512
2011M08	1,979093	4,049886	0,09	1,985942	2,00189	2,777289	0,028105	1,998056	0,013187	2,000393
2011M09	2,004751	4,053994	0,09	1,982596	2,014084	2,765063	0,029732	1,998491	0,012916	1,996836
2011M10	2	4,050012	0,09	1,98372	2,006534	2,776121	0,029625	1,998959	0,013035	1,996084
2011M11	1,992995	4,057681	0,09	1,985706	2,010801	2,73173	0,033133	1,998282	0,01167	1,993066
2011M12	1,998695	4,049019	0,0625	1,979948	2,005074	2,749042	0,036674	1,995728	0,010659	1,987508
2012M01	1,962369	4,038093	0,0625	1,972134	2,004176	2,819587	0,040125	1,993354	0,007732	1,977936
2012M02	1,960471	4,057315	0,0625	1,973891	1,997182	2,73698	0,040187	1,993568	0,0056	1,981867
2012M03	1,95376	4,054616	0,0625	1,977097	2,007998	2,664376	0,029681	1,992444	0,003992	1,980786
2012M04	1,966142	4,095556	0,0625	1,978954	2,010827	2,668319	0,0249	1,992852	0,003561	1,979932
2012M05	1,975432	4,083029	0,0625	1,981809	2,005998	2,69172	0,026061	1,993157	0,0034	1,978202
2012M06	1,980458	4,065776	0,0625	1,977244	2,010176	2,690778	0,02855	1,990813	0,003276	1,973291
2012M07	1,976808	4,064728	0,0625	1,975104	2,005039	2,754809	0,028887	1,986903	0,001665	1,967644
2012M08	1,987666	4,06192	0,0625	1,976274	2,016877	2,750932	0,02764	1,987052	0,000838	1,9644
2012M09	1,973128	4,056293	0,0625	1,986415	2,003717	2,710584	0,026588	1,992443	0,000728	1,974131
2012M10	1,972203	4,055817	0,0625	1,98202	2,005076	2,669828	0,025122	1,990397	0,000603	1,973672
2012M11	1,969882	4,053141	0,0625	1,98161	1,997603	2,650024	0,022403	1,989614	0,00055	1,970354
2012M12	1,974051	4,050609	0,0625	1,983154	1,996773	2,678125	0,018685	1,992074	0,000532	1,977856
2013M01	1,969416	4,044553	0,0625	1,984827	2,004782	2,629006	0,017774	1,994338	0,000538	1,983421
2013M02	1,96895	4,046636	0,0625	1,987901	2,010538	2,649997	0,017967	1,99715	0,000556	1,98838
2013M03	1,965202	4,052178	0,0625	1,982087	1,99786	2,590453	0,016413	1,99336	0,000583	1,98151
2013M04	1,965202	4,081307	0,0625	1,980879	2,007017	2,542274	0,016114	1,99452	0,000608	1,980966
2013M05	1,960946	4,080966	0,0625	1,981246	1,995268	2,48205	0,01486	1,994383	0,00058	1,984449
2013M06	1,965672	4,079924	0,0625	1,986682	2,003675	2,632283	0,014387	1,996566	0,000653	1,990304
2013M07	1,957128	4,075078	0,0625	1,985909	1,999774	2,74919	0,014849	1,998006	0,000757	1,992682
2013M08	1,975432	4,0734	0,0625	1,986204	2,004047	2,749185	0,014686	1,999245	0,00081	1,993946
2013M09	1,953276	4,068909	0,0625	1,983143	2,002339	2,739121	0,014578	1,998609	0,000855	1,993348
2013M10	1,956649	4,064316	0,0625	1,98057	2,004564	2,734764	0,013078	1,998305	0,000871	1,993536
2013M11	1,964731	4,109497	0,0625	1,982056	2,005517	2,735833	0,012681	1,997455	0,001025	1,993009
2013M12	1,960471	4,110842	0,0625	1,983204	2,01582	2,675795	0,01286	1,998084	0,001856	2,000319
2014M01	1,973128	4,110355	0,05	1,985087	2,007488	2,772337	0,011827	1,998755	0,002018	1,999943

2014M02	1,970812	4,099327	0,05	1,984712	2,002803	2,853829	0,010723	1,999383	0,001974	2,002167
2014M03	1,965672	4,082786	0,05	1,984915	2,008438	2,861194	0,010327	2,001823	0,002079	2,006246
2014M04	1,96895	4,06746	0,05	1,984571	2,010507	2,851237	0,010073	2,000261	0,002248	2,003869
2014M05	1,960471	4,114496	0,05	1,983271	2,009747	2,865186	0,010181	1,999485	0,002359	2,000089
2014M06	1,966142	4,09113	0,05	1,980658	2,014542	2,872296	0,009186	1,997842	0,001335	1,994609
2014M07	1,965202	4,092989	0,05	1,980297	2,02162	2,882721	0,009007	1,997254	0,000857	1,994846
2014M08	1,963316	4,09412	0,05	1,977037	2,010083	2,873175	0,008555	1,994702	0,000773	1,987668
2014M09	1,967548	4,084789	0,05	1,975902	2,010343	2,83681	0,008159	1,993137	0,000107	1,981343
2014M10	1,968483	4,101768	0,05	1,973864	2,020315	2,823862	0,008389	1,992041	4,16E-05	1,97636
2014M11	1,97359	4,096002	0,05	1,974536	2,018892	2,863539	0,008978	1,992189	4,11E-05	1,977641
2014M12	1,980912	4,103381	0,05	1,974188	2,019234	2,856152	0,009036	1,99512	0,000113	1,980919
2015M01	1,954243	4,064599	0,05	1,968817	2,026585	2,886783	0,010543	1,9899	-6,5E-05	1,964082
2015M02	1,972203	4,109445	0,05	1,965044	2,025417	2,875387	0,009294	1,987094	-7E-05	1,957007
2015M03	1,976808	4,150994	0,05	1,96311	2,028796	2,934127	0,009964	1,983181	-0,00012	1,944617
2015M04	1,974512	4,168406	0,05	1,961349	2,02898	2,880955	0,010266	1,978584	-0,00042	1,939586
2015M05	1,983175	4,151158	0,05	1,964621	2,029983	2,898375	0,009537	1,98155	-0,00063	1,948459
2015M06	1,974051	4,137784	0,05	1,964399	2,032634	2,905719	0,011814	1,982252	-0,00073	1,95202
2015M07	1,984527	4,175814	0,05	1,962292	2,032317	2,921233	0,00995	1,981987	-0,00081	1,949525
2015M08	1,974051	4,158515	0,05	1,96673	2,035299	2,892064	0,009052	1,985609	-0,00099	1,956592
2015M09	1,990783	4,128288	0,05	1,967481	2,036981	2,878964	0,007998	1,987452	-0,00114	1,962697
2015M10	1,996949	4,153263	0,05	1,965444	2,038207	2,910996	0,007324	1,984675	-0,00128	1,958727
2015M11	1,987219	4,146869	0,025	1,962144	2,039768	2,886354	0,006844	1,980761	-0,0015	1,946323
2015M12	1,983175	4,13693	0,025	1,962787	2,034899	2,833581	0,007014	1,984592	-0,00193	1,954735
2016M01	1,98945	4,132184	0,025	1,964539	2,057117	2,861239	0,007423	1,985772	-0,00222	1,960899
2016M02	1,990339	4,113478	0,025	1,967425	2,051566	2,852222	0,007683	1,98707	-0,00251	1,965005
2016M03	2,004751	4,120535	0,025	1,968055	2,049222	2,790221	0,00664	1,98579	-0,0031	1,962647
2016M04	1,996512	4,121194	0,025	1,97071	2,053196	2,753665	0,006193	1,985457	-0,00342	1,964478
2016M05	1,990783	4,108172	0,025	1,967868	2,052249	2,762664	0,006037	1,986897	-0,00352	1,966527
2016M06	1,992554	4,111815	0,025	1,965128	2,057029	2,753898	0,00613	1,986514	-0,00357	1,962895
2016M07	1,990783	4,143188	0,025	1,966456	2,06064	2,729558	0,00602	1,98622	-0,00366	1,962771
2016M08	1,985875	4,149129	0,025	1,964901	2,062141	2,707726	0,006105	1,984851	-0,00371	1,959857
2016M09	1,998259	4,115242	0,025	1,966181	2,06665	2,729672	0,00616	1,984206	-0,00374	1,960646
2016M10	2,003891	4,113706	0,025	1,966992	2,064963	2,689549	0,005973	1,983153	-0,00378	1,957701
2016M11	2,017451	4,145214	0,025	1,968071	2,068232	2,701482	0,005323	1,982952	-0,00381	1,956905
2016M12	2,043362	4,130786	0,025	1,964861	2,076529	2,730175	0,005183	1,980636	-0,00382	1,954407

K3 The country Data FYROM

date	ip	fs	i	reer	ips	fss	is	reers	eur	eureer
2002M01	1,926342	2,663341	0,1357	2,031907	1,950678	3,847054	0,093317	1,915755	0,033463	1,944135
2002M02	1,960471	2,67483	0,1328	2,033808	1,943455	3,830677	0,093611	1,917505	0,033367	1,944397
2002M03	1,940018	2,686024	0,1142	2,036031	1,941675	3,831134	0,093906	1,918019	0,033446	1,945522
2002M04	1,970812	2,696936	0,1216	2,036027	1,958251	3,837074	0,089831	1,919592	0,033351	1,95067

2002M05	1,920645	2,70758	0,1218	2,039511	1,946008	3,847117	0,090466	1,916999	0,033719	1,955653
2002M06	1,952792	2,717971	0,1241	2,0414	1,951881	3,85765	0,087467	1,92303	0,033827	1,966754
2002M07	1,929419	2,728118	0,1196	2,038305	1,956828	3,845913	0,086098	1,925585	0,03359	1,980764
2002M08	1,935507	2,738033	0,1018	2,036251	1,958507	3,843153	0,08309	1,926555	0,033325	1,978532
2002M09	1,925312	2,747728	0,0951	2,035122	1,959393	3,8231	0,08009	1,927136	0,033159	1,981641
2002M10	2,004751	2,75721	0,1105	2,032159	1,958923	3,86864	0,078305	1,927721	0,033041	1,98101
2002M11	1,996512	2,76649	0,1292	2,031542	1,966897	3,889535	0,076256	1,926344	0,032281	1,983287
2002M12	1,980003	2,775576	0,1521	2,030076	1,960778	3,891988	0,069817	1,926138	0,029754	1,983879
2003M01	1,962843	2,784475	0,1475	2,033653	1,975194	3,881386	0,066287	1,927751	0,028524	1,992778
2003M02	1,907949	2,793196	0,135	2,032767	1,967824	3,869898	0,064585	1,929812	0,027724	2,002826
2003M03	2,006038	2,801745	0,096	2,033877	1,973776	3,833723	0,064276	1,930336	0,026008	2,005082
2003M04	1,970812	2,81013	0,0701	2,040034	1,975708	3,842047	0,063771	1,933276	0,025767	2,009256
2003M05	1,968483	2,818355	0,07	2,038705	1,968102	3,833621	0,067722	1,935135	0,025232	2,020144
2003M06	1,948413	2,826427	0,07	2,037116	1,974734	3,842717	0,066232	1,935865	0,021748	2,021799
2003M07	1,981819	2,834353	0,07	2,038598	1,977994	3,852301	0,064657	1,935643	0,021286	2,019662
2003M08	1,897627	2,842136	0,07	2,038833	1,974751	3,864751	0,06441	1,936263	0,021205	2,01448
2003M09	2,046495	2,846397	0,07	2,03754	1,982079	3,863516	0,065457	1,936269	0,021248	2,016378
2003M10	2,026125	2,849206	0,0683	2,037589	1,985774	3,876949	0,065619	1,939686	0,020999	2,023222
2003M11	2,007748	2,849782	0,0612	2,038779	1,984704	3,881221	0,067057	1,941212	0,020875	2,02325
2003M12	1,941014	2,850898	0,0615	2,042714	1,985348	3,86408	0,067859	1,943887	0,021308	2,031098
2004M01	1,958564	2,853805	0,0675	2,034173	1,990192	3,840893	0,067293	1,945167	0,020741	2,033302
2004M02	1,965202	2,852181	0,0737	2,031831	1,998743	3,837091	0,067735	1,94697	0,020597	2,036905
2004M03	1,967548	2,869257	0,0749	2,027295	2,002304	3,839591	0,067886	1,944601	0,020417	2,027174
2004M04	1,960946	2,861246	0,0758	2,022506	2,001217	3,841064	0,067227	1,942638	0,020519	2,022827
2004M05	1,948413	2,852481	0,0755	2,019879	2,002859	3,846375	0,068489	1,945217	0,020602	2,023705
2004M06	1,960471	2,849206	0,0755	2,020575	1,999606	3,858012	0,070281	1,945969	0,020767	2,023009
2004M07	1,982271	2,846397	0,074	2,021022	2,002956	3,852909	0,071576	1,947143	0,020751	2,027727
2004M08	2,000868	2,874209	0,0761	2,020513	1,996958	3,861086	0,064913	1,94737	0,020777	2,027625
2004M09	1,954243	2,870108	0,0766	2,020027	2,008592	3,867411	0,063009	1,948802	0,020771	2,030272
2004M10	1,947924	2,856436	0,0798	2,022212	1,998229	3,865497	0,062069	1,949867	0,020859	2,033587
2004M11	1,951338	2,850898	0,0882	2,02492	2,006244	3,860207	0,062645	1,953856	0,021099	2,03853
2004M12	2,021189	2,855481	0,0895	2,021144	2,007217	3,834568	0,060849	1,955921	0,021656	2,040312
2005M01	1,986324	2,856023	0,0871	2,013711	2,005195	3,825298	0,060066	1,955453	0,021103	2,031927
2005M02	1,993877	2,86409	0,0808	2,015725	2,003221	3,824799	0,057859	1,956372	0,021028	2,030967
2005M03	1,972666	2,86747	0,0931	2,013617	2,006835	3,83119	0,051584	1,958348	0,021029	2,032811
2005M04	2,010724	2,871145	0,1	2,01058	2,007581	3,835393	0,048738	1,961665	0,021033	2,030377
2005M05	2,026533	2,874377	0,1	2,00539	2,012432	3,840926	0,047985	1,958208	0,021041	2,023118
2005M06	2,019947	2,89097	0,1	2,006451	2,013211	3,859658	0,047514	1,955793	0,02104	2,012025
2005M07	2,000434	2,908829	0,1	2,004108	2,015999	3,856303	0,046994	1,955784	0,021078	2,014295
2005M08	2,01157	2,915333	0,1	2,003983	2,011974	3,867536	0,046665	1,958711	0,021135	2,017462
2005M09	1,986324	2,942785	0,1	2,003879	2,021037	3,8759	0,047299	1,958953	0,02115	2,01668
2005M10	1,979093	2,955666	0,0995	2,003502	2,023381	3,880289	0,046497	1,959976	0,021208	2,013372
2005M11	1,978181	2,966936	0,0908	1,999955	2,025	3,883867	0,046691	1,958418	0,022245	2,008027

2005M12	2,01157	3,050352	0,0852	1,99952	2,026938	3,880583	0,0467	1,957285	0,024107	2,005738
2006M01	2,000434	2,986497	0,0731	2,000383	2,02359	3,875041	0,043986	1,959542	0,023892	2,007188
2006M02	1,990339	2,989456	0,071	2,001765	2,0232	3,87099	0,044399	1,964563	0,024603	2,006211
2006M03	2,003461	3,063615	0,0678	2,000841	2,02385	3,878755	0,04581	1,966065	0,026347	2,006167
2006M04	2,007321	3,076672	0,0619	2,001136	2,031289	3,903063	0,047039	1,968731	0,026493	2,011265
2006M05	2,039811	3,083666	0,057	2,004277	2,042143	3,912278	0,047681	1,972105	0,026944	2,017505
2006M06	2,057666	3,093888	0,0577	2,004838	2,038584	3,911516	0,047715	1,975527	0,028708	2,020526
2006M07	2,042969	3,105877	0,0557	2,005022	2,034338	3,927094	0,048365	1,972997	0,029401	2,023117
2006M08	2,049993	3,12891	0,0552	2,003182	2,043356	3,918926	0,048608	1,972968	0,030956	2,023175
2006M09	2,019532	3,136744	0,0536	2,001376	2,04148	3,926915	0,048693	1,971457	0,031582	2,022404
2006M10	2,0187	3,146664	0,0546	1,999696	2,042765	3,937392	0,048304	1,972706	0,033513	2,018977
2006M11	2,009026	3,150383	0,0566	2,000071	2,040041	3,95158	0,048846	1,974849	0,034228	2,019572
2006M12	2,024896	3,151269	0,0574	1,996599	2,046244	3,93862	0,049496	1,97736	0,036408	2,021805
2007M01	2,03623	3,144594	0,0571	1,987592	2,052772	3,851015	0,050706	1,978258	0,036167	2,019306
2007M02	2,049218	3,140683	0,0544	1,988939	2,061432	3,86355	0,051112	1,978719	0,036523	2,023335
2007M03	2,044932	3,150164	0,053	1,989852	2,059774	3,877271	0,050851	1,978287	0,038456	2,021014
2007M04	2,032216	3,163062	0,0509	1,990695	2,060044	3,87717	0,051483	1,979458	0,038599	2,02394
2007M05	2,014521	3,166139	0,0504	1,991223	2,064165	3,87989	0,052236	1,980938	0,039173	2,023701
2007M06	2,028164	3,151799	0,049	1,990178	2,063555	3,880333	0,05087	1,983569	0,040999	2,021166
2007M07	2,034628	3,161099	0,0513	1,990484	2,067375	3,887297	0,053153	1,988251	0,041068	2,024899
2007M08	2,05038	3,171852	0,0511	1,992726	2,065351	3,893843	0,051533	1,993852	0,043124	2,02482
2007M09	2,03583	3,182438	0,0483	1,994318	2,06535	3,931925	0,05256	1,994436	0,04435	2,028533
2007M10	2,065953	3,19065	0,0478	1,99436	2,067018	3,93193	0,053845	1,995337	0,042338	2,030517
2007M11	2,037426	3,189498	0,0466	1,999017	2,068223	3,937311	0,055715	1,996422	0,042165	2,034723
2007M12	2,04454	3,183088	0,0477	2,000089	2,069352	3,939469	0,057404	1,996011	0,047061	2,033525
2008M01	2,089905	3,186324	0,0489	2,003541	2,072823	3,926636	0,05754	1,996375	0,041949	2,035478
2008M02	2,081707	3,190028	0,0515	2,008191	2,06648	3,927594	0,06019	1,998237	0,041825	2,034782
2008M03	2,041787	3,181654	0,0585	2,011209	2,065019	3,943311	0,062106	2,002103	0,043075	2,041934
2008M04	2,056142	3,17443	0,06	2,012635	2,073893	3,950181	0,062534	2,005954	0,043693	2,043695
2008M05	2,083144	3,178959	0,068	2,008977	2,069918	3,946973	0,063915	2,005251	0,043864	2,043762
2008M06	2,076276	3,18847	0,07	2,010143	2,074974	3,953399	0,065532	2,006299	0,044707	2,041144
2008M07	2,087781	3,192265	0,07	2,007431	2,068598	3,963703	0,066614	2,008008	0,044693	2,042799
2008M08	2,079543	3,204012	0,07	2,002866	2,061147	3,969182	0,067489	2,005468	0,044818	2,032488
2008M09	2,093071	3,22763	0,07	2,000003	2,063623	3,97943	0,068095	2,004554	0,046567	2,026426
2008M10	2,023252	3,223543	0,07	2,00474	2,054661	3,970679	0,067877	2,002008	0,048146	2,014408
2008M11	2,021603	3,201187	0,07	2,006576	2,035197	3,977183	0,070088	2,000914	0,038224	2,008586
2008M12	1,994757	3,174623	0,07	2,015923	2,022	3,9493	0,069145	2,00641	0,029822	2,031774
2009M01	2,009026	3,158896	0,07	2,01621	1,997466	3,937264	0,068601	2,005775	0,021295	2,032575
2009M02	2,020775	3,15033	0,07	2,015177	2,00754	3,932205	0,066694	2,006465	0,0162	2,032684
2009M03	2,014521	3,103044	0,07	2,015955	1,999112	3,923917	0,062774	2,007989	0,012628	2,034442
2009M04	2,0141	3,080561	0,09	2,013583	2,000322	3,934903	0,063416	2,006334	0,010019	2,028994
2009M05	2,000434	3,067006	0,09	2,015205	1,997375	3,933691	0,060713	2,008716	0,00878	2,034628
2009M06	1,998695	3,080487	0,09	2,010228	1,99823	3,93343	0,058459	2,01231	0,008917	2,03832

2009M07	1,98945	3,144078	0,09	2,013257	2,00173	3,935961	0,05965	2,009246	0,005696	2,038118
2009M08	2,031812	3,177538	0,09	2,013386	1,996761	3,967296	0,053718	2,009116	0,004627	2,039357
2009M09	2,052309	3,183719	0,09	2,01412	1,996905	3,97555	0,052546	2,010152	0,004065	2,042262
2009M10	2,022428	3,190057	0,09	2,011727	2,002387	3,980071	0,051513	2,010291	0,003905	2,043363
2009M11	2,030195	3,201896	0,09	2,00951	2,002134	3,987536	0,050131	2,00985	0,004021	2,040435
2009M12	2,061075	3,203444	0,085	2,01077	1,99217	3,999765	0,052223	2,008821	0,00447	2,037808
2010M01	2,003891	3,209604	0,08	2,007387	1,991669	3,988907	0,052713	2,006656	0,003991	2,028002
2010M02	1,992111	3,209323	0,0761	2,002456	1,981347	3,985749	0,051979	2,004307	0,003849	2,018145
2010M03	1,981819	3,205903	0,0726	2,000421	1,998934	3,871693	0,05087	2,001721	0,003732	2,009874
2010M04	1,976808	3,2159	0,065	1,999547	1,992906	3,991421	0,052264	1,99975	0,003685	2,002303
2010M05	1,992995	3,225986	0,0624	1,997121	1,996499	4,000572	0,057753	1,99685	0,00389	1,992896
2010M06	2,01368	3,232556	0,0546	1,997734	2,003821	4,019749	0,055337	1,994363	0,00408	1,982617
2010M07	2,007321	3,215943	0,05	1,999609	1,99705	4,026085	0,058795	1,999252	0,005333	1,99413
2010M08	2,006038	3,235214	0,0468	1,997749	2,005231	4,027846	0,060102	1,99908	0,00581	1,991871
2010M09	1,993436	3,227694	0,045	1,996631	2,003697	4,022977	0,061012	1,998675	0,005755	1,991563
2010M10	1,990783	3,220867	0,045	2,001359	2,008909	4,030413	0,056829	2,001424	0,007379	2,00275
2010M11	2,031408	3,226901	0,045	2,000883	2,007686	4,024012	0,061535	1,99988	0,007888	1,995175
2010M12	2,011993	3,234139	0,0411	1,998122	2,007655	4,031698	0,062581	1,997292	0,007391	1,988086
2011M01	2,037825	3,232193	0,04	1,998208	2,009278	4,015506	0,063323	1,998013	0,007334	1,98757
2011M02	2,031812	3,231098	0,04	2,000271	2,0118	4,016233	0,062277	2,002098	0,008462	1,994173
2011M03	2,040207	3,278754	0,04	2,003616	2,011699	4,014627	0,064306	2,005444	0,008586	1,998063
2011M04	2,025306	3,273507	0,04	2,004635	2,007503	4,008234	0,069332	2,007087	0,010718	2,004034
2011M05	2,045323	3,2748	0,04	2,003238	2,011322	4,014525	0,072458	2,007341	0,011928	2,003826
2011M06	2,023252	3,263018	0,04	2,001886	1,999645	4,018823	0,07546	2,006628	0,012386	2,002157
2011M07	2,032216	3,258022	0,04	2,002544	2,014703	4,01984	0,075436	2,003746	0,013705	2,000512
2011M08	2,022841	3,265652	0,04	2,003916	2,001658	4,02502	0,077528	2,004054	0,013187	2,000393
2011M09	2,026125	3,266645	0,04	2,001835	2,014232	4,040075	0,085371	2,002389	0,012916	1,996836
2011M10	2,023664	3,264487	0,04	2,000251	2,004758	4,039134	0,092061	2,001762	0,013035	1,996084
2011M11	2,016616	3,266335	0,04	2,000353	2,006058	4,03403	0,109315	2,001225	0,01167	1,993066
2011M12	2,033021	3,315739	0,04	1,998357	1,996595	4,039087	0,123042	1,997738	0,010659	1,987508
2012M01	2,007321	3,315379	0,04	1,99981	1,996126	4,040342	0,12085	1,992749	0,007732	1,977936
2012M02	1,996949	3,314249	0,04	2,001124	1,991138	4,031975	0,124675	1,993166	0,0056	1,981867
2012M03	2,021189	3,315521	0,04	2,000643	1,998113	4,032719	0,102581	1,993169	0,003992	1,980786
2012M04	2,026533	3,314293	0,0396	2,00004	1,999036	4,039911	0,079555	1,992784	0,003561	1,979932
2012M05	2,029789	3,313366	0,0375	2,002891	2,008705	4,043348	0,086597	1,992357	0,0034	1,978202
2012M06	2,016616	3,305065	0,0373	2,002402	2,006278	4,043914	0,094515	1,99046	0,003276	1,973291
2012M07	2,024486	3,321452	0,0373	1,999028	2,007194	4,060581	0,090522	1,987998	0,001665	1,967644
2012M08	2,026533	3,325217	0,0373	2,001565	2,013774	4,061511	0,083306	1,987991	0,000838	1,9644
2012M09	1,992554	3,322962	0,0373	2,006774	2,003111	4,073034	0,07238	1,994225	0,000728	1,974131
2012M10	2,023664	3,32005	0,0373	2,004246	2,001528	4,062858	0,065438	1,992045	0,000603	1,973672
2012M11	2,021603	3,321694	0,0373	2,002609	1,99996	4,059705	0,062585	1,991267	0,00055	1,970354
2012M12	2,017868	3,341106	0,0373	2,004557	2,007614	4,058219	0,052725	1,993445	0,000532	1,977856
2013M01	2,024486	3,354761	0,0349	2,002264	2,005071	4,034499	0,048044	1,996876	0,000538	1,983421

2013M02	2,022841	3,351061	0,0348	2,003442	1,997218	4,032988	0,047672	1,997872	0,000556	1,98838
2013M03	2,046495	3,348384	0,0342	2,002058	1,997886	4,037347	0,049668	1,994014	0,000583	1,98151
2013M04	2,05423	3,33156	0,0338	2,007616	2,000731	4,030612	0,048361	1,993563	0,000608	1,980966
2013M05	2,026942	3,325907	0,0337	2,007577	1,987779	4,020356	0,042348	1,994641	0,00058	1,984449
2013M06	2,035029	3,309463	0,0321	2,011507	2,003947	4,019677	0,044155	1,996975	0,000653	1,990304
2013M07	2,042182	3,312802	0,0325	2,010689	1,999685	4,044641	0,046247	1,995439	0,000757	1,992682
2013M08	2,021189	3,319005	0,0325	2,01272	2,007933	4,047223	0,043067	1,994878	0,00081	1,993946
2013M09	2,009876	3,314873	0,0325	2,012945	2,005018	4,04112	0,042544	1,99397	0,000855	1,993348
2013M10	2,0187	3,311379	0,0325	2,012325	2,00739	4,035954	0,039321	1,993501	0,000871	1,993536
2013M11	2,029384	3,305454	0,0325	2,011901	2,00386	4,030989	0,037752	1,992736	0,001025	1,993009
2013M12	2,037028	3,299506	0,0325	2,012582	2,006501	4,022375	0,038735	1,995264	0,001856	2,000319
2014M01	2,050766	3,296477	0,0325	2,012607	2,00881	4,036842	0,035206	1,995604	0,002018	1,999943
2014M02	2,037825	3,298209	0,0325	2,011759	2,009087	4,050638	0,032793	1,995462	0,001974	2,002167
2014M03	2,04883	3,288068	0,0325	2,014348	2,003749	4,061826	0,030764	1,997835	0,002079	2,006246
2014M04	2,063709	3,278567	0,0325	2,012751	2,008791	4,056834	0,029656	1,996657	0,002248	2,003869
2014M05	2,067071	3,28332	0,0325	2,01391	2,011451	4,052956	0,030179	1,994102	0,002359	2,000089
2014M06	2,056142	3,272535	0,0325	2,009011	2,000169	4,059542	0,029048	1,993255	0,001335	1,994609
2014M07	2,067443	3,376066	0,0325	2,013464	2,005569	4,069185	0,029284	1,992705	0,000857	1,994846
2014M08	2,027757	3,388999	0,0325	2,011124	2,002038	4,069183	0,028789	1,989467	0,000773	1,987668
2014M09	2,046105	3,386496	0,0325	2,010089	2,006556	4,067664	0,027979	1,986809	0,000107	1,981343
2014M10	2,04883	3,385452	0,0325	2,011659	2,01183	4,067268	0,0298	1,984564	4,16E-05	1,97636
2014M11	2,052694	3,383298	0,0325	2,014292	2,012048	4,076336	0,032576	1,984227	4,11E-05	1,977641
2014M12	2,040998	3,386763	0,0325	2,02213	2,010515	4,0866	0,033357	1,985006	0,000113	1,980919
2015M01	2,05576	3,395098	0,0325	2,016527	2,012889	4,084346	0,037276	1,979038	-6,5E-05	1,964082
2015M02	2,048053	3,367493	0,0325	2,015781	2,018111	4,106382	0,036053	1,976038	-7E-05	1,957007
2015M03	2,052694	3,371961	0,0325	2,010765	2,019189	4,14065	0,038956	1,973045	-0,00012	1,944617
2015M04	2,062958	3,370019	0,0325	2,005854	2,01767	4,138133	0,041925	1,970989	-0,00042	1,939586
2015M05	2,048053	3,367075	0,0325	2,008396	2,013987	4,124779	0,039239	1,973209	-0,00063	1,948459
2015M06	2,084934	3,353115	0,0325	2,010723	2,011573	4,119458	0,050219	1,97367	-0,00073	1,95202
2015M07	2,058046	3,34209	0,0325	2,010228	2,015622	4,12781	0,041623	1,971438	-0,00081	1,949525
2015M08	2,077731	3,337991	0,0325	2,014029	2,019409	4,123381	0,037614	1,97645	-0,00099	1,956592
2015M09	2,080266	3,33992	0,0325	2,014768	2,019296	4,120774	0,032899	1,979345	-0,00114	1,962697
2015M10	2,099681	3,340052	0,0325	2,013168	2,019225	4,139217	0,030015	1,975975	-0,00128	1,958727
2015M11	2,09899	3,343094	0,0325	2,01006	2,023245	4,136749	0,025966	1,970821	-0,0015	1,946323
2015M12	2,083144	3,354445	0,0325	2,014153	2,023492	4,132273	0,028206	1,973264	-0,00193	1,954735
2016M01	2,090258	3,351576	0,0325	2,017005	2,027606	4,130112	0,030667	1,975508	-0,00222	1,960899
2016M02	2,104828	3,352841	0,0325	2,018896	2,022361	4,142261	0,03266	1,977508	-0,00251	1,965005
2016M03	2,090258	3,355325	0,0325	2,018053	2,024312	4,153231	0,02944	1,974927	-0,0031	1,962647
2016M04	2,081707	3,341214	0,0325	2,017654	2,028112	4,154787	0,027858	1,975318	-0,00342	1,964478
2016M05	2,070407	3,33533	0,04	2,019194	2,020365	4,155039	0,024874	1,975299	-0,00352	1,966527
2016M06	2,068557	3,334206	0,04	2,01757	2,031317	4,161816	0,025749	1,974219	-0,00357	1,962895
2016M07	2,081347	3,331336	0,04	2,01911	2,029904	4,170384	0,025894	1,974485	-0,00366	1,962771
2016M08	2,097604	3,328967	0,04	2,017131	2,030294	4,168874	0,02667	1,973986	-0,00371	1,959857

2016M09	2,097604	3,326584	0,04	2,017402	2,032158	4,169479	0,026931	1,973247	-0,00374	1,960646
2016M10	2,083503	3,324189	0,04	2,016575	2,035896	4,162804	0,0264	1,971689	-0,00378	1,957701
2016M11	2,078094	3,32178	0,04	2,015126	2,039024	4,166211	0,023263	1,97183	-0,00381	1,956905
2016M12	2,096562	3,319358	0,04	2,010797	2,049585	4,170513	0,022893	1,970434	-0,00382	1,954407

K4 The country Data Greece

date	ip	fs	i	reer	eur	eureer	ips	fss	is	reers
2002M01	2,075547	3,974512	0,052	1,936127	0,033463	1,944135	1,903431	3,549777	0,132569	1,928594
2002M02	2,086004	3,897407	0,053	1,936205	0,033367	1,944397	1,900854	3,556477	0,131864	1,931033
2002M03	2,084576	3,904467	0,055	1,936151	0,033446	1,945522	1,894955	3,557311	0,127111	1,931751
2002M04	2,090963	3,902275	0,054	1,939827	0,033351	1,95067	1,919571	3,568102	0,124274	1,932139
2002M05	2,071882	3,902873	0,055	1,94099	0,033719	1,955653	1,896287	3,585041	0,124194	1,929231
2002M06	2,080987	3,926497	0,053	1,946069	0,033827	1,966754	1,91136	3,589604	0,120718	1,934509
2002M07	2,079181	3,858056	0,052	1,951157	0,03359	1,980764	1,910645	3,599424	0,116896	1,934366
2002M08	2,072985	3,816042	0,049	1,953523	0,033325	1,978532	1,915639	3,611677	0,109435	1,93472
2002M09	2,070776	3,702517	0,047	1,953568	0,033159	1,981641	1,912875	3,623935	0,103892	1,934703
2002M10	2,082785	3,844291	0,048	1,953995	0,033041	1,98101	1,927089	3,637676	0,103858	1,935111
2002M11	2,085647	3,895146	0,047	1,954813	0,032281	1,983287	1,933444	3,645491	0,105023	1,932925
2002M12	2,083144	3,915664	0,045	1,955795	0,029754	1,983879	1,924486	3,646339	0,102062	1,931467
2003M01	2,082426	3,926497	0,045	1,958486	0,028524	1,992778	1,938955	3,633254	0,096339	1,9332
2003M02	2,075182	3,858056	0,042	1,96729	0,027724	2,002826	1,917515	3,638558	0,092112	1,932928
2003M03	2,079181	3,720986	0,042	1,967085	0,026008	2,005082	1,946012	3,641924	0,082289	1,934691
2003M04	2,086004	3,702517	0,042	1,968677	0,025767	2,009256	1,937816	3,657511	0,075076	1,937898
2003M05	2,083861	3,680879	0,041	1,974871	0,025232	2,020144	1,928357	3,654471	0,080393	1,937541
2003M06	2,082426	3,694254	0,038	1,975096	0,021748	2,021799	1,932926	3,662688	0,080125	1,93818
2003M07	2,084934	3,703807	0,04	1,971747	0,021286	2,019662	1,943663	3,6778	0,077692	1,939565
2003M08	2,066326	3,708421	0,042	1,971447	0,021205	2,01448	1,925245	3,691769	0,076765	1,940376
2003M09	2,089198	3,695657	0,043	1,97058	0,021248	2,016378	1,961342	3,69455	0,078303	1,940385
2003M10	2,087071	3,707911	0,043	1,974088	0,020999	2,023222	1,960315	3,708296	0,078419	1,943256
2003M11	2,080266	3,711301	0,045	1,975306	0,020875	2,02325	1,958282	3,708301	0,078661	1,944645
2003M12	2,093071	3,66323	0,044	1,978814	0,021308	2,031098	1,941014	3,702259	0,080149	1,947546
2004M01	2,076276	3,607669	0,044	1,978298	0,020741	2,033302	1,955826	3,691383	0,081449	1,947075
2004M02	2,086004	3,572523	0,043	1,983283	0,020597	2,036905	1,962145	3,697414	0,083547	1,946952
2004M03	2,095518	3,5636	0,043	1,978579	0,020417	2,027174	1,96293	3,713115	0,084132	1,944724
2004M04	2,099335	3,546419	0,042	1,975934	0,020519	2,022827	1,958907	3,716288	0,084182	1,942128
2004M05	2,09482	3,533009	0,044	1,977983	0,020602	2,023705	1,961888	3,726778	0,085125	1,943879
2004M06	2,083861	3,523486	0,044	1,9775	0,020767	2,023009	1,962835	3,745202	0,087356	1,945126
2004M07	2,093071	3,54083	0,044	1,977986	0,020751	2,027727	1,969242	3,736074	0,088239	1,946358
2004M08	2,06032	3,517064	0,042	1,979027	0,020777	2,027625	1,976007	3,760538	0,081167	1,946017
2004M09	2,08849	3,502837	0,042	1,980348	0,020771	2,030272	1,969883	3,772762	0,078345	1,948062
2004M10	2,070038	3,473341	0,041	1,982811	0,020859	2,033587	1,962881	3,777904	0,077971	1,949647
2004M11	2,08636	3,431364	0,04	1,985128	0,021099	2,03853	1,967571	3,783451	0,080872	1,955063

2004M12	2,083144	3,299725	0,039	1,985143	0,021656	2,040312	1,984975	3,796473	0,078882	1,95727
2005M01	2,084576	3,296884	0,038	1,98526	0,021103	2,031927	1,972806	3,786078	0,077234	1,955842
2005M02	2,082785	3,256718	0,037	1,984096	0,021028	2,030967	1,973105	3,801183	0,0724	1,958044
2005M03	2,072617	3,249932	0,036	1,983323	0,021029	2,032811	1,976787	3,812205	0,064796	1,960059
2005M04	2,071882	3,243038	0,038	1,984373	0,021033	2,030377	1,983219	3,82032	0,060842	1,963251
2005M05	2,081347	3,232996	0,038	1,981445	0,021041	2,023118	1,988867	3,830785	0,0596	1,959504
2005M06	2,070407	3,259116	0,036	1,977142	0,02104	2,012025	1,990899	3,847806	0,059688	1,958614
2005M07	2,073718	3,277838	0,034	1,978194	0,021078	2,014295	1,989641	3,844044	0,059732	1,957967
2005M08	2,078094	3,285557	0,033	1,979875	0,021135	2,017462	1,988874	3,859316	0,059624	1,961517
2005M09	2,087071	3,294687	0,034	1,97986	0,02115	2,01668	1,987741	3,873292	0,060229	1,962376
2005M10	2,081707	3,311754	0,034	1,979343	0,021208	2,013372	1,991807	3,875757	0,058827	1,962209
2005M11	2,081707	3,296226	0,036	1,977015	0,022245	2,008027	1,99189	3,886612	0,056315	1,960247
2005M12	2,074085	3,28892	0,036	1,976406	0,024107	2,005738	2,004491	3,902257	0,055097	1,958891
2006M01	2,072617	3,297979	0,035	1,978128	0,023892	2,007188	1,99944	3,877413	0,051993	1,961511
2006M02	2,081347	3,26998	0,037	1,97722	0,024603	2,006211	1,993632	3,880101	0,051438	1,968116
2006M03	2,092018	3,276921	0,038	1,977302	0,026347	2,006167	1,996472	3,904713	0,052772	1,970275
2006M04	2,082426	3,339849	0,041	1,979481	0,026493	2,011265	2,008291	3,91665	0,05196	1,972641
2006M05	2,091315	3,328991	0,043	1,982013	0,026944	2,017505	2,024671	3,930578	0,050913	1,976546
2006M06	2,083503	3,319522	0,042	1,984388	0,028708	2,020526	2,027973	3,933762	0,051479	1,979545
2006M07	2,074085	3,343999	0,043	1,987097	0,029401	2,023117	2,020453	3,947498	0,051485	1,975635
2006M08	2,084934	3,339253	0,042	1,987247	0,030956	2,023175	2,029112	3,94762	0,05204	1,975156
2006M09	2,076276	3,356599	0,041	1,986122	0,031582	2,022404	2,023063	3,957346	0,052111	1,974388
2006M10	2,084219	3,344981	0,041	1,985587	0,033513	2,018977	2,021415	3,976084	0,051874	1,975914
2006M11	2,069298	3,365301	0,04	1,985107	0,034228	2,019572	2,02027	3,984991	0,053283	1,978652
2006M12	2,083861	3,33626	0,041	1,986189	0,036408	2,021805	2,025887	3,982135	0,053933	1,981203
2007M01	2,104487	3,308778	0,042	1,986124	0,036167	2,019306	2,03151	3,923841	0,054909	1,98071
2007M02	2,100715	3,328583	0,043	1,98703	0,036523	2,023335	2,045883	3,926193	0,054384	1,981088
2007M03	2,082067	3,349666	0,042	1,986154	0,038456	2,021014	2,048001	3,938119	0,053577	1,981182
2007M04	2,086004	3,349083	0,043	1,986829	0,038599	2,02394	2,043907	3,942781	0,053441	1,982651
2007M05	2,095169	3,354685	0,045	1,986856	0,039173	2,023701	2,041843	3,943945	0,053222	1,984722
2007M06	2,090611	3,321391	0,047	1,986298	0,040999	2,021166	2,045624	3,953189	0,050477	1,988548
2007M07	2,09482	3,346157	0,048	1,987946	0,041068	2,024899	2,049941	3,958782	0,053387	1,994262
2007M08	2,08636	3,325516	0,046	1,988641	0,043124	2,02482	2,054207	3,979201	0,051274	2,000018
2007M09	2,089905	3,376212	0,045	1,989803	0,04435	2,028533	2,050093	4,012008	0,052414	1,999668
2007M10	2,086004	3,369216	0,045	1,990386	0,042338	2,030517	2,059811	4,015631	0,054093	2,000671
2007M11	2,090963	3,371068	0,044	1,993357	0,042165	2,034723	2,053451	4,02027	0,056447	2,000923
2007M12	2,091315	3,396374	0,045	1,993196	0,047061	2,033525	2,057713	4,014462	0,058736	1,999575
2008M01	2,098644	3,357554	0,044	1,995245	0,041949	2,035478	2,067413	4,012317	0,059483	1,998795
2008M02	2,073352	3,366049	0,043	1,996293	0,041825	2,034782	2,066427	4,01064	0,061964	2,00213
2008M03	2,063333	3,379849	0,044	1,999097	0,043075	2,041934	2,058317	4,019256	0,066224	2,005912
2008M04	2,087426	3,37767	0,045	2,001205	0,043693	2,043695	2,064345	4,028399	0,066718	2,010343
2008M05	2,066326	3,375115	0,046	2,001778	0,043864	2,043762	2,074025	4,02618	0,070138	2,008294
2008M06	2,08849	3,378943	0,049	1,999948	0,044707	2,041144	2,068006	4,034869	0,071694	2,01007

2008M07	2,082785	3,382017	0,051	1,999826	0,044693	2,042799	2,068026	4,045843	0,072273	2,011906
2008M08	2,070407	3,382197	0,05	1,996095	0,044818	2,032488	2,061607	4,058107	0,073779	2,009266
2008M09	2,070038	3,397592	0,048	1,994484	0,046567	2,026426	2,067661	4,070484	0,075281	2,007386
2008M10	2,064832	3,385964	0,049	1,99014	0,048146	2,014408	2,041604	4,065913	0,075176	2,00712
2008M11	2,049218	3,397071	0,053	1,989324	0,038224	2,008586	2,023726	4,063376	0,076783	2,006393
2008M12	2,047664	3,401573	0,052	1,997009	0,029822	2,031774	2,007027	4,026682	0,076335	2,011731
2009M01	2,028164	3,389698	0,056	1,999704	0,021295	2,032575	1,987445	4,014427	0,074448	2,008466
2009M02	2,046495	3,400711	0,055	2,000177	0,0162	2,032684	1,997492	4,006796	0,072944	2,008797
2009M03	2,032216	3,391993	0,055	2,000764	0,012628	2,034442	1,99046	3,987468	0,068218	2,010761
2009M04	2,026942	3,434569	0,054	1,996785	0,010019	2,028994	1,992887	3,981297	0,073837	2,009706
2009M05	2,028571	3,443419	0,052	1,999566	0,00878	2,034628	1,987362	3,980358	0,071283	2,011887
2009M06	2,025715	3,429429	0,052	2,00179	0,008917	2,03832	1,990012	3,984705	0,068329	2,013429
2009M07	2,034628	3,426836	0,05	2,003607	0,005696	2,038118	1,989349	4,001889	0,070225	2,010305
2009M08	2,016616	3,524785	0,045	2,004868	0,004627	2,039357	1,998514	4,016594	0,064402	2,009583
2009M09	2,027757	3,543074	0,045	2,006294	0,004065	2,042262	1,999864	4,023482	0,062995	2,010754
2009M10	2,021603	3,542701	0,045	2,006718	0,003905	2,043363	2,000227	4,0296	0,061749	2,009682
2009M11	2,026125	3,545183	0,046	2,007768	0,004021	2,040435	2,001184	4,038084	0,059465	2,008513
2009M12	2,016616	3,58625	0,054	2,006361	0,00447	2,037808	2,002211	4,037919	0,058317	2,008874
2010M01	2,005609	3,579555	0,06	2,003048	0,003991	2,028002	1,988783	4,030064	0,055933	2,007608
2010M02	2,002598	3,583992	0,065	2,001205	0,003849	2,018145	1,974659	4,028742	0,052281	2,004519
2010M03	2,009876	3,610979	0,062	1,999919	0,003732	2,009874	1,991622	4,014107	0,050926	2,001753
2010M04	1,995196	3,606596	0,07	1,998683	0,003685	2,002303	1,988257	4,034171	0,048173	1,999399
2010M05	2,003891	3,601408	0,095	1,998007	0,00389	1,992896	1,993488	4,044061	0,046	1,995828
2010M06	2,002166	3,667173	0,087	1,994246	0,00408	1,982617	2,008424	4,045846	0,043656	1,993853
2010M07	1,988113	3,665393	0,1	2,001049	0,005333	1,99413	2,003034	4,044716	0,042639	1,998307
2010M08	2,011993	3,665018	0,105	2,001394	0,00581	1,991871	2,002201	4,051434	0,041904	1,998044
2010M09	1,976808	3,64434	0,11	1,999696	0,005755	1,991563	2,008986	4,054437	0,041019	1,998314
2010M10	2,003891	3,697229	0,095	2,002399	0,007379	2,00275	2,008687	4,046709	0,040636	2,002204
2010M11	1,998695	3,6466	0,113	2,000715	0,007888	1,995175	2,018253	4,055214	0,040636	2,001172
2010M12	1,997386	3,679155	0,117	1,998728	0,007391	1,988086	2,015076	4,058659	0,03974	1,998416
2011M01	1,991669	3,673297	0,12	1,999881	0,007334	1,98757	2,026612	4,043613	0,03946	1,999094
2011M02	1,987219	3,676694	0,116	2,000841	0,008462	1,994173	2,028303	4,043231	0,03946	2,003867
2011M03	1,986772	3,658679	0,123	2,004084	0,008586	1,998063	2,030301	4,054064	0,039696	2,007978
2011M04	1,96708	3,663607	0,14	2,004942	0,010718	2,004034	2,026029	4,045169	0,040184	2,010273
2011M05	1,972666	3,662663	0,155	2,005772	0,011928	2,003826	2,034079	4,052965	0,03924	2,010266
2011M06	1,95376	3,675045	0,168	2,004755	0,012386	2,002157	2,022413	4,054152	0,038768	2,00947
2011M07	1,990783	3,676785	0,167	2,003097	0,013705	2,000512	2,029875	4,052746	0,038925	2,006734
2011M08	1,969882	3,674218	0,175	2,002059	0,013187	2,000393	2,02207	4,06303	0,038925	2,007757
2011M09	1,991226	3,732876	0,205	2,003887	0,012916	1,996836	2,027119	4,064011	0,038925	2,004771
2011M10	1,954725	3,727623	0,232	2,001495	0,013035	1,996084	2,027728	4,062764	0,038577	2,004229
2011M11	1,969416	3,723374	0,3	2,001079	0,01167	1,993066	2,023942	4,059805	0,037789	2,003378
2011M12	1,947924	3,72689	0,365	1,998036	0,010659	1,987508	2,022647	4,077418	0,03743	2,000481
2012M01	1,966611	3,726564	0,36	1,995232	0,007732	1,977936	2,014983	4,076082	0,035984	1,996454

2012M02	1,956168	3,725585	0,38	1,993532	0,0056	1,981867	2,010266	4,069094	0,034196	1,997273
2012M03	1,955688	3,73512	0,3	1,993394	0,003992	1,980786	2,024819	4,072663	0,032977	1,996618
2012M04	1,956649	3,73416	0,215	1,993077	0,003561	1,979932	2,024922	4,075357	0,031936	1,995582
2012M05	1,96426	3,738701	0,242	1,991711	0,0034	1,978202	2,034712	4,077658	0,031442	1,995378
2012M06	1,958086	3,737431	0,275	1,988626	0,003276	1,973291	2,029672	4,078565	0,030509	1,994826
2012M07	1,975432	3,728451	0,26	1,985392	0,001665	1,967644	2,027915	4,100962	0,030357	1,991938
2012M08	1,978637	3,738384	0,24	1,983017	0,000838	1,9644	2,033564	4,099461	0,027997	1,993375
2012M09	1,966611	3,77386	0,2	1,98579	0,000728	1,974131	2,019498	4,106195	0,027374	2,000175
2012M10	1,974972	3,774444	0,175	1,986837	0,000603	1,973672	2,021945	4,094956	0,026896	1,997059
2012M11	1,960471	3,775246	0,165	1,985342	0,00055	1,970354	2,025228	4,092344	0,026739	1,996519
2012M12	1,957607	3,740363	0,128	1,985867	0,000532	1,977856	2,034269	4,1044	0,026616	1,999478
2013M01	1,952792	3,732394	0,11	1,986821	0,000538	1,983421	2,034502	4,085566	0,026082	2,003621
2013M02	1,942504	3,725748	0,11	1,985928	0,000556	1,98838	2,027941	4,083994	0,025604	2,004661
2013M03	1,955688	3,737272	0,12	1,983679	0,000583	1,98151	2,031706	4,087916	0,024848	2,001097
2013M04	1,957128	3,701222	0,115	1,983362	0,000608	1,980966	2,03661	4,08596	0,024756	2,002137
2013M05	1,944976	3,686815	0,092	1,984167	0,00058	1,984449	2,016805	4,080542	0,024733	2,003484
2013M06	1,969882	3,636688	0,1	1,98452	0,000653	1,990304	2,031752	4,081923	0,024074	2,00586
2013M07	1,943	3,663418	0,108	1,983526	0,000757	1,992682	2,038564	4,099115	0,024166	2,004495
2013M08	1,955207	3,683227	0,1	1,981398	0,00081	1,993946	2,037268	4,096897	0,02233	2,004851
2013M09	1,95376	3,65887	0,098	1,981925	0,000855	1,993348	2,034741	4,097928	0,02233	2,003663
2013M10	1,947434	3,656769	0,088	1,9809	0,000871	1,993536	2,041409	4,093615	0,021486	2,003933
2013M11	1,931966	3,635383	0,084	1,977495	0,001025	1,993009	2,043473	4,085094	0,020698	2,003861
2013M12	1,951338	3,620344	0,087	1,982333	0,001856	2,000319	2,042306	4,081381	0,020934	2,005348
2014M01	1,941014	3,65887	0,081	1,983988	0,002018	1,999943	2,050627	4,080923	0,020073	2,00494
2014M02	1,944483	3,703807	0,074	1,98349	0,001974	2,002167	2,047576	4,079611	0,019245	2,004728
2014M03	1,935003	3,736954	0,067	1,986473	0,002079	2,006246	2,047257	4,081654	0,01901	2,007179
2014M04	1,943495	3,717254	0,062	1,983352	0,002248	2,003869	2,053202	4,083103	0,019245	2,006589
2014M05	1,966611	3,695569	0,064	1,980064	0,002359	2,000089	2,051521	4,077841	0,019245	2,005127
2014M06	1,929419	3,701309	0,06	1,978061	0,001335	1,994609	2,046147	4,084601	0,019189	2,004461
2014M07	1,938019	3,701741	0,061	1,978989	0,000857	1,994846	2,052304	4,119044	0,019173	2,004473
2014M08	1,937016	3,697055	0,062	1,974613	0,000773	1,987668	2,039687	4,12392	0,018126	2,001689
2014M09	1,935507	3,700271	0,059	1,970808	0,000107	1,981343	2,049717	4,123974	0,01811	1,999614
2014M10	1,947434	3,688776	0,068	1,963871	4,16E-05	1,97636	2,052401	4,126303	0,017316	1,999769
2014M11	1,947434	3,693815	0,079	1,963905	4,11E-05	1,977641	2,052943	4,132881	0,017198	1,999762
2014M12	1,93902	3,709015	0,083	1,962358	0,000113	1,980919	2,050038	4,141468	0,016717	2,002767
2015M01	1,943	3,750508	0,098	1,957332	-6,5E-05	1,964082	2,058418	4,130096	0,016673	1,996632
2015M02	1,95376	3,757624	0,096	1,954785	-7E-05	1,957007	2,057349	4,142388	0,015558	1,994093
2015M03	1,957128	3,778874	0,108	1,951018	-0,00012	1,944617	2,057937	4,169128	0,015277	1,990707
2015M04	1,944976	3,769156	0,121	1,946743	-0,00042	1,939586	2,062513	4,169019	0,014614	1,988827
2015M05	1,923762	3,719911	0,112	1,948249	-0,00063	1,948459	2,059986	4,16894	0,014057	1,991082
2015M06	1,923244	3,708846	0,154	1,950166	-0,00073	1,95202	2,06714	4,163848	0,014057	1,99112
2015M07	1,933993	3,709185	0,121	1,950323	-0,00081	1,949525	2,061105	4,164239	0,014098	1,988559
2015M08	1,954243	3,699751	0,106	1,955249	-0,00099	1,956592	2,065009	4,165054	0,013998	1,993365

2015M09	1,949878	3,706035	0,088	1,957002	-0,00114	1,962697	2,064908	4,16493	0,013993	1,996542
2015M10	1,940516	3,730378	0,077	1,952641	-0,00128	1,958727	2,071294	4,176731	0,013987	1,993936
2015M11	1,958086	3,719745	0,074	1,948244	-0,0015	1,946323	2,071642	4,180354	0,013329	1,988664
2015M12	1,967548	3,743118	0,083	1,950601	-0,00193	1,954735	2,066027	4,174817	0,013212	1,991373
2016M01	1,960471	3,751587	0,094	1,95324	-0,00222	1,960899	2,072047	4,167605	0,012729	1,993584
2016M02	1,939519	3,809021	0,104	1,957459	-0,00251	1,965005	2,076106	4,167179	0,012005	1,994694
2016M03	1,93902	3,820727	0,092	1,953254	-0,0031	1,962647	2,073694	4,180202	0,01193	1,992663
2016M04	1,959995	3,831422	0,087	1,953667	-0,00342	1,964478	2,071221	4,177775	0,011612	1,992479
2016M05	1,941014	3,824841	0,076	1,954195	-0,00352	1,966527	2,064678	4,180799	0,013211	1,992806
2016M06	1,958564	3,835881	0,079	1,952481	-0,00357	1,962895	2,072031	4,184728	0,013323	1,992118
2016M07	1,958086	3,839101	0,08	1,951446	-0,00366	1,962771	2,073754	4,191492	0,013194	1,993012
2016M08	1,959995	3,832317	0,083	1,951318	-0,00371	1,959857	2,078247	4,191935	0,013188	1,992349
2016M09	1,949878	3,834611	0,084	1,949862	-0,00374	1,960646	2,081983	4,194759	0,013188	1,99187
2016M10	1,970812	3,828724	0,082	1,948965	-0,00378	1,957701	2,07581	4,191377	0,013183	1,989845
2016M11	1,966142	3,81498	0,07	1,948438	-0,00381	1,956905	2,078095	4,194287	0,013183	1,989644
2016M12	1,977266	3,815511	0,069	1,947602	-0,00382	1,954407	2,088242	4,198688	0,013059	1,987601

K2 The country Data Romania

date	ip	fs	i	reer	ips	fss	is	reers	eur	eureer
2002M01	1,914872	3,740094	0,348	1,932493	1,9351	3,81901	0,051574	1,904529	0,033463	1,944135
2002M02	1,914343	3,75254	0,346	1,931295	1,92564	3,803876	0,052176	1,907506	0,033367	1,944397
2002M03	1,917506	3,766881	0,342	1,923305	1,921954	3,799826	0,052325	1,910089	0,033446	1,945522
2002M04	1,925312	3,773238	0,341	1,923866	1,945086	3,80862	0,046894	1,911328	0,033351	1,95067
2002M05	1,885361	3,823924	0,322	1,918753	1,934781	3,813502	0,052233	1,908437	0,033719	1,955653
2002M06	1,918555	3,787553	0,306	1,915876	1,938559	3,832506	0,051274	1,91674	0,033827	1,966754
2002M07	1,921166	3,806261	0,283	1,905316	1,942609	3,82173	0,053759	1,92151	0,03359	1,980764
2002M08	1,92737	3,826988	0,272	1,914215	1,944387	3,81963	0,051098	1,92054	0,033325	1,978532
2002M09	1,925828	3,832509	0,256	1,91566	1,943594	3,805862	0,049749	1,920466	0,033159	1,981641
2002M10	1,926857	3,856227	0,238	1,920597	1,944285	3,846755	0,051144	1,920409	0,033041	1,98101
2002M11	1,92737	3,85072	0,222	1,918608	1,955	3,868239	0,052225	1,918521	0,032281	1,983287
2002M12	1,922725	3,845656	0,204	1,913538	1,948237	3,872826	0,04734	1,918709	0,029754	1,983879
2003M01	1,919601	3,840815	0,196	1,909435	1,971537	3,857599	0,043424	1,921806	0,028524	1,992778
2003M02	1,913284	3,839359	0,192	1,907323	1,958306	3,847511	0,041595	1,924261	0,027724	2,002826
2003M03	1,907411	3,835462	0,184	1,907476	1,972652	3,819168	0,041046	1,92605	0,026008	2,005082
2003M04	1,91803	3,829992	0,174	1,905549	1,969646	3,834497	0,041128	1,929641	0,025767	2,009256
2003M05	1,916454	3,800064	0,179	1,902751	1,958196	3,832004	0,046301	1,93175	0,025232	2,020144
2003M06	1,925312	3,810716	0,182	1,905481	1,966164	3,840761	0,044331	1,932243	0,021748	2,021799
2003M07	1,920123	3,866246	0,182	1,913112	1,97354	3,844434	0,041668	1,930748	0,021286	2,019662
2003M08	1,91803	3,890069	0,182	1,911991	1,967518	3,855049	0,040945	1,931961	0,021205	2,01448
2003M09	1,912753	3,891074	0,1911	1,912976	1,983044	3,854394	0,040571	1,93182	0,021248	2,016378
2003M10	1,91169	3,903036	0,1925	1,914252	1,986849	3,870611	0,040692	1,935951	0,020999	2,023222
2003M11	1,913814	3,887657	0,2019	1,90798	1,986562	3,875946	0,040541	1,93946	0,020875	2,02325

2003M12	1,916454	3,874575	0,2041	1,905589	1,983206	3,860668	0,041514	1,943651	0,021308	2,031098
2004M01	1,919078	3,870392	0,2125	1,907662	1,99323	3,8347	0,039298	1,944522	0,020741	2,033302
2004M02	1,920645	3,873082	0,2125	1,908143	2,001695	3,83407	0,04024	1,945983	0,020597	2,036905
2004M03	1,918555	3,897248	0,2125	1,910879	2,005022	3,840416	0,040653	1,942406	0,020417	2,027174
2004M04	1,91169	3,906637	0,2125	1,904665	2,004312	3,840264	0,040182	1,941373	0,020519	2,022827
2004M05	1,92993	3,919575	0,2125	1,910129	2,004856	3,848898	0,041882	1,943246	0,020602	2,023705
2004M06	1,919078	3,946619	0,2125	1,913484	2,003717	3,863284	0,044702	1,943626	0,020767	2,023009
2004M07	1,926857	3,984104	0,2075	1,912369	2,006395	3,845639	0,047607	1,94552	0,020751	2,027727
2004M08	1,93044	4,017067	0,2029	1,913616	2,002031	3,855372	0,038885	1,945124	0,020777	2,027625
2004M09	1,921166	4,033013	0,1924	1,919156	2,014888	3,864247	0,038112	1,946535	0,020771	2,030272
2004M10	1,926342	4,041045	0,1875	1,926598	2,001763	3,865102	0,037981	1,946472	0,020859	2,033587
2004M11	1,924796	4,040155	0,1875	1,944479	2,011107	3,86426	0,039363	1,948272	0,021099	2,03853
2004M12	1,921166	4,076739	0,1796	1,956157	2,016198	3,839472	0,038481	1,948744	0,021656	2,040312
2005M01	1,906335	4,092394	0,1731	1,965603	2,01396	3,821238	0,038593	1,946097	0,021103	2,031927
2005M02	1,905256	4,117881	0,1569	1,975541	2,012288	3,822203	0,038333	1,945391	0,021028	2,030967
2005M03	1,910624	4,135953	0,1075	1,981398	2,018437	3,828814	0,039248	1,946726	0,021029	2,032811
2005M04	1,913284	4,146952	0,0845	1,988679	2,016641	3,833651	0,039418	1,949762	0,021033	2,030377
2005M05	1,904174	4,157547	0,0796	1,98924	2,024672	3,840847	0,039219	1,945364	0,021041	2,023118
2005M06	1,907949	4,175741	0,08	1,98804	2,025519	3,859734	0,038762	1,943244	0,02104	2,012025
2005M07	1,914343	4,205342	0,08	1,994131	2,027722	3,846417	0,038351	1,94157	0,021078	2,014295
2005M08	1,923762	4,246242	0,08	2,000661	2,02193	3,854488	0,037992	1,944644	0,021135	2,017462
2005M09	1,919078	4,254647	0,0825	2,003364	2,030602	3,865253	0,038289	1,944968	0,02115	2,01668
2005M10	1,920123	4,255721	0,0772	1,997763	2,035971	3,868754	0,038114	1,946437	0,021208	2,013372
2005M11	1,92737	4,257119	0,075	1,995086	2,034522	3,875987	0,038151	1,945006	0,022245	2,008027
2005M12	1,933993	4,261408	0,075	1,991478	2,038704	3,872571	0,037981	1,944236	0,024107	2,005738
2006M01	1,933487	4,275392	0,075	2,000855	2,034706	3,855192	0,036502	1,94515	0,023892	2,007188
2006M02	1,933487	4,284807	0,075	2,008337	2,031837	3,849181	0,036759	1,950978	0,024603	2,006211
2006M03	1,93044	4,300385	0,0847	2,013888	2,035142	3,859247	0,03674	1,952394	0,026347	2,006167
2006M04	1,94939	4,301165	0,085	2,016532	2,042048	3,885368	0,03778	1,955145	0,026493	2,011265
2006M05	1,953276	4,299599	0,085	2,019521	2,056026	3,899571	0,038141	1,959119	0,026944	2,017505
2006M06	1,961895	4,295928	0,085	2,019359	2,051411	3,899983	0,038445	1,963444	0,028708	2,020526
2006M07	1,958564	4,300248	0,085	2,014436	2,04461	3,918737	0,039181	1,960388	0,029401	2,023117
2006M08	1,961895	4,30426	0,0875	2,015648	2,055498	3,910467	0,039105	1,959956	0,030956	2,023175
2006M09	1,972203	4,308229	0,0875	2,019575	2,050544	3,923339	0,03936	1,957975	0,031582	2,022404
2006M10	1,97359	4,356899	0,0875	2,023392	2,050164	3,928786	0,03881	1,959115	0,033513	2,018977
2006M11	1,971276	4,358985	0,0875	2,03032	2,048446	3,943539	0,039881	1,960513	0,034228	2,019572
2006M12	1,981366	4,360503	0,0875	2,039929	2,052368	3,932007	0,040738	1,962177	0,036408	2,021805
2007M01	1,980912	4,368954	0,0875	2,044345	2,061337	3,840273	0,042307	1,96251	0,036167	2,019306
2007M02	1,992111	4,3688	0,0875	2,042834	2,072478	3,849915	0,04256	1,963298	0,036523	2,023335
2007M03	1,997823	4,365617	0,0808	2,043456	2,07053	3,868459	0,043551	1,962802	0,038456	2,021014
2007M04	1,988113	4,36343	0,08	2,045879	2,072139	3,871231	0,044365	1,963953	0,038599	2,02394
2007M05	1,994317	4,372584	0,075	2,053352	2,074262	3,871105	0,046088	1,964414	0,039173	2,023701
2007M06	1,999131	4,373317	0,0725	2,061975	2,073398	3,878492	0,044099	1,96698	0,040999	2,021166

2007M07	2,001301	4,381601	0,0725	2,073401	2,077734	3,885815	0,047472	1,971384	0,041068	2,024899
2007M08	2,003029	4,420662	0,061	2,062744	2,076808	3,893325	0,047609	1,981403	0,043124	2,02482
2007M09	2	4,430448	0,0648	2,055254	2,076745	3,941677	0,048464	1,983005	0,04435	2,028533
2007M10	2,007321	4,431669	0,0687	2,060281	2,07882	3,942286	0,04963	1,983027	0,042338	2,030517
2007M11	2,0086	4,435147	0,07	2,048447	2,078524	3,948116	0,052336	1,986253	0,042165	2,034723
2007M12	2,012415	4,434358	0,075	2,03877	2,081029	3,947872	0,0538	1,987021	0,047061	2,033525
2008M01	2,016197	4,441298	0,075	2,023999	2,08315	3,933531	0,054226	1,989854	0,041949	2,035478
2008M02	2,0141	4,437241	0,08	2,02882	2,078689	3,93346	0,055331	1,991817	0,041825	2,034782
2008M03	2,017451	4,43352	0,09	2,025973	2,07513	3,95155	0,056424	1,997403	0,043075	2,041934
2008M04	2,008174	4,434583	0,0903	2,033452	2,087338	3,963664	0,056842	2,001118	0,043693	2,043695
2008M05	2,0187	4,431709	0,095	2,028895	2,085009	3,959844	0,058127	2,000816	0,043864	2,043762
2008M06	2,009876	4,429445	0,0975	2,028611	2,087026	3,9701	0,059609	2,00249	0,044707	2,041144
2008M07	2,011993	4,434318	0,0975	2,036925	2,081798	3,983	0,060826	2,003164	0,044693	2,042799
2008M08	2,015779	4,444254	0,1	2,037148	2,071804	3,992278	0,061819	1,999961	0,044818	2,032488
2008M09	2,0141	4,44874	0,1025	2,030431	2,076503	4,004641	0,062576	1,999819	0,046567	2,026426
2008M10	2,009451	4,465769	0,1025	2,024043	2,060926	3,992195	0,062549	1,999008	0,048146	2,014408
2008M11	1,970812	4,467466	0,1025	2,023025	2,045073	3,996823	0,065455	1,997703	0,038224	2,008586
2008M12	1,959995	4,451324	0,1025	2,016708	2,032198	3,961371	0,064561	2,005819	0,029822	2,031774
2009M01	1,963316	4,45313	0,1025	1,990639	1,998492	3,946355	0,063065	2,009563	0,021295	2,032575
2009M02	1,97359	4,45334	0,1025	1,989789	2,00945	3,940338	0,060799	2,010622	0,0162	2,032684
2009M03	1,965672	4,438169	0,1014	1,993435	2,000916	3,929571	0,055078	2,012061	0,012628	2,034442
2009M04	1,980458	4,433186	0,1007	1,994466	1,998854	3,938552	0,057222	2,010059	0,010019	2,028994
2009M05	1,982723	4,464805	0,1002	1,998564	1,994816	3,932825	0,053629	2,011975	0,00878	2,034628
2009M06	1,983626	4,457726	0,0971	1,997019	1,997581	3,934145	0,050751	2,016241	0,008917	2,03832
2009M07	1,986772	4,470413	0,095	1,993808	2,000252	3,936617	0,053306	2,012738	0,005696	2,038118
2009M08	1,983175	4,476404	0,09	1,99105	1,998328	3,967518	0,046142	2,012849	0,004627	2,039357
2009M09	1,989895	4,485943	0,0853	1,996097	1,995715	3,976045	0,045593	2,013081	0,004065	2,042262
2009M10	1,994757	4,487803	0,085	1,996045	2,000993	3,981721	0,044087	2,012484	0,003905	2,043363
2009M11	1,990339	4,496008	0,08	1,998172	2,002485	3,988113	0,042809	2,01119	0,004021	2,040435
2009M12	1,992111	4,489376	0,08	2,002313	1,993019	3,999063	0,044419	2,009768	0,00447	2,037808
2010M01	1,993436	4,486049	0,08	2,01282	1,987628	3,986434	0,043983	2,005216	0,003991	2,028002
2010M02	1,988559	4,511426	0,075	2,009636	1,973295	3,978351	0,042847	2,002918	0,003849	2,018145
2010M03	1,997386	4,541382	0,0725	2,007472	1,996714	3,942987	0,04201	2,00013	0,003732	2,009874
2010M04	2,001734	4,54814	0,07	1,996786	1,989109	3,978044	0,04293	2,000002	0,003685	2,002303
2010M05	1,996512	4,547179	0,065	1,989762	1,995216	3,988371	0,047921	1,997779	0,00389	1,992896
2010M06	2,009451	4,544058	0,0625	1,983759	2,005054	4,005287	0,045757	1,995926	0,00408	1,982617
2010M07	2,009876	4,538713	0,0625	1,996036	1,99647	4,009666	0,048584	1,99931	0,005333	1,99413
2010M08	1,983626	4,541562	0,0625	1,997759	2,008757	4,012494	0,049586	1,998989	0,00581	1,991871
2010M09	2,01494	4,55365	0,0625	1,999013	2,003879	4,009412	0,050047	1,998808	0,005755	1,991563
2010M10	2,021189	4,550612	0,0625	2,004734	2,00834	4,013812	0,046154	2,001601	0,007379	2,00275
2010M11	2,020361	4,560169	0,0625	2,003318	2,009438	4,009359	0,050263	2,000349	0,007888	1,995175
2010M12	2,02735	4,555707	0,0625	2,00048	2,007992	4,020117	0,051007	1,9978	0,007391	1,988086
2011M01	2,028571	4,55566	0,0625	2,003776	2,014285	3,999495	0,051602	1,997976	0,007334	1,98757

2011M02	2,03543	4,54982	0,0625	2,007324	2,015222	4,001579	0,050689	2,002832	0,008462	1,994173
2011M03	2,033424	4,557789	0,0625	2,01635	2,016162	3,997581	0,052588	2,005483	0,008586	1,998063
2011M04	2,03583	4,55039	0,0625	2,023436	2,009463	3,990308	0,057144	2,006372	0,010718	2,004034
2011M05	2,033826	4,559455	0,0625	2,022789	2,016558	3,99735	0,059364	2,007055	0,011928	2,003826
2011M06	2,036629	4,578333	0,0625	2,0176	2,001848	3,998936	0,061729	2,007547	0,012386	2,002157
2011M07	2,039414	4,561665	0,0625	2,010656	2,01693	4,003568	0,061734	2,005396	0,013705	2,000512
2011M08	2,041393	4,565446	0,0625	2,010379	2,003584	4,012799	0,06356	2,006202	0,013187	2,000393
2011M09	2,039811	4,575669	0,0625	2,005282	2,015079	4,024132	0,070408	2,004727	0,012916	1,996836
2011M10	2,042182	4,559786	0,0625	2,005421	2,007313	4,026482	0,076103	2,003875	0,013035	1,996084
2011M11	2,044932	4,556552	0,06	2,00331	2,006773	4,021636	0,091324	2,003285	0,01167	1,993066
2011M12	2,043755	4,571147	0,06	2,001834	1,996454	4,028522	0,105283	1,999688	0,010659	1,987508
2012M01	2,042969	4,569243	0,0575	1,995685	1,997026	4,028275	0,10306	1,995133	0,007732	1,977936
2012M02	2,039811	4,577742	0,055	1,991808	1,991993	4,016062	0,106036	1,996588	0,0056	1,981867
2012M03	2,042576	4,588351	0,0525	1,988326	2,003647	4,018323	0,086833	1,996856	0,003992	1,980786
2012M04	2,039811	4,582708	0,0525	1,984449	2,003671	4,024129	0,066201	1,996745	0,003561	1,979932
2012M05	2,050766	4,576658	0,0525	1,978716	2,014044	4,030202	0,072256	1,997127	0,0034	1,978202
2012M06	2,049606	4,569622	0,0525	1,980844	2,009983	4,034861	0,078659	1,995138	0,003276	1,973291
2012M07	2,048053	4,562936	0,0525	1,97129	2,010019	4,060117	0,075059	1,994172	0,001665	1,967644
2012M08	2,053846	4,548421	0,0525	1,975292	2,016148	4,063518	0,067482	1,993718	0,000838	1,9644
2012M09	2,057286	4,568336	0,0525	1,984281	2,002597	4,074415	0,057573	1,999413	0,000728	1,974131
2012M10	2,051538	4,558435	0,0525	1,980135	2,001452	4,063116	0,051256	1,997383	0,000603	1,973672
2012M11	2,057666	4,551382	0,0525	1,983154	2,000978	4,061207	0,04874	1,995893	0,00055	1,970354
2012M12	2,063333	4,549163	0,0525	1,98907	2,011242	4,064797	0,040111	1,997689	0,000532	1,977856
2013M01	2,064832	4,551168	0,0525	2,006725	2,008413	4,034139	0,035924	1,998835	0,000538	1,983421
2013M02	2,068928	4,558886	0,0525	2,004732	1,997041	4,029719	0,035342	2,000315	0,000556	1,98838
2013M03	2,072985	4,560937	0,0525	2,000356	1,997516	4,036616	0,03678	1,996695	0,000583	1,98151
2013M04	2,082785	4,558298	0,0525	2,0017	1,999529	4,030598	0,035621	1,996177	0,000608	1,980966
2013M05	2,040207	4,560051	0,0525	2,006846	1,990134	4,020414	0,030367	1,996637	0,00058	1,984449
2013M06	2,077004	4,548774	0,0525	2,001262	2,002636	4,020346	0,031739	2,000456	0,000653	1,990304
2013M07	2,085647	4,564629	0,0525	2,006067	2,000785	4,044734	0,033583	1,997346	0,000757	1,992682
2013M08	2,087781	4,552431	0,045	2,006123	2,006912	4,048277	0,031539	1,996815	0,00081	1,993946
2013M09	2,090611	4,560931	0,045	2,000017	2,005032	4,042464	0,031082	1,997033	0,000855	1,993348
2013M10	2,096215	4,577677	0,0425	2,00444	2,008388	4,032494	0,028415	1,996006	0,000871	1,993536
2013M11	2,097604	4,549812	0,04	2,004865	2,004568	4,026829	0,027201	1,995134	0,001025	1,993009
2013M12	2,096562	4,549426	0,04	2,004736	2,005956	4,019383	0,028187	1,998024	0,001856	2,000319
2014M01	2,101059	4,556094	0,0375	2,00436	2,009572	4,027894	0,026223	1,99802	0,002018	1,999943
2014M02	2,103119	4,54233	0,035	2,004207	2,009026	4,040963	0,024266	1,997896	0,001974	2,002167
2014M03	2,106191	4,536683	0,035	2,005735	2,002843	4,055103	0,022367	2,000659	0,002079	2,006246
2014M04	2,100715	4,550919	0,035	2,007021	2,010256	4,050445	0,021527	1,999205	0,002248	2,003869
2014M05	2,105851	4,528302	0,035	2,008252	2,010935	4,044932	0,021983	1,995923	0,002359	2,000089
2014M06	2,108227	4,537091	0,035	2,014557	1,99785	4,054829	0,020987	1,994	0,001335	1,994609
2014M07	2,108565	4,533159	0,035	2,012127	2,004823	4,0742	0,02119	1,993781	0,000857	1,994846
2014M08	2,103462	4,533126	0,0325	2,007886	1,999689	4,075993	0,020783	1,990931	0,000773	1,987668

2014M09	2,109916	4,534814	0,0325	2,006798	2,005783	4,076248	0,020073	1,987946	0,000107	1,981343
2014M10	2,111934	4,548103	0,03	2,006787	2,010831	4,073175	0,021818	1,986128	4,16E-05	1,97636
2014M11	2,111263	4,539552	0,03	2,005115	2,0108	4,08618	0,024178	1,985952	4,11E-05	1,977641
2014M12	2,111599	4,550297	0,0275	2,003593	2,008136	4,096684	0,025182	1,987936	0,000113	1,980919
2015M01	2,116276	4,535462	0,0275	1,999898	2,014409	4,093592	0,02856	1,981256	-6,5E-05	1,964082
2015M02	2,117271	4,532277	0,0225	1,996697	2,017401	4,119219	0,028076	1,978431	-7E-05	1,957007
2015M03	2,117934	4,534829	0,0225	1,992594	2,017689	4,157839	0,030458	1,975583	-0,00012	1,944617
2015M04	2,117271	4,527398	0,02	1,991257	2,018343	4,157536	0,03328	1,973726	-0,00042	1,939586
2015M05	2,11694	4,529351	0,0175	1,992299	2,014273	4,146422	0,031218	1,976107	-0,00063	1,948459
2015M06	2,120245	4,526624	0,0175	1,985814	2,013001	4,141588	0,040805	1,977848	-0,00073	1,95202
2015M07	2,121231	4,511053	0,0175	1,985498	2,014365	4,150144	0,033324	1,974795	-0,00081	1,949525
2015M08	2,119256	4,514136	0,0175	1,988994	2,019459	4,148487	0,029771	1,980226	-0,00099	1,956592
2015M09	2,124178	4,511549	0,0175	1,993281	2,016592	4,149344	0,025654	1,983319	-0,00114	1,962697
2015M10	2,122871	4,545652	0,0175	1,993505	2,018223	4,16113	0,023135	1,97927	-0,00128	1,958727
2015M11	2,122544	4,550133	0,0175	1,987614	2,022803	4,160832	0,021224	1,97388	-0,0015	1,946323
2015M12	2,121231	4,550045	0,0175	1,98579	2,022001	4,155313	0,023125	1,977427	-0,00193	1,954735
2016M01	2,11227	4,545047	0,0175	1,985483	2,029251	4,150521	0,025017	1,980264	-0,00222	1,960899
2016M02	2,115611	4,539035	0,0175	1,98594	2,024996	4,163998	0,026371	1,9821	-0,00251	1,965005
2016M03	2,118926	4,54283	0,0175	1,985237	2,024707	4,180741	0,02353	1,978953	-0,0031	1,962647
2016M04	2,128076	4,546648	0,0175	1,983713	2,025815	4,181992	0,021981	1,979379	-0,00342	1,964478
2016M05	2,109241	4,559868	0,0175	1,981847	2,021207	4,182029	0,019636	1,980035	-0,00352	1,966527
2016M06	2,118595	4,55234	0,0175	1,982928	2,032496	4,191882	0,020463	1,978822	-0,00357	1,962895
2016M07	2,122216	4,564228	0,0175	1,983669	2,030383	4,198712	0,020524	1,979148	-0,00366	1,962771
2016M08	2,126131	4,567	0,0175	1,98474	2,031313	4,197304	0,021201	1,978421	-0,00371	1,959857
2016M09	2,12969	4,571194	0,0175	1,984978	2,033028	4,200654	0,021429	1,977354	-0,00374	1,960646
2016M10	2,126131	4,582345	0,0175	1,98199	2,034519	4,19182	0,020964	1,975616	-0,00378	1,957701
2016M11	2,130655	4,581198	0,0175	1,981041	2,036705	4,193995	0,018225	1,975884	-0,00381	1,956905
2016M12	2,137671	4,578697	0,0175	1,978557	2,046087	4,201258	0,017838	1,974791	-0,00382	1,954407

K2 The country Data Slovenia

date	ip	fs	i	reer	ips	fss	is	reers	eur	eureer
2002M01	1,94939	3,684495	0,079872	1,985051	1,945584	3,677169	0,133292	1,95328	0,033463	1,944135
2002M02	1,947924	3,706923	0,078631	1,983082	1,939496	3,678812	0,132889	1,95391	0,033367	1,944397
2002M03	1,944976	3,704751	0,07739	1,982528	1,937525	3,687289	0,131096	1,952722	0,033446	1,945522
2002M04	1,955688	3,713264	0,076149	1,985065	1,944306	3,687148	0,130829	1,954313	0,033351	1,95067
2002M05	1,943	3,712338	0,074908	1,984149	1,939568	3,69936	0,125291	1,953326	0,033719	1,955653
2002M06	1,943989	3,722757	0,074908	1,984615	1,93976	3,697442	0,122975	1,956781	0,033827	1,966754
2002M07	1,949878	3,721555	0,073668	1,987616	1,94791	3,705289	0,119585	1,955812	0,03359	1,980764
2002M08	1,949878	3,726189	0,073668	1,989484	1,95329	3,713614	0,116463	1,957396	0,033325	1,978532
2002M09	1,951823	3,768261	0,073668	1,989279	1,962684	3,711953	0,113501	1,960375	0,033159	1,981641
2002M10	1,946452	3,773794	0,072427	1,98922	1,96863	3,720353	0,112059	1,959864	0,033041	1,98101
2002M11	1,945469	3,823063	0,071186	1,9889	1,971565	3,726347	0,111087	1,959515	0,032281	1,983287

2002M12	1,945961	3,818153	0,071186	1,989189	1,960248	3,714522	0,109403	1,959876	0,029754	1,983879
2003M01	1,943	3,817579	0,069945	1,992549	1,955253	3,706806	0,107483	1,958485	0,028524	1,992778
2003M02	1,953276	3,822573	0,069945	1,995321	1,956679	3,726771	0,105839	1,955855	0,027724	2,002826
2003M03	1,94939	3,812118	0,069182	1,995735	1,962167	3,714637	0,102002	1,951754	0,026008	2,005082
2003M04	1,944976	3,814241	0,069182	1,996094	1,967378	3,723952	0,098812	1,957897	0,025767	2,009256
2003M05	1,949878	3,812532	0,069	1,998084	1,966863	3,718306	0,10013	1,957971	0,025232	2,020144
2003M06	1,946452	3,830736	0,0608	1,998362	1,967145	3,722211	0,100412	1,958117	0,021748	2,021799
2003M07	1,949878	3,826567	0,0595	1,997233	1,966946	3,726128	0,100127	1,960693	0,021286	2,019662
2003M08	1,950851	3,83633	0,0598	1,995662	1,964585	3,743523	0,100049	1,961062	0,021205	2,01448
2003M09	1,953276	3,830973	0,0598	1,995069	1,971569	3,749179	0,101348	1,961436	0,021248	2,016378
2003M10	1,961895	3,825828	0,0549	1,997175	1,97535	3,753452	0,101501	1,962613	0,020999	2,023222
2003M11	1,963788	3,824516	0,0513	1,997226	1,967524	3,768703	0,102434	1,961639	0,020875	2,02325
2003M12	1,958086	3,824451	0,0511	1,99798	1,958745	3,764923	0,102887	1,961486	0,021308	2,031098
2004M01	1,963316	3,82835	0,0503	1,998328	1,961971	3,765545	0,104276	1,962965	0,020741	2,033302
2004M02	1,961421	3,832777	0,0539	1,999071	1,977049	3,765419	0,10476	1,963996	0,020597	2,036905
2004M03	1,968483	3,824432	0,051	1,995271	1,980276	3,749408	0,104915	1,96469	0,020417	2,027174
2004M04	1,97174	3,831307	0,044	1,993427	1,975703	3,762707	0,104984	1,961522	0,020519	2,022827
2004M05	1,960946	3,815956	0,041	1,99371	1,973405	3,76254	0,105195	1,964605	0,020602	2,023705
2004M06	1,966142	3,803177	0,0387	1,993219	1,974544	3,767861	0,10554	1,966258	0,020767	2,023009
2004M07	1,967548	3,797392	0,0382	1,993807	1,978391	3,770209	0,105042	1,966402	0,020751	2,027727
2004M08	1,97359	3,801719	0,0373	1,993052	1,982207	3,783209	0,103508	1,968041	0,020777	2,027625
2004M09	1,973128	3,803519	0,0368	1,992819	1,978714	3,784839	0,101914	1,966412	0,020771	2,030272
2004M10	1,970812	3,799527	0,0363	1,993565	1,97445	3,781489	0,101393	1,967	0,020859	2,033587
2004M11	1,970347	3,80599	0,0368	1,997497	1,978031	3,778437	0,102104	1,971231	0,021099	2,03853
2004M12	1,966142	3,803996	0,0355	1,994519	1,986697	3,785918	0,100936	1,974278	0,021656	2,040312
2005M01	1,972203	3,813094	0,0365	1,991833	1,982179	3,791513	0,09982	1,974249	0,021103	2,031927
2005M02	1,970347	3,815319	0,0365	1,993083	1,980542	3,796877	0,096984	1,977423	0,021028	2,030967
2005M03	1,981819	3,807738	0,0366	1,994146	1,973764	3,805802	0,090643	1,980555	0,021029	2,032811
2005M04	1,980458	3,807738	0,0368	1,992601	1,995885	3,811313	0,087749	1,983247	0,021033	2,030377
2005M05	1,983626	3,78331	0,0373	1,990474	1,996818	3,823449	0,087001	1,979806	0,021041	2,023118
2005M06	1,990783	3,817486	0,0373	1,987693	2,000643	3,832314	0,086999	1,977604	0,02104	2,012025
2005M07	1,997386	3,819096	0,0364	1,990869	1,99618	3,836223	0,086953	1,978301	0,021078	2,014295
2005M08	1,979548	3,816003	0,037	1,989617	1,99052	3,843766	0,086902	1,978906	0,021135	2,017462
2005M09	1,992554	3,827175	0,0371	1,992025	2,001802	3,845256	0,087307	1,976566	0,02115	2,01668
2005M10	1,998259	3,815106	0,0367	1,991871	1,994253	3,852262	0,086478	1,981647	0,021208	2,013372
2005M11	1,999565	3,819169	0,0362	1,989238	2,005941	3,857715	0,08559	1,980667	0,022245	2,008027
2005M12	2,003461	3,830634	0,0349	1,987817	2,009556	3,872134	0,085209	1,979622	0,024107	2,005738
2006M01	2,001301	3,837708	0,0343	1,986711	2,003199	3,875301	0,07069	1,98328	0,023892	2,007188
2006M02	2	3,844639	0,033	1,987515	2,004236	3,887588	0,0706	1,987336	0,024603	2,006211
2006M03	1,995196	3,832419	0,0317	1,988115	1,992677	3,901801	0,071826	1,986804	0,026347	2,006167
2006M04	2,004751	3,824523	0,0318	1,989529	2,005414	3,910312	0,071606	1,989131	0,026493	2,011265
2006M05	2,017033	3,822456	0,0332	1,991167	2,014512	3,922617	0,071315	1,991081	0,026944	2,017505
2006M06	2,000434	3,809081	0,032	1,990581	2,018259	3,93113	0,071404	1,994092	0,028708	2,020526

2006M07	2,019532	3,781418	0,0319	1,990752	2,020797	3,942734	0,07136	1,99184	0,029401	2,023117
2006M08	2,018284	3,76177	0,034	1,993966	2,026077	3,934012	0,071661	1,991347	0,030956	2,023175
2006M09	2,020361	3,761567	0,0334	1,995713	2,025482	3,917854	0,071585	1,986746	0,031582	2,022404
2006M10	2,023664	3,767668	0,0335	1,991335	2,02803	3,939671	0,071588	1,988361	0,033513	2,018977
2006M11	2,033021	3,759947	0,0336	1,990921	2,025343	3,957784	0,071839	1,99232	0,034228	2,019572
2006M12	2,041393	3,724644	0,0335	1,992452	2,034494	3,948382	0,071996	1,992978	0,036408	2,021805
2007M01	2,039811	2,815445	0,0353	1,991541	2,027675	3,96193	0,072143	1,992251	0,036167	2,019306
2007M02	2,033826	2,885248	0,037	1,991203	2,037203	3,974497	0,071979	1,99281	0,036523	2,023335
2007M03	2,03583	2,886378	0,0379	1,990856	2,042762	3,975453	0,071002	1,992547	0,038456	2,021014
2007M04	2,046495	2,85083	0,0388	1,992004	2,036065	3,975678	0,070832	1,993154	0,038599	2,02394
2007M05	2,036629	2,89215	0,0398	1,994148	2,040951	3,975697	0,07026	1,995379	0,039173	2,023701
2007M06	2,048053	2,893207	0,0401	1,994472	2,041552	3,966669	0,069576	1,995752	0,040999	2,021166
2007M07	2,052309	2,809425	0,0405	1,996349	2,04462	3,977898	0,070116	1,99836	0,041068	2,024899
2007M08	2,055378	2,808414	0,0405	1,998259	2,043384	3,979177	0,06842	2,000174	0,043124	2,02482
2007M09	2,048053	2,861475	0,0405	1,999182	2,040983	3,972588	0,068886	2,002052	0,04435	2,028533
2007M10	2,055378	2,848251	0,0403	2,000598	2,047131	3,979399	0,069561	2,00367	0,042338	2,030517
2007M11	2,047275	2,85467	0,04	2,001621	2,046265	3,98495	0,069981	2,004464	0,042165	2,034723
2007M12	2,042969	2,806112	0,0398	2,002524	2,042604	3,991174	0,070963	2,005688	0,047061	2,033525
2008M01	2,063709	2,806384	0,0398	2,004798	2,056234	3,991411	0,071088	2,005563	0,041949	2,035478
2008M02	2,066326	2,778513	0,0395	2,004096	2,050322	4,002001	0,08228	2,00666	0,041825	2,034782
2008M03	2,064083	2,837399	0,039	2,006701	2,051107	4,007427	0,084351	2,008785	0,043075	2,041934
2008M04	2,067443	2,784332	0,0405	2,007598	2,049826	4,01157	0,084533	2,011835	0,043693	2,043695
2008M05	2,060698	2,770336	0,0418	2,007128	2,049478	4,014748	0,085897	2,010446	0,043864	2,043762
2008M06	2,073718	2,779163	0,0431	2,007488	2,060577	4,012919	0,086568	2,01208	0,044707	2,041144
2008M07	2,054996	2,83155	0,045	2,008154	2,049608	4,010337	0,086697	2,013886	0,044693	2,042799
2008M08	2,064458	2,770557	0,0452	2,003623	2,04489	4,015756	0,087172	2,01303	0,044818	2,032488
2008M09	2,058805	2,790778	0,0453	2,002763	2,047465	4,018348	0,087618	2,013047	0,046567	2,026426
2008M10	2,064083	2,800236	0,035	2,001576	2,042637	4,006105	0,087717	2,008667	0,048146	2,014408
2008M11	2,005609	2,801815	0,03	1,99775	2,031823	4,014506	0,088113	2,009616	0,038224	2,008586
2008M12	1,955207	2,764923	0,022	2,004291	2,011021	3,989111	0,088083	2,011449	0,029822	2,031774
2009M01	1,992554	2,78597	0,022	2,007629	1,99931	3,971605	0,087928	2,007285	0,021295	2,032575
2009M02	1,965672	2,719497	0,012	2,011455	2,007509	3,967062	0,08776	2,006512	0,0162	2,032684
2009M03	1,960471	2,682506	0,012	2,013107	2,003509	3,971282	0,086942	2,007311	0,012628	2,034442
2009M04	1,948413	2,691524	0,012	2,008094	2,016505	3,970675	0,088417	2,007497	0,010019	2,028994
2009M05	1,954725	2,610447	0,0105	2,00914	2,006134	3,971358	0,087938	2,010449	0,00878	2,034628
2009M06	1,952308	2,620136	0,0121	2,011866	2,001295	3,981141	0,087137	2,013882	0,008917	2,03832
2009M07	1,959041	2,67431	0,0121	2,010712	2,000544	3,985089	0,087113	2,010357	0,005696	2,038118
2009M08	1,968016	2,643058	0,0121	2,010188	2,000419	4,000825	0,085538	2,010228	0,004627	2,039357
2009M09	1,979548	2,623869	0,0055	2,010768	2,002411	4,004675	0,084847	2,011542	0,004065	2,042262
2009M10	1,970812	2,615634	0,0055	2,010199	2,011891	4,013063	0,08463	2,014373	0,003905	2,043363
2009M11	1,982271	2,603577	0,0055	2,011708	2,002914	4,033988	0,083753	2,013766	0,004021	2,040435
2009M12	1,971276	2,617	0,0055	2,010017	1,992592	4,041009	0,083635	2,011633	0,00447	2,037808
2010M01	1,965672	2,57565	0,0045	2,006577	2,006635	4,040368	0,083285	2,011396	0,003991	2,028002

2010M02	1,980003	2,564903	0,0045	2,005333	1,998731	4,034297	0,082179	2,008138	0,003849	2,018145
2010M03	1,985875	2,56573	0,0045	2,002227	1,999959	3,357345	0,08147	2,005404	0,003732	2,009874
2010M04	1,989895	2,534026	0,0048	2,00056	1,997829	4,038534	0,08073	2,001443	0,003685	2,002303
2010M05	1,998259	2,621695	0,0048	1,998328	1,995251	4,0441	0,080493	1,99691	0,00389	1,992896
2010M06	1,997386	2,647774	0,0048	1,997767	1,999365	4,049727	0,079325	1,99562	0,00408	1,982617
2010M07	1,997386	2,643058	0,0055	2,000317	1,999448	4,076124	0,079387	1,999905	0,005333	1,99413
2010M08	2,005609	2,634175	0,0055	2,000272	2,000753	4,08091	0,079308	1,9981	0,00581	1,991871
2010M09	2,003891	2,591065	0,0055	1,997565	2,012189	4,075022	0,07926	1,99675	0,005755	1,991563
2010M10	2,005609	2,563481	0,0071	1,998185	2,001943	4,073049	0,078739	1,998088	0,007379	2,00275
2010M11	2,006466	2,603361	0,0071	1,996578	2,003743	4,072894	0,079282	1,995547	0,007888	1,995175
2010M12	2,019116	2,579097	0,0071	1,995869	1,997797	4,063911	0,079123	1,992058	0,007391	1,988086
2011M01	2,001734	2,54058	0,0066	1,994299	1,99508	4,056069	0,079134	1,993273	0,007334	1,98757
2011M02	2,003891	2,529687	0,0066	1,994478	2,004544	4,055714	0,079014	1,997029	0,008462	1,994173
2011M03	2,011147	2,51746	0,0066	1,997136	2,002147	4,085464	0,079259	1,999426	0,008586	1,998063
2011M04	2,003029	2,4843	0,0111	1,997827	2,013992	4,081266	0,079806	2,000967	0,010718	2,004034
2011M05	2,01494	2,497206	0,0111	1,999084	2,008761	4,08487	0,080121	1,998898	0,011928	2,003826
2011M06	2,001734	2,463594	0,0111	1,997009	2,002801	4,088127	0,080444	1,99654	0,012386	2,002157
2011M07	2,000434	2,480151	0,0139	1,994605	2,012188	4,080806	0,080414	1,993356	0,013705	2,000512
2011M08	1,998259	2,452247	0,0139	1,995679	1,993759	4,082776	0,080655	1,993028	0,013187	2,000393
2011M09	2,011993	2,431525	0,0139	1,996849	2,012392	4,088857	0,08156	1,989701	0,012916	1,996836
2011M10	2,004751	2,447468	0,0119	1,997773	2,008392	4,083778	0,08234	1,990261	0,013035	1,996084
2011M11	2,009876	2,390759	0,0119	1,997137	2,003531	4,088588	0,083989	1,991239	0,01167	1,993066
2011M12	2,003029	2,406881	0,0119	1,994532	2,00711	4,088817	0,067226	1,98659	0,010659	1,987508
2012M01	2,003029	2,498311	0,017	1,992301	1,98082	4,080213	0,066536	1,979979	0,007732	1,977936
2012M02	1,996074	2,391817	0,016	1,992787	1,977825	4,094015	0,066599	1,980843	0,0056	1,981867
2012M03	2,006894	2,296226	0,0083	1,991667	1,976536	4,095041	0,063784	1,98251	0,003992	1,980786
2012M04	2,0103	2,301681	0,0082	1,992606	1,984845	4,122462	0,061054	1,983135	0,003561	1,979932
2012M05	2,001734	2,331832	0,008	1,993291	1,994265	4,113454	0,061717	1,984448	0,0034	1,978202
2012M06	2,009026	2,33163	0,009	1,990415	1,996058	4,100713	0,06256	1,981424	0,003276	1,973291
2012M07	2,000868	2,412293	0,0105	1,9867	1,994036	4,102204	0,062073	1,978256	0,001665	1,967644
2012M08	2,01494	2,407391	0,0105	1,986494	2,002958	4,098896	0,061125	1,979747	0,000838	1,9644
2012M09	2,002166	2,351023	0,012	1,991732	1,98987	4,09979	0,059815	1,988897	0,000728	1,974131
2012M10	2,001301	2,300161	0,0119	1,98973	1,990387	4,097011	0,058992	1,984933	0,000603	1,973672
2012M11	1,992111	2,275081	0,0091	1,98879	1,989554	4,094296	0,05869	1,984823	0,00055	1,970354
2012M12	1,990339	2,311542	0,0069	1,991151	1,994142	4,093475	0,057575	1,987053	0,000532	1,977856
2013M01	2,000434	2,249198	0,0072	1,992661	1,991226	4,087631	0,056859	1,990749	0,000538	1,983421
2013M02	2,009026	2,276692	0,0075	1,996317	1,989976	4,089134	0,056783	1,992748	0,000556	1,98838
2013M03	1,98945	2,198657	0,0049	1,992263	1,989909	4,09459	0,056973	1,987689	0,000583	1,98151
2013M04	1,999565	2,140508	0,0049	1,993211	1,992006	4,112524	0,056793	1,987371	0,000608	1,980966
2013M05	1,991669	2,064458	0,0049	1,992529	1,979993	4,111674	0,056092	1,988435	0,00058	1,984449
2013M06	1,996512	2,263873	0,0039	1,995209	1,990628	4,106102	0,056184	1,991972	0,000653	1,990304
2013M07	1,991669	2,410271	0,0039	1,997006	1,986317	4,10688	0,056454	1,991722	0,000757	1,992682
2013M08	1,997823	2,409426	0,0049	1,998578	1,998316	4,104858	0,055076	1,991981	0,00081	1,993946

2013M09	1,996512	2,397766	0,0049	1,9982	1,982764	4,102137	0,055016	1,989057	0,000855	1,993348
2013M10	1,998259	2,391817	0,0039	1,997607	1,986804	4,100162	0,054312	1,987807	0,000871	1,993536
2013M11	1,999565	2,397766	0,0039	1,996758	1,992683	4,125473	0,053789	1,988742	0,001025	1,993009
2013M12	2,011147	2,322012	0,0039	1,997062	1,990281	4,125739	0,053914	1,989894	0,001856	2,000319
2014M01	1,999131	2,443889	0,0032	1,997876	2,000918	4,126154	0,04484	1,991114	0,002018	1,999943
2014M02	1,993877	2,546913	0,0025	1,998809	1,99879	4,117474	0,044227	1,990755	0,001974	2,002167
2014M03	2,000868	2,554973	0,0025	2,001255	1,995683	4,106442	0,043981	1,991596	0,002079	2,006246
2014M04	2,001734	2,543074	0,0025	1,999536	1,998966	4,097022	0,043865	1,991282	0,002248	2,003869
2014M05	1,998695	2,564311	0,0025	1,99873	1,994404	4,124945	0,043925	1,990279	0,002359	2,000089
2014M06	2,0086	2,572639	0,0015	1,996737	1,99612	4,110771	0,043805	1,9889	0,001335	1,994609
2014M07	2,015779	2,575996	0,0012	1,995755	1,997053	4,120556	0,043835	1,988584	0,000857	1,994846
2014M08	2,005181	2,56265	0,0008	1,993444	1,991884	4,122495	0,043428	1,985275	0,000773	1,987668
2014M09	2,003029	2,515476	0,0005	1,992014	1,997637	4,11675	0,043338	1,983933	0,000107	1,981343
2014M10	2,014521	2,498586	0,0004	1,990957	1,999266	4,129893	0,043207	1,98243	4,16E-05	1,97636
2014M11	2,012415	2,549616	0,0004	1,991071	2,002899	4,125612	0,043522	1,982794	4,11E-05	1,977641
2014M12	2,014521	2,537315	0,0004	1,994246	2,006767	4,133802	0,043285	1,983049	0,000113	1,980919
2015M01	2,021603	2,575303	0,0013	1,989022	1,991048	4,105366	0,043724	1,977759	-6,5E-05	1,964082
2015M02	2,019947	2,561221	0,00025	1,986053	2,003244	4,13652	0,042936	1,974378	-7E-05	1,957007
2015M03	2,023664	2,632862	0,0003	1,982176	2,006781	4,169156	0,043256	1,971826	-0,00012	1,944617
2015M04	2,023664	2,565494	0	1,977132	2,00584	4,180294	0,043267	1,969927	-0,00042	1,939586
2015M05	2,027757	2,59151	-0,0001	1,980418	2,010072	4,166986	0,042628	1,972713	-0,00063	1,948459
2015M06	2,027757	2,603361	-0,0001	1,981445	2,006694	4,155885	0,043895	1,971962	-0,00073	1,95202
2015M07	2,028978	2,62521	-0,0002	1,98137	2,012326	4,179385	0,042906	1,970108	-0,00081	1,949525
2015M08	2,029789	2,58816	-0,0003	1,984793	2,006913	4,167976	0,04244	1,97449	-0,00099	1,956592
2015M09	2,031812	2,570776	-0,0004	1,98644	2,01877	4,147545	0,041897	1,976024	-0,00114	1,962697
2015M10	2,032216	2,607241	-0,0005	1,983483	2,024196	4,17058	0,041565	1,974117	-0,00128	1,958727
2015M11	2,033021	2,575303	-0,0009	1,979797	2,018101	4,167339	0,024409	1,970209	-0,0015	1,946323
2015M12	2,027757	2,50515	-0,0013	1,984172	2,014107	4,161485	0,024667	1,971024	-0,00193	1,954735
2016M01	2,056524	2,541454	-0,0015	1,985139	2,018042	4,156483	0,02493	1,972682	-0,00222	1,960899
2016M02	2,049218	2,526081	-0,0018	1,986265	2,019606	4,144938	0,025128	1,975047	-0,00251	1,965005
2016M03	2,047275	2,443576	-0,0023	1,985192	2,028863	4,153193	0,024759	1,974946	-0,0031	1,962647
2016M04	2,051153	2,396548	-0,0025	1,984882	2,024232	4,153892	0,024563	1,976547	-0,00342	1,964478
2016M05	2,053846	2,407901	-0,0026	1,986683	2,016199	4,146494	0,024752	1,974511	-0,00352	1,966527
2016M06	2,057666	2,396025	-0,0027	1,986408	2,019977	4,149066	0,02486	1,972563	-0,00357	1,962895
2016M07	2,061075	2,363236	-0,0029	1,985868	2,019888	4,172974	0,024873	1,973712	-0,00366	1,962771
2016M08	2,061075	2,335458	-0,003	1,984234	2,018341	4,177323	0,024964	1,972616	-0,00371	1,959857
2016M09	2,067071	2,363236	-0,003	1,983512	2,027349	4,154962	0,024994	1,973415	-0,00374	1,960646
2016M10	2,065206	2,311542	-0,0031	1,982648	2,02997	4,154858	0,024933	1,973275	-0,00378	1,957701
2016M11	2,069668	2,327972	-0,0031	1,982608	2,039645	4,175901	0,024571	1,973798	-0,00381	1,956905
2016M12	2,077004	2,364926	-0,0032	1,980316	2,060505	4,166084	0,024524	1,970864	-0,00382	1,954407

Data for Euribor

date	EUR1MTD156N
2002-01-01	0,03346
2002-02-01	0,03337
2002-03-01	0,03345
2002-04-01	0,03335
2002-05-01	0,03372
2002-06-01	0,03383
2002-07-01	0,03359
2002-08-01	0,03332
2002-09-01	0,03316
2002-10-01	0,03304
2002-11-01	0,03228
2002-12-01	0,02975
2003-01-01	0,02852
2003-02-01	0,02772
2003-03-01	0,02601
2003-04-01	0,02577
2003-05-01	0,02523
2003-06-01	0,02175
2003-07-01	0,02129
2003-08-01	0,02121
2003-09-01	0,02125
2003-10-01	0,02100
2003-11-01	0,02088
2003-12-01	0,02131
2004-01-01	0,02074
2004-02-01	0,02060
2004-03-01	0,02042
2004-04-01	0,02052
2004-05-01	0,02060
2004-06-01	0,02077
2004-07-01	0,02075
2004-08-01	0,02078
2004-09-01	0,02077
2004-10-01	0,02086
2004-11-01	0,02110
2004-12-01	0,02166
2005-01-01	0,02110
2005-02-01	0,02103
2005-03-01	0,02103
2005-04-01	0,02103
2005-05-01	0,02104
2005-06-01	0,02104
2005-07-01	0,02108
2005-08-01	0,02114
2005-09-01	0,02115
2005-10-01	0,02121
2005-11-01	0,02224

2005-12-01	0,02411
2006-01-01	0,02389
2006-02-01	0,02460
2006-03-01	0,02635
2006-04-01	0,02649
2006-05-01	0,02694
2006-06-01	0,02871
2006-07-01	0,02940
2006-08-01	0,03096
2006-09-01	0,03158
2006-10-01	0,03351
2006-11-01	0,03423
2006-12-01	0,03641
2007-01-01	0,03617
2007-02-01	0,03652
2007-03-01	0,03846
2007-04-01	0,03860
2007-05-01	0,03917
2007-06-01	0,04100
2007-07-01	0,04107
2007-08-01	0,04312
2007-09-01	0,04435
2007-10-01	0,04234
2007-11-01	0,04216
2007-12-01	0,04706
2008-01-01	0,04195
2008-02-01	0,04182
2008-03-01	0,04308
2008-04-01	0,04369
2008-05-01	0,04386
2008-06-01	0,04471
2008-07-01	0,04469
2008-08-01	0,04482
2008-09-01	0,04657
2008-10-01	0,04815
2008-11-01	0,03822
2008-12-01	0,02982
2009-01-01	0,02129
2009-02-01	0,01620
2009-03-01	0,01263
2009-04-01	0,01002
2009-05-01	0,00878
2009-06-01	0,00892
2009-07-01	0,00570
2009-08-01	0,00463
2009-09-01	0,00407
2009-10-01	0,00391
2009-11-01	0,00402
2009-12-01	0,00447
2010-01-01	0,00399

2010-02-01	0,00385
2010-03-01	0,00373
2010-04-01	0,00369
2010-05-01	0,00389
2010-06-01	0,00408
2010-07-01	0,00533
2010-08-01	0,00581
2010-09-01	0,00576
2010-10-01	0,00738
2010-11-01	0,00789
2010-12-01	0,00739
2011-01-01	0,00733
2011-02-01	0,00846
2011-03-01	0,00859
2011-04-01	0,01072
2011-05-01	0,01193
2011-06-01	0,01239
2011-07-01	0,01370
2011-08-01	0,01319
2011-09-01	0,01292
2011-10-01	0,01303
2011-11-01	0,01167
2011-12-01	0,01066
2012-01-01	0,00773
2012-02-01	0,00560
2012-03-01	0,00399
2012-04-01	0,00356
2012-05-01	0,00340
2012-06-01	0,00328
2012-07-01	0,00166
2012-08-01	0,00084
2012-09-01	0,00073
2012-10-01	0,00060
2012-11-01	0,00055
2012-12-01	0,00053
2013-01-01	0,00054
2013-02-01	0,00056
2013-03-01	0,00058
2013-04-01	0,00061
2013-05-01	0,00058
2013-06-01	0,00065
2013-07-01	0,00076
2013-08-01	0,00081
2013-09-01	0,00085
2013-10-01	0,00087
2013-11-01	0,00103
2013-12-01	0,00186
2014-01-01	0,00202
2014-02-01	0,00197
2014-03-01	0,00208

2014-04-01	0,00225
2014-05-01	0,00236
2014-06-01	0,00134
2014-07-01	0,00086
2014-08-01	0,00077
2014-09-01	0,00011
2014-10-01	0,00004
2014-11-01	0,00004
2014-12-01	0,00011
2015-01-01	-0,00006
2015-02-01	-0,00007
2015-03-01	-0,00012
2015-04-01	-0,00042
2015-05-01	-0,00063
2015-06-01	-0,00073
2015-07-01	-0,00081
2015-08-01	-0,00099
2015-09-01	-0,00114
2015-10-01	-0,00128
2015-11-01	-0,00150
2015-12-01	-0,00193
2016-01-01	-0,00222
2016-02-01	-0,00251
2016-03-01	-0,00310
2016-04-01	-0,00342
2016-05-01	-0,00352
2016-06-01	-0,00357
2016-07-01	-0,00366
2016-08-01	-0,00371
2016-09-01	-0,00374
2016-10-01	-0,00378
2016-11-01	-0,00381
2016-12-01	-0,00382

APPENDIX H

From VECM to G-VAR (additions and prerequisites on the methodology, presented and analyzed on Chapter 4)

H.2.1 An introduction to Vector Autoregressive and Vector Error Correction Models

Given that Vector Autoregressive models were used historically before Vector Error Correction models and Global VAR models, and in a way they could be seen as a prerequisite to comprehend the latter, we are briefly introducing them in this section, to help the reader capture the relative complexity of this proposed methodology. On top of that we choose to do so given that before the empirical application of two G-VAR related chapters we will initially apply a VEC Model as well, to highlight a more efficient path towards the final G-VARs.

Vector Autoregressive models, as known, were introduced to the research of applied macroeconomics by Sims (1980). Since then they were being used and presented by a considerable number of researchers, indicatively, Brooks (2008), Verbeek (2008), Greene (2002), Baltagi (1998), Thomas (1996), Pesaran et al. (1995), Griffiths et al. (1992) and Epstein (1991). They have received, on their standard, i.e. reduced form, a critique (indicatively see Pesaran, 2015) that is related to the existence of unit roots and/or cointegration, which leads to inconsistent estimations of impulse response functions at long horizons. A critique that does hold in the case of standard-reduced form VARs, or on the unrestricted ones, that lead to Vector Error Correction Models (VECM) which generate consistent Impulse Response functions estimates and optimal predictions as well.

Thus, within the above context, we will initially introduce the standard Vector Autoregressive model and then we will proceed to VECM which is the methodology to be used initially. From VECM we will proceed to the G-VAR model which is the main empirical contribution of this research. Still, note that given that the IRF estimates that are based on the Error Correction Model (ECM) are consistent and prior to that, given that proper cointegrating procedures –in determining the cointegration rank by Likelihood Ratio tests– to estimate IRFs are going to be applied as well, the ECM helps us in capturing more effectively the cointegrating properties and the Generalized IRFs in the final G-VARs. In all cases the stationarity properties of the investigated variables must be addressed in advance.

As it is econometrically known Vector Autoregressive models are being commonly used for multivariate time series analysis. The structure is the one of a system that uses each variable one by one as a linear function of the current to past lags of itself and past lags of the other related or chosen variables.[1]

It is useful to add that Vector Autoregressive models are a specific case of more general Vector Autoregressive Moving Average models (VARMA). VARMA models for multivariate time series include the Vector Autoregressive structure above along with moving average terms for each variable. Even further, these are special cases of ARMAX models, which are ARMA models with exogenous inputs. This type of model allows the addition of other predictors that are outside the multivariate set of principal interest. An attribute which is being used within Vector Error Correction models (VECM) where the Error Correction Term (ECT) is used only as an exogenous

---

[1] In order to provide a mathematical example consider two different time series variables that are expected to be measured. We denote these two variables as $y_{t,1}$ and $y_{t,2}$. The Vector Autoregressive model in the indicative case that the research chooses to use only one past value, i.e. if it is of a lag order of one, it is named a Vector Autoregressive of order one and it is denoted as VAR(1). Note that the endogenous variables, on the left hand side (LHS) of the system of the equations, are at their current values, i.e. at t=0, and the ones on the right hand side (RHS), those treaded as exogenous variables are in their lagged forms. The system is a general case, where 'p' stands for the number of lags, a VAR(p), is as follows:

$$y_{1t} = \beta_{10} + \beta_{11}\, y_{11\, t-1} + \ldots + \beta_{1k}\, y_{1\, t-k} + a_{11}\, y_{2\, t-1} + \ldots + a_{1k}\, y_{2\, t-k} + u_{1t}$$

$$y_{2t} = \beta_{20} + \beta_{21}\, y_{2\, t-1} + \ldots + \beta_{2k}\, y_{2\, t-k} + a_{21}\, y_{1\, t-1} + \ldots + a_{2k}\, y_{1\, t-k} + u_{2t} \qquad (4.1)$$

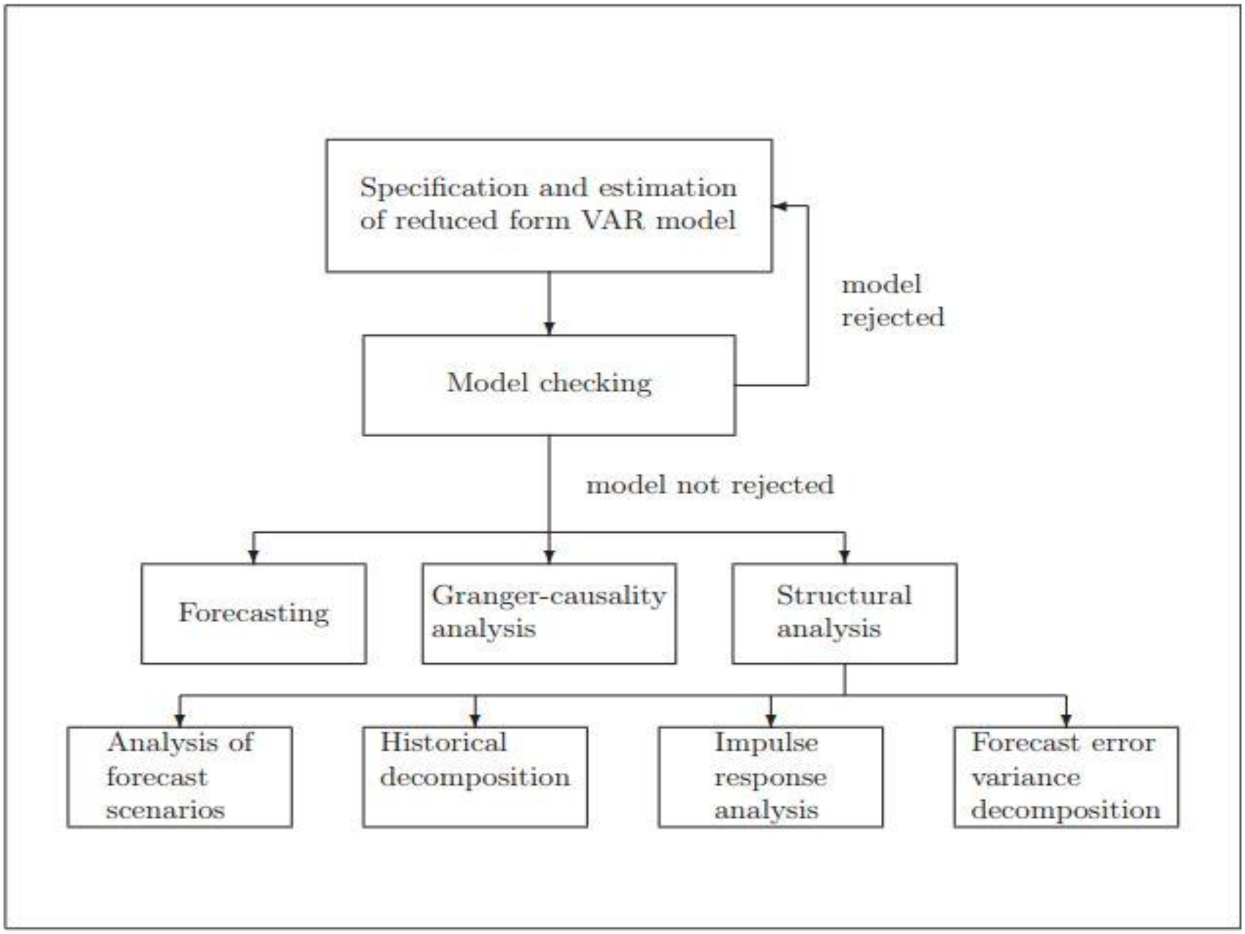
Note also, that each variable is a linear function of the lag p values for all variables in the set and also u_t are the residuals differently noted for each estimated equation. A linearity that is exposed to critique and could generate, without the imposition for example of sign restrictions that could be brought in the model the financial and economic theory considerations, inconsistent estimations that are sensitive to variables ordering, and even major distortions in Impulse response functions if important variables are being omitted. Distortions that could make the empirical results worthless. A Vector Autoregressive of two, will incorporate two lagged values for all variables that are added to the RHS of the two respective equations. Note that the number of lags can be determined with lag length criteria (Brooks, 2014) (see below Section 4.2 and 4.3). In the case of two y-variables there would be four variables on the right hand side of each equation, two lag one variables and two lag two variables, and so forth, ending up in general to the VAR(p) model, where the first p lags of each variable in the system will be used as regression predictors for each variable.

variable on the right hand side (RHS) of the system of equations and it is also being used within G-VAR when exogeneity, weak or not, is introduced as well. A process that allows us to overcome the aforementioned problems of Vector Autoregressive models, given that within this context, VECMs generates reliable results that are not sensitive to the particular ordering of the variables and also are not exposed to 'major distortions' if a key variable is not included in the system. The above can be done either by the Cholesky decomposed residuals, that control the impact of correlation amongst residuals, or by the Generalized Impulse Response Functions (GIRFs) that were initially introduced by Pesaran and Shin (1998) and were further advanced later on (Pesaran, 2015; Pesaran, 2014, Chudik and Pesaran, 2014; Dees et. al, 2007). Specifically, GIRFs use non-linear Impulse response functions and compute the mean IRF. Which means that when one variable is 'shocked', other variables do vary as well, as it is clearly implied by the co-variance. GIRFs manage to compute the mean by 'integrating out' all other shocks while they are unaffected by the particular ordering of the variables.

Vector Autoregressive models generally are more flexible and adaptable than other uni-variate models as they 'allow the value of a variable to depend on more than just its own lags or combinations of white noise terms' (Brooks 2008, p. 291). According to Brooks predetermined variables include all exogenous variables and lagged values of the endogenous variables, as well (Brooks 2008). Vector Autoregressive models enable forecasting better than traditional structural models. Sims (1980) states that, in comparison with large-scale structural models, Vector Autoregressive model processes are more accurate in terms of out-of-sample forecasts, which may be explained by the nature of the identifying restrictions on the structural models. Brooks (2008) maintains that, similarly to ARMA models, Vector Autoregressive models are 'a-theoretical', as the theoretical information they employ about variable relationships for model specification is rather poor. Still this non-theoretical aspect of the Vector Autoregressive models is viewed alternatively as a serious drawback (Pesaran, 2015; Pesaran and Shin, 1998). However, Brooks (2008) insists that information on the structure of the model is gained by the "valid exclusion restrictions that ensure identification of equations from a simultaneous structural system" (p. 292). According to the aforementioned author also, in cases of small samples, 'degrees of freedom will rapidly be used up, implying large standard errors and therefore wide confidence intervals for model coefficients'. Vector Autoregressive models do not ensure Stationarity of components. However, when stationary variables are required to examine the statistical significance of coefficients, for example, in hypothesis testing, Vector Autoregressive components should be stationary, which is rather questioned by many researchers who favour the application of Vector Autoregressive models.

Before we proceed further and discuss step by step the prerequisites of the finally used VECM, it is good to briefly consider the structure of the VAR models as it is presented on the table below (see Lütkepohl, 2011). Note that these prerequisites include the unit root tests that will determine the Stationarity properties of the series, the Cointegration tests that will capture the cointegrating properties of the co-movements of the investigated variables, the Lag Length Criteria that will determine the proper lag selection of the VECM and stability tests that will ensure the robustness of the used model. On top of the above Cholesky decomposed Impulse Response Functions (IRFs) and Generalized Impulse Response Functions (GIRFs) will be presented and will be explained as well.

Figure 1: A structure for VAR models



Source: Lütkepohl (2011, p.3)

Thus, in order to replicate and follow the above stated structure we have to introduce, as stated, the tests of Stationarity, Cointegration and the used Vector Error Correction model to smoothly upgrade the above aiming into the final G-VAR.

Last but not least, apart from the stability tests that are analyzed below as well, the Lag selection of the VECM is considered analytically too. The lag length related criteria are a rather complicated topic and indicatively at this introductory stage, according to Brooks (2008), plenty of tests can be used to determine lag selection and results do not tend to coincide.

H.2.2 Stationarity on VECM

Stationarity, is a process applicable in time series data. In order to determine if a series is stationary, i.e. if the mean and variance are constant over time, the Dickey-Fuller and/or Augmented Dickey-Fuller Unit Root test are going to be used for the VECM. The lag length of each series is going to be determined by using the Akaike and Schwarz Information criteria (Smith and Galesi, 2014; Maddala, 2009; Gujarati, 2009) favouring the AIC results (Pesaran, 2015; Smith and Galesi, 2014). If x and y series are non-stationary then the generated results will be 'spurious' (Asari et al., 2011) thus they will not have any explanatory strength.

According to Agung (2009), Dickey and Fuller calculated the DF and the ADF statistics values on the basis of using Monte Carlo simulations, which means that they are structured differently and subsequently are not following the standard t-statistic distribution, but rather a pseudo-t statistic one. The three following different types of equations are being used:

$$d(Y_t) = c(1)Y_{t-1}+c(2)+u_t \qquad (4.2)$$

$$d(Y_t) = c(1)Y_{t-1}+c(2)+c(3)t+u_t \qquad (4.3)$$

$$d(Y_t) = c(1)Y_{t-1}+u_t \qquad (4.4)$$

The first provided equation above (4.2) represents a random walk with drift, including the intercept (i.e. the constant) which is captured by the parameter c(2). The next equation (4.3) incorporates both time-trend and the intercept and is considered to be a random walk with a drift around a stochastic trend. The third equation (4.4) is a pure random walk, i.e. a random walk without intercept and trend (Agung, 2009). For all three equations, the null hypothesis (Ho: c(1)=0) tests the coefficient of the slope of the lagged y variable and it does indicate, if not rejects, the existence of a unit root. If a unit root exists then the series is known to be as a non-stationary one. The alternative hypothesis, H1: c(1)<0, is the exact opposite, which means that the series is a stationary one (see indicatively Hacker, 2010; Agung, 2009).

If the null hypothesis is not rejected then a ‘differenced series’ must be used in order to de-trend the dynamics of the investigated variable. This process allows us to produce different sets of values (first differenced or second differenced ones), which eventually are the ones that will be used in the final VECM and the G-VAR as well. For example if X is not stationary in levels then the first difference can be generated by simply subtracting X_{t-1} from $X_{t,}$ which is denoted as ΔXt. The second differenced X respectively would be $\Delta X_{t-1} - \Delta X_{t-2}$ (see for example Asari et al., 2011).

Last but not least, it has to be noted as well, in introducing the commonly used econometric terminology, that a time series which is stationary in levels is said to be integrated of order zero I(0), while a series that becomes stationary in its first difference is integrated of order one I(1), and I(2) if it becomes stationary in its second difference. The stationarity of each series is being tested through the Augmented Dickey Fuller (ADF) test and the Phillips Perron test (see Dickey and 1979; Phillips and Perron, 1988). We use the ADF statistic for the VECM (though the Levin, Lin and Chu t-statistic, the Im, Pesaran and Shin W-statistic, the ADF-Fisher Chi-square and the PP-Fisher Chi-square will be considered as well) and the ADF, while we use the Weighted-Symmetric Dickey Fuller (WS) for the G-VAR model.

H. 2.3 Cointegration Test

Engle and Granger (1987) were the first to study further (Granger and Weiss 1983; Granger 1981) and stress that a linear combination of non-stationary variables could be stationary, which means that the existence of a stationary linear combination allows us to address through cointegrating equations non-stationary time series, known as co-integrated ones. Specifically, the stationary linear combination is named as “cointegrating equation” and could be interpreted as a long-run equilibrium relationship that could be evident between the investigated time series.The most common test for this purpose is the Johansen cointegration test. A test, as stated, which is used to determine if the investigated variables are moving together in the long-run. According to Gujarati (2009) when cointegration exists between the series, then the investigated series move together over time.

More analytically, the vector autoregressive based cointegration tests use the methodology that was developed by Johansen (1995, 1991). Johansen's method estimates a coefficient matrix from an unrestricted vector autoregressive model and then tests if the implied restrictions by the reduced rank can be rejected. In doing so the deterministic variables appear within the cointegrating relations (as an Error Correction Term), while at the same time the deterministic variables appear on the "outside' of the cointegrating relations, i.e. in the Vector Error Correction equation. Note that below we provide the five deterministic trend-cases that are considered by Johansen.

Thus, summarizing the five deterministic trend cases considered by Johansen (1995) we may report the following forms:

1. The level data Y_t have 'no deterministic trends' and the cointegrating equations do not have 'intercepts':

$$H_2(r)\colon \Pi y_{t-1} + Bx_t = \alpha\beta' y_{t-1} \tag{4.5}$$

2. The level data Y_t have 'no deterministic trends' and the cointegrating equations have 'intercepts':

$$H_1^*(r)\colon \Pi y_{t-1} + Bx_t = \alpha(\beta' y_{t-1} + \rho_0) \tag{4.6}$$

3. The level data Y_t have 'linear trends' but the cointegrating equations have only 'intercepts':

$$H_1(r)\colon \Pi y_{t-1} + Bx_t = \alpha(\beta' y_{t-1} + \rho_0) + \alpha_{\perp}\gamma_0 \tag{4.7}$$

4. The level data Y_t and the cointegrating equations have 'linear trends':

$$H^*(r)\colon \Pi y_{t-1} + Bx_t = \alpha(\beta' y_{t-1} + \rho_0 + \rho_1 t) + \alpha_{\perp}\gamma_0 \tag{4.8}$$

5. The level data Y_t have 'quadratic trends' and the cointegrating equations have 'linear trends':

$$H(r)\colon \Pi y_{t-1} + Bx_t = \alpha(\beta' y_{t-1} + \rho_0 + \rho_1 t) + \alpha_{\perp}(\gamma_0 + \gamma_1 t) \tag{4.9}$$

Where the coefficient 'a_1' is the deterministic term 'outside' the cointegrating-relations. While if the deterministic term appears both 'inside' and 'outside' the cointegrating relation, then the decomposition, as it is said, is not uniquely identified. Johansen (1995) manages though to identify the part that belongs inside the Error Correction Term (ECT) by 'orthogonally' projecting the exogenous terms onto the 'a' space so that 'a_1' is the null space of 'a' such that $a'a_1=0$.

Specifically, to proceed, cases 2 and 4 do not have the same set of deterministic terms −where some of the deterministic term is restricted to belong only in the cointegrating relation− while cases 3 and 5 have same deterministic terms. Case 5, and case 1 as well, in practice are not commonly used, because case 1 presupposes that all-time series have zero-mean, while case 5, even though it tends to provide a good fit in-sample, it generates out-of-sample 'implausible forecasts'. The most commonly used cases are case 2, if none of the time series have a time-trend, and for the trending ones, case 3, which should be used if 'all trends' are stochastic, while if we have some evidence that some of the series are trend-stationary, then we should be using case 4[2].

We have to determine the cointegration rank by Likelihood Ration (LR) tests first, in order to build a co-integrated system and then we will be able to generate a proper and stable Vector Error Correction Model (VECM) and Impulse Response Functions as well (with Cholesky decomposed residuals and the Generalized Impulse Response Functions (GIRFs too). In order to determine the number of the cointegrating vectors, within the previously provided Cointegration

---

[2] In terms of the imposed 'restrictions', the five Johansen cases in estimating the Vector Error Correction Model (VECM) are: 1st: unrestricted trend: cointegrating equations are trend stationary; 2nd: restricted trend, $t = 0$: cointegrating equations are trend stationary, and trends in levels are linear but not quadratic; 3rd: unrestricted constant: $t = \rho_0 = 0$: cointegrating equations are stationary around constant means, linear trend in levels; 4th: restricted constant: $t = \rho_0 = \gamma_0 = 0$: cointegrating equations are stationary around constant means, no linear time trends in the data and 5th: no trend: $t = \rho_0 = \gamma_0 = \mu = 0$: cointegrating equations, levels and differences of the data have means of zero.

equation “structure”, we use two tests or statistics: the Maximum Eigenvalue test and the Trace Statistic (Johansen and Juselius, 1990).

Analytically the Maximum Eigenvalue tests the null hypothesis of k cointegrating relations against the alternative one of k+1 cointegrating relations for different k i.e. k = 0, 1, 2…. Thus:

$$LR_{max} (k / n +1)= - T \ * \log(1-\hat{\lambda}) \qquad (4.10)$$

where LR is the Maximum Eigenvalue and T is the sample size (Asari et al., 2011 and Dritsaki et al. 2004).

It has to be noted that the Trace Statistic examines the null hypothesis of k cointegrating equations against the alternative one of n cointegrating relations (n is the number of variables in the system for k = 0, 1, 2…n-1, using the following formula:

$$LR_{tr}(k/n)= - T^{*}\sum_{i=0}^{n} + \log(1-\widehat{\lambda\iota}) \qquad (4.11)$$

According to Alexander (2001) if the Maximum Eigenvalue and the Trace Statistic give contradictory or quite different results, then the proposed number of cointegrating equations of the Trace test is the one that should be chosen.[3]

---

[3] Once we manage to establish any long-run relationships between the variables, we will be in the position to move into a Vector Error Correction Model (VECM) a model that generates more robust and consistent results and also one that allows us to investigate further the dynamics and the interlinkages of the variables. These interlinkages, as stated above, can be split into short-run and long-run ones via the VECM. A problem though that rises in this process, and one which we have to overcome, is related to the fact that there is no such a thing as a ‘long-run solution’, and within such a “differenced perspective”, all terms that are differenced will be equal to zero. One way to overcome this problem is by using simultaneously first differenced variables and level terms. For example, we could be using the following format:

$$\Delta y_t = \beta_1 \Delta x_t + \beta_2 (y_{t-1} - \gamma x_{t-1}) + u_t \qquad (4.12)$$

where $y_{t-1} - \gamma x_{t-1}$ is the Error Correction Term, known as ECT, which is equal to the lagged estimated error term, i.e. the lagged residual from the cointegrating regression. Differently stated the ECT represents any deviations from the ‘equilibrium’ in time period t (Vazakidis and Adamopoulos, 2009). Also, it has to be noted that the estimated coefficient of the ECT must be negative and statistically significant, because the negative sign shows how a recovery path of the variables exists and how the variables have a tendency long-run

H. 2.4 The lag length criteria within a VECM structure

As it is commonly known and as it is indicatively suggested by Brooks (2008), financial theory tends to be silent in determining the "correct" lags that we should be choosing on the Vector Autoregressive models. This fact is expected given that the fluctuations and generally the variability and the responsiveness of the variables to random, multi-factor, diverse, dynamic and complicated in nature shocks, influences any system in different and multiple ways. Gujarati and Porter (2008), for example underline the challenge which is related with the proper lag length choice in Vector Autoregressive models and indicate towards a rather practical approach.

Specifically, the Information Criteria (IC), which are practically used in determining the proper number of lags, are essentially statistical measures that quantify the distance between the observations and the model classes. If the Information criteria are small, then the distance is respectively small as well and thus the model class contains a good descriptor of the data generating process, commonly known as DGP. The ICs consist of two parts. The first one, which is a 'goodness of fit' measure, such as the statistical measure minus the 'maximized likelihood' within a given model class or a residual variance matrix, which by its nature becomes smaller as the model becomes more sophisticated; while the second part is a penalty that increases with the model's complexity. Thus, in mathematical terms the general form of the criteria takes the following form:

$$\mathrm{C(m)} = \log|\Sigma\,(\mathrm{m})| + \mathrm{cT}\varphi(\mathrm{m}) \qquad (4.13)$$

---

towards their 'equilibrium' dynamic path after every shock. Thus, through the negative sign the "correction" process does take place and the shocks are being absorbed over time.

where the summation within the determinant is the residual covariance matrix estimator for a model of order m and on the second part of the equation the $\mathrm{cT}\varphi(\mathrm{m})$ is a function of the order m which imposes a penalty on the large Vector Autoregressives. Thus, within this structure it is obvious that we deal with a 'sequence' which depends on the sample size and identifies the specific criterion and it is clear that the selection of the lag length (the lag order) is selected by optimally balancing the above two forces.

Some examples of model selection criteria of the above type are Akaike's Information criterion (Akaike 1973, 1974), the Hannan-Quinn criterion (Hannan and Quinn 1979; Quinn 1980), the Schwarz (or Rissanen) criterion (Rissanen 1978; Schwarz 1978) amongst other criteria, denoted as AIC, HQ and SC, respectively.

According to Lütkepohl (2005) the AIC suggests the largest order, SC chooses the smallest order and HQ is in between. It has to be noted, as observed due to the above mathematical and theoretical structure and in practice, the three criteria do not always "agree" in their selection of the Vector Autoregressive order.

For example, Akaike's Information criteria (AIC), the most popular and commonly used information criteria out of the three stated above is taking the following format:

$$\mathrm{AIC(m)} = \ln|\Sigma \mathrm{u}\ (\mathrm{m})| + \frac{2m}{\mathrm{T}} \qquad (4.14)$$

where obviously, following the provided generic form (4.13), the first part is the Maximum Likelihood (ML) estimate of the error variance matrix and the second one is a "monotonic function of the number of estimated parameters", where m is the number of free parameters, T is the sample size, and the summation of residuals (Σu) denotes the Maximum Likelihood (ML) estimate of the error variance matrix, based on using the given model class with m free parameters (Lütkepohl, 2001, p. 16).

The limitations of this practice could be related to the fact that choosing too many lags will lead to less degrees of freedom, while on the contrary, few lags could result in specification bias, i.e. to wrong functional forms. We could mention here though, as a rule of thumb that for monthly data there is a tendency to use a total of twelve lags. Part of literature also, chooses to select the highest number of the provided statistics and criteria or instead choose to follow the Akaike Information Criteria or the Schwarz one (Smith and Galesi, 2014).

H. 2.5 Error Correction Models

The Vector Error Correction Model (VECM) is used only if cointegration properties are being established between the investigated time series. It has to be noted of course that the Error Correction model captures not only the long-run tendencies of the series but the short-run as well. Overall, these models allow the researcher to determine the possible interlinkages that exist between the time series. These interlinkages are captured through the potentially statistically significant impact that could be present in the population coefficients and runs from the lagged to the lead variables (see indicatively Asari et al., 2011). In all cases the above do not suggest "causality", but a chronological ordering of the variables. The commonly used regression equations of VECM are of the following form:

$$\Delta Y_t = a_1 + p_1 e_1 + \sum_{i=0}^{n} + \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} + \delta_i \Delta X_{t-i} + \sum_{i=0}^{n} + \gamma_i Z_{t-i} \tag{4.15}$$

$$\Delta X_t = a_2 + p_2 e_{i-1} + \sum_{i=0}^{n} + \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} + \delta_i \Delta X_{t-i} + \sum_{i=0}^{n} + \gamma_i Z_{t-i} \tag{4.16}$$

where the subscripts signify time.

In the above provided model, the number of cointegrating vectors represents the rank of cointegration. This is a system of equations with two variables where on the left hand side (LHS) we have the first differenced variables (assuming that they become stationary in their first difference) and on the right hand side (RHS) all variables −both in this case− are on their lagged forms, starting from minus one lag to minus n. The stated Z is the lagged error term and allows us to capture the long-run properties of the variables. It has to be noted that the coefficient 'γ' of Z_{t-1} must be negative and statistically significant as well, in order for the Error Correction Model to yield sustainable long-run relations that go along with the prerequisite cointegration. The short-run relationships are captured by δ and β on the first and the second equation respectively (see indicatively Pesaran, 2015; Asari et al., 2011).

To continue, it is important to explain briefly the concept of 'exogeneity', since it links further VEC models to G-VAR models. The concept as it is known has been elaborated in an influential and important article of Engle, Hendry and Richard (1983) and it refers to variables that are generated outside the system or the equations that are being used. The dependent variables, as they are generated within the system, are described as the endogenous ones.

The term of exogeneity is useful and applicable to cases where regression equations reciprocate to components of the economy that could be considered as structural entities embodying 'causal' relationships running from the explanatory variables to the dependent variables (Pollock, 1999). A fact that will allow us to quantify the transition mechanism of the monetary policy in our case and to better capture and determine the interdependencies between the SEEC and the EMU and specifically the impact of the EMU money and market rate, i.e. the EMU Euribor (and the EMU Real Effective Exchange Rate as well) that is expected to have a statistically significant impact that could be evident in a uni-directionally way from EMU to the SEE economies and not the other way around.

Thus, within this context it is important to stress that within the VECM, the EMU Euribor (Euribor) and the EMU Real Effective Exchange Rate (EUREER) will be treated only as exogenous variables within the models. Thus by using Euribor and EUREER only on the RHS of the system of equations we will be able to detect if any long-run relationships exists between the variables. In such a way that the EMU variables could be providing evidence of a statistically significant impact that runs only from those into the SEE ones. To do so, we will be using t-statistics and F-statistics and through those we will practically capture the probable and eventually evident 'co-movements' of the interlinked time series with a time lag, not only from EMU to SEE, but within the SEE economies as well.[4] The Block exogeneity Wald test checks if the endogenous variables could be treated as exogenous variables as well, something which is a pre-requisite for the structure of the Vector Error Correction (VEC) model.

H. 2.6 Testing the population parameters within the VECM

Given that practically it is impossible in a non-financial or monetary theory related model to exhaust all possible variables that could be responsible for the interactions that exist between X and Y, we cannot end up, in any means, with final conclusions in terms of 'Granger-causalities'. The above means that we have not only to be aware of other possible "causal links" but to be careful with the interpretation of the usage of these F-statistic related tests, especially under a reduced form, i.e. a standard Vector Autoregressive Model. This is also another reason why we have proceeded with a VEC model, instead of a standard Vector Autoregressive one. This way we construct a channel that will allow us to further address these complexities within the implemented G-VAR.

---

[4] It has to be noted that this practice does not mean that we will be capturing and determining any 'causality' in the strict sense, in any 'Granger-causality' way. Thus even though the concept was introduced by Granger (1969) in terms of a 'cause occurring before the effect', the "Granger-cause" of one variable to another −assume a unidirectional "Granger-causality" running from X to Y− should be perceived, as stated on Pesaran (2015), as such: "a variable X is said to 'Granger cause' a variable Y if past and present values of X contain information that helps predict future values of Y better than using the information contained in past and present values of Y alone" (p. 514). On top of that it is further argued that even if we confine the "causality" in 'Granger's sense', we still have to be cautious in approximating and considering the 'third-party' channels that could have an effect on the interactions between X and Y. Pesaran (2015) specifically, provides an example of a 'crude' application of "Granger-causality" that leads to a false and misleading conclusion where "the decision to take the umbrella causes rain!" (p. 515). The above brief example is useful in understanding –even though if you address this problem in chronological ordering terms it makes sense– that the addition of a third variable in the model, responsible for capturing the forecasting rain related skills of an agent, will reveal that the 'correlation between X and Y measure the extent to which the agent is 'good' at forecasting weather conditions.

Having stated the above, the ‘Granger-causality’ test, also known as the ‘Pairwise Granger-causality’ test, allows us to determine the direction of the statistically significant impact that could be evident between the variables. Still, within this context it could be stated that a unidirectional relation running from x to y or from y to x could be evident, a relationship that could be detected within the VECM as well, a bidirectional running from one to the other in both ways or none of the above (see Maddala, 2009; Gujarati, 2009).

For the previously provided regression equations of the VECM (4.17 and 4.18):

$$\Delta Y_t = a_1 + p_1 e_1 + \sum_{i=0}^{n} + \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} + \delta_i \Delta X_{t-i} + \sum_{i=0}^{n} + \gamma_i Z_{t-i} \tag{4.17}$$

$$\Delta X_t = a_2 + p_2 e_{i-1} + \sum_{i=0}^{n} + \beta_i \Delta Y_{t-i} + \sum_{i=0}^{n} + \delta_i \Delta X_{t-i} + \sum_{i=0}^{n} + \gamma_i Z_{t-i} \tag{4.18}$$

where the subscripts signify time, we could state that two variables (Y and X) are involved in the process in the following ways: the first one tests the null hypothesis that X could have a statistically significant impact on Y through the following null hypothesis: H0: $\delta_i=0$, see equation 4.16), and the second one tests the null hypothesis that Y could have a statistically significant impact X (H0: $\beta_i=0$, see equation 4.17). Indicatively if the Ho is being rejected (equation 4.16) it means that X has a statistically significant impact on Y (see indicatively Gul and Ekinc, 2006). If one of the two null hypotheses (related to the above indicatively provided equations) is being rejected, then we say that there is a uni-directional statistically significant relation between the two variables running from one to the other and not both ways, whereas bi-directional statistically significant relation exists, if both null hypotheses are being rejected. If the null hypotheses related to both equations are not being rejected, then there is no statistically significant relation between the investigated variables at all (Duasa, 2007).

H. 2.7. From Impulse Response Function (IRF) to Generalized Impulse Response Function (GIRFs) and from Variance Decomposition (VDC) to Generalized Variance Decomposition (GVDCs)

Before we proceed with this section note that the Impulse Response Functions (IRFs), and Variance Decompositions (VDCs), are just a preliminary concept that will help us in proceeding with the Generalized ones (GIRFs) within the VECM and the G-VAR framework. There are some important limitations in the use of IRFs on Vector Autoregressive models that we have to briefly consider. These limitations are related to the ordering of the variables of the unrestricted VARs that lead to not robust results –if not misleading– that should be considered accordingly. The orthogonalization of the variables that lead to Orthogonalized IRFS and further the Generalized IRFs provide a solution to the 'ordering problem' leading to robust results in the VECM and G-VAR context as we shall see in the next section.

Having stated the above, according to Brooks (2008, p. 325), an Impulse response function (IRF) "traces out the responsiveness of the dependent variables in the VAR to shocks to each of the variables", while Variance Decompositions "give the proportion of the movements in the dependent variables that are due to their 'own' shocks, versus shocks to the other variables" (p. 326). In other words, and as stated by Lütkepohl (2008), Impulse response functions describe how the economy reacts over time to exogenous impulses, namely shocks (impulses are often modelled in the context of a Vector Autoregressive model). Thus, an Impulse Response Function describes the reaction of endogenous macroeconomic variables at the time of the shock and over subsequent points in time. While VDC tests decompose the variance of the forecasted error of a given variable into proportions susceptible to shocks in each variable within the model constructed, and IRF, captures the dynamic responses of every dependent variable to a one period standard deviation shock to the system (Agung, 2009; Erjavec and Cota, 2003).

Thus even though the Impulse response functions are modelled frequently within the VARs, it has to be stressed that the aforementioned 'problem of ordering dependence' of these IRFs appears (see Swanson and Granger, 1997) and also the quite probable 'omission' of a key variable as well, could lead not only to inconsistent estimates but also to 'major distortions' in IRFs (Pesaran, 2015; Pesaran and Shin, 1998). Even though any particular ordering of the investigated variables could be supported, up to a degree, in a rational manner, it cannot be supported exhaustively by any financial and/or economic theory, or any monetary theory in the context of this research, and thus subsequently the used IRFs cannot be perceived as robust ones. These aforementioned limitations will be addressed by using initially Cholesky decomposed residuals and later on by implementing the Generalized Impulse response functions (GIRFs) that were introduced by Pesaran and Shin, 1998 (see also Pesaran, 2015). It could be repeated, in comparing these two approaches that the first one, the Cholesky decomposition controls the impact of correlation among residuals, while the second one, the Pesaran solution to the orthogonalization problem, chooses to use non-linear IRFs and compute the man IRF as well. The above mean that when a variable is undergoing a shock, the rest do vary as well, as it is clearly implied by the existing co-variance of the variables and the related parameters. Differently stated the Generalized impulse response functions (GIRFs), and the respective analysis of them, compute the mean by 'integrating out' all other shocks. It is useful to insist here on a Cholesky decomposition solution as well, by stating that this approach imposes a 'recursive causal structure' from the top variables to the bottom ones, by ensuring that this is not inverse, given that it is impossible to impose a shock to one variable by holding the others fixed. Thus, Cholesky does not only use Moving Averages coefficients in measuring the Impulse Responses, which is common with the IRFs generally, but introduces a diagonal matrix that allows to measure and capture the sequence of shocks (Pourahmadi_et. al, 2007; Pourahmadi, 2007).

What needs to be noted at this point is that our choice to use the VECM and the G-VAR, instead of a reduced form Vector Autoregressive model, is based on these properties and these solutions. Specifically, VECMs provide consistent IRFs, following Cholesky decomposed residuals, and GIRFs are not affected at all by the particular ordering of the variables. The used formula of

GIRFs is derived under the assumption of a multi-variate 'normality' that might not hold in all empirical cases.

Within the above context it would be useful to briefly present and discuss the mathematical and econometric structure of the Impulse Response Function analysis. A practice that will help us further to address and understand their General form, i.e. the General Impulse Response Functions (GIRFs) that will be elaborated even further and used eventually in our main and final models, i.e. the VECM and the G-VARs.

Thus, we could start by rewriting the Vector Autoregressive model into a Vector Moving Average (VMA) format, which could look like this:

$$y_t = \mu + \varepsilon_t + \Psi_1 \varepsilon_{t-1} + \Psi_2 \varepsilon_{t-2} + \cdots + \Psi_s \varepsilon_{t-p} \qquad (4.19)$$

where at time t + s, the model could be transformed and be rewritten as such:

$$y_{t+s} = \mu + \varepsilon_{t+s} + \Psi_1 \varepsilon_{t+s-1} + \Psi_2 \varepsilon_{t+s-2} + \cdots + \Psi_s \varepsilon_t + \Psi_{s+1} \varepsilon_{t-1} + \cdots \quad (4.20)$$

As expected, the components of matrix Ψ_s, a (n x n) matrix, are the multipliers that capture the dynamic properties of the model or differently stated the impulse response functions, that could be expressed as follows: $\psi_{ij} = \frac{\partial y_{i,t+s}}{\partial \varepsilon_t}$. Through this format we can capture the response of every variable in a cross sectional context at point i, and then at time t+s, in terms of its time dynamics, given that we have quantified the change, for example a one unit increase of another variable at j, in a context of a shock at time t, assuming at the same time, through a Cholesky decomposition orthodiagonalization of the residuals, that all other shocks are held fixed.

Thus, the above suggest that the errors are not correlated, meaning that the variance of the errors, i.e. var(ε_T) = Σ, where Σ is a diagonal matrix. By employing the Cholesky decomposition of Σ, which is equal to PP', P is a lower triangular matrix (see the provided equations below and Pesaran 2015) that manages to proceed and overcome this theoretical problem, for the given expectation of correlated error terms and given that we have to overpass it. This can be done by diagonalizing the Σ matrix or by introducing orthogonal shocks (see Agung, 2009). By doing so, we can manage to interpret the impulse response functions and capture the 'evolution' of the previously specified shocks. Thus, the first variable in the Vector Autoregressive model is affected contemporaneously only by the shock itself, the second one is affected again contemporaneously by the shocks to the first variable and the shock to itself, etc.

More analytically, the Cholesky decomposition could take the following format, assuming as stated that P is a lower-triangular matrix of the $\Sigma = PP'$ and also $P^{-1}\Sigma P'^{-1} = I_k$. These orthogonal 'innovations' can be utilized by the inverse P matrix, i.e. the P^{-1}. Thus, overall the Moving Average (MA) form of the Vector Autoregressive Model can be represented now as such:

$$y_t = \mu + \sum_{i=0}^{\infty} \Psi_i \, PP^{-1}\varepsilon_{t-1} \qquad (4.21)$$

and by calling $M_i = \Psi_i P$ and $w_t = P^{-1}\varepsilon_t$, which are the Orthogonalized shocks, we can get:

$$y_t = \delta t + \mu_t + u_t \qquad (4.22)$$

or:

$$y_t = \mu + \sum_{i=0}^{\infty} M_i \, w_{t-1} \qquad (4.23)$$

where $E(w_t w'_t) = I_k$. Following Kwiatkowski et al. (1992), we can state that any time series could be decomposed into three main components as they are stated above, where δ_t is a deterministic time trend, μ_t is a random walk process (where $\mu_t = \mu_{t-1} + \varepsilon_t$) and u_t is the error term. To return and continue with (4.20) the components of w_t are uncorrelated and have a unit variance, which means that any unit shock is a shock with the size of exactly one standard deviation. Thus, overall, we could express the response to an Orthogonalized shock by this last format: $\frac{\partial y_{t+s}}{\partial_t} = \Psi_s P$.

Variance Decomposition (VDC), as a pre-stage of the Generalized ones (GVDCs), on the other hand is a technique that partitions the variance of the forecasted error for every used variable. The decomposition of variance manages to capture the part of information which is evident in each time series and it contributes to the other time series within the Vector Error Correction model. Under such a framework It could also help us to determine what part of the forecasted Error Variance of each variable can be 'explained' by the external shocks to the other related variables (Agung, 2009; Erjavec and Cota, 2003). Differently stated, the VDC, exposed to the same critique with the non-generalized IRFs (GIRFs) allows us to trace the relative impact of every shock to all endogenous variables one, only if we advance to their General Form, i.e. if they become Generalized Variance Decompositions (GVDCs) the initial Variance Decompositions could be captured by the following expression:

$$R_{ij,s}^2 = 100 \frac{\sum_{k=0} \psi_{ij,k}^2}{\sum_{h=1}^{m} \sum_{k=0}^{s} \psi_{ih,k}^2} \tag{4.24}$$

where $\boldsymbol{\sum_{k=0}^{s} \psi_{ij,k}^2}$ is the summation of the variance of the error components that occur due to y_j. The $\sum_{h=1}^{m} \sum_{k=0}^{s} \psi_{ih,k}^2$is the summation of the innovations responses.