EXCHANGE RATE REGIMES AND FINANCIAL REPRESSION

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"To the memory of my father who taught me how to live,"

" how to love, how to wish ..."

"and how to die! "

Abstract

The main purpose of this study is to explore the role of financial repression for optimal exchange rate regimes. This issue is investigated within two different frameworks. In the first part, a short run stabilization target is the main concern. In this part, a New-Structuralist approach is taken and the idea is developed within a simple IS/LM stochastic-sticky price macro model. It is shown how the direct linkage between the financial sector and the supply side of the economy may overturn some standard perceptions regarding the price and output (supply) stabilization properties of exchange rate (fixed-float) regimes. We explore the conditions under which the fixed rates would entail a full insulation for domestic prices against foreign price and foreign interest rate shocks, and circumstances involving the fixed rates would not be able to isolate fully the domestic prices against domestic monetary shock. We also demonstrate the conditions under which the floating rates would provide a full isolation for the domestic prices against the domestic monetary shock and the occasions where they are not able to insulate fully the domestic prices against foreign price and foreign interest rate shocks. In part two, a longer-run perspective with a (micro based) welfare criterion is chosen and the analysis turns mainly towards the McKinnon-Shaw School. In this part, within a stochastic general equilibrium model, it is shown for a semi-small open economy how the optimality of the exchange rate flexibility is affected by the degree of financial repression among many other structural and policy variables. Conventional policy implications for optimal exchange rate regimes, resulting from applying partial equilibrium models, seems to be less convincing when government is maximising the welfare of a representative agent and there are imperfections in the economy. The role of financial repression as a shock absorber in the context of growth and inflation stabilization is explored. Liberalization of financial markets is not always the best policy and under well defined circumstances when the economy is exposed to various shocks, financial repression policy may improve welfare (growth). It is shown how the optimality of the exchange rate regime may be affected by the type of monetary authorities (ultra-conservative, opportunist) who govern the central bank. The welfare implications of the type of central banker in a financially repressed economy is examined. The implications of financial repression, exchange rate and taxation on foreign assets policies for the real business cycles are also analysed. Different consequences of financial repression policies through the marginal productivity of (domestic) capital (Goldsmith channel) and via savings-investment incentives (McKinnon-Shaw channel) for the expected and the variance of growth are explored.

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INTRODUCTION

One of the most elusive components of national and international economic policy decision-making, in a sense going back to Friedman (1953) and Meade (1955), is the choice among alternative exchange rate regimes. Although neutrality conditions of nominal exchange rate regimes - with respect to real allocations - discussed by Helpman (1981), Lucas (1982), Stockman (1983) and Sevensson (1985) could lessen the importance of this choice, fragility of these conditions in the actual economic experience provides an emphasis for paying more attention to this topic. Stockman (1983) and Mussa (1986) have presented evidence revealing the importance of the choice of nominal exchange rate regime for economic magnitudes. Having examined real exchange rate data, they conclude that not only nominal exchange rates but also real exchange rates exhibit significantly more variability in the floating exchange rates regime than that in fixed exchange rates regime, which is in contrast with the Black (1976) and Williamson (1982) conjectures[1]. To resolve this paradox, which would have arisen because of the causality problem, Savvides (1990) designs a simultaneous limited-dependent variable model and his results corroborate the Black-Williamson conjectures. Ghosh et al (1997) have investigated the relationship between nominal exchange rate regimes, inflation and growth. They have concluded that the inflation has been lower and more stable under pegged regimes while real volatility has been higher in the pegged regimes. As such, there are doubts on the neutrality proposition.

The implications of exchange rate volatility on the volume and patterns of domestic and foreign direct investment have been discussed by Froot & Stein (1989), Edwards (1989), Goldberg (1990), Aizenman (1992) among others. A negative effect of real exchange rate volatility for economic performance including growth for a group of developing countries has been documented by Edwards (1989). Lal (1980, 1987), using a model of a dependent open economy, shows the weakness of a "hard-money" monetary system to cope with the exogenous shock of the type of foreign exchange windfalls, when there is (downward) rigidity in prices. He also studies its consequences for the misalignment of the real exchange rate[2]. In his line of reasoning, the flexible exchange rate arrangement seems to be the best candidate for the episode of foreign windfalls. Because of uncertainties in the determination of the correct direction and magnitude of the required exchange rate movements, he does not recommend a managed exchange rate regime for economies experiencing terms of trade shocks. In his analysis discretionary exchange rate regimes, together with unsustainable fiscal expansions, are the main causes of the collapse in growth experienced in a number of developing countries. This can bring about an emphasis on the role of the disciplinary effects of exchange rate regimes on fiscal as well as monetary policy, since any arrangement has its own specific effects under special conditions[3].

The optimality of (short run) macroeconomic stability in terms of minimizing the variance of real output, the price level or real consumption in the face of domestic and foreign shocks and the role and relative merits of different types of exchange rate arrangement in between, have been discussed in a relatively large body of theoretical literature in the context of a small open economy (Poole (1970), Fischer (1977), Enders and Lapan (1979), Lapan and Enders (1980), Aizenman (1983), Frenkel and Aizenman (1982) among others). The striking feature of this strand of literature regarding the optimal choice of exchange rate regime is the lack of a general consensus on the merit of one arrangement compared with the others, among the policy making and academic circles. This is because the choice of optimal regime is sensitive to the objective function specification, the nature of the shocks to which the economy is subject and the structural characteristics of the economy in question. The role of structural characteristics for the choice of exchange rate regime had been emphasized in the early literature on optimum currency areas as well. Among the structural characteristics receiving more attention were factor mobility, proportion of trade of the foreign sector, openness, capital mobility, proportion of trade concentrated on the major trading partners, deviation between domestic and foreign inflation rates, the level of economic development and real wage flexibility (e.g. Mundell (1961), McKinnon (1963), Ishiyama (1975), Tower & Willett (1976), Heller (1978), Holden et al (1979)). Some of these characteristics have a bearing on the susceptibility of an economy to specific shocks and thereby the degree of insulation provided by any exchange rate regime. For instance, the more open is international trade, the more costly is likely to be the exchange rate changes, the more effectively money shocks would be channeled abroad and therefore, the more likely is the case for the fixed rates. Nonetheless, the higher degree of openness would increase the economy's exposure to external shocks and would decrease the effectiveness of demand management under the fixed rates. This occasion would make stronger the case for flexible rates as a more effective arrangement to cope with the domestic demand and external shocks. Likewise, when the degree of wage indexation is high, the flexibility of the exchange rates would be less effective in stabilization of output against the domestic shocks (Flood & Marion (1982), Aizenman & Frenkel (1985)).

Flood (1979) has also examined the role of capital mobility for the optimality of the fixed and floating rates in isolating the domestic economy against domestic and foreign shocks. He shows that if, following a foreign expansionary monetary policy, the foreign interest rate falls, the domestic interest rate will consequently decline under fixed exchange rates and perfect capital mobility. Therefore, a reduction in the domestic interest rate would strengthen the output destabilizing effect of a higher foreign expansionary monetary policy through the current account. However, the flexibility of the exchange rate would help to stabilize domestic output through an appropriate appreciation. The reverse holds true when a foreign fiscal expansionary policy is the case. Namely, the higher interest rate associated with a foreign expansionary fiscal policy would help to stabilise domestic output. In the case of a domestic demand shock, perfect capital mobility will be more destabilising under the fixed rates since it involves a fixed domestic nominal interest rate. By contrast, when there is a domestic monetary shock, the perfect capital mobility is more stabilizing under a fixed exchange rate regime.

Accordingly, leaving aside the relationship between the objectives and structures, there has already been identified a close relationship between the structural characteristics of any economy and the insulative property of the exchange rate regimes. This is in fact the main point of departure in the first part of this study. More strictly, the analysis of the first part serves to underscore the importance of the implications of the incompleteness of domestic financial markets accompanied by imperfections in foreign financial markets as a salient characteristic of developing countries for the optimality of exchange rate regimes in the context of short-run stabilization objectives.

The financial disciplinary trait of any type of exchange rate regime has been another theme on which the relative merits of fixed and flexible exchange rates have been debated. This aspect of the optimal choice of exchange rate regime has recently shifted the focus of the analysis from the stabilization approach to a more (public) finance-oriented one. The (monetary) policy independence trait of floating rates has been pronounced by its advocates as one of the main benefits of the floating rates (see e.g. Friedman (1953), Johnson (1969)). The conventional arguments run as follows. By disentangling the monetary authorities' hands from exchange rate policy and leaving the task of the determination of the appropriate level of the exchange rates to the international currency markets, the monetary authorities will be able to respond freely to domestic economic problems, particularly, to choose the proper rate of money (supply) growth in order to meet the government's revenue requirements. The more flexible rates backers claim that the fixed rates, in spite of what its proponents suggest, does not necessarily discourage monetary authorities from resorting to inflationary finance. They point to the episodes of financial crises leading to successive devaluations as revealing stylised facts against the ability of the fixed rates in rendering financial discipline and its ensuing price stability. At a theoretical level, the persistent inflationary budget deficits financing has been the main driving mechanism behind the "first generation" (Krugman (1979), Flood & Garber (1984)) and to some extent the "second generation" (Obstfeld (1994)) currency crises models. While in the first generation models the collapse of the fixed rate is the result of a mechanical process in which the foreign exchange reserves fall to a critical level following an inflationary monetary policy, in the second generation models the fixed rate is abandoned through an optimizing policy making process where either the short-run (inflation-output) stabilisation or the costs and benefits of money financing and taxation are the main concern. This strand of literature, in general, suggests the fixed rate would be sustainable as long as the government is perceived financially solvent by private agents (speculators). All of this indicates that different types of exchange rate regime can be viewed as alternative forms of government commitment on inflation tax financing (De Kock & Grilli (1987,1993)).

While this literature has intensively investigated the impact of inflationary money financing on the immediate causes and the timing of the currency crises, proper attention was not given to the more fundamental forces that determine the optimal choice of exchange rate regimes within a micro based general equilibrium set up where a (benevolent) government is concerned about the optimal arrangement from a longer-term perspective. In this environment one would more consistently argue how the diversified observed patterns of exchange rate regimes may, across the countries and time, be attributed to the differences in more fundamental macro-micro parameters mirrored in a well defined social welfare criterion. A more comprehensive analytical framework would also enable us to incorporate the problem of optimal choice of exchange rate regimes as alternative desired paradigms in the application of inflation tax revenue with other sources of public finance in an endogenously more coherent structure. This is in fact what we think is a major step ahead towards integration of two main, somewhat separated, strands of literature, viz, financial repression and exchange rate regimes, in the context of developing countries. The basic intuition originates from a parallelled new change in perspective regarding financial repression as a potential source of public finance in the area of monetary economics and more specifically in the theory of inflation (Giovannini (1988), Dornbusch & Giovannini (1990), Roubini & Sala-i-Martin (1995)). The framework presented by Grinols & Turnovsky (1994) and Turnovsky (1995) offers the opportunity to integrate the problem of the optimal choice of the exchange rate regime and financial repression as part of a more general public finance perspective. In such a framework, of course, the short-run issues such as the circumstances and timing of the speculative attacks to a currency and the optimal time of switching between the exchange rate regimes would be viewed as a secondary issue relative to a longer-term choice of degrees of exchange rates flexibility and financial repression for the optimization of a welfare function including mean and variance of growth. This issue, in general, has taken up our main concern in the second part of this study.

The rest of the thesis is organised as follows. Chapter 1 and 2 study the implications of domestic and foreign financial incompleteness for the optimal exchange rate regime in the context of a short-run stabilization target. Chapter 1 develops the main idea in a New-Structuralist oriented IS/LM stochastic-sticky price macro framework. The main contribution is the introduction of an aggregate supply which, as a result of the imperfection in domestic financial markets and the pivotal role of the curb market in financing working capital needs of firms, is responsive to the curb market (real) interest rate. Due to nonlinearity involved in the (analytical) reduced form solution, the model is solved only for two polar exchange rate regimes, that is the fixed rate and the floating rate regimes. Then the full insulating property of both regimes against domestic and foreign (real and nominal) shocks is investigated. For instance, the conditions under which the fixed rates may provide a full insulation for domestic prices against foreign price and foreign interest shocks and the circumstances in which the fixed rates would not be able to isolate fully the domestic prices against a domestic money demand shock are worked out.

Chapter 2 addresses the relationship between financial repression and the optimal exchange rate regime numerically. In this chapter a continuous time version of the model is simulated for a set of plausible values of parameters. Then the optimal exchange rate regime involving minimum asymptotic variance of the domestic price and aggregate supply are singled out. This exercise is carried out not only for white noise but also for autoregressive (transitory-permanent) shocks. We will see that the less degree of integration with foreign financial markets, the more crucial is the role of domestic financial imperfections for the optimal exchange rate regime.

Chapter 3 develops a stochastic macroeconomic general equilibrium model of financial repression and exchange rate regime to study the welfare implications pertaining to both fiscal and monetary policies. This chapter serves mainly as a building-block for our more detailed investigation of the relationship between financial repression and the optimal exchange rate regime in chapters 4, 5 and 6. We will demonstrate how in the presence of inflation variance cost and financial repression (product and financial markets imperfections), the possibility of having infinite ways in reaching the same target does not necessarily hold. Chapter 3 also examines the welfare implications of appointing different types of central banker when the economy is subject to financial repression. It is shown how under flexible exchange rate arrangements one may be able to make a growth case for appointing an ultra-conservative central banker in the presence of the McKinnon-Shaw effect.

On the basis of the model developed in chapter 3, chapter 4 analyses the welfare effects of exchange rate and financial repression policies when the effect of financial repression policies is limited to their distortionary role for the marginal productivity of the domestic capital (Goldsmith effect). One of the main novel results in this chapter is exploration of the role of financial repression as a shock absorber. This role may provide an incentive for the governments in the economies which are exposed to real and monetary shocks to use financial repression policies in order to stabilize the economy. This chapter also investigates the implications of the exchange rate and financial repression policies for real business cycles.

Chapter 5 examines the welfare (growth) implications of the financial repression policies under the fixed and floating rates regimes when financial repression policies affect the savings-investment incentives (McKinnon-Shaw effect). It is shown how welfare consequences of the financial repression policies differ when they imply a reduction in the volume of savings and thereby the level of investment and/or the efficiency of allocation of savings to investment purposes (McKinnon-Shaw channel) with those when they distort the marginal productivity of (domestic) capital (Goldsmith channel). In this chapter we demonstrate that under the fixed rate regime, when the real return on foreign assets is positive, financial repression is growth deteriorating as long as real money balances do not involve any utility.

Chapter 6 follows two main objectives by calibrating the complete version of the model. First, it demonstrates that our propositions regarding the welfare implications of financial repression are not just idiosyncratic. Second, it focuses on the welfare consequences of different mixture of the exchange rate flexibility and financial repression when the McKinnon-Shaw and the Goldsmith effects are both at work and the economy is exposed to all types of domestic and foreign (inflation) shocks. In particular, we will see how, from a public finance point of view, the financial repression policy might be a less distortionary source of tax revenue than the more regular sources of public finance.Finally, we conclude by summarizing the main findings of the thesis.

Notes

1.According to delinking hypothesis proposed by Krugman, the excessive volatility of exchange rate, increasing its uncertainty, can be interpreted as its weak role for real (trade) sector, but lack of enough empirical evidence precludes its generalization.

2.The model presents a justification for the necessity of nominal depreciation in the economies suffering from Dutch disease, in the presence of the shock.

3.For instance, fixed rate system, when capital mobility is high, may help to finance irresponsible fiscal policy. Only when there is speculative attack threat, its disciplinary feature will emerge.

Part One

Exchange Rate Regimes, Financial Repression and Short Run Stabilization

Prologue

The dynamic nature of the real world as well as the heterogeneity of its different parts has precluded economists and policy makers from coming to an agreement on the optimality and feasibility of a specific exchange rate regime as a once-and-for-all decision. Since there is a close relationship between the choice of an exchange rate regime and other economic policies, a model of the economy incorporating the most important relevant characteristics of the economy and its reactions to the economic policies associated with any exchange rate regime would be an essential part of the analysis. Among those one can point to the structure of financial markets as a key component for any exchange rate analysis.

Stylized facts indicate that imperfect capital mobility and financial repression resulted in a limited capital markets in Developing Countries (DCs). Black (1976) has pointed to the absence of a forward market, thin, underdeveloped and often lack of securities markets, trivial capital position of and usually severely controlled domestic network of exchange dealers, imposition of interest rate ceiling on domestic securities by central banks and relatively small financial markets as the most important characteristics of exchange and money markets caused the low capital mobility in DCs. He argues that an underdeveloped system of financial intermediation, due to the absence of a network of securities brokers and dealers, led to a predominant role of commercial banks offering a limited range of financial services. Crockett and Nsouli (1977) also emphasize the dominant role of political considerations and expectations influenced by political stability over changes in interest rate differentials and expected changes in the exchange rate for capital flows formation in DCs.

Van Wijnbergen (1978,1982,1986), Bruno (1979), Taylor (1979,1981) and Cavallo (1981) suggest that in DCs securities markets are generally absent and commercial banks are the main source of short-term working capital requirements and long-term fixed capital formation for the firms rather than consumer credits. Commercial banks will often ration their credits because of existing excess demands for credits at a low fixed interest rate imposed by the authorities. In such a financially repressed environment, unofficial (curb) markets for loan will emerge and play an essential role to finance working capital needs[1]. These markets are unofficial in the sense that they are not under government regulations.

Therefore, there is no interest ceilings on loans in these markets and the interest rate tends to be market determined. Furthermore, since they are not subject to a legal reserve or liquidity requirements, financial institutions in these markets have a competitive advantage relative to official institutions.

They, among others, as the representatives of "New Structuralists" establish a direct relationship between financial markets and the supply side of the economy. Connection between financial sectors and real sectors in a financially repressed economy has also been emphasized in the McKinnon-Shaw financial development models originated by McKinnon (1973) and Shaw (1973) and extended by Kapur (1976), Galbis (1977,1979), Mathieson (1979,1980), Fry (1980,1982) and others. However, the main distinction between the Neo-Structuralist and McKinnon-Shaw frameworks can be attributed to their attitude towards the role of the informal credit markets. More precisely, though the existence of the curb markets is accepted by the McKinnon-Shaw school, these markets do not play a central role in the linkage between the financial and real sectors of the economy in their analysis. While in the New-Structuralist framework the interest rate in curb markets are considered as the marginal cost of funds for saving and spending decisions made by private agents.

Montiel et al (1992) have presented empirical evidence regarding the role of curb markets in financial transactions in some DCs. They suggested that the volume of loans transacted in curb markets are several fold greater than that in official markets in DCs. Empirical evidence shows variations in the degree of capital mobility across the DCs. More recent ones (Takashi (1986), Haque et al (1993)), somewhat surprisingly, suggest an extremely high degree of *effective* capital mobility "on average" justified by the existence of unofficial exchange markets as a result of using illegal means (over and under-invoicing, smuggling, bribery etc) . By the unofficial markets, it would be possible for the domestic residents to own assets abroad and consequently their remittance decisions may highly thwart official controls on international capital movements de facto. Phylaktis (1988) for Argentina, Edwards and Khan (1985) for Colombia and Haque and Montiel (1991) for the India case, however, found significant differences between nominal internal interest rates and external ones showing relatively low capital mobility which should be accounted for official capital controls and risk premium.

There is, therefore, almost a widespread agreement among economists on the co-existence of repressed credit markets and imperfect capital mobility as one of the predominant characteristics of DCs' economy. Although, questions have been raised on whether absence of institutional structure and efficient intermediation in financial markets are the result of particular structural characteristics of DCs or policy-induced over the time, it can hardly be accepted that in most DCs well-organized domestic and foreign financial markets would emerge as soon as policy-makers in DCs decide to remove all controls over the economy. This is so because efficient macroeconomic (liberalization) reforms usually need premicroeconomic (structural) reforms as well. The latter usually involves implementation of basic legal and economic reforms (such as property rights, bankruptcy laws, efficient tax system etc) which are usually time consuming to put into effect. In the absence of these legal decentralized frameworks for determining prices by private agents, the policy of decontrolling prices seems not to be effective. Therefore, the present financial repression and low capital mobility can be interpreted as at least medium-run structural features of the financial sectors in DCs. Even if one assumes those characteristics to be policy induced, the crucial question would be: what are the implications of liberalization in domestic financial markets and integration with external financial markets for such macroeconomic policies in DCs?

The concurrent presence of domestic financial repression and imperfect capital mobility may have special implications for macroeconomic policies in general and the optimal degree of the exchange rate flexibility in DCs as an essential part of them. This is because they may influence the ways that policy and exogenous shocks impinge on the economy. This part of the study attempts to examine these implications in a common analytical framework integrating (domestically) a financially repressed economy and different degrees of capital mobility for a typical DC. Analytical tractability considerations preclude us from incorporating all characteristics of DCs in a theoretical model. But we have tried to include the most (important) related ones in the analysis. In general, the model which is presented in this part should be considered as a version of the "New Structuralist" type, such as has been developed by Van Wijnbergen (1982,1986). Nevertheless, it is closest in spirit to the original Dornbusch (1976) model. The analysis, in general, proceeds as follows. In chapter one, the basic model (discrete time version) is sketched and solved for two polar cases, that is, the fixed and floating rates regimes. Chapter two presents a continuous time version of the model in order to address the optimality of exchange rate flexibility numerically.

Notes

1.Obviously, in a precise cost and benefit analysis of any monetary, fiscal and exchange rate policy in DC's variability and responsiveness characteristics of these structural features over the time should be taken into account too.

Chapter One

Financial Repression and The Insulating Property of The Fixed and Floating Rates

1.1 Introduction

The contributions on optimal exchange rate intervention rules under uncertainty are far from new, going back at least to Poole (1970), Turnovsky (1976), Boyer (1978) and Weber (1981). Almost at the same time, in another area of monetary economics oriented mainly on the analysis of the consequences of stabilization plans in developing countries sponsored by the IMF, the incomplete feature of financial markets in DCs attracted the development economists's attention. Starting with Cavallo (1977) and followed notably by Bruno (1979), Van Wijnbergon (1979) and Taylor (1980) among others, the structure of financial markets in DCs was singled out as the key factor responsible for the stagflationary effects of contractionary monetary policies. This approach opens a new channel through which the financial sector of the economy is directly linked to the economy's supply side. This channel, which plays a crucial role in the explanation of the observed perverse effects of tight monetary policies on inflation in many DCs, is the result of high dependence of firms on credit financing the working capital needs. This linkage between the financial and real sector of the economy leads to an aggregate supply which is inversely responsive to the real interest rate. This besides considering a pivotal role for curb markets, where loanable funds are marginally supplied for financing firms' working capital requirements, serve as a main channel whereby a restrictive monetary policy or a stiff devaluation of domestic currency may end up to a stagflationary stance in the economy. More strictly, if the contractionary effect of a higher real interest rate, following a monetary restraint, on aggregate supply is more than that on aggregate demand, an effect which is so-called *Cavallo's effect,* the economy will be trapped in a stagflationary situation.

These two strands of literature, though contemporaneous, have remained mostly separated areas of research. That is, the supply side effect of an imperfect domestic and foreign financial market as a pervasive structural characteristic of most DCs has been ignored in the literature related to the optimal exchange rate intervention under uncertainty. This chapter attempts to remedy this shortcoming by incorporating the main idea in a simple macro model which focuses on the implications of foregoing an imperfect domestic capital market with a limited foreign capital market for the insulating property of different types of exchange rate regime in the face of foreign and country-specific disturbances. Apart from tractability purposes, the use of a standard macro model will facilitate the task of singling out and comparing the implications of the introduction of this new aspect into the previous conventional framework.

The remainder of the chapter is organized as follows. In section 2, the basic model will be set up. Section 3 includes the solution of the model for two polar cases: fixed and floating rates. This section ventures an evaluation of full insulating property of the two exchange rate regimes too. Section 4 closes the chapter by summarizing the main findings in this chapter.

1.2 The Model

In order to minimize technical details, the analysis will be based on a simple (IS-LM) stochastic model. A (semi-)small open economy, in both product and financial markets, is considered in which one good is domestically produced and two imperfect substitute goods -one is imported and the other is produced domestically- are consumed. Imported good are consumed as final or intermediate goods. There are three kinds of agents: the private sector (firms and households), the central bank and the commercial banks. Government is explicitly excluded by the assumption that it conducts its policies somehow via the central bank which can either act completely independently or take into account, somehow, of the government's objectives. In addition, its expenditure is fixed over the time and can depart from its normal level only randomly.

The financial sector consists of official and unofficial money markets. The central bank imposes a required reserve ratio over commercial bank deposits and ceilings on commercial bank interest rates so that it leads to the emergence of an unofficial (curb) loan market. The central bank also determines the foreign exchange policy for the economy. Households are able to hold three types of assets, that is, domestic currency notes (which are in the form of non-interest bearing assets), banking system deposits and curb market loans. All assets are denominated in domestic currency and, in general, are assumed imperfect substitutes. Curb market loans supply has been viewed as an asset stock demand. In fact, such loans can be interpreted as short run maturity bonds issued by firms and taken up by households. In addition, bank credits will be repaid at the end of any period. Households do not have access to (domestic and foreign) capital markets in order to take out loans. That is, bank credit, curb market and foreign loans are available only for firms in order to finance their working capital and intermediate input needs, not consumer expenditure. All this brings about a direct linkage between the financial sector and the supply side of the economy (Cavallo (1977), Van Wijnbergen (1982, 1983, 1986), Taylor (1983)). Hence, firms finance their working capital needs by commercial banks, curb market and/or foreign loans and since a fixed capital stock has been assumed over the time frame of the analysis, private capital formation and real capital stock adjustment have been ignored. Evidently, curb market rates are determined by prevailing market conditions and will be taken into account as a marginal cost of fund.

Prices of domestic goods will be determined endogenously in the domestic markets, while the foreign price of imported goods and the foreign interest rate, due to the small economy assumption, are exogenously determined. The general price level is a weighted average of domestic goods and imported goods prices.

The set of structural relationships of a typical DC described above has been represented in Table (1.1) (P. 16). All variables are in logarithmic form except (I^d,I^c, I^f) and all the constants can be considered as the constants of log-linear approximations.

Equation (1-1) in Table (1.1) is the aggregate supply (Y^s) function showing, on the one hand, a positive relationship between the supply of domestic output and a real production shock (U_t^s) and, on the other hand, a negative relationship between supply and the real exchange rate (or terms of trade) and real interest rate[1]. It is necessary to mention that since the nature of the loans assumed in this analysis is short term loans, it is the expected rate of inflation (E_tP_{t+1}-P_t) which must be incorporated in the equation[2].

Equation (1-2) explains the aggregate demand (Y^d) function as a positive function of real exchange rate and a negative function of real interest rate. It has been assumed that curb market interest rate will influence saving propensities and, following the McKinnon hypothesis, a positive saving response to a higher real rate is assumed. Moreover, by this specification of aggregate demand we have implicitly assumed that it depends on an average intertemporal price (in terms of the home consumption bundle) and that only instantaneous average intertemporal relative price, (i.e. real interest rate), affects it[3].

TABLE (1.1) THE MODEL

$$Y_t^s = a_0 - a_1(I_t^c - E_t P_{t+1} + P_t) - a_2(S_t + P_t^n - P_t^d) + U_t^s \quad (1\text{-}1)$$

$$Y_t^d = d_0 - d_1(I_t^c - E_t P_{t+1} + P_t) + d_2(S_t + P_t^n - P_t^d) + d_3 Y_t^s + U_t^d \quad (1\text{-}2)$$

$$P_t = \theta P_t^d + (1-\theta)(S_t + P_t^n) \quad (1\text{-}3)$$

$$P_{t+1}^d - P_t^d = \gamma(Y_t^d - Y_t^s) + E_t P_{t+1} - P_t + U_t^p \quad (1\text{-}4)$$

$$M_t - P_t = b_0 + kY_t^s + b_1 I_t^d - b_2 I_t^c + U_t^m \quad (1\text{-}5)$$

$$I_t^d = \pi(1-h) I_t^c \quad (1\text{-}6)$$

$$w_1(S_t + P_t^n - P_t^d) - w_2 Y_t^s + [\varphi/(1-\varphi)](I_t^c - E_t S_{t+1} + S_t - I_t^f) - \Delta M_t + c_0 = 0 \quad (1\text{-}7)$$

$$M_t = \bar{M} - \rho(S_t - \bar{S}) \quad (1\text{-}8)$$

$$P_t^n = \bar{P}^n + U_t^{p^n} \quad (1\text{-}9)$$

$$I_t^f = \bar{I}^f + U_t^f \quad (1\text{-}10)$$

$$L = \mu E(Y_t^s - \bar{Y}^s)^2 + (1-\mu)E(P_t^d - \bar{p}^d)^2 \quad (1\text{-}11)$$

where all the parameters -i.e. a_0, a_1, a_2, d_0, d_1, d_2, b_0, b_1, b_2, θ, k, c_0, w_1, w_2 - are positive.

Equation (1-3) defines the general price level (P) as a geometric weighted average of domestic good (P^d) and imported good ($S+P^n$) prices, where θ is the share of consumers' expenditure allocated to home good. Equation (1-4) suggests the adjustment of domestic prices in terms of excess demand and expected rate of inflation as well as a stochastic element. This equation assumes a sticky price in the real sector of the economy (Barro (1972), Fischer (1972) and Sheshinsky and Wiess (1977)). The price adjustment scheme assumed here is not analogous to those postulated by Mussa (1977,1982), Frankel (1979), Liviatan (1980), Obstfeld and Rogoff (1984), Beetsma and Van der pleog (1992). According to this equation, any change in expectations of the foreign inflation rate will also transmit to expectation of the domestic inflation rate, which has an immediate implication for the real side of the economy. In this equation γ denotes the speed at which domestic prices are adjusted in order to clear the goods market, implying the degree of labour market flexibility[4]. Considering the price equation, it is obvious that purchasing power parity (PPP) does not hold in general. Needless to say, in this sticky price environment, since domestic price is a predetermined variable, a high short run volatility of exchange rate and PPP violations in the face of real shocks and (temporarily) monetary shocks is expected. Therefore, there is not a complete dichotomy between the real and monetary sectors. In addition, by introducing this market friction we have added an intrinsic component to the present extrinsic component to the economy's dynamics. Persistent effects of shocks on output, the interest rate and prices reflect the intrinsic dynamics.

Equation (1-5) is the money demand function in which M includes (domestic) currency and interest-bearing deposits demands. It specifies a positive relation between real output (Y^s) and interest rate on time deposits (I^d), and a negative one between curb market interest rates (I^c) and money demand (real money balances).

The time deposit interest rate, due to the repressed banking system assumption, is exogenous and its relationship with the curb market interest rate is shown by equation (1-6). In this equation π is the index of the degree of repression of domestic financial markets and can take on values between one and zero (i.e. $0 \leq \pi \leq 1$). When π is zero, the domestic financial market is highly repressed and a strict ceiling has been imposed on the banking system. The value one for π represents a competitive domestic financial system. The term h in this equation stands for the commercial bank required reserve ratio and constitutes another policy instrument for the monetary authorities. Therefore, the actual degree of financial repression is the result of the interaction between these two monetary instruments[5]. The feature of this index needs more clarification. When the (repressed) official financial sector becomes more liberalized, in terms of our index, π (h) will increase (diminish), for instance, in such a way that provides one percentage increase in official market interest rate, the demand for bank deposits will rise. This, through an adding-up constraint, means a reduction in either demand for currency or supply in curb market loans. Throughout this analysis we have assumed, in line with new structuralists, that the curb market loans are a closer substitute to bank deposits than the currency. To be more specific, it has been postulated that while an increase in the banking system interest rate may reduce the demand for currency it will decrease the supply for loans in the curb market much more than the demand for currency. Accordingly, an increase in the official market interest rate implies a rise in M as whole. Also, given the total demand for (curb market) loans, the reduction in supply of loans in the curb market results into an increase in the curb market interest rate. Note that whereas an increase in banking system deposits, as a result of a rising interest rate in the official market, expands the supply of bank credit, the total supply of loanable funds in the economy would not necessarily increase. More formally, like new structuralists, here it has been assumed that the official banking system provides so inferior intermediation that any unit increase in bank deposit will not be transformed into an effective reduction in the demand for loans to fulfill the working capital requirements of the firms. There is evidence which may justify this assumption. First, as opposed to unofficial loans (curb) market, the official banking system is subject to a legal reserve requirement. Second, usually in practice the official banking system holds free reserves while it is not the case for the curb market. Third, the official banking system is often regulated in accordance with stabilisation policies in DCs involving the imposition of sever restrictions on aggregate credit expansions.

Equation (1-7) is the balance of payments, or intertemporal budget constraint of the economy, including different degrees of international capital mobility. In this equation, when the parameter φ is zero, the economy is completely isolated from the international financial markets. In this case, the exchange rate is not any more a jump variable and will be determined by the current account. On the other extreme, when φ is equal to one, the domestic financial (curb) market is integrated with the rest of the world and the capital account plays a crucial role in the determination of the exchange rates. Obviously, in this case the curb market interest rate would be equal to expected return on foreign assets (i.e. UIP). Nevertheless, in this sticky price environment, it would not necessarily be true for the real interest rate. When φ is between zero and one, determination of exchange rate is the result of the interaction between capital and current accounts. More strictly, in our framework, when φ is between zero and one, the curb market loans and foreign loans are imperfect substitute sources of financing the firms' working capital needs. When φ is zero, it means firms are deprived from the foreign borrowing. However, when φ is equal to one it means curb market and foreign loans become perfectly substitutable. Moreover, ΔM_t represents the effects of changes in foreign reserve component of monetary base on the balance of payments. In other words, it reflects the consequences of different degrees of monetary intervention on the balance of payments which has its own implications for the general process of adjustment in the economy. In this equation w_1 would reflect the Marshal-Lerner condition which excludes "J-curve" possibility.

The exchange rate policy feed back rule is represented by equation (1-8). In this equation $\bar{s}$ is the steady state exchange rate (or policy makers' target exchange rate). Parameter ρ take on value zero when exchange rate is completely flexible and is infinity for a fixed exchange rate. Between these two polar cases the degree of flexibility of exchange rate can change and imply a managed float arrangement. This can be interpreted as an unsterilized intervention feedback rule. Noted that when ρ is positive it is considered as the degree of "*lean against the wind* " implying that when, for example, the exchange rate is over its long run level, a monetary contraction policy should be implemented by the monetary authorities, and when it is negative it can be thought as "*lean with the wind* ", involving an expansionary monetary policy for the previous case. Clearly, in terms of the specified policy feedback rule, the only marginal interventions has been excluded and an intermarginal intervention linear rule without any explicit bands has been considered. An advantage of commitment on this simple rule by the monetary authorities is its easily observability and understandability by the market participants[6]. Furthermore, current values of money supply and exchange rates in the feed back rule have been postulated implying both are instantly observable for monetary authorities (Karaken et al (1973)). Evidently, by this specification of feedback rule, we are not going to address the possibility of neutralization of disturbances from various sources simultaneously (Turnovsky(1985)).

Supply (U^s), demand (U^d), monetary (U^m), and domestic price (U^p) shocks are independent and serially uncorrelated random variables with zero mean and limited variance. As a result, knowing the realization of $U_t^{i's}$ in no way helps in predicting either what $U_k^{i's}$ (k>t) itself or what the other shocks will be. In fact, we are assuming the effects of any shock will be exhausted within any period. Equations (1-9) and (1-10) describe a random motion for two foreign variables. P^n and $\bar{I}^f$ are constants (their steady-state values) and U^{pn} and U^{if} are iid random variables with zero mean and limited variance variables as well.

To identify an optimal degree of flexibility we need an objective function. In this study, two objectives will be considered for authorities. One is to minimize aggregate supply (real output) instability measured in terms of the variance of aggregate supply around the expected steady-state level of output. The other one is to minimize price instability calculated as the variance of the price level around its steady-state level. Therefore, minimizing the weighted average of asymptotic (unconditional) variances constitutes the policy makers' target in this analysis. In order to show how the results may be influenced by different combinations of these two objectives, a weighted average of them has been considered. Evidently, the more the authorities of central bank are independent, the more is the probability of assigning higher weight to price stability. Equation (1-11) presents the policy makers' objective function which is, in effect, an asymptotic welfare loss criterion and L stands for the welfare loss[7]. By this specification of the objective function, our analysis has explicitly ignored the minimization of exchange rates and interest rate variability as an objective for the economy. In other words, a zero penalty has been assigned to those targets. However, since most DCs suffer from relatively huge deficits in their balance of payments, this as an effective constraint has been incorporated into the model. Furthermore, it has been assumed that there is not any cost for intervention and monetary authorities have no aversion to intervening[8].

Finally, here it has been assumed that private agents' expectations are formed on the basis of full information on all current variables (Y_t^s, Y_t^d, I_t, P_t, S_t) and the expected exchange rate (E_tS_{t+1}). However, they are not able to observe the future value of domestic price level (i.e. P^d_{t+1}) at time t, thus, U_t^p can not be observed by the private agents in period t[9].

1.3 Solution of The Model

There are various methods to get a full reduced form solution for this type of Macro model. To the end of singling out a "bubble-free" solution, the undetermined coefficients method

(Lucas (1972), Barro (1976,1978)) with a minimal set of state variables (Mc Callum (1983)) was applied. But before applying that, the model was changed into the deviation from its steady-state values determined by setting all disturbances in the model equal to zero and assuming the expectations are realized. In addition, to reduce the degree of complexity of the solution, the perfect substitutability between domestic and foreign assets has been assumed in this section. This version has been presented by Table (1.2) in which lowercase letters denote deviations and for convenience i^f ,m_t and Δm_t have been replaced.

TABLE(1.2)-THE DEVIATION FORM

$$y_t^s=-a_1(i_t^c-E_tp_{t+1}+p_t)-a_2(s_t+p_t^n-p_t^d)+U_t^s \qquad \text{(D-1)}$$

$$y_t^d=-d_1(i_t^c-E_tp_{t+1}+p_t)+d_2(s_t+p_t^n-p_t^d)+d_3y_t^s+U_t^d \qquad \text{(D-2)}$$

$$p_{t+1}^d-p_t^d=\gamma(y_t^d-y_t^s)+E_tp_{t+1}-p_t+U_t^p \qquad \text{(D-3)}$$

$$\rho s_t+p_t+ky_t^s+b_1i_t^d-b_2i_t^c+U_t^m=0 \qquad \text{(D-4)}$$

$$w_1(s_t+p_t^n-p_t^d)-w_2y_t^s+[\varphi/(1-\varphi)](i_t^c-E_ts_{t+1}+s_t-i_t^f)+\rho(s_t-s_{t-1})=0 \qquad \text{(D-5)}$$

To determine the dynamic paths of p_t^d, s_t and y_t^s, the model has been solved for them. The pseudo-reduced forms are as shown in equations (P-1), (P-2) and (P-3) (page 24).

In order to proceed towards a final solution of the model, that is, taking into account the endogenous property of the expectations, it was necessary to solve a system of at least six non-linear equations (in general sixteen equations) which would yield four possible roots for any variable (some of them may be complex). The specific timing structure of the model and, in particular, the presence of s_{t-1} ,which in fact comes into play by the intertemporal budget constraint, among the predetermined and exogenous variables, are responsible for this non-linearity and the complexity of the solution so that one can not get any analytical tractable final solution for the model. Therefore, a numerical solution seems, in general, to be required (even) for this seemingly simple model, which is the subject of the next chapter. However, to get some analytical insights for this structure, the model was analytically solved for two polar cases, i.e. completely (permanent) fixed and floating arrangements[10]. Nevertheless, since the final expressions for the general case, that is, when all the (domestic and foreign) shocks exist at the same time, is still intractable, the following the analysis focuses on the cases corresponding to the separate shocks, taken one at a time. Therefore, in this section we have ignored the possibility of correlated shocks and their implications for optimal exchange rate flexibility (Boyer (1978)). However, as the future results simply illustrate a possible counter-example to the importance of specific features regarded in the study, it seems that adding the correlation possibility would be an unnecessary complication. In addition, the analysis here will reduce to the study of (full) insulation properties of fix versus float which has its own implications for the optimal degree of flexibility of exchange rate as well.

There are some points worthy to mention. First, from (P-2) we observe, there is no role for current account parameters in the dynamics of exchange rates (exchange rate determination) when the foreign capital is perfectly mobile (foreign loans are perfect substitutes for domestic curb market loans). This is so because one can easily show that in this case we have :

$$\lim_{\psi\to\infty} s_t = \frac{1}{[ka_1(1-\theta)+ka_2+\theta-1-\rho-\lambda]}[-(\theta ka_1 - ka_2 - \theta)p_t^{\,d} + \theta ka_1 E_t p_{t+1}^{d} +$$
$$(ka_1(1-\theta)-\lambda)E_t s_{t+1} - (ka_1(1-\theta)+ka_2+\theta-1)U_t^{p^n} - \lambda U_t^{i^f} + U_t^{m} + kU_t^{s}]$$

This result, indeed, follows the intuition of the underlying macro model. Second, in spite of apparent complications in the coefficients of the pseudo-reduced form equations, they have their own simple meaning. For instance, the parameter λ in the above equations indicates the interest rate (semi-)elasticity of the money market (real money balances). The Δ_1 is the (real) interest rate (semi-) elasticity of the output market. The Δ_2 is the real exchange rate elasticity of the output market. The Δ_3 is the domestic price elasticity of the money market. The Δ_4 is the (nominal) exchange rate elasticity of the money market under floating rates. The parameter Λ, shows the exchange rate elasticity of domestic price adjustment. It consists of two main components. The first one, indicated by the terms in the first curly brackets, stands for the direct effect of exchange rate changes on the domestic price adjustment. The second component, shown by the terms in the second curly brackets, represents the indirect effect of exchange rate on domestic price adjustment through the nominal interest rate (adjusted for the nominal interest rate effect on money market).

$$
\begin{aligned}
p^d_{t+1}=&\{\gamma(\theta\Delta_1-\Delta_2-\Delta_1\Delta_3/\lambda)-\theta+1+\Lambda\lambda[w_2a_1\theta-w_2a_2-w_1-(w_2a_1+\psi)\Delta_3/\lambda]/\mathrm{T}\}p^d_t\\
&+\{\gamma\theta ka_1\Delta_1/\lambda-\gamma\theta\Delta_1+\theta+\Lambda\lambda[\theta ka_1(w_2a_1+\psi)/\lambda-w_2a_1\theta]/\mathrm{T}\}E_tp^d_{t+1}\\
&+\{\gamma\Delta_1(1-\theta)(ka_1/\lambda-1)+1-\theta+\Lambda\lambda[ka_1(1-\theta)(w_2a_1+\psi)/\lambda-w_2a_1(1-\theta)-\psi]/\mathrm{T}\}E_ts_{t+1}\\
&-\{\Lambda\lambda\rho/\mathrm{T}\}s_{t-1}+ \qquad \text{(P-1)}\\
&\gamma(\Delta_1(1-\theta)+\Delta_2-\Delta_1\Delta_4/\lambda)-1+\theta+\Lambda\lambda[w_1+w_2a_1(1-\theta)+w_2a_2-(w_2a_1+\psi)/\lambda]/\mathrm{T}\}U^p_t\\
&-\{\Lambda\lambda\psi/\mathrm{T}\}U^{i^f}_t+\{\gamma\Delta_1/\lambda+\Lambda(w_2a_1+\psi)/T\}U^m_t\\
&+\{\gamma k\Delta_1/\lambda-(1-d_3)\gamma+\Lambda[k(w_2a_1+\psi)-\lambda w_2]/\mathrm{T}\}U^s_t+\gamma U^d_t+U^p_t
\end{aligned}
$$

$$
\begin{aligned}
s_t=&\{\lambda[w_2a_1\theta-w_2a_2-w_1-(w_2a_1+\psi)\Delta_3/\lambda]/\mathrm{T}\}p^d_t\\
&+\{\lambda[(w_2a_1+\psi)\theta ka_1/\lambda-w_2a_1\theta]/\mathrm{T}\}E_tp^d_{t+1}\\
&+\{\lambda[(w_2a_1+\psi)ka_1(1-\theta)/\lambda-w_2a_1(1-\theta)-\psi]/\mathrm{T}\}E_ts_{t+1}-\{\lambda\rho/\mathrm{T}\}s_{t-1} \qquad \text{(P-2)}\\
&+\{\lambda[w_1+w_2a_1(1-\theta)+w_2a_2-(w_2a_1+\psi)\Delta_4/\lambda]/\mathrm{T}\}U^{p^n}_t-\{\lambda\psi/\mathrm{T}\}U^{i^f}_t\\
&+\{(w_2a_1+\psi)/\mathrm{T}\}U^m_t+\{[k(w_2a_1+\psi)-\lambda w_2]/\mathrm{T}\}U^s_t
\end{aligned}
$$

$$
\begin{aligned}
y^s_t=&\{(-a_1^2\theta k/\lambda)+a_1\theta\}E_tp^d_{t+1}+\{[a_1\Delta_3/\lambda]+(a_2-a_1\theta)\}p^d_t\\
&+\{[-a_1(ka_1(1-\theta))/\lambda]+a_1(1-\theta)\}E_ts_{t+1}\\
&+\{[a_1(\Delta_4-\rho)/\lambda]-(a_1(1-\theta)+a_2)\}s_t \qquad \text{(P-3)}\\
&+\{[a_1\Delta_4/\lambda]-(a_1(1-\theta)+a_2)\}U^{p^n}_t\\
&+\{(-ka_1/\lambda)+1\}U^s_t+\{-a_1/\lambda\}U^m_t
\end{aligned}
$$

where:

$$\Delta_1=(a_1-d_1-a_1d_3)$$
$$\Delta_2=(a_2+d_2-a_2d_3)$$
$$\Delta_3=(\theta ka_1-ka_2-\theta)$$
$$\Delta_4=[ka_1(1-\theta)+ka_2+\theta-1]$$

$$\psi=[\varphi/(1-\varphi)]$$
$$\lambda=ka_1+b_1\pi(1-h)-b_2$$
$$\Lambda=\{\gamma[(1-\theta)\Delta_1+\Delta_2]-1+\theta\}-\{[\gamma\Delta_1(\Delta_4-\rho)/\lambda]\}$$
$$T=\{(w_2a_1+\psi)(\Delta_4-\rho)\}-\{\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi+\rho)\}$$

Also, the term T/λ represents the exchange rate elasticity of the balance of payments. This contains two main channels. The first channel, indicated by the terms in the first curly brackets of the right hand side of T divided by λ, constitutes the indirect effect of the exchange rate on the balance of payments through the (money market) nominal interest rate. As observed, this channel contains the exchange rate elasticity of the money market represented by the term: $[ka_1(1-\theta)+ka_2+\theta-1-\rho]$. The second channel, shown by the terms in the second curly brackets of the right hand side of T divided by λ, is the direct effect of the exchange rate on the balance of payments through the current and capital accounts. Notice that the direct channel includes the indirect effect of the exchange rate on the real income as well (i.e. the term: $[w_2a_1(1-\theta)+w_2a_2]$). Further, the term $\Lambda\lambda/T$ states the domestic price adjustment exchange rate elasticity adjusted for the balance of payments elasticity of exchange rate. As is evident, both the trade balance and domestic price adjustment elasticities of the exchange rate are directly affected by the type of exchange rate arrangement which is in operation in the economy (i.e. by the parameter ρ).

Having these considerations in mind, the model will be solved at first for the fixed rate regime and the effects of any shock on the arguments of the objective function will be analysed, then the same will be carried out for the float case.

1.3.1 The Fixed Rates Arrangement

The full-reduced forms for the fixed exchange rate are as follows:

$$p_{t+1}^{d}=\Pi_1 p_t^{d}+\Pi_2 U_t^{p^n}+\Pi_3 U_t^{i^f}+\Pi_4 U_t^{m}+\Pi_5 U_t^{s}+\Pi_6 U_t^{d}+\Pi_7 U_t^{p} \qquad \text{(FI-1)}$$

$$y_t^{s}=\Gamma_1 p_t^{d}+\Gamma_2 U_t^{p^n}+\Gamma_3 U_t^{i^f}+\Gamma_4 U_t^{m}+\Gamma_5 U_{Tt}^{s}+\Gamma_6 U_t^{d} \qquad \text{(FI-2)}$$

where:

$$\Pi_1=\{\gamma(\theta\Delta_1-\Delta_2-\Delta_1\Delta_3/\lambda)-\theta+1+\gamma\Delta_1[w_2a_1\theta-w_2a_2-w_1-(w_2a_1+\psi)\Delta_3/\lambda]/\text{H}\}/\text{Z}$$

$$\Pi_2=\{\gamma[\Delta_1(1-\theta)-\Delta_2-\Delta_1\Delta_4/\lambda]-1+\theta+$$
$$\gamma\Delta_1[w_1+w_2a_1(1-\theta)+w_2a_2-(w_2a_1+\psi)\Delta_4/\lambda]/\text{H}\}/\text{Z}$$

$$\Pi_3=\{-\gamma\psi\Delta_1/\text{HZ}\}$$

$$\Pi_4=\{[\gamma\Delta_1/\lambda]+[\gamma\Delta_1(w_2a_1+\psi)/\lambda\text{H}]\}/\text{Z}$$

$$\Pi_5=\{[\gamma k\Delta_1/\lambda]-(1-d_3)\gamma+\gamma\Delta_1[k(w_2a_1+\psi)/\lambda-w_2]/\text{H}\}/\text{Z}$$

$$\Pi_6=\gamma/\text{Z}$$

$$\Pi_7=1$$

$$\text{H}=\{-w_2a_1-\psi-ka_1-b_1\pi(1-1h)+b_2\}$$

$$\text{Z}=1-\theta-(\gamma\Delta_1\theta ka_1/\lambda)+\gamma\theta\Delta_1-\gamma\Delta_1\{[ka_1\theta(w_2a_1+\psi)/\lambda]-w_2a_1\theta\}/\text{H}$$

$$\Gamma_1=\{\Pi_1(a_1\theta-a_1^2\theta k/\lambda)+[a_1\theta(ka_1-ka_2-\theta)/\lambda]+(a_2-a_1\theta)\}$$

$$\Gamma_2=\{\Pi_2(a_1\theta-a_1^2\theta k/\lambda)+(a_1\Delta_4/\lambda)-(a_1(1-\theta)+a_2)\}$$

$$\Gamma_3=\{\Pi_3(a_1\theta-a_1^2\theta k/\lambda)\}$$

$$\Gamma_4=\{\Pi_4(a_1\theta-a_1^2\theta k/\lambda)-a_1 k/\lambda)\}$$

$$\Gamma_5=\{\Pi_5(a_1\theta-a_1^2\theta k/\lambda)+(1-ka_1/\lambda)\}$$

$$\Gamma_6=\{\Pi_6(a_1\theta-a_1^2\theta k/\lambda)\}$$

and λ,ψ, Δ_1, Δ_2, Δ_3, Δ_4 are the same as before.

Note that the term $\gamma\ \Delta_1$ /H in the parameters' relationships shows the domestic price adjustment exchange rate elasticity adjusted for the balance of payments exchnage rates elasticity under the fixed rates arrangement. In fact, it is the fixed rates arrangement counterpart of the term $\Lambda\lambda/T$ explained above. In addition, as it is observed, except for the foreign price shock, the elasticities of domestic price and aggregate supply with respect to all other shocks (i.e. foreign interest rate, domestic monetary, domestic supply and demand) are independent of the real exchange rate elasticity of the output market. The intuition behind this is very simple. When there is no foreign price shock and the nominal exchange rate is fixed, in the case of the above mentioned shocks, the real exchange rate would change only through the domestic price changes whose effects through real exchange rate on domestic prices and aggregate supply have been captured by the parameters Π_1 and Γ_1. This has an interesting implication for the full insulation property of the fixed rates with respect to domestic prices (stabilization). We will return to this point below.

The stability of the system requires $|\Pi_1| < 1$. In general, there are many combinations of the values of parameters which may fulfill the stability condition. However, two following necessary conditions can be easily distinguished:

1) $\gamma\neq 0$ 2) If: $\theta=1 \Rightarrow (a_1-d_1-a_1d_3)\neq 0$

Furthermore, if the necessary conditions are satisfied, three sufficient conditions will be as follows:

1)If: $(a_1-d_1-a_1d_3)=0 \Rightarrow 0<\gamma<2(1-\theta)/(a_2+d_2-a_2d_3)$

2)If: $[-w_2a_1-\psi-ka_1-b_1\pi(1-h)+b_2]=0 \Rightarrow 0<(w_2a_2+w_1+ka_2+\theta)<2\theta(w_2a_1+ka_1)$, $\theta\neq 0$, $a_1\neq 0$

3)If: $ka_1+b_1\pi(1-h)-b_2=0 \Rightarrow 0 < \{\gamma(a_1-d_1-a_1d_3)(ka_2+\theta+w_2a_2+w_1)+$

$(w_2a_1+\psi)[1-\theta-\gamma(a_2+d_2-a_2d_3)]/\gamma\theta(a_1-d_1-a_1d_3)(ka_1-\psi)\} < 2$

Since we want to deal with the cases in which capital is perfectly mobile, (i.e. $\psi\rightarrow\infty$), and domestic price is completely flexible, (i.e.$\gamma \rightarrow\infty$), the stability conditions for these cases have been investigated as well. Considering the structure of Π_1 , the following conditions constitute necessary conditions for the stability of the system, when capital is completely mobile but domestic price does not adjust perfectly:

1)$\gamma \neq 0$ 2) $[1-\theta+\gamma\theta(a_1-d_1-a_1d_3)]\neq 0$

Regarding the necessary conditions, sufficient condition for this case is as follows:

$$0 < \{\gamma(a_2+d_2-a_2d_3)/[1-\theta+\gamma\theta(a_1-d_1-a_1d_3)]\} < 2$$

The above condition implies that:

1)If: $\theta=0 \Rightarrow \gamma < 2/(a_2+d_2-a_2d_3)$

2)If: $\theta \neq 0$ and

2-1) $(a_1-d_1-a_1d_3)\leq 0 \Rightarrow \gamma < 2(1-\theta)/[(a_2+d_2-a_2d_3)-2\theta(a_1-d_1-a_1d_3)]$

2-2) $0 < (a_1-d_1-a_1d_3) < (a_2+d_2-a_2d_3)/2\theta \Rightarrow \gamma < 2(1-\theta)/[(a_2+d_2-a_2d_3)-2\theta(a_1-d_1-a_1d_3)]$

2-3) If: $(a_2+d_2-a_2d_3)/2\theta < (a_1-d_1-a_1d_3) \Rightarrow \gamma > 0$

Needless to say that only in the (2-3) case, there is no restriction for the γ meaning the complete price flexibility is possible. If we add: $\theta(a_1-d_1-a_1d_3)\neq 0$ as necessary condition to the case (2-3), this will provide the sufficient condition for the case that capital mobility is perfect and there is not any sluggishness in domestic prices. When capital mobility is not perfect but prices are flexible, the necessary condition would be as follows:

1) $(a_1-d_1-a_1d_3)\neq 0$ 2) $\theta \neq 0$

Considering the above necessary conditions, the sufficient conditions are:

1) $[-w_2a_1-\psi-ka_1-b_1\pi(1-h)+b_2]=0 \Rightarrow 0 < (w_2a_2+w_1+ka_2) < \theta[2(w_2a_1+ka_1)-1]$

2) $[ka_1+b_1\pi(1-h)-b_2]=0 \Rightarrow$

2-1) If: $\theta(ka_1-\psi)< 0$, $(a_1-d_1-a_1d_3)< 0 \Rightarrow$

$(a_1-d_1-a_1d_3)< (w_2a_1+\psi)(a_2+d_2-a_2d_3)/(w_2a_2+w_1+ka_2+\theta)-2\theta(ka_1-\psi)$

2-2) If: $\theta(ka_1-\psi)< 0$, $(a_1-d_1-a_1d_3)> 0 \Rightarrow$

$(a_1-d_1-a_1d_3)< (w_2a_1+\psi)(a_2+d_2-a_2d_3)/(w_2a_2+w_1+ka_2+\theta)$

2-3) If: $\theta(ka_1-\psi)> 0$, $(a_1-d_1-a_1d_3)> 0$, $|2\theta(ka_1-\psi)| < |(w_2a_2+w_1+ka_2+\theta)| \Rightarrow$

$(a_1-d_1-a_1d_3)< (w_2a_1+\psi)(a_2+d_2-a_2d_3)/(w_2a_2+w_1+ka_2+\theta)-2\theta(ka_1-\psi)$

2-4) If: $\theta(ka_1-\psi)\succ 0$, $(a_1-d_1-a_1d_3)\succ 0$, $|2\theta(ka_1-\psi)| \succ |(w_2a_2+w_1+ka_2+\theta)| \Rightarrow$

$(a_1-d_1-a_1d_3)\succ (w_2a_1+\psi)(a_2+d_2-a_2d_3)/(w_2a_2+w_1+ka_2+\theta)-2\theta(ka_1-\psi)$

At the end, it should be stressed that the above conditions are not the only cases for which the system is stable but they may be viewed as the most related ones among those.

Bearing these stability conditions and the independence assumption for the disturbance terms of the model in mind, the following relations lay out asymptotic (unconditional) variances for the domestic price and supply for the fixed exchange rate arrangement:

$$\sigma^2_{p^d}=\{\Pi_2^2/(1-\Pi_1^2)\}\sigma^2_{U^{p^n}}+\{\Pi_3^2/(1-\Pi_1^2)\}\sigma^2_{U^{i^f}}+\{\Pi_4^2/(1-\Pi_1^2)\}\sigma^2_{U^m}+\{\Pi_5^2/(1-\Pi_1^2)\}\sigma^2_{U^s}+\{\Pi_6^2/(1-\Pi_1^2)\}\sigma^2_{U^d}+\{\Pi_7^2/(1-\Pi_1^2)\}\sigma^2_{U^p} \quad \text{(VFI-1)}$$

$$\sigma^2_{y^s}=\{\Gamma_1^2[\Pi_2^2/(1-\Pi_1^2)]+\Gamma_2^2\}\sigma^2_{U^{p^n}}+\{\Gamma_1^2[\Pi_3^2/(1-\Pi_1^2)]+\Gamma_3^2\}\sigma^2_{U^{i^f}}+\{\Gamma_1^2[\Pi_4^2/(1-\Pi_1^2)]+\Gamma_4^2\}\sigma^2_{U^m}+\{\Gamma_1^2[\Pi_5^2/(1-\Pi_1^2)]+\Gamma_5^2\}\sigma^2_{U^s}+\{\Gamma_1^2[\Pi_6^2/(1-\Pi_1^2)]+\Gamma_6^2\}\sigma^2_{U^d}+\{\Gamma_1^2[\Pi_7^2/(1-\Pi_1^2)]\}\sigma^2_{U^p} \quad \text{(VFI-2)}$$

where the Π_i's and Γ_i's are the same as before.

It is evident from the relation (VFI-2) that in general there is not necessarily conflict between stabilization of prices and aggregate supply against specific shock under the fixed exchange rate arrangement. Nevertheless, this should not be viewed as a conclusive result for all types of shocks. For instance, although minimization of price variance for the foreign interest rate, domestic demand and price shocks will absolutely minimize the supply variance this is not necessarily the case for foreign price, domestic money demand and supply shocks. Since the latter cases seem to happen for exceptional values of parameters, in the following the analysis will be focused only on the consequences of any specific shock, separately, for the price variance. However, it should be mentioned that for the cases in which fixed rates can not completely remove the effects of specific shocks for prices, it does not necessarily mean that the same would hold for supply variance.

1.3.1.1 Foreign Price Shock

Considering the components of the foreign price shock coefficient in equation (VFI-1), one can conclude, in general, the values of parameters of structural relationships, and among those the parameters which are related to a financially repressed economy, interactively play an important role in the way that the foreign price shock impinges on the domestic prices. This implies that the fixed rate does not necessarily insulate prices fully from this shock. However, there are some cases in which this conclusion is not valid and fixed arrangement is able to present full insulation property in the model. Two following cases show this possibility:

1) $(a_1\text{-}d_1\text{-}a_1d_3)=0$, $\gamma=(1\text{-}\theta)/(a_2+d_2\text{-}a_2d_3)$, $\theta \neq 1$
2) $[-w_2a_1\text{-}\psi\text{-}ka_1\text{-}b_1\pi(1\text{-}h)+b_2]=0$, $w_2a_1+w_1+ka2+w_2a_1(1\text{-}\theta)+ka_1(1\text{-}\theta)=(1\text{-}\theta)$

The crucial question here is whether these values fulfill the stability conditions or not. Comparing these values with the stability conditions, it is obvious they meet those conditions. This result is in contrast with conventional recognized characteristic of the fixed rates arrangement for the stabilizing (domestic) price and thereby supply against the foreign price shock (see e.g. Black (1976), Flanders & Helpman (1978), Fukuda & Humada (1987)). Generally speaking, the first case emphasizes the role of inertia in domestic prices and the second case lays stress on the key role of (foreign) capital mobility in the insulating property of the fixed rates against the foreign price (real) shocks for small (semi-)open economies. Also, they reveal the important implications of the direct link between the financial sector and the supply side (real sector) of the economy, reflected in the parameters a_1 and a_2, for the stabilization of the domestic prices against the foreign price shock under the fixed rates arrangement. For instance, case (1) occurs only if : $a_1=d_1/(1\text{-}d_3)$. Since d_3 is less than one, it means a_1 must be greater than d_1. This, somehow, stresses the Cavallo (1977) effect and can be viewed as one of the implications of the linkage between the financial sector and supply side of the economy which does not appear in (orthodox) standard models. Note that the first condition in case (1) implies the insensitivity of the output market with respect to the real interest rate. This condition, when the speed of adjustment in domestic prices is equal to the consumers' expenditure share of foreign goods adjusted for the real exchange rates elasticity of output market, ensures a full isolation of the domestic price adjustment from the foreign price shock.

The first condition in the case (2) involves the equality between the absolute values of the (semi-) elasticity of balance of payments and money market (real money balances) with respect to domestic nominal interest rates. As is evident, this condition has a close relationship with the financial repression stance of the economy. More specifically, the less foreign capital is mobile and the more the domestic financial sector is repressed, the more the condition is likely to hold. The second condition implies that the foreign price elasticity of balance of payments must be equal to the expenditure share of foreign goods. These two conditions together provide a full insulation for domestic prices under the fixed arrangement against the foreign price shocks. It should be mentioned that case (2) is highly dependent on the linkage between the financial sector and the supply side of the economy. This is so because one can easily show that when the first condition holds, we have the following:

$$\Pi_2^2\Big|_{[-w_2a_1-\psi\ \ ka_1\ \ b_1\pi(1-h)+b_2]=0}=\frac{[w_1+w_2a_1(1-\theta)+w_2a_2+ka_1(1-\theta)+ka_2+\theta-1]^2}{a_1^2\theta^2(k+w_2)^2}$$

As we see when a_1 is zero, there is no direct linkage between the financial sector and supply side of the economy, and there would not be any room for full insulation in domestic prices against the foreign price shocks under a fixed rates arrangement.

An interesting case is the situation where capital mobility is prefect (domestic and foreign loans are perfect substitutes) but there is a degree of inertia in domestic prices. Even in this case, for specific values of parameters fixed rates are able to insulate fully prices[11]. For example, this will occur if the parameters take on values for which the following relation holds:

$$\gamma=(1-\theta)/[(1-\theta)(a_1-d_1-a_1d_3)+(a_2+d_2-a_2d_3)]$$

This situation is not incompatible with stability conditions, if $\gamma\neq0$ or $\theta\neq1$. Moreover, as γ can not take negative values there might be a sign restriction involving $(a_1-d_1-a_1d_3)\succ 0$ as well. Notice that when: $(a_1-d_1-a_1d_3)\succ 0$, that is the Cavallo effect is in place, the γ values meet the stability condition. However, in general, the fixed arrangement is not able to isolate prices from this shock in this instance[12].

Now, consider the case in which the domestic price is not sticky but there is some degree of imperfection in foreign financial markets. The insulation property of the fixed arrangement comes into play again if the following holds:

$$[-w_2a_1-\psi-ka_1-b_1\pi(1-h)+b_2]=0\ ,\quad w_2a_1+w_1+ka_2+w_2a_1(1-\theta)+ka_1(1-\theta)=(1-\theta)$$

which satisfies the stability condition for the case, if $\theta(a_1-d_1-a_1d_3)\neq 0$.

To study whether the model shows the classical properties of the fixed rates in the case of a foreign price shock when there exist no imperfections in the foreign financial markets and prices (e.g. Enders & Lapan (1979), Flood(1979)), this situation was examined as well. In this case, the foreign price shock does not pass to prices only if:

$$(a_1-d_1-a_1d_3)=-(a_2+d_2-a_2d_3)/(1-\theta)$$

But this is not compatible with the stability condition. Therefore, if we are interested only in the stable solutions, the fixed rates arrangement can not fully insulate prices against this shock. Thus, in general, one can state the following:

Remark 1-1: *The necessary condition for the fixed exchange rates not to fully insulate the (domestic) prices against the foreign price shock is the lack of any imperfection in the financial and real sectors of the economy.*

To be more precise, in terms of our set up the above remark suggests that imperfect capital mobility and inertia in domestic prices are necessary in order for the fixed rates to be able to provide full insulation for domestic prices against the foreign price shocks[13].

Needless to say that none of the above mentioned cases for fully stabilizing prices necessarily guarantee the perfect supply stabilization. Note that when the supply side of the economy is neither interest rate elastic nor real exchange rate elastic, the full insulation for domestic prices is equivalent to full insulation for the aggregate supply which is a very obvious outcome. However, when the aggregate supply is real interest rate and real exchange rate elastic, the sufficient condition in order for full domestic price insulation cases to provide full isolation for the aggregate supply is as follows:

$$a_1/[a_1(1-\theta)+a_2]=\lambda/[ka_1(1-\theta)+ka_2+\theta-1]$$

That is, it requires the equality between the (real) interest rate semi-elasticity of the aggregate supply adjusted for the foreign elasticity of the aggregate supply and the (nominal) interest rate semi-elasticity of money market. As we see, this condition is not necessarily in contrast to the stability of the system. Therefore, one may conceive cases in which the fixed rates would lead to full insulation for domestic prices and the aggregate supply against the foreign price shock.

1.3.1.2 Foreign Interest Rate Shock

If there is only a foreign interest shock, due to the structure of its coefficient in equation (VFI-1), the fixed arrangement is not generally able to cope with it unless in following circumstances:

1) $\gamma=0$ 2) $\psi=0$ 3) $(a_1-d_1-a_1d_3)=0$ 4) $(ka_1+b_1\pi(1-h)-b_2)=0$

Since the first one is incompatible with the necessary condition for stability of the system, it should not be taken into account as a possible case. Referring to the stability conditions, it is realized that all the other cases are not necessarily inconsistent with the stability of the system and, therefore, can be considered as possible cases. Among those, the second one has a very simple interpretation, that is, if capital is not mobile at all there is no channel in the model through which the foreign interest rate shock hits the economy. Case (3) implies the (real) interest rate insensitivity of the output market, while case (4) involves the nominal interest rate insensitivity of money market (real money balances). As is observed, cases (3) and (4) are independent of the degree of capital mobility and inertia in domestic prices as long as γ and ψ do not tend to infinity simultaneously. In words, as long as there is at least some degree of imperfections in one of either the product (output) market or (foreign) financial market. Accordingly, in the sketched structure, there are some cases, which are justifiable from economic point of view, in which the fixed arrangement can completely insulate prices against this shock. The interesting point which should be mentioned here is the provision of full insulating cases for the supply stabilization as well. For the case of perfect capital mobility (prefect substitutability between domestic and foreign loans) in the presence of inertia in domestic prices the foregoing cases, except the second one, will make a full immunization for the prices. Considering the related stability conditions previously mentioned, apart from the first one (i.e. $\gamma=0$), the two other cases can be regarded as stable ones. Nonetheless, those cases are special ones and one can generally imagine many other situations where the fixed rate is unable to show full insulation property against foreign interest shocks under perfect substitutability between domestic and foreign loans and sluggishness in prices.

When there is not any inertia in domestic prices but capital mobility is imperfect, the third and fourth cases previously mentioned still insulate prices completely. However, according to the related stability conditions, the third one can not be accepted as a stable case any more. But this is not the same for the fourth one and it provides an acceptable circumstance for full isolation from a foreign interest rate shock. Like the other cases, the full price flexibility assumption does not, in general, change the inability of the fixed arrangement to stabilize price and aggregate supply against a foreign interest rate shock. Thus, one can establish the following:

Remark 1-2: *As long as there is either some degree of inertia in domestic prices or some degree of imperfection in foreign capital mobility, the sufficient condition for the fixed rates arrangement to render full insulation for (domestic) prices and aggregate supply against the foreign interest rate (monetary) shocks is either the output market to be real interest rate insensitive or the money market (real money balances) to be nominal interest rate insensitive.*

Finally, when all the imperfections in domestic prices and capital mobility are removed it is not possible to find any combination insulating fully prices from this foreign shock. In this case, the value of Π_3 will tend to $(1/\theta)$ that can vary between (1) and less than (∞) and never can reach zero.

1.3.1.3 Domestic Money Demand Shock

Under the domestic monetary shock, when there are imperfections in both domestic price and capital mobility, the fixed rates arrangement, in general, is not able to isolate fully prices in the economy. The full insulation property of fixed rates is possible only if the output market is independent of the (domestic real) interest rate. That is, when we have: $(a_1\text{-}d_1\text{-}a_1d_3)=0$, which is not incompatible with the stability conditions. Therefore, we can establish the following:

Remark 1-3: *As long as the output market is not (domestic real) interest rate insensitive, capital mobility is not perfect and there is sluggishness in domestic prices, the fixed rate can not insulate perfectly the (domestic) prices against the (domestic) monetary shock.*

The above conclusion will be reversed when capital mobility is perfect but prices are not completely flexible, that is, the fixed arrangement will generally insulate prices against the money demand shock unless under the specific case. To be more precise, when we have: $\gamma=(\theta-1)/\theta(a_1-d_1-a_1d_3)\succ 0$, the effect of a money demand shock on the variance of prices would not be necessarily zero under the fixed rates arrangement even if domestic and foreign loans are perfectly substitutable. In this situation, Π_4 will tend to $-1/\theta(w_2a_1+ka_1)$ which is different from zero and independent of ψ. Therefore, one may conclude that *the perfect capital mobility (perfect financial market) is not a sufficient condition for the perfect insulation property of the fixed rates.*

In the other extreme case, that is, when the domestic price is not subject to any stickiness but there is imperfection in capital mobility, a fixed arrangement is not generally able to stabilize domestic prices in the presence of the domestic monetary shock.

Once both imperfections are eliminated from the model, the prominent property of the fixed arrangement under domestic monetary shocks will come into play and it completely stabilizes domestic prices. In other words, one may like to state, *as long as the output market is real interest rate sensitive, the perfect capital mobility (the perfect substitutability between domestic and foreign loans) is a necessary condition and the lack of any inertia in domestic prices is a sufficient condition for the fixed rates to be able to isolate domestic prices fully against the (domestic) monetary shock.*

It is worthwhile noting that the cases producing full insulation for prices do not necessarily ensure perfect stabilization for supply against the monetary shock. More precisely, the full insulation in prices would imply a full isolation for aggregate supply only if either the supply side of the economy is (real) interest rate insensitive or the money market is real income insensitive.

1.3.1.4 Domestic Supply Shock

If, for instance, a productivity shock hits the economy, under fixed exchange rates and imperfection in the capital mobility, irrespective of the existence or non-existence of sluggishness in domestic prices, the structure of the productive shock coefficient in equation (VFI-1) indicates that the fixed arrangement can not generally insulate the economy perfectly. Nonetheless, there are cases in which the foregoing conclusion does not hold and fixed rates can fully isolate the economy from the supply shock. The following case indicates this circumstance:

$$b_2-b_1\pi(1-h)= \psi + d_1(k+w_2)/(1-d_3)$$

Considering the stability conditions, it is not necessarily incompatible with the stability of the system. Under this circumstance, in fact, all the supply shock is accommodated partially by aggregate demand and partially by the change in the nominal interest rate so as to leave the domestic prices unchanged. This can be well understood by imagining an extreme value for the aggregate demand equation parameters involved in this case. That is, if we consider the case where the aggregate demand is real interest rate insensitive (i.e. $d_1=0$) with a unitary real income elasticity (i.e. $d_3=1$). In this occasion, a one percentage unanticipated change in supply (supply shock) will lead to exactly one percentage corresponding change in aggregate demand so that the domestic prices will be left unchanged and the necessary adjustment in money market is carried out by nominal interest rates without any repercussion in the output market. Note that these values of parameters satisfy the above condition.

When capital is perfectly mobile (domestic and foreign capital loans are perfect substitutes), regardless of the presence or absence of inertia in domestic prices, the fixed exchange rate can not fully insulate prices from the domestic supply shock as long as $d_3\neq 1$ (that is, the income elasticity of aggregate demand is not unity). In this situation, Π_4 will tend to: $-(1-d_3)\ \gamma/[1-\theta+\theta\gamma(a_1-d_1-a_1d_3)]$, if there is inertia in prices and to: $-(1-d_3)\ /\theta(a_1-d_1-a_1d_3)$, if prices are completely flexible.

Regarding the supply variance equation (VFI-2), there are cases in which the above mentioned conditions for prices will provide the same result for supply stabilization as well. For instance, when: $b_1\pi(1\text{-}h)\text{-}b_2=0$. However, this is not the case for supply stabilization in general.

1.3.1.5 Domestic Demand Shock

In the case of demand (IS) shock, which can be interpreted as the fiscal shock as well, when capital is not perfectly mobile, regardless of the presence or absence of any sluggishness in prices, the fixed arrangement is not generally able to cope with it. However, one can conceive the following cases in which the fixed rates can totally insulate prices and it is not necessarily in contrast with the stability conditions, holds:

$$[-w_2a_1-\psi-ka_1-b_1\pi(1-h)+b_2]=0$$

This implies the equality between absolute values of the semi-elasticity of the balance of payments and real money balances (money market) with respect to the domestic nominal interest rate. This option does not occur plausibly in conventional set ups and should be viewed as a result of the new features introduced in the structural underlying model here. The interesting point in this case is the validity of this result for the aggregate supply stabilization as well.

If capital is perfectly mobile (domestic and foreign loans are perfect substitutes), irrespective of the degree of stickiness in prices, there is not any way under the fixed arrangement to immunize fully prices against the IS shock. In this case, Π_6 tends to $-\gamma/[1-\theta+\theta\gamma(a_1-d_1-a_1d_3)]$, if there is inertia in prices and to $-1/\theta(a_1-d_1-a_1d_3)$ if prices are perfectly flexible. This result replicates the findings based on the standard models in the presence of demand shock.

1.3.1.6 Domestic Price Shock

The structure of the coefficient of the domestic price shock in (VFI-1) indicates that under a fixed arrangement, there is no way to insulate domestic prices completely against this type of shock. This result is sustained irrespective of the presence or absence of imperfections in capital mobility and domestic prices. However, one should not generalize it to aggregate supply stabilization. For instance, a very obvious case for perfect insulation of aggregate supply against domestic price shocks is when $a_1=a_2=0$.

At the end of this section, as we mentioned earlier and demonstrated in detail above, there is no role for the real exchange rate elasticity of the output market in the full insulation property of the fixed rates for the domestic prices against foreign interest rate and domestic monetary and real (supply-demand) shocks. Therefore, one can state the following:

Remark 1-4: *The (domestic) price full insulation property of the fixed exchange rate is independent of the real exchange rate elasticity of the output market as long as the economy is subject to foreign interest rate, domestic monetary and real shocks.*

1.3.2 Floating Rates Arrangement

Before addressing the clean float arrangement, it would be useful to transform the pseudo reduced form for p^d_{t+1} and s_t to Blanchard-Kahn's canonical form as follows:

$$\begin{bmatrix} p^d_{t+1} \\ E_t s_{t+1} \end{bmatrix} = \begin{bmatrix} (1-\alpha_2) & -\alpha_3 \\ -\beta_2 & -\beta_3 \end{bmatrix}^{-1} \begin{bmatrix} \alpha_1 & 0 \\ \beta_1 & -1 \end{bmatrix} \begin{bmatrix} p^d_t \\ s_t \end{bmatrix} + \begin{bmatrix} (1-\alpha_2) & -\alpha_3 \\ -\beta_2 & -\beta_3 \end{bmatrix}^{1} \begin{bmatrix} \alpha_5 & \alpha_6 & \alpha_7 & \alpha_8 & \alpha_9 & (1-\alpha_2) \\ \beta_5 & \beta_6 & \beta_7 & \beta_8 & \beta_9 & -\beta_2 \end{bmatrix} \begin{bmatrix} U^{p^n}_t \\ U^{i^f}_t \\ U^m_t \\ U^s_t \\ U^d_t \\ U^p_t \end{bmatrix} \qquad \text{(CFL)}$$

Applying the foregoing (undetermined coefficient) method, the full-reduced form solution for the clean float arrangement is as follows:

$$p_{t+1}^{d}=\Sigma_1 p_t^{d}+\Sigma_2 U_t^{p^n}+\Sigma_3 U_t^{i^f}+\Sigma_4 U_t^{m}+\Sigma_5 U_t^{s}+\Sigma_6 U_t^{d}+\Sigma_7 U_t^{p} \quad \text{(Fl-1)}$$

$$s_t=\Theta_1 p_t^{d}+\Theta_2 U_t^{p^n}+\Theta_3 U_t^{i^f}+\Theta_4 U_t^{m}+\Theta_5 U_t^{s}+\Theta_6 U_t^{d}+\Theta_7 U_t^{p} \quad \text{(Fl-2)}$$

$$y_t^{s}=\Xi_1 p_t^{d}+\Xi_2 s_t+\Xi_3 U_t^{p^n}+\Xi_4 U_t^{i^f}+\Xi_5 U_t^{m}+\Xi_6 U_t^{s}+\Xi_7 U_t^{d} \quad \text{(Fl-3)}$$

where s_t in (FI-3) is substituted from (FI-2) and the parameters are as:

$$\Sigma_1=1/2\{[-1+\alpha_2+\beta_1\alpha_3-\beta_3\alpha_1+(1-2\alpha_2-2\beta_1\alpha_3-2\beta_3\alpha_1+\alpha_2^2+2\alpha_2\beta_1\alpha_3+2\alpha_2\beta_3\alpha_1$$
$$+\beta_1^2\alpha_3^2-2\beta_1\alpha_3\beta_3\alpha_1+\beta_3^2\alpha_1^2-4\alpha_1\beta_2\alpha_3)^{1/2}]/(-\beta_2\alpha_3+\alpha_2\beta_3-\beta_3)\}$$

$$\Sigma_2=\alpha_5\Sigma_1/\alpha_1$$

$$\Sigma_3=\alpha_6\Sigma_1/\alpha_1$$

$$\Sigma_4=\alpha_7\Sigma_1/\alpha_1$$

$$\Sigma_5=\alpha_8\Sigma_1/\alpha_1$$

$$\Sigma_6=\alpha_9\Sigma_1/\alpha_1$$

$$\Sigma_7=\alpha_7\Sigma_1/\alpha_1$$

$$\Theta_1=-(-\Sigma_1+\alpha_1+\alpha_2\Sigma_1)/\alpha_3\Sigma_1$$

$$\Theta_2=(\beta_5\alpha_3\alpha_1+\beta_2\alpha_5\Sigma_1\alpha_3+\beta_3\alpha_5\Sigma_1-\beta_3\alpha_5\alpha_1-\beta_3\alpha_5\alpha_2\Sigma_1)/\alpha_3\alpha_1$$

$$\Theta_3=(\beta_6\alpha_3\alpha_1+\beta_2\alpha_6\Sigma_1\alpha_3+\beta_3\alpha_6\Sigma_1-\beta_3\alpha_6\alpha_1-\beta_3\alpha_6\alpha_2\Sigma_1)/\alpha_3\alpha_1$$

$$\Theta_4=(\beta_7\alpha_3\alpha_1+\beta_2\alpha_7\Sigma_1\alpha_3+\beta_3\alpha_7\Sigma_1-\beta_3\alpha_7\alpha_1-\beta_3\alpha_7\alpha_2\Sigma_1)/\alpha_3\alpha_1$$

$$\Theta_5=(\beta_8\alpha_3\alpha_1+\beta_2\alpha_8\Sigma_1\alpha_3+\beta_3\alpha_8\Sigma_1-\beta_3\alpha_8\alpha_1-\beta_3\alpha_8\alpha_2\Sigma_1)/\alpha_3\alpha_1$$

$$\Theta_6=(\beta_9\alpha_3\alpha_1+\beta_2\alpha_9\Sigma_1\alpha_3+\beta_3\alpha_9\Sigma_1-\beta_3\alpha_9\alpha_1-\beta_3\alpha_9\alpha_2\Sigma_1)/\alpha_3\alpha_1$$

$$\Theta_7=0$$

$$\Xi_1=\{[a_1(1-\theta)-a_1^2k(1-\theta)/\lambda]\Theta_1+(a_1\theta-a_1^2\theta k/\lambda)\}\Sigma_1+[a_1\theta(ka_1-ka_2-\theta)/\lambda]+(a_2-a_1\theta)$$

$$\Xi_2=[a_1(ka_1(1-\theta)+ka_2+\theta-1)/\lambda]-[a_2+a_1(1-\theta)]$$

$$\Xi_3=\{[a_1(1-\theta)-a_1^2k(1-\theta)/\lambda]\Theta_1+(a_1\theta-a_1^2\theta k/\lambda)\}\Sigma_2+$$
$$[a_1(ka_1(1-\theta)+ka_2+\theta-1)/\lambda]-(a_2+a_1(1-\theta))$$

$$\Xi_4=\{[a_1(1-\theta)-a_1^2k(1-\theta)/\lambda]\Theta_1+(a_1\theta-a_1^2\theta k/\lambda)\}\Sigma_3$$

$$\Xi_5=\{[a_1(1-\theta)-a_1^2k(1-\theta)/\lambda]\Theta_1+(a_1\theta-a_1^2\theta k/\lambda)\}\Sigma_4-(a_1/\lambda)$$

$$\Xi_6=\{[a_1(1-\theta)-a_1^2k(1-\theta)/\lambda]\Theta_1+(a_1\theta-a_1^2\theta k/\lambda)\}\Sigma_5+(1-a_1k/\lambda)$$

$$\Xi_7=\{[a_1(1-\theta)-a_1^2k(1-\theta)/\lambda]\Theta_1+(a_1\theta-a_1^2\theta k/\lambda)\}\Sigma_6$$

$$\alpha_1=\gamma(\theta\Delta_1-\Delta_2-\Delta_1\Delta_3/\lambda)-\theta+1+\Upsilon\beta_1$$

$$\alpha_2=\gamma\theta\Delta_1[(ka_1/\lambda)-1]+\theta+\Upsilon\beta_2$$

$$\alpha_3=\gamma(1-\theta)\Delta_1[(ka_1/\lambda)-1]-\theta+1+\Upsilon\beta_3$$

$$\alpha_5=\gamma[(1-\theta)\Delta_1+\Delta_2]+\theta-1-(\gamma\Delta_1\Delta_4/\lambda)+\Upsilon\beta_5$$

$$\alpha_6=\Upsilon\beta_6$$

$$\alpha_7=(\gamma\Delta_1/\lambda)+\Upsilon\beta_7$$

$$\alpha_8=[\gamma k\Delta_1/\lambda]-\gamma(1-d_3)+\Upsilon\beta_8$$

$$\alpha_9=\gamma$$

$$\beta_1=\lambda[w_2a_1\theta-w_2a_2-w_1-(w_2a_1+\psi)\Delta_3/\lambda]/[(w_2a_1+\psi)\Delta_4-\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi)]$$

$$\beta_2=\lambda[-w_2a_1\theta+(w_2a_1+\psi)\theta ka_1/\lambda]/[(w_2a_1+\psi)\Delta_4-\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi)]$$

$$\beta_3=\lambda[-w_2a_1(1-\theta)-\psi+(w_2a_1+\psi)(1-\theta)ka_1/\lambda]/$$
$$[(w_2a_1+\psi)\Delta_4-\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi)]$$

$$_5=\lambda[w_2a_1(1-\theta)+w_2a_2+w_1-(w_2a_1+\psi)\Delta_4/\lambda]/[(w_2a_1+\psi)\Delta_4-\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi$$

$$\beta_6=-\lambda\psi/[(w_2a_1+\psi)\Delta_4-\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi)]$$

$$\beta_7=(w_2a_1+\psi)/[(w_2a_1+\psi)\Delta_4-\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi)]$$

$$\beta_8=[k(w_2a_1+\psi)-\lambda w_2]/[(w_2a_1+\psi)\Delta_4-\lambda(w_1+w_2a_1(1-\theta)+w_2a_2+\psi)]$$

$$\beta_9=0$$

$$\Upsilon=\gamma[(1-\theta)\Delta_1+\Delta_2-(\Delta_1\Delta_4/\lambda)]-1+\theta$$

$$\lambda=ka_1+b_1\pi(1-h)-b_2$$

where ψ,Δ_1, Δ_2, Δ_3 and Δ_4 are the same as before.

Note that the term $\beta_1\Upsilon$ in the above equations indicates the exchange rate elasticity of the balance of payments under the floating rates arrangement (recall the term $\lambda\Lambda/T$ in pseudo-reduced form). The term Υ shows the exchange rate elasticity of the domestic price adjustment under floating rates. Also, the parameter β_2 represents the elasticity (sensitivity) of the exchange rate at time "t" with respect to the expectations about domestic prices in the next period under floating rates (recall the pseudo-reduced form equation (P-2)). The parameter β_3 shows the elasticity (sensitivity) of the exchange rates at time "t" with respect to the expectations about the exchange rate in next period under floating rates (refer to the pseudo -reduced form equation (P-2)). The parameter α_2 indicates the elasticity of the domestic price at time "t+1" with respect to the expectations of the domestic prices for time "t+1" at time "t" under floating rates (recall the pseud-reduced form equation (P-1)). The parameter α_3 represents the elasticity of the domestic price at time "t+1" with respect to the expectations on the exchange rates for time "t+1" at time "t".

For the purpose of interpreting the saddle point property of the system, the following characteristic polynomial is defined:

$$\Psi(\chi)=\chi^2-(Trace\,\mathrm{M}^*)\chi+|\mathrm{M}^*|$$

where M^* is the state transition matrix in the right-hand side of the (CFL) relation. Accordingly, the necessary and sufficient condition for a saddle point stability of the system is as follows (Sargent (1979)):

either: 1) $\Psi(1)<0$ and $\Psi(-1)>0$

or: 2) $\Psi(1)>0$ and $\Psi(-1)<0$

In the context of our model this implies that (given the system's eigenvalues inside the unit circle is corresponding to the predetermined variable) the following would be sufficient in order for the model to be saddle path stable:

$$|1-\alpha_1|<|[\beta_3\alpha_1+1-\alpha_2-\beta_1\alpha_3]/[\beta_3(1-\alpha_2)+\alpha_3\beta_2]|$$

Note that the denominator of the right-hand side should not be equal to zero. Further, considering the above explanation about β_2, β_3, α_2 and α_3, it shows the interactive effects of the expectations about the domestic price and exchange rate on the domestic prices. In order to examine if the system can in general be saddle path stable, the following cases have been chosen:

1)If: $(a_1-d_1-a_1d_3)=0 \Rightarrow$

$$1\text{-}1)\ \beta_1=1\ ,\ \gamma(a_2+d_2-a_2d_3)\succ 2(1-\theta)$$

$$1\text{-}2)\ \gamma(a_2+d_2-a_2d_3)=(1-\theta)\ ,\ \beta_1=[\gamma(a_2+d_2-a_2d_3)+\theta]/[\gamma(a_2+d_2-a_2d_3)+\theta-1]$$

2)If: $\gamma=0\ ,\ \theta\neq 1 \Rightarrow |\theta-\beta_1(1-\theta)| \prec |[\beta_3+\beta_2+1-\beta_1+2\beta_1\beta_3]/(\beta_3+\beta_2)|\ ,\ \beta_3\neq-\beta_2$

3)If: $[ka_1+b_1\pi(1-h)-b_2]=0 \Rightarrow$

$$3\text{-}1)\ \theta ka_1=ka_2+\theta$$

$$3\text{-}2)\ (a_1-d_1-a_1d_3)=0\ ,\ ka_2\neq 0\ ,\ [2\theta ka_1-ka_2-2\theta-ka_1+1]=0\ ,\ \theta\neq 1$$

4)If: $[ka_1+b_1\pi(1-h)-b_2]=1 \Rightarrow (a_1-d_1-a_1d_3)=-(a_2+d_2-a_2d_3)\ ,\ ka_1=ka_2,$

$$\beta_1=[-3\gamma(a_1-d_1-a_1d_3)+\theta+I]/\gamma(a_1-d_1-a_1d_3)(ka_1+1)$$

where: $|1-I| \prec |[3\beta_3-ka_1+1+\beta_2(ka_1+1)]/\beta_3(ka_1-1)|$

The system would be saddle point stable if the above mentioned conditions, among (many) others, hold.

When capital is perfectly mobile (domestic and foreign loans are perfectly substitutable) but domestic prices are not completely flexible, the following case, among (many) others, constitutes a sufficient condition:

1) If: $(a_1-d_1-a_1d_3)=0\ ,\ b_1\pi(1-h)-b_2=-1 \Rightarrow \gamma(a_2+d_2-a_2d_3)\succ 2(1-\theta)$

2) If: $(a_1-d_1-a_1d_3)=0 \Rightarrow \beta_1=1\ ,\ \gamma(a_2+d_2-a_2d_3)\succ 2(1-\theta)$

When there is no sluggishness in domestic prices but capital mobility is still imperfect, the following cases, among others, indicate sufficient conditions if the system is going to be conditionally stable:

1)If: $(a_1-d_1-a_1d_3)=0 \Rightarrow \beta_1=1$

2)If: $\theta=1 \Rightarrow$ 2-1) $(a_1-d_1-a_1d_3)=(a_2+d_2-a_2d_3)\ ,\ ka_1=ka_2+1,\ b_1\pi(1-h)-b_2=-2$

2-2) $(a_1-d_1-a_1d_3)=-\beta_7(a_2+d_2-a_2d_3)(ka_1+b_1\pi(1-h)-b_2)\ ,\ ka_1=2\ ,\ ka_2=0$

In the case of perfect capital mobility and complete flexibility of prices, the system is saddle point stable if the following conditions, among others, hold:

1) If: $(a_1-d_1-a_1d_3)=0 \Rightarrow$ 1-1) $b_1\pi(1-h)-b_2=1-\theta ka_1$

1-2) $\beta_1=[\gamma(a_2+d_2-a_2d_3)+\theta+I]/[\gamma(a_2+d_2-a_2d_3)+\theta-1]$

where: $-\infty \prec I \prec \infty$

2) If: $\theta=1 \Rightarrow (a_1-d_1-a_1d_3)=(a_2+d_2-a_2d_3)\ ,\ ka_1=ka_2+1,\ b_1\pi(1-h)-b_2=-2$

Given the stability conditions, domestic price and supply variances for the clean float rates would be as follows:

$$\sigma^2_{p^d}=\{\alpha_5^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)\}\sigma^2_{U^{p^n}}+\{\alpha_6^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)\}\sigma^2_{U^{i^f}}+\{\alpha_7^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)\}\sigma^2_{U^m}+ \\ \{\alpha_8^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)\}\sigma^2_{U^s}+\{\alpha_9^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)\}\sigma^2_{U^d}+\{1/(1-\Sigma_1^2)\}\sigma^2_{U^p} \quad \text{(VFl-1)}$$

$$\sigma^2_{y^s}=\{[(\Xi_1+\Xi_2\Theta_1)^2\alpha_5^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)]+(\Xi_2\Theta_2+\Xi_3)^2\}\sigma^2_{U^{p^n}}+ \\ \{[(\Xi_1+\Xi_2\Theta_1)^2\alpha_6^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)]+(\Xi_2\Theta_3+\Xi_4)^2\}\sigma^2_{U^{i^f}}+ \\ \{[(\Xi_1+\Xi_2\Theta_1)^2\alpha_7^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)]+(\Xi_2\Theta_4+\Xi_5)^2\}\sigma^2_{U^m}+ \\ \{[(\Xi_1+\Xi_2\Theta_1)^2\alpha_8^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)]+(\Xi_2\Theta_5+\Xi_6)^2\}\sigma^2_{U^s}+ \\ \{[(\Xi_1+\Xi_2\Theta_1)^2\alpha_9^2\Sigma_1^2/\alpha_1^2(1-\Sigma_1^2)]+(\Xi_2\Theta_6+\Xi_7)^2\}\sigma^2_{U^d}+ \\ \{[(\Xi_1+\Xi_2\Theta_1)^2/(1-\Sigma_1^2)]+\Theta_7^2\}\sigma^2_{U^p} \quad \text{(VFl-2)}$$

where α's, Σ's, Θ's and Ξ's are the same as before.

Although the coefficients in the aggregate supply variance equation (VFL-2) are so complicated that one can not assert any definitive conclusion, paying more attention to their relation with the coefficients of the price variance, no conflict is necessarily observed between the perfect stabilizing prices and aggregate supply. However, this should not be regarded as a definitive conclusion. For instance, perfect insulation of prices for the foreign price, domestic monetary and supply shocks does not necessarily ensure the same for the aggregate supply in those cases. Moreover, when a clean float is not able to provide full insulation for domestic prices against any specific shock, it should not necessarily be interpreted that the same holds for the supply stabilization. Keeping these considerations in mind, we will focus, like the fixed rates case, mainly on the problem of price stabilization in this part. But before addressing the effects of different shocks on the domestic prices in detail, since there is a common term in all coefficients in the price variance equation, its role should be evaluated. Having examined the structure of Σ_1 and α_1, it is found out when α_1 is equal to zero, Σ_1 would be equal to zero as well. Furthermore, this is the only case in which Σ_1 can reasonably be equal to zero. Determining the value of the coefficients for this case, we found out their values depend on the values which specific component of any coefficient will take on and, hence, one may conclude that the clean float arrangement can not necessarily insulate prices against all the shocks for specific values of parameters. Accordingly, in the following, the analysis will proceed with this consideration in mind.

1.3.2.1 Foreign Price Shock

The structure of the coefficient related to a foreign price shock, under the floating rates and the presence of imperfections in the capital mobility and domestic prices, indicates that this shock will generally transmit to the domestic prices and through it to the aggregate supply. However, under following circumstances involving specific values of parameters, full isolation property of the clean float for the domestic prices will appear:

1) $\gamma=0$, $\theta=1$ 2) $\beta_5=-1$ 3) $\Upsilon=0$

The first one can not satisfy the saddle point condition. Therefore, it must not be taken into account as a plausible case. Nevertheless, the second and third ones are not necessarily in contrast with the saddle point condition. However, the economic interpretation of these cases are of particular interest. The economic intuition behind case (2) can be best understood by recalling the (P-2) pseudo-reduced form equation. As observed, β_5 shows the foreign price shock elasticity of the exchange rate in the pseudo-reduced form under floating rates. When β_5 takes on the value minus one it implies a one percentage offsetting adjustment in the exchange rate under float arrangement following a one percentage unanticipated change in foreign price. Although in this occasion the exchange rate elasticity of domestic price adjustment under floating rates is not zero (i.e. $\Upsilon\neq0$), it will be exactly equal to the minus of foreign price elasticity of domestic price adjustment under floating rates. Therefore, in total, the adjustment in the exchange rate will counteract the foreign price shock so as to leave the domestic prices unchanged.

The economic intuition behind case (3) is simple. It implies a zero exchange rate elasticity of domestic prices. Accordingly, corresponding adjustment in the floating exchange rate following a foreign price shock will have no repercussion on the domestic prices. More strictly, when $\Upsilon=0$, the endogenous adjustments in floating exchange rates and nominal interest rates following an unanticipated change in foreign prices are such that they involve a full insulation for domestic prices.

When perfect capital mobility (the perfect substitutability between domestic and foreign loans) holds, in general, floating rates are not able to provide complete insulation for domestic prices and aggregate supply. This result remains true regardless of the existence or non-existence of any sluggishness in the prices. Nonetheless, for the former case (i.e. $\gamma \neq \infty$), one may find cases in which full immunization for domestic prices is provided by the clean float arrangement, such as: 1) $\lambda=0$ 2) $\Upsilon=0$

These circumstances are not necessarily inconsistent with the stability condition. The economic interpretation of these cases is straightforward. Case (1) implies a nominal interest rate insensitive money market and case (2) implies a zero domestic price adjustment exchange rate elasticity, viz, independence of domestic prices from exchange rate adjustments. Under both cases all the foreign price shock is accommodated partially by corresponding necessary changes in exchange rate and partially by nominal interest rate adjustments without any repercussion on the domestic prices.

For the latter case (i.e. $\gamma \to \infty$), again case (1) remains true and provides full insulation for domestic prices against a foreign price shock under floating rates. Also, one can show that when the consumers' expenditure share of foreign goods is zero (i.e. $\theta=1$) and the ratio of (semi) elasticity of real interest rate to real exchange rate (domestic price) elasticity of output market is equal to the ratio of (semi) elasticity of (domestic) nominal interest rate to the real exchange rate (domestic price) elasticity of money market (real money balances), the floating rates would fully isolate domestic prices against the foreign price shock in the case of no inertia in domestic prices and perfect capital mobility. Put differently, when we have the following: $\theta=1$, $(a_1-d_1-a_1d_3)/(a_2+d_2-a_2d_3)=\lambda/ka_2$, which is not necessarily inconsistent with the saddle point condition. In this case, once more, the offsetting adjustment in the exchange rate and, correspondingly, domestic interest rate following a foreign price shock will leave the domestic prices unaffected. Note that while $\theta=1$ implies consumers' expenditure share of foreign good is zero, it does not mean necessarily a full dichotomy of the real side of the economy from the foreign price change. This is due to the foreign component (intermediate inputs) of the aggregate supply in the economy.

Likewise, when imperfection in (foreign) capital mobility exists but domestic prices are not sticky, a clean float, generally, does not isolate prices and aggregate supply against a foreign price shock. However, two following cases, which are not necessarily in contrast with stability conditions, can produce full insulation for domestic prices:

1) β_5=-1 2) θ=1 , $(a_1-d_1-a_1d_3)/(a_2+d_2-a_2d_3)=\lambda/ka_2$

The economic intuition of case (2) has already been explained. As we discussed earlier, case (1) implies a unitary elasticity of exchange rate with respect to foreign price shock in the pseudo-reduced form (recall equation (P-2)). This case, in fact, follows the standard property of floating rates in insulating the domestic prices against the foreign price shocks. That is, β_5=-1 implies an exactly equivalent offsetting adjustment in the exchange rate following an unanticipated change in the foreign price. Therefore, there would not be any change in domestic prices.

Turnovsky (1977,1985) has shown the necessary and sufficient condition in order for a flexible exchange rate regime to provide a full insulation against a foreign inflation (price) shock is that the rest of the world should be "Fisherian". That is, the foreign interest rate must fully be adjusted for changes in foreign inflation. Given this condition, the rate of exchange depreciation of domestic currency will be equal to the change in foreign inflation rate. This will lead to full insulation of the economy under the floating rates against foreign inflation (price) shocks. Here, as specified above, it has been demonstrated that a "Fisherian" rest of the world is not a necessary condition in order for the floating rates to bring about a full insulation against the foreign price shock. To be more precise, we explored conditions which are totally dependent on the domestic characteristics of any economy and lead to a full insulation property for floating rates. The main factor responsible for this result is the aggregate supply sensitivity with respect to real exchange rate and real interest rate.

Finally, it should be noted that none of the full isolation cases, for imperfect capital mobility, will necessarily guarantee full supply stabilization.

1.3.2.2 Foreign Interest Rate Shock

If there is only foreign interest shock when the domestic price is subject to a degree of stickiness and capital is not perfectly mobile, the clean float, in general, will not fully immunize domestic price and supply against this type of shock. Nevertheless, the following relations indicate situations in which a clean float leads to a full stabilization for prices:

1) $\gamma=0$, $\theta=1$ 2) $\psi=0$

3) $(ka_1+b_1\pi(1-h)-b_2)=(a_1-d_1-a_1d_3)=0$ 4) $\Upsilon=0$

The first one is not acceptable, since it conflicts with the saddle point condition. However, the other cases are not necessarily inconsistent with the stability condition. The second one has a simple justification, that is, when capital is completely immobile there is no channel for impinging a foreign interest shock to the prices. The last two conditions, in effect, provide full insulation for prices even for the case in which capital is perfectly mobile. Case (3) implies the insensitivity of the money and output markets with respect to nominal and real interest rates respectively which is quite straightforward. Namely, when capital is mobile the only channel whereby the foreign interest rate shock hits the economy is through the nominal interest rate. When money and output markets are insensitive to changes in the domestic interest rate, there would not be any way for the foreign interest rate to hit the domestic prices. Therefore, all the shock can be accommodated with a corresponding adjustment in nominal interest rate without any reflection in the monetary and real sides of the economy. Case (4), which is already familiar, involves a zero exchange rate elasticity of domestic price adjustment and can be viewed as full accommodation of the foreign interest rate shock through the floating exchange rates without any repercussion for the domestic prices.

In the case of domestic price full flexibility, the clean float is not generally able to cope with this type of shock. Only under the following circumstances, can floating rates provide full isolation for prices;

1) $\psi=0$ 2) $\theta=1$, $(a_1-d_1-a_1d_3)/(a_2+d_2-a_2d_3)=\lambda/ka_2$ 3) $\theta=1$, $(a_1-d_1-a_1d_3)=(a_2+d_2-a_2d_3)=0$

None of the above situations are necessarily incompatible with the saddle point condition. In addition, except for the first one, the other two cases will render full insulation when there is not any imperfection in capital mobility and prices. Case (2) involves equality between the ratio of real interest rate and real exchange rate (domestic price) elasticities of money market when the consumers' expenditure does not contain the foreign goods. This occasion indicates situation where the adjustment in money and output markets following an unanticipated change in foreign interest rate are offsetting such that the domestic prices will remain unaffected thereafter. Case (3) implies zero real interest rate and exchange rate elasticities of output market and is revealing enough. The interesting point for the foreign interest shock is the validity of the above full insulation cases for the supply stabilization as well.

1.3.2.3 Domestic Money Demand Shock

If a stochastic disturbance occurs in the domestic monetary sector (money demand), the clean float can not in general stabilize completely prices and aggregate supply in the case of presence imperfect capital mobility and inertia in prices. However, the interesting question in this case is whether or not the floating rates are able to provide full insulation for prices in any economically plausible circumstances? The following cases demonstrate this possibility holds for the float arrangement:

1) $\gamma=0$, $\theta=1$ 2) $(a_1-d_1-a_1d_3)=0$, $\gamma=(1-\theta)/(a_2+d_2-a_2d_3)$

3) $\theta=1$, $(a_2+d_2-a_2d_3)/(a_1-d_1-a_1d_3)=(w_1+w_2a_2+\psi)/(w_2a_1+\psi)$

4) $\gamma=\{\beta_7\lambda(1-\theta)/\{\Delta_1\{1+\beta_7[\lambda(1-\theta)-\Delta_4]\}+\beta_7\lambda\Delta_2\}\} > 0$

Except for first case, the other cases are not necessarily in contrast with the saddle point condition. The economic interpretation of case (2) is straightforward. It states that when domestic prices are subject to inertia and (foreign) capital mobility is imperfect, the floating rates are able to fully insulate the domestic prices against the monetary shock if the output market is real interest rate insensitive and the speed of adjustment in domestic prices is equal to the share of foreign goods in consumers' expenditure adjusted for real exchange rate elasticity of the output market. This, in fact, ensures a zero exchange rate elasticity of domestic prices. The economic intuition of case (3) can be stated as follows. If the consumers' expenditure share of foreign goods in consumption is zero, the floating rates provide perfect isolation in domestic prices against the (domestic) monetary shocks, as long as the ratio of the real exchange rate and real interest rate elasticities of the output market is equal to the ratio of exchange rate and the (nominal) interest rate elasticities of the balance of payments. Note that since the ratio of the balance of payments elasticities with respect to the exchange rate and (nominal) interest rate is positive, it is required that the real interest rate elasticity of output be greater than zero. This calls for the presence of the Cavallo effect in the economy. Put differently, this occasion plausibly occurs when there is a direct linkage between the financial and real (supply) sectors of the economy. As mentioned earlier, $\theta=1$ does not necessarily mean a zero demand for foreign goods as an intermediate input in the product sector. It just shows the share of foreign goods as final goods in consumers' expenditure. Further, it is clear that case (3) is independent of the degree of inertia in domestic prices.

For the perfect capital mobility (perfect substitutability of domestic and foreign loans) case in the presence of inertia in prices, the results are the same as above except for the two last ones which are as follows:

3') $\gamma=(1-\theta)/[(a_2+d_2-a_2d_3)-\theta\ (a_1-d_1-a_1d_3)]$ 4') $\theta=1\ ,\ (a_2+d_2-a_2d_3)/(a_1-d_1-a_1d_3)=1$

Accordingly, in case of perfect capital mobility, a zero real interest rate elasticity of output and a speed of adjustment in domestic prices equal to the foreign goods consumers' expenditure share adjusted for the real exchange rate elasticity of output, viz, case (2) above, ensure a full insulation of domestic prices against the (domestic) monetary shock for floating rates.

The economic interpretation of case (4') here is the same as above with only this new consideration in mind: that the ratio of exchange rate and interest rate elasticities of balance of payments in case of perfect capital mobility is one. This implies the equality between the real exchange rate and real interest rate of output market for this occasion.

When there is no sluggishness in the prices but capital mobility is not perfect, only under following circumstances, can the clean float make prices fully insulated from a money demand shock:

1) $(a_1-d_1-a_1d_3)=(w_2a_1+\psi)=0$ 2) $\theta=1\ ,\ (a_2+d_2-a_2d_3)/(a_1-d_1-a_1d_3)=(w_1+w_2a_2+\psi)/(w_2a_1+\psi)$

None of the above mentioned cases are necessarily in contrast with the saddle point condition. Notice that case (1) refers to a very extreme situation where the (foreign) capital mobility is zero and either the supply side of the economy should be real interest rate inelastic or the balance of payments should be real income inelastic.

To examine whether full isolation is possible under floating rates for the classical case in the present model, the situation in which capital mobility is perfect and domestic price is not subject to sluggishness was investigated. Although the result indicates that the float arrangement is not in general capable of coping with a money demand shock, there is a case in which the clean float provides full insulation for the domestic prices, as follows:

$$\theta=1 \;,\;\; (a_2+d_2-a_2d_3)/(a_1-d_1-a_1d_3)=1$$

which is not necessarily in conflict with the stability condition. The economic interpretation of this case has already been discussed. Therefore, in general, we can state the following:

Remark 1-5: *When consumers' expenditure share of foreign good is zero, the necessary and sufficient condition for floating rates to insulate perfectly the (domestic) prices from the (domestic) monetary shock is the equality of the ratio of the real exchange rate elasticity to the real interest rate elasticity of output with the ratio of the exchange rate elasticity to the nominal interest rate elasticity of the balance of payments.*

Needless to say that those cases involving full insulation for prices do not necessarily guarantee the same for the aggregate supply stabilization. Therefore, under the floating rates we see, unlike the monetary and sticky-price models, that long run neutrality with respect to monetary shocks does not hold in our model. This is due to the sensitivity of aggregate supply with respect to the real interest rate and real exchange rate.

1.3.2.4 Domestic Supply Shock

The coefficient of the supply shock in equations (VFL-1) and (VFL-2) show the clean float can not generally provide full insulation for domestic price and aggregate supply when perfect capital mobility and price flexibility assumptions are violated unless the following cases are in place:

1) $\gamma=0$, $\theta=1$ 2) $\gamma=0$, $[k\,(w_2a_1+\psi)-\lambda w_2]=0$

3) $(a_1-d_1-a_1d_3)/(1-d_3)=\lambda/k=(w_2a_1+\psi)/w_2$

4) $\gamma=\beta_8\lambda(1-\theta)/\{\Delta_1\{k+\beta_8[\lambda(1-\theta)-\Delta_4]\}+\beta_8\lambda\Delta_2-(1-d_3)\lambda\}\succ 0$

The first case does not satisfy the saddle point condition and the second one not seem to be plausible. So they are not of our concern. However, the two other cases are not necessarily incompatible with the stability condition. The economic intuition of case (3) is simple. It implies equality of the ratio of the real interest rate and real (income) elasticities of the output market with the ratio of nominal interest rate and real income elasticities of money market, on the one hand, and the ratio of nominal interest rate and real income elasticities of balance of payments, on the other hand. Note that in this case there is no role for degree of inertia in domestic prices and real exchange rate elasticity of the output market. However, it is highly dependent on the degree of capital mobility. Also, as is evident, the direct linkage between the supply side and the financial sector of the economy plays a crucial role in this case. To be more precise, when there is no linkage between the financial and the real sector, case (3) would hold only for a very extreme case where capital mobility is zero and money and output markets are interest rate inelastic. Case (4) emphasizes the role of price inertia in accommodating the supply shock for domestic price stabilization. Note that since γ is always positive, this will impose a sign restriction on the acceptable values which fulfill the fourth case.

The general inability property of the clean float to cope with supply shocks remains true, when capital mobility is perfect (domestic and foreign loans are perfect substitutes) and prices are subject to stickiness. Nonetheless, there are some circumstances entailing full price stabilization in this case, such as follows:

1) $\gamma=0$, $\theta=1$ 2) $\theta=1$, $(\Delta_2-\Delta_1)/(1-d_3)=(ka_2-\lambda)/k$

3) $\gamma=k(1-\theta)/\{k(\Delta_2-\theta\Delta_1)-(1-d_3)(\Delta_4-\lambda)\}$

Except for the first one, the other cases are not necessarily in conflict with the stability condition. Noting that the sign restriction should be considered to the acceptable values for the third one as well. The economic intuition of case (2) is as follows: when the consumers' expenditure share of foreign goods is zero, the supply shock would not pass through the domestic prices under floating rates if and only if the ratio of the difference between real exchange rate and real interest rate elasticities to the real income elasticity of output market to be equal to the ratio of the difference between the real exchange rate and nominal interest rate elasticities to the real income elasticity of money market. As is evident, this circumstance is independent of the degree of domestic price stickiness. Case (3), however, lays stress on the role of inertia in domestic prices in accommodating the supply shock when domestic and foreign loans are perfectly substitutable.

When prices are not sticky any more but capital mobility is still imperfect, the clean float lacks the full immunization property in general, except for the following case:

1) $\theta=1$,

$$\frac{(a_2+d_2-a_2d_3)[(w_2a_1+\psi)-\frac{\lambda w_2}{k}]-(w_1+\psi)(a_1-d_1-a_1d_3)}{(1-d_3)}=\frac{(w_2a_1+\psi)ka_2-\lambda(w_1+w_2a_2+\psi)}{k}$$

2) $(a_1-d_1-a_1d_3)/(1-d_3)=\lambda/k=(w_2a_1+\psi)/w_2$

which are not necessarily incompatible with the stability of the system. Case (1) can be viewed as an imperfect capital mobility counterpart of case (2) when capital is perfectly mobile. It stresses how in a flexible price environment, when the consumers' expenditure share of foreign goods in consumption is zero and capital mobility is not perfect, floating rates provide a full insulation for domestic prices against the supply shock. However, case (2) shows that, if the share of foreign goods in consumption is not zero, the equality of the ratio of the real interest rate and real income elasticities of the output market with the ratio of the nominal interest rate and real income elasticities of balance of payments would ensure perfect isolation for domestic prices against the supply shock in a flexible price environment. As it is seen, this case is exactly the same as case (3) when domestic prices are subject to inertia and capital is not perfectly mobile. This allows us to raise the following:

Remark 1-6: *As long as capital mobility is not perfect, the sufficient condition for floating rates to isolate perfectly (domestic) prices against the supply shock is the equality of the ratio of the real interest rate elasticity to the real income elasticity of the output market with the ratio of the nominal interest rate elasticity to the real income elasticity of the money market and the ratio of the nominal interest rate elasticity to the real income elasticity of the balance of payments. This is true regardless of the degree of inertia in domestic prices.*

In the case of perfect capital mobility (perfect substitutability in domestic and foreign loans) and flexible prices, the general inability property of the clean float to cope with a supply shock remains as before. Nevertheless, the following case would provide full insulation for prices:

$$\theta=1\ ,\ [(a_2+d_2-a_2d_3)-(a_1-d_1-a_1d_3)]/(1-d_3)=[ka_2-\lambda]/k$$

which is not necessarily in contrast with the stability conditions. This replicates exactly case (2) when (foreign) capital is perfectly mobile but domestic prices are subject to sluggishness. Therefore, it enables us to establish the following:

Remark 1-7: *When domestic and foreign loans are perfectly substitutable (capital is perfectly mobile) and the consumers' expenditure share of foreign goods is zero, the sufficient condition for the floating rates to insulate fully (domestic) prices against a supply shock is the equality of the ratio of the difference between the real exchange rate and real interest rate elasticities to the real income elasticity of output market with the ratio of the difference between the real exchange rate and nominal interest rate elasticities to the real income elasticity of money market. This would be a necessary condition when the domestic prices are perfectly flexible.*

Finally, it should be emphasized that the full insulation case already raised, does not necessarily ensure the same for the aggregate supply stabilization under a supply shock.

1.3.2.5 Domestic Demand Shock

When a shock impinges on the aggregate demand for goods under floating rates, irrespective of the degree of capital mobility and the presence or absence of inertia in prices, in general, there is no way the prices and the aggregate supply can be isolated completely. The only extreme case, providing full insulation for output and prices, is : $\gamma=0$. This special case is not plausible and, therefore, the general conclusion for a demand shock would be the inability of floating rates to isolate fully the economy against the IS shock.

1.3.2.6 Domestic Price Shock

Like the fixed rate, floating rates are not able to insulate domestic prices completely from this shock. This conclusion remains true regardless of the presence or absence of imperfections in capital mobility and prices. However, one should avoid generalizing it to the aggregate supply stabilization[14].

1.4 Conclusion

The main objective of this chapter was to study whether the economies suffering from repression in their financial sector and its consequences for the real sector, introduces any implication for the insulating property of floating and fixed rates regimes. To this end, a simple macro model incorporating the most important related characteristics of these structures was developed and solved analytically for these two polar arrangements. Briefly, the foregoing analysis emphasizes the important role of those features for insulating property of either exchange rate regimes. Almost in all of the full insulation cases, the repression parameters play an important role and provide some plausible cases which do not exist in classical models. Regarding the optimality of the degree of flexibility, it is evident that the cases which provide full insulation should be taken into account as optimal ones as well. Accordingly, by the analytical intuitions presented so far, one can conclude that the optimal degree of flexibility for any specific shock, inter alia, will depend upon the values of the repression parameters.

In summary, our findings in this chapter show how the new features introduced into the simple standard macro model are able to overturn in many occasions the standard classical perceptions regarding the fixed and floating rates regimes in the context of short run stabilization policies. Moreover, in the case of some shocks, we have explored the necessary and sufficient conditions under which the classical results, which are mainly subject to ambiguities, hold.

It is worthy to note that, since the occasions involving full insulation under imperfect (foreign) capital mobility, almost in all cases, include a repression index which may be, to some extent, considered as a policy instrument which is under the authorities' control, one may conclude that full insulation properties of any specific exchange rate regimes can be influenced by the other monetary policies followed by the authorities. In other words, though the cases depend highly on structural characteristics of the economies, they also reflect the effects of other authorities' financial policies. This raises the probability of occurrence of the occasions by policy manipulations in the actual economic experiences.

Notes

1.We have derived an aggregate supply function which is responsive to the real interest rate and the real exchange rate in an analytical framework such as those of Bruno & Sachs (1979), Marston & Turnovsky (1985) and Hardouvelis (1987). The analysis begins with assuming a risk-neutral producer who maximizes his expected profits and finances his working capital requirements (including labour and intermediate inputs) by borrowing from either limited low cost official commercial banks credits or unofficial financial markets. Due to space limitation we have avoided a formal presentation of this (partial equilibrium) analysis in the thesis. However, it is available from the author upon request.

2.It deserves emphasis that, by inclusion of real interest rate in supply function, the model will contain the intertemporal smoothing effects of anticipated jumps in exogenous variables for supply side as well.

3.By this assumption, since we are neglecting the possibility of substitutions between the goods over time, a strong restriction has been imposed on the consumer decision making which may have its own implication for the optimization exercise undertaken here

4.Since the model is ad hoc in nature, it does not include the micro foundations of institutional or informational features of the economy that may lead the economy to possess sluggishness in its domestic price level. However, in the next chapter where the capital accumulation aspects is going to be addressed, more attention will be given to this issue by a more elaborated micro foundation based structure.

5.It is necessary to mention that here it has been supposed the non-interest-bearing demand deposits is equal to zero.

6.Lindberg and Söderlind(1992) have shown that the linear managed float rule can be considered as a good approximation of actual exchange rate band regimes and Svensson(1992,1994) has emphasized on the practical advantage of this type of rule in a stochastic linear-quadratic optimization framework. However, making use of some simple manipulations in the feed back rule, it would be possible to incorporate the possibility of target zone as an option for policy makers. For instance, one of the proposals raised by Edison, Miller and Williamson (1987) takes the following form:

$$\Delta M_t = -\rho[(s-\bar{s})/\hat{s}]^n$$

Where: $\hat{s}$ is half of the band of target zone
n is an odd integer greater than one
$\bar{s}$ is central target

Of course, they have considered interest rate rather than foreign exchange rate reserves limited as the instrument to keep exchange rate within the band. This option, however, at this stage has not been taken into account in the analysis. Although one may make a welfare gain for exchange rate bands in the context of credibility, it is difficult to consider a welfare case for bands when only stabilization is in our concern. Accordingly, implementing the non-linear policy rule in our linear dynamic model and quadratic preference framework, the conjecture ,as Davis(1977), would be more welfare losses than linear one. In addition, since the basic structural characteristics of the model is more similar to sticky-price model proposed by Miller and Weller (1991) than flex-price ones (Krugman (1991), Flood and Graber (1991)), the properties of the adjustments would be rather similar to the former.

7.Since we did not want to get involve in the initial-value problems, this type of objective function, instead of minimizing the discounted integral of squared deviations, has been chosen here.

8.Accordingly, our analysis is not going to address the problem of precise measure of intervention that monetary authorities would be concerned about.

9.This expectation hypothesis is the same as what has been followed by Fukuda and Hamada(1987).

10.Here, the possibility of exchange rate regime switching or devaluation for the fix exchange rate arrangement has been ignored.

11.Flood & Hodrick(1986), in their sticky price model have characterized fixed rate as an arrangement which fully insulate output from foreign (price and interest rate) shocks.

12.Although Flood & Marion(1982) in a different structure have concluded full insulation under fix rates, their result is valid only under full indexation.

13.Note that though in Flood & Marion (1982) the (uniformed) fixed rates regime, where the UIP and PPP hold, provide perfect insulation against foreign disturbance, their result is valid only when the wage indexation is perfect implying total supply independence of price innovations. To be more precise, their objective function by which the full insulation property of exchange rates is evaluated, when the wage indexation is perfect becomes totally independent of variance of prices. Therefore, in fact, their full insulation case does not imply the full insulation of domestic prices. The same applies for the case of two-tier exchange rates (TT) regime, albeit in this case UIP does not hold in their setup anymore.

14.It should be mentioned that though we have carried out the same analysis for the full insulation of the general price level against all types of the shocks studied in this chapter, space limitation has precluded us from presenting them in the thesis. For instance, one can easily show that all the remarks raised so far apply also to the full insulation of the general price level. Moreover, one can demonstrate that the equality of the reduced form elasticity of (nominal) exchange rate with respect to the domestic prices under floating rates with the minus ratio of the consumers' expenditure share on domestic good to that on foreign good would be sufficient for full insulation of the general price level against an aggregate demand shock and a domestic price shock. Further we have performed a numerical comparative analysis of the relative merits of the fixed exchange rate regime versus the floating exchange rate regime in the context of the aggregate supply and the (general and domestic) price level. More detailed results are available upon request to the author.

Chapter Two

The Optimal Exchange Rate Regime: A Simulation Exercise

2.1 Introduction

In this chapter in order to proceed towards a full closed-form solution, a continuous time version of the model, presented in Table (2.1) (P. 60), has been considered[1]. In Table (2.1), all the variables, except i^d, i^c and i^f, are in logarithmic form. As our analysis henceforth is concerned with the issue of the optimal degree of flexibility of the exchange rate for aggregate supply and domestic price stabilization, a simulation method in which asymptotic (unconditional) variances of the aggregate supply and domestic price will be minimized only by conditionally stable interventions for various values of intervention parameter (ρ) has been applied on the basis of Alan Sutherland's SSP (Stochastic Saddle Point) software[2]. The only modification in SSP is to add a simple direct search optimization algorithm in order to make it suitable for the main objective of this chapter.

The plan of the chapter is as follows. Section two has been devoted to an overview on general considerations about the simulation exercise. Section three presents the results of the simulation. In section four, we have briefly addressed this question that: what is the optimal π for the domestic price and the aggregate supply stabilization. Section five contains some concluding remarks.

2.2 An Overview of General Considerations

Before presenting the results, it is worth mentioning some general points at the outset. First, to impose stickiness on the domestic price, a right-hand side time derivative of the jump variable has been postulated in the domestic price adjustment equation. Accordingly, the domestic price is predetermined, although the exchange rate is a non-predetermined forward looking variable when capital is mobile.

Second, the variances are unconditional in the sense that the conditional covariance matrix of the linear dynamical system described by the linear vector (Ito) stochastic differential equation (in our instance with a non-random time invariant state transition matrix) satisfying its equation of evolution will coincide with the steady-state covariance matrix.

Third, the stability concept should also be viewed as the result of Liapunov theorem characterizing the asymptotic stability of (linear) (non-)autonomous systems and not necessarily as the stochastic stability concept mainly defined on the concept of a positive supermartingale which corresponds to that of the Liapunov function.

Fourth, all the disturbance terms are White Gaussian noise with zero mean and (constant) variance σ^2 and z^{pd} in the price equation follows an independent wiener process with mean zero and instantaneous variance σ^2. However, in order to distinguish between the effects of temporary (transitory) and permanent shocks an Ornstein-Uhlenbeck process has been assumed for the disturbance terms as well. Equation (2-10) indicates the law of the disturbance terms' motion, in which η is a positive constant. Therefore, a mean reverting process with zero mean and long run variance equal to $(\sigma^2/2\eta)$ has been postulated for the disturbance terms.

Fifth, since the objective function did not, in general, show monotonic (decreasing or increasing) behaviour, a direct search method for the optimization part was considered. Accordingly, the optimal intervention (values) should be viewed in the worst case as a local optimum but in general can be seen as global one. More precisely, due to the computation cost, the optimization has been carried out for a limited (although in our view for the most cases large enough) range of intervention parameter.

Sixth, in order to investigate the sensitivity of the objective function with respect to different weights that may be attached to its arguments, we have run the simulation for five values of μ -containing two extreme cases (say, zero and one) and the probable two-dimensional trade off between targets has been traced out. To economize the presentation of results obtained, only the results related to the two polar cases have been reported here. However, in the reported table we have marked cases in which the sensitivity of the objective function is monotonic (increasing or decreasing) by (*), and those ones which do not illustrate a monotonic sensitivity by (**). When the objective function is not sensitive with respect to various values of μ, we have not used any mark. Also figures (2.1)-(2.9) are a selective collection which have been chosen to illustrate how the optimum values of the objective function will change by varying the values of μ for special cases.

TABLE 2.1-CONTINUOUS TIME VERSION OF THE MODEL

$$y^{s}= -a_1(i^{c}-Dp) -a_2(s+p^{n}-p^{d})+\epsilon^{s} \tag{2-1}$$

$$y^{d}= -d_1(i^{c}-Dp)+ d_2(s+p^{n}-p^{d})+ d_3y^{s}+\epsilon^{d} \tag{2-2}$$

$$m-p= ky^{s}+ \beta_1 i^{d} -\beta_2 i^{c} -\beta_3(i^{f}+Ds)+\epsilon^{m} \tag{2-3}$$

$$i^{d}=\pi(1-h)i^{c} \tag{2-4}$$

$$w_1(s+p^{n}-p^{d})dt-w_2y^{s}dt+[\varphi/(1-\varphi)][(i^{c}-i^{f})dt-Ds]-Dm=0 \tag{2-5}$$

$$p= \theta p^{d} +(1-\theta)(s+p^{n}) \tag{2-6}$$

$$Dp^{d}=[\gamma/(1-\theta)](y^{d}-y^{s})dt +D^{+}s +Dp^{n}+\sigma d\epsilon^{p^{d}},\ d\epsilon^{p^{d}}\sim N(0,dt) \tag{2-7}$$

$$Dm= -\rho(s-\bar{s}) \tag{2-8}$$

$$L= \mu Var(p^{d}) + (1-\mu)Var(y^{s}) \tag{2-9}$$

$$d\epsilon^{i^{f},s}= -\eta\epsilon^{i^{f},s} +\sigma dz\ ,\ dz\sim N(0,dt) \tag{2-10}$$

Seventh, although the model has been simulated under circumstances of perfect substitutability between the informal market loans and foreign assets holdings, since for DCs this assumption can hardly be convincing, the occasions where those assets are imperfect substitutes in the portfolio of wealth holders have also been taken into consideration. The latter case can be justified because holding foreign assets for DCs' wealth holders usually involves some sort of risks which make them different from other financial assets. Therefore, for the latter case, the simulation has been performed by using two ways of incorporating imperfections between those two assets. First, an exogenous variable was added to the capital flow component of the balance of payments implying a constant risk attached to foreign asset returns. Accordingly, even though φ is equal to one it does not imply perfect interest rate arbitrage. Second, an imperfect capital mobility case (φ=0.5) was considered which implies differences between domestic and foreign asset returns[3].

Eighth, it should be emphasized here we are interested in the issue of the optimality of exchange rate arrangements rather than their full insulating properties which do not necessarily coincide with each other.

Finally, as this study is concerned with the optimal flexibility of exchange rate for DCs, the values of parameters for which the model has been simulated, are related to those of DCs. In fact, in the simulation experiment, the model has been parameterized by the available evidence for DCs. These values are displayed in Table (2.2).

TABLE 2.2-BENCHMARK VALUES
$h=0.4$ $\beta_1=1.1$ $\beta_2=0.6$ $\beta_3=0.5$ $k=0.4$ $d_1=0.5$ $d_3=0.7$ $sd_2=0.125$ $ld_2=0.8843$
$sw_1=0.183$ $sw_2=0.135$ $lw_1=1.57$ $lw_2=0.882$ $\theta=0.5$ $\gamma=1$ $a_1=0.3$ $a_2=0.2$

It should be pointed out that among the estimations reported in empirical studies, those ones which possessed a relatively more similar underlying structure to our model and followed the rational expectation hypothesis and more powerful econometric methods with a larger sample have been chosen. In Tables (2.3)-(2.42), attached in appendix A, the value of the required reserve ratio (h) on bank deposits is in accordance with what has been usually imposed in financially repressed economies with high inflation. The semi-elasticities of money demand with respect to official interest rate (β_1), unofficial interest rate (β_2), rate of return on foreign assets (β_3), the aggregate goods (d_3) and money demand elasticities of income (k) are similar to what has been reported in Agenor et al (1993)[4]. Short run and long run elasticity of terms of trade (s/lw_1) and income elasticity of imports (s/lw_2) in the balance of payments are the same as what has been mentioned by Haque et al (1993). Long run elasticities have been incorporated in the simulation experiment, since we intended to see whether the introduction of the Marshal-Lerner Condition (hereafter cited as MLC) has any implication for the optimality of the exchange rate[5]. In order to keep a common base for comparison between situations where the MLC holds and where it does not, only the parameters related to the balance of payments have been changed in the simulation experiments. The semi-elasticity of the real interest rate of aggregate demand (d_1) accords almost with what has been derived by Rossi (1988)(for consumption) and Fry (1988) (for saving). Furthermore, the values of the real interest rate and exchange rate elasticities of the aggregate supply have been chosen in such a way that they can provide minimal consistency with the empirical evidence regarding the elasticities of output with respect to labour and intermediate inputs which are respectively equal to (0.3) and (0.2) (Agenor et al (1993)). To introduce the Cavallo (1977) effect in the model, the case in which the real interest rate (semi-)elasticity of supply is equal to (0.75) has been exercised in the simulation experiment as well. In fact, we are going to study whether circumstances in which the deflationary (direct) impact of a higher real interest rate on aggregate demand is weaker than that on the aggregate supply, have any specific implication for the optimal exchange rate policy or not. Our analysis also includes cases in which the aggregate supply does not respond to the real interest rate (i.e. a_1=0) and the real exchange rate (i.e. a_2 =0). The former case implies that financial repression has no repercussion on the supply side of the economy. In addition, to avoid a long taxonomy of cases, in the following we have focused only on the specific value θ=0.5 and γ=1. The latter has been chosen because the system was in general unstable for high values of γ. Since we did not want to bias the results towards any specific bundle of consumer goods, that value has been assigned to θ. Nevertheless, to study the sensitivity of the results with respect to various values of these parameters, the simulation was exercised for very low and high (about extreme) values. The results, in general, were not so different from what will be reported in the below.

Taking into account the above considerations, Tables SW111, SW121, SW211, SW221, LW111, LW121, LW211, LW221, SA111, SA121, SA211, SA221, LA111, LA121, LA211, LA221 (refer to appendix A) display the results of the simulation experiment for the leaning with and against the wind interventions[6]. In these Tables PRIC stands for the domestic price, OUT for the aggregate supply and X for fixed , T for clean float and M for managed float exchange rate regimes. In the case of managed float, a high and low degree of interventions have been characterized by MH ($741.25 < \rho < 751.25$) and ML ($0 < \rho < 10$) respectively. Wherever there is not any suffix (i.e. there is only M), it should be viewed as a medium one. Needless to say, this classification does not imply the same optimal values for the intervention parameter. More precisely, it means they are located in the same, somewhat arbitrary, interval, even though in almost all cases the exact values of the optimal degree of flexibility are not the same. Here we have chosen this type of presentation only for the purpose of making it more tractable.

All the results are related to the situations where only single shocks have been introduced into the model. Moreover, since the leaning with the wind intervention was not optimal in any case, there is not any characterization for it in the tables. This might be somewhat justified in terms of our objective function and the values of the structural parameters of the model. Put simply, according to the specified supply function and the parameterized model, any shock producing an exchange rate appreciation (depreciation) would lead to an increase (fall) in the aggregate supply. If the policy maker is primarily concerned with aggregate supply stabilization, such an intervention strategy would offset the initial appreciation (depreciation) by increasing (reducing) money supply and thereby a fall (increase) in the aggregate supply. If the policy maker is mainly interested in price level stabilization, the domestic price equation indicates such a money market condition would provide the best stability in the domestic price as well. As a positive ρ will promote both price and aggregate supply stabilization, one may conclude there is not necessarily any fundamental conflict between exchange rate policies for stabilization of the aggregate supply and price in the parameterized structure. However, one should not generalize it to all the possible values of the structural parameters.

2.3 Model Simulation

2.3.1 Domestic Demand Shock

2.3.1.1 White Noise Disturbance

Price Stabilization

When capital mobility is high, the clean float is an optimal arrangement for stabilization of the domestic price. This result is valid irrespective of all characterizations considered in the simulation (Tables SW111, SW121, SW211, SW221, LW111, LW121, LW211 and LW221). The only exception -i.e. managed float with tiny intervention- is in the case of a nearly solvent domestic financial sector and a relatively inelastic export and import demand, irrespective of the presence of real exchange rate effect on the aggregate supply.

When capital is mobile but not perfectly, there are ambiguities in the results. That is, if export and import demands are relatively inelastic, the clean float is optimal under all various characterizations regarded in the study. But when export and import demands are relatively elastic, there is no conclusive outcome for the optimality of the exchange rate arrangements. In general, if the domestic financial sector is highly repressed, the fixed rate would be optimal. If the domestic financial sector is repressed but not completely (i.e. π=0.5) and supply is directly sensitive with respect to the real interest rate, the fixed exchange rate is optimal, except when aggregate supply is affected by the real exchange rate and domestic and foreign assets are perfect substitutes. In that circumstance, either a managed float, fixed rate or managed float with high degree of intervention performs better depending on the real interest rate elasticity of supply. A clean float is optimal in this case only if the aggregate supply is not responsive to the real interest rate. When the domestic economy is financially solvent, in the absence of the Cavallo effect, the clean float is optimal for all regarded characterizations. However, indeterminacy will emerge in the presence of the Cavallo effect. (Tables: SW112, SW122, SW212, SW222 in appendix A)

When capital mobility is highly restricted, the previous patterns, broadly, tend towards more fixed arrangements. This is true whether the supply side is affected by financial repression or not (Tables: SW113, SW213, LW113, Lw213 in appendix A). However, when the MLC does not hold and the domestic financial sector is nearly unrestricted, more flexible arrangements are superior. This pattern will dramatically change if the financial sector is somewhat significantly repressed. When the MLC is satisfied, a clean float is preferable only if the domestic financial sector is almost lax and supply is not sensitive to the real interest rate.

Supply Stabilization

When capital is highly mobile, more flexible arrangements are in general superior. However, this deduction is not conclusive and depends on perfect substitutability between domestic and foreign assets as well as on the terms of trade elasticities of export and import demand. That is, where domestic and foreign assets are imperfect substitutes and exports and imports are relatively inelastic, more fixed arrangements are preferable if supply is real interest rate sensitive and the domestic financial sector is lax. It is worthwhile noting that the introduction of repression in the domestic financial sector mostly change the type of optimal arrangement, namely, from managed float to clean float even from the fixed rate to the managed rate when the aggregate supply is responsive to the real interest rate.

When capital is mobile but not perfectly, it seems the MLC plays an important role in the optimality of exchange rate flexibility. Broadly speaking, where the domestic financial sector has been somewhat tightened up, more flexible arrangements are superior if the MLC does not hold and vice versa. Nonetheless, if the domestic financial sector is nearly solvent, in general, more flexible arrangements are more desirable, irrespective of the MLC situation. Exceptional cases mainly occur when the Cavallo effect comes into play and the MLC holds. However, it should not be viewed as a conclusive result, since the clean float can be superior even in the case of perfect substitutability and real exchange rate sensitivity of the aggregate supply function.

When capital mobility is highly restricted and the domestic financial sector is not lax, more fixed arrangements are optimal. However, in the case of a nearly full liberalized domestic financial sector, the foregoing conclusion holds only if the aggregate supply is influenced by the real interest rate and the MLC holds. This pattern will dramatically change when the MLC does not hold, viz, more flexible arrangements are superior. If supply is not directly affected by the real interest rate and the MLC holds, a managed float would be preferable.

2.3.1.2 Autoregressive Disturbance

Price Stabilization

In the case of a high degree of capital mobility, the clean float is optimal under almost all characterizations considered here (Tables: SA111, SA121, SA211, SA221, LA111, LA121, LA211, LA221 in appendix A). Two exceptions also indicate optimality of the managed float with tiny intervention and they are related to temporary shocks and relatively inelastic export and import demands.

When capital mobility is not high, the foregoing result will highly be influenced by the MLC, viz, if the MLC is not fulfilled, the clean float is superior under all circumstances but one for which a managed float would be optimal. Where the MLC holds, ambiguity arises in the definite conclusion about the optimality of a specific arrangement. However, there are cases which provide a clear-cut distinction. For instance, in the case of a permanent shock, on the one hand, if the domestic financial sector is highly repressed, a clean float is the optimal arrangement for all circumstances. On the other hand, if the domestic financial sector is nearly solvent, the clean float would be superior. The interesting point is the inferiority of the fixed rate in all cases when shocks hitting the economy are permanent. When shocks impinging on aggregate demand are temporary, one can conclude the optimality of the fixed rate for a fully domestic financially repressed economy if the Cavallo effect does not exist. On the other hand, when the domestic financial sector is nearly liberalized, in the absence of a Cavallo effect, more flexible arrangements would generally be superior if the economy is susceptible to temporary shocks. In the other cases, the optimal degree of exchange rate flexibility depends on relative values of structural and policy parameters.

In the case of highly restricted capital mobility, when the domestic financial sector is not lax and if the shock is permanent either a managed float or a managed float with a high degree of intervention would be optimal. But if the shock is temporary, in general either a fixed rate or managed float with a high degree of intervention is superior. Two exceptions can be attributed to the simultaneous presence of the Cavallo effect and a high degree of repression in the domestic financial sector when the MLC holds. When the domestic financial sector is almost liberalized the optimal degree of flexibility depends crucially on the MLC. That is, if the MLC does not hold a clean float is broadly optimal. Two exceptions include a managed float with tiny intervention and a managed float. This pattern will mainly turn to either more fixed arrangements or a managed float if the MLC is satisfied. However, a clean float can be optimal if the shock is permanent and aggregate supply is not directly affected by the real interest rate.

Supply Stabilization

Where a high degree of capital mobility holds, in the case of a temporary shock, more flexible rates -either float or dirty float with a low degree of intervention- is broadly superior under all characterizations regarded in the simulation. Although in the case of a permanent shock one can not find a uniform pattern for optimal arrangements, there is a common feature among them indicating that the fixed rate is not optimal in any circumstance. However, one may conclude the superiority of a managed float in most cases.

When capital mobility is not highly restricted, the MLC plays an important role for the temporary shock. That is, if the MLC does not hold and supply is sensitive to the real interest rate, a fixed rate is superior where the domestic financial sector is not solvent under all circumstances. The same is true when the domestic financial sector is almost liberalized and imperfect substitutability holds between foreign and domestic assets. This pattern will considerably change for a highly financially repressed situation when the MLC holds. That is, the clean float would be broadly optimal whilst the fixed rate is superior for the other instances as long as the aggregate supply is directly affected by the real interest rate. When the real interest rate does not directly affect supply, the clean float is optimal for a highly repressed situation if the MLC holds, and if it is not the case, the fixed rate would be superior. In this circumstance, more flexible arrangement is optimal for other cases. When the shock is permanent, although there are ambiguities, one can perceive that more fixed arrangements -fixed rate and float with a high degree of intervention- would not be superior in any occasion. Generally speaking, under this type of shock, the managed float is more likely to be optimal and if the MLC holds and supply responds to real interest rate changes, managed float with tiny intervention is superior for a highly financially repressed situation.

When capital mobility is highly restricted, a managed float with a low degree of intervention is superior if the domestic financial sector is not solvent as long as supply is directly affected by the real interest rate. If the real interest rate does not directly affect supply, fixed arrangements are optimal for temporary shocks while more flexible arrangements are optimal for permanent shocks. Where the aggregate supply directly responds to the real interest rate and the domestic financial sector is nearly, solvent more fixed arrangements are optimal under the temporary shock. In the case when a shock is permanent, a managed float under holding the MLC and managed float with tiny intervention when the MLC is violated would be superior.

2.3.1.3 Summary

It is evident that though there is nearly a conclusive outcome for price stabilization for the case in which capital mobility is high, little can be said about the price stabilizing property of various arrangements when capital mobility is not perfect. To put it simply, under a high degree of capital mobility, since the interest rate can not be different from the foreign interest rate in the long run, if the exchange rate can not change, all the adjustment in the face of an aggregate demand shock should be carried out by the price level. Accordingly, one can conceive the price variance under fixed rates would be higher than that under floating rates. However, this clear cut distinction is not possible for the case of supply stabilization. This is so because, on the one hand, the key difference among arrangements lies in the behaviour of the money supply adjusted to stabilize the exchange rate. But changes in the money supply which is highly dependent upon relative values of the parameters reflecting the repression situation, involves real effects on the real variables in the model. On the other hand, since the supply side in the model is responsive to the real interest and exchange rate, the ultimate steady-state position of output is crucially affected by the relative values of aggregate demand and supply as well as money demand parameters[7]. Under imperfect capital mobility ambiguities arise not only for output but also for price stabilization. In this occasion, since the interest rate is able to have its own dependent effect on the key variables in the steady state, even a fixed rate - depending on MLC situation and value of financial repression index - can outperform the others.

2.3.2 Supply Shock

2.3.2.1 White Noise Disturbance

Price Stabilization

When capital mobility is high, the clean float outperforms the other arrangements. This is true irrespective of all the characterizations regarded in our simulation. Two exceptions - i.e. a managed float with tiny intervention - occur only in the case of a nearly liberalized domestic financial sector and relatively inelastic exports and imports, regardless of the presence or absence of a real exchange rate effect on aggregate supply.

When the degree of capital mobility is not too high, ambiguities arise in the results. In general, if the MLC does not hold, the clean float outperforms the other arrangements under all characterizations considered in the simulation. If the MLC holds, the previous uniform pattern for the optimality of a specific arrangement will disappear. However, in the case of a highly financially repressed situation, the fixed arrangement is optimal under all of the conditions. When the domestic financial sector is repressed but not highly and the aggregate supply responds directly to the real interest rate, the fixed rate would be optimal, except for the case when aggregate supply is affected by the real exchange rate but with a tiny response to the real interest rate and domestic and foreign assets are perfectly substitutable. In this circumstance, a clean float would outperform the other arrangements if the aggregate supply is not directly influenced by the real interest rate. In the case of a solvent domestic financial sector, if the Cavallo effect is not present, the clean float would be superior under all regarded characterizations. In the presence of the Cavallo effect there are ambiguities in the optimality of specific arrangement.

When capital mobility is highly restricted, the more fixed arrangements in general outperform the others. This holds true whether supply is directly affected by the real interest rate or not. Nevertheless, more flexible arrangements can stabilize domestic price better than others, when the MLC does not hold and domestic financial is almost solvent. When the MLC holds the clean float can outperform the others if solvency in the domestic financial sector almost holds and supply is not responsive to the real interest rate. In this case, a managed float would also be among the optimal arrangements if supply is affected by the real exchange rate. For all other cases, either fixed or managed with a high degree of intervention is preferable.

Supply Stabilization

Under a high degree of capital mobility, the clean float is the optimal arrangement for all the characterizations only if the aggregate supply is affected by neither the real interest rate nor the real exchange rate. When supply is responsive to the real interest rate and the domestic financial sector is somewhat repressed, a fixed arrangement outperforms the others irrespective of all the characterizations included in the study. When the domestic financial sector is nearly lax and supply responds to the real interest rate, there is not a clear-cut case in the optimality of a specific arrangement. However, when the MLC holds a managed float with tiny intervention is broadly superior. Also, when the MLC is violated and assets are imperfect substitutes, a fixed rate is the preferable arrangement.

When capital is mobile but not perfectly, ambiguities arise in the superiority of a specific arrangement. However, when supply is not directly affected by the real interest rate, more flexible arrangements -mostly clean float- are broadly superior. Exceptions occur when the MLC holds and supply is affected by the real exchange rate. Also, one can in general perceive the superiority of more fixed arrangements- fixed or managed with a high degree of intervention- when the domestic financial sector is highly repressed. Again, two exceptions occur when the MLC holds and supply is affected by the real exchange rate. In addition, if the MLC holds in the presence of the Cavallo effect more fixed arrangements generally outperform the others. Apart from cases in which the MLC holds and the Cavallo effect exists, under all other conditions one can consider more flexible arrangements as a superior arrangement when the domestic financial sector is almost solvent.

When capital mobility is highly restricted, again there are ambiguities regarding the superiority of a specific arrangement. However, in the absence of real interest rate and real exchange rate effects on supply, the clean float is optimal. Furthermore, when the MLC holds in general more fixed arrangements outperform the others. Exceptions are related to the cases in which solvency in the domestic financial sector exist and aggregate supply is responsive to the real exchange rate. When the MLC does not hold more flexible arrangements -mostly clean float- can be viewed as superior arrangements if the domestic financial sector is nearly lax. Also, if the MLC does not hold but supply is highly influenced by the real interest rate, more fixed arrangements are superior. Broadly speaking, one might consider more fixed arrangements as a better candidate when the domestic financial sector is somewhat significantly repressed and the aggregate supply is under exposure of the real interest rate effect.

2.3.2.2 Autoregressive Disturbance

Price Stabilization

When capital is highly mobile, the MLC plays an important role in the optimality of a specific exchange rate arrangement. That is, if the MLC does not hold the clean float, in general, outperforms the other arrangements, irrespective of the timing nature of the shock. Exceptions -i.e. a managed float with a tiny intervention- occur when supply is not responsive to the real interest rate and the domestic financial sector is almost liberalized. But when the MLC holds, the timing nature of the shock is an important factor, viz, if the shock is permanent, either a managed float or a managed float with a high degree of intervention is generally superior. If the shock is temporary, the clean float is superior when domestic and foreign assets are imperfect substitutes. When they are perfect substitutes a clean float is broadly optimal if supply is directly affected by real exchange rate. However, one can consider a clean float as a superior arrangement when the domestic financial sector is nearly lax and the Cavallo effect is absent. The interesting point is the presence of a fixed rate among the probable optimal arrangements. When capital is mobile but not perfectly, the MLC plays a crucial role again. If the MLC does not hold a clean float in general outperforms the other arrangements. However, there are exceptions when the domestic financial sector is almost liberalized and assets are perfect substitutes. In this circumstance, when the shock is permanent and supply is not directly affected by the real interest rate, a managed float with a tiny intervention is preferable, and when the shock is temporary a fixed rate outperforms the clean float if either supply is not sensitive to the real interest rate or its degree of sensitivity is not relatively low. If the MLC holds, again, either the managed float or a managed float with a high degree of intervention is optimal when the shock is permanent. If the shock is temporary there is not a conclusive outcome. In this occasion, a prominent feature is the absence of the clean float as an optimal arrangement if the domestic financial sector is somewhat significantly repressed.

When capital mobility is very low, it is difficult to find a uniform pattern. However, one can distinguish some main features especially in connection with the MLC and the domestic financial situation. For instance, when the MLC does not hold, either a managed float or a managed float with a high degree of intervention is superior if the domestic financial sector is subject to a moderate degree of repression. This is true irrespective of the nature of the shock. However, there are two exceptions under temporary shock where the fixed rate outperforms the others if supply is not directly sensitive to the real interest rate and the domestic financial sector is not completely repressed. Also, in the case of MLC violation and solvency in the domestic financial sector a clean float is generally optimal. Exceptions emerge only when supply is not directly responsive to the real interest rate. When the MLC holds, the nature of the shock also does matter. That is, if the shock is permanent, the clean float outperforms the others when the domestic financial sector is completely repressed. In this occasion, the managed float is generally optimal if the domestic financial sector is not completely repressed. When the shock is temporary it is difficult to make a clear-cut judgment among the cases. However, one can perceive that the clean float is not among the optimal arrangements if the domestic financial sector suffers from a somewhat significant degree of repression.

Supply Stabilization

When foreign capital is relatively highly mobile, there are in general ambiguities in following a uniform arrangement under all the characterizations considered in the study. However, the main common feature among all the conditions is the inferiority of the fixed rate in comparison with the others. Furthermore, when the MLC does not hold and the shock is temporary more flexible arrangements - mostly clean float - are superior if the aggregate supply is real interest rate sensitive. This is valid irrespective of the degree of domestic financial repression.

When capital is mobile but not highly, indeterminacy in the uniform pattern of optimal arrangements is again the general feature of the results. However, as the prominent common feature, one may point to the inferiority of the fixed rate under all the characterizations, when the shock is permanent. Moreover, when the MLC does not hold and the shock is temporary the fixed rate is superior if supply is responsive to the real interest rate and the domestic financial sector is somewhat significantly repressed. Also, in case of the violation of the MLC, a temporary shock, almost solvency of domestic financial sector and responsiveness of aggregate supply to the real interest rate, the clean float is superior if assets are perfect substitutes and the fixed rate is optimal if they are imperfect substitutes. The other sensible pattern emerges when the MLC does not hold and the shock is permanent but supply is directly sensitive to the real interest rate and the real exchange rate. When the MLC holds and the shock is permanent, a managed float is optimal if assets are imperfect substitutes and the domestic financial sector is somewhat significantly repressed.

In the case of highly restricted capital mobility, if the domestic financial sector is subject to a relatively significant repression under a temporary shock, irrespective of the MLC situation, a managed float with a tiny intervention is optimal if the aggregate supply is real interest rate sensitive and the clean float is superior if the aggregate supply is not responsive to the real interest rate. The same is true under a permanent shock but only if the MLC does not hold. In the latter situation, if the domestic financial sector is nearly liberalized, the clean float and if the MLC also holds more flexible arrangements would be optimal. However, under a temporary shock the foregoing pattern will mainly tend to the managed float while if the MLC holds the pattern will generally tend to more flexible arrangements. The interesting point is the inferiority of the fixed rate under all the characterizations.

2.3.2.3 Summary

The results indicate the presence of ambiguities in the optimality of specific arrangements. A couple of illustrations will clarify the reason of these ambiguities. For instance, in the face of an expansionary supply shock, there would be an excess supply in the goods market and an excess demand for money. Therefore, there is the need for a depreciation in the exchange rate to restore the goods market equilibrium and an appreciation for maintaining the money market equilibrium in steady state when capital mobility is high. Under the fixed rate, a combination of an increase in the money supply and a reduction in the domestic price will ultimately retain the money market equilibrium and the whole adjustment in the goods market would be carried in effect by the reduction in the domestic price. However, under floating rates it is not clear if the exchange rate in the steady state will depreciate or appreciate, and relative values of parameters in money demand and aggregate supply and demand play an important role. If a depreciation happens, such as in most cases in our simulation experiment, the floating rates would outperform the others for price stabilization. It is so because a less reduction in the domestic price would be necessary under floating rates than under fixed rates. Conversely, if an appreciation occurs the fixed rate would be superior to the floating rates. For aggregate supply, one can conceive cases in which floating rates not only for price but also for aggregate supply stabilization outperform the fixed rate and vice versa. In other words, provided a depreciation occurs, it is not clear under the floating rates if supply variance would be more or less than that under the fixed rate. This indeterminacy occurs, since supply is real interest rate and exchange rate sensitive. When capital mobility is not high, this ambiguity may even increase, because the interest rate would have its own separate role in between as well.

2.3.3 Money Demand Shock

2.3.3.1 White Noise Disturbance

Price Stabilization

When capital mobility is high, the fixed rate is the optimal arrangement to cope with the monetary shock in order to stabilize the domestic price. This is true for all the characterizations considered in the simulation.

When capital is not highly mobile, the MLC plays an important role, viz, if the MLC does not hold, the managed float seems to be a superior arrangement for all the conditions regarded in the study, but when the MLC holds this pattern changes. In the latter case, if the domestic financial sector is highly repressed, the fixed rate is generally optimal for all the characterizations. The only exception occurs when the aggregate supply is not sensitive to real interest and exchange rates and assets are imperfect substitutes. In the case of near financial solvency, the managed float is still generally a superior arrangement. Two exceptions -i.e. managed with high degree of intervention- are related to the presence of the Cavallo effect in the absence of a real exchange rate effect on aggregate supply. When the domestic financial sector is not highly repressed a more fixed arrangement generally outperforms the others. Exceptions emerge mainly when aggregate supply is not directly responsive to real interest rate.

In the case of highly restricted capital mobility, when the domestic financial sector is somewhat significantly repressed, more fixed arrangements are superior. More precisely, if the MLC holds the fixed rate is the optimal one. The foregoing conclusion is valid for all the characterizations. When the domestic financial sector is nearly solvent, the MLC plays a role, namely, if the MLC is violated the managed float with low degree of intervention outperforms the others in case of sensitivity of aggregate supply to the real interest rate. Conversely, if the MLC holds more fixed arrangements are superior when aggregate supply is directly affected by real interest rate.

Supply Stabilization

Under high capital mobility, a clean float outperforms the others. This is true under all the conditions considered in the study.

When capital mobility is not highly restricted, if the MLC is violated the clean float outperforms the others for all the characterizations. If the MLC holds more fixed arrangements -mainly fixed rate- are in general superior when the domestic financial sector suffers from a moderate degree of repression. Exceptions occur only if aggregate supply is not directly affected by the real interest rate. In the case of near financial liberalization, a clean float is generally the best candidate in this regard. Exceptions mainly occur in the presence of the Cavallo effect when the real exchange rate effect on aggregate supply does not exist.

When capital mobility is highly restricted, optimal arrangements more or less follow the same pattern as the price stabilization. That is, more fixed arrangements -with optimality of the fixed rate under holding the MLC- are superior when the domestic financial sector is subject to a relatively significant degree of repression. Also, when the domestic financial sector is almost lax and aggregate supply is affected by the real interest rate, the clean float would be the optimal arrangement if the MLC does not hold, and more fixed arrangements are superior if the MLC holds.

2.3.3.2 Autoregressive Disturbance

Price Stabilization

When capital is highly mobile, the fixed rates seems to outperform the others. When capital is mobile but not highly, if the MLC is violated, either the managed float or the managed float with a high degree of intervention is superior under a temporary and permanent shock.

However, for the temporary shock the fixed rate appears among the optimal arrangements especially when the aggregate supply is not affected by the interest rate. When the MLC holds, under a permanent shock, although a fixed rate can be optimal for some cases, the managed float and the managed float with a high degree of intervention -mostly the latter one- are optimal. In this occasion, under a temporary shock, the managed float is generally a superior arrangement if aggregate supply is real interest rate sensitive. The only exception is the fixed rate when the domestic financial sector is almost solvent and assets are imperfect substitutes. When supply is not directly influenced by the real interest rate, the fixed rate is optimal if the domestic financial sector is moderately repressed. In total, one can not easily distinguish a uniform pattern for all the conditions.

When capital mobility is highly restricted, under a permanent shock, either the managed float or the managed float with a high degree of intervention is superior. However, the fixed rate can be optimal either when supply is not directly influenced by the real interest rate and the domestic financial sector is moderately repressed or the domestic financial sector is nearly lax and the Cavallo effect exists.

Supply Stabilization

When capital is highly mobile, if aggregate supply is affected by the real interest rate and assets are perfect substitutes, either the managed float or the managed float with tiny intervention -mostly the latter one- is superior under a permanent shock. In this case, the managed float outperforms the others under a temporary shock. However, when the aggregate supply is not responsive to the real interest rate, either the managed float or the managed float with a high degree of intervention is optimal under a permanent shock, and either the clean float and the fixed rate or more flexible arrangements - depending on the import and export elasticities - are preferable under a temporary shock. When assets are imperfect substitutes and supply is interest rate sensitive, the managed float under a permanent shock is optimal and the same is true if imports and exports are relatively elastic. If they are inelastic, either the clean float or the managed float - mostly the latter one - outperform the others under a temporary shock. When aggregate supply is not responsive to the real interest rate, mainly more fixed arrangements under a permanent shock and mainly the clean float under a temporary shock are optimal.

When capital mobility is not highly restricted, more flexible arrangements, mainly the managed float with a tiny intervention under a permanent shock and mostly a clean float under a temporary shock are superior if the aggregate supply is directly affected by the real interest rate. This is true under all the conditions considered in the study. When supply is not real interest rate sensitive, it is difficult to distinguish a uniform pattern.

Under highly restricted capital mobility again more flexible arrangements - mainly the managed float with a tiny intervention under a permanent shock- are optimal when the aggregate supply is directly influenced by the real interest rate. This is true when aggregate supply is not affected by the real interest rate and the shock is permanent.

2.3.3.3 Summary

Again, ambiguity in the optimality of a specific arrangement is the main feature of the results. When capital mobility is high, the fixed rates seems to be generally superior to the other arrangements in the stabilization of domestic prices. However, this is not necessarily the case for aggregate supply stabilization. This may be justified because an appreciation/a depreciation has opposite effects on the aggregate supply (increasing/decreasing) and demand (decreasing/ increasing) which can offset each other in such a way that they leave the output unchanged in the steady state. Under moderate capital mobility the managed rates, in general, might be viewed as an optimal arrangement for price stabilization. Nevertheless, the results are still ambiguous for both output and price in general. The ambiguities emerge due to UIP violation which allows the interest rate to be different from the foreign interest rate and, hence, the balance of payments components will play their own specific roles in the process of adjustment. In this situation, if the authorities try to accommodate the money demand shock by only changes in money stock - i.e. to follow a fixed rate - since capital is not perfectly mobile this may create a disequilibrium in the balance of payments which necessitates an adjustment in the domestic price level and interest rate and thereby aggregate demand and supply are required to be adjusted according to the circumstances.

2.3.4 Domestic Price Shock

2.3.4.1 White Noise Disturbance

Price Stabilization

Under high capital mobility, the clean float is generally the optimal arrangement under all the characterizations. Two exceptions - i.e. a managed float with a tiny intervention - occur when the domestic financial sector is nearly solvent and aggregate supply is real interest rate sensitive.

When capital is mobile but not perfectly, the MLC plays an important role, viz, if the MLC is violated a clean float is superior for all the characterizations regarded in the study, but if the MLC holds this pattern remains mainly when the domestic financial sector is almost liberalized and the Cavallo effect is absent. In this occasion, the fixed rate outperforms the others when the domestic financial sector is completely repressed. The same is true when the domestic financial sector is not highly repressed and the supply is real interest rate sensitive. Therefore, one can perceive that, when the domestic financial sector is subject to a relatively high degree of repression, a fixed rate is optimal if supply is responsive to the real interest rate.

When capital mobility is highly restricted, again the MLC has an important role. That is, when the MLC holds the fixed rate is optimal under all the conditions. Exceptions - i.e. the clean float - happen only when the domestic financial sector is nearly solvent. When the MLC does not hold, more fixed arrangements are superior if the domestic financial sector is moderately repressed, and more flexible arrangements - mainly a clean float - are preferable if the domestic financial sector is almost liberalized.

Supply Stabilization

When the degree of capital mobility is high, a clean float is optimal if the domestic financial sector is subject to a sensible degree of repression and import and export demands are relatively elastic. In this circumstance, either more flexible arrangements - mostly a clean float- or a managed float can be viewed as superior arrangements when the domestic financial sector is nearly lax. In the case of relatively inelastic import and export demands, when the domestic financial sector is moderately repressed more flexible arrangements are preferable. However, when the domestic financial sector is almost liberalized more fixed arrangements are superior if assets are imperfect substitutes and supply is real interest rate sensitive. In this circumstance, more flexible arrangements, however, outperform the other occasions.

Under imperfect, but not highly restricted, capital mobility, the MLC has a crucial role. That is, if the MLC does not hold, the clean float is superior when the domestic financial sector is completely repressed, and more flexible arrangements -mostly the clean float- are optimal for the other cases. But when the MLC holds the fixed rate is superior if the domestic financial sector is moderately repressed. The only exception occurs when aggregate supply is not real interest rate sensitive and the degree of repression is not complete. In this occasion, if the domestic financial sector is almost solvent in the absence of the Cavallo effect, the clean float is optimal.

When capital mobility is highly restricted, once more the MLC plays an important role. If the MLC holds the fixed rate is optimal when the domestic financial sector is moderately repressed. Moreover, when the domestic financial sector is nearly solvent, more fixed arrangements are superior if the aggregate supply is real interest rate sensitive and the managed float is preferable if supply is not. When the MLC is violated, more fixed arrangements -mainly the managed float with a high degree of intervention- are optimal if the domestic financial sector is moderately repressed, and more flexible arrangements - mostly the clean float - outperform the others if solvency holds in the domestic financial sector.

2.3.4.2 Autoregressive Disturbance

Price Stabilization

In the case of high capital mobility, the clean float is generally optimal under all the characterizations. Two exceptions emerge under a temporary shock when the domestic financial sector is almost solvent and assets are perfect substitutes.

When capital mobility is not perfect, the MLC has a crucial role. That is , when the MLC is violated a clean float is the optimal arrangement under all other circumstances. When the MLC holds, under a permanent shock the managed float is generally optimal if the domestic financial sector is completely repressed. In this occasion, when the domestic financial sector is nearly solvent, the clean float is superior. For the other cases either the clean float, managed float with a tiny intervention or managed float are preferable depending on the relative values of the repression index and the real interest rate sensitivity of aggregate supply. Nevertheless, in any case the fixed rate is not superior. For the temporary shock it is difficult to find a uniform pattern. However, when the domestic financial sector is completely repressed the fixed rate generally outperforms the others while when the domestic financial sector is solvent the clean float mainly is preferable.

When capital mobility is very low, the MLC again has some implications for the optimality of the arrangements. That is, when the MLC is violated and under a permanent shock the clean float is superior if the domestic financial sector is nearly liberalized. When the domestic financial sector is subject to a relatively significant degree of repression either the managed float or the managed float with a high degree of intervention is optimal. In the case of a temporary shock, again the clean float is mostly preferable if the domestic monetary sector is nearly lax while if the domestic monetary sector is moderately repressed more fixed arrangements are superior. When the MLC holds under a permanent shock the managed float is optimal if the domestic financial sector is almost solvent and supply is directly responsive to the real interest rate. In this occasion, if the domestic financial sector is subject to a relatively high degree of repression either the managed float or the managed float with a high degree of intervention would be optimal. Under a temporary shock, the fixed rate is generally the best arrangement if the domestic financial sector is about solvent and more fixed arrangements - again mostly fixed rate - are in general superior if the domestic financial sector is not solvent. However, the managed float can be optimal when the domestic financial sector is completely repressed and the Cavallo effect exists.

Supply Stabilization

Under a high degree of capital mobility, the prominent feature is the inferiority of the fixed rate in comparison with the other arrangements. In this case, for the temporary shock more flexible arrangements are generally optimal. Exceptions occur in the presence of the Cavallo effect and solvency in the domestic financial sector. Under a permanent shock it is difficult to distinguish a uniform pattern in terms of our characterizations. However, one can perceive that, when import and export demands are relatively inelastic and supply is not directly affected by the real exchange rate, the managed float is generally optimal. In addition, when demands for export and import are relatively elastic and assets are perfect substitutes, more flexible arrangements - mostly a managed float with a tiny intervention - are preferable if the domestic financial sector is subject to relatively significant repression.

When capital is mobile but not perfectly, the common feature is the absence of a fixed rate among the optimal arrangements. Apart from this common feature, it would be difficult to distinguish a uniform pattern. However, one may perceive the optimality of a managed float with a tiny intervention when supply is directly affected by the real interest rate and assets are imperfect substitutes. For a temporary shock, if the MLC holds and supply is responsive to real interest rate, more flexible arrangements - mostly the clean float - are superior when the domestic financial sector is completely repressed while the fixed rate would be optimal if the domestic financial sector is not solvent. This pattern will change when the MLC is violated. In this circumstance, if aggregate supply is real interest rate sensitive, the fixed rate is superior when the domestic financial sector is not solvent. The same result is true for a relatively solvent domestic financial sector if assets are imperfect substitutes. When assets are perfect substitutes, the managed float is optimal.

Under highly restricted capital mobility, when supply is directly affected by the real interest rate, the managed float with tiny intervention outperforms the others if the domestic financial sector is subject to a relatively moderate repression. The same is true for a solvent domestic financial sector, if the MLC holds and the shock is permanent. However, when the MLC is violated, under a permanent shock the managed float would be optimal. Under a temporary shock more fixed arrangement - mostly the clean float - are superior for a nearly solvent financial sector. When aggregate supply is directly affected by the real interest rate, more fixed arrangements are optimal for a temporary shock while more flexible ones are preferable for permanent shocks.

2.3.4.3 Summary

In total, under a domestic price shock, which can happen due to an autonomous change in expectations regarding prices, the clean float outperformed the others for price stabilization in the case of a high degree of capital mobility. This is so because when we are close to UIP, the only way to offset the effects of this shock in the long run, is the adjustment in exchange rate. Under a fixed rate, the whole shock will be accommodated by changes in the money supply to equilibrate the money market. However, under floating rates, it would be possible that parts of the shock to be offset by changes in the exchange rate. Although the same can be true for supply stabilization, in general, the optimality of any arrangement depends on the relative values of the parameters, specially those reflecting the repression situation of the economy. Under imperfect capital mobility, the foregoing clear-cut distinction for price stabilization will be undermined to some extent due to the possibility of interest rate differences between domestic and foreign ones. With the adjustment role of the interest rate, a fixed rate - depending on relative values of parameters - may even outperforms the others and, hence, ambiguity can arise for price as well as output stabilization.

2.3.5 Foreign Interest Rate (Monetary) Shock

2.3.5.1 White Noise Disturbance

Price and Supply Stabilisation

A clean float is the optimal arrangement for the price as well as output stabilization under almost all of the characterizations regarded in the simulation experiment. However, this pattern will change when capital mobility is not high, the MLC holds and assets are not perfect substitutes. In this case, if the domestic financial sector is completely repressed, the fixed arrangement is superior for both price and supply stabilization. The same is generally true if supply is directly affected by the real interest rate and repression in the domestic financial sector exists but its degree is not complete. The only exception - i.e. a managed float with a high degree of intervention- occurs for the price stabilization in the presence of the Cavallo effect. In this situation, when supply is not directly affected by the real interest rate a clean float is again the best candidate for all but one case. The exception happens when supply is not directly sensitive to the real exchange rate and the Cavallo effect exists.

2.3.5.2 Autoregressive Disturbance

Price Stabilization

In case of high capital mobility, when imports and exports are relatively inelastic and the shock is permanent, the clean float is generally optimal. Under a temporary shock, the clean float outperforms the others if supply is real interest rate sensitive and a complete repression in the domestic financial sector holds. When the domestic financial sector is completely repressed, demands for imports and exports are relatively elastic and supply is directly affected by the real interest rate, either a managed float or a managed float with a high degree of intervention is optimal for a permanent shock and the managed float is superior for a temporary shock. In this occasion the clean float is optimal when the domestic financial sector is almost lax and assets are perfect substitutes while when assets are imperfect substitutes and supply is relatively very responsive to the real interest rate, a managed float is superior. For the other cases, one can hardly distinguish a uniform pattern and the optimality of arrangements depends on the relative magnitudes of the parameters reflecting the specific characterizations considered in the study.

Where capital is mobile but not highly, when the MLC is violated and the shock is permanent, the clean float outperforms the others under all conditions. In this occasion, for a temporary shock and if assets are imperfect substitutes, a managed float is generally optimal. Exceptions - i.e. a fixed rate - emerge when supply is not responsive to the real interest rate and solvency almost holds in the domestic financial sector. When the MLC holds and the shock is temporary the managed float is generally optimal. Exceptions are related to the domestic financial solvency and insensitivity of supply with respect to the real interest rate. For a permanent shock, a clean float outperforms the others if assets are perfect substitutes and the domestic financial sector is nearly liberalized while either the managed float or the managed float with a high degree of intervention is preferable if the domestic financial sector is completely repressed. When the degree of repression is not complete, in the absence of the Cavallo effect, again the clean float would be optimal. If assets are imperfect substitutes and solvency holds in the domestic financial sector, the managed float with high degree of intervention when supply is real exchange rate sensitive, and the managed float when aggregate supply is not directly affected by the real exchange rate, are superior.

Under highly restricted capital mobility, when the MLC is violated and the shock is permanent the clean float is optimal while under a temporary shock a managed float is generally superior if supply is responsive to the real exchange rate. When aggregate supply is not directly affected by the real exchange rate, the managed float is generally superior if solvency holds in the domestic financial sector and a managed float with a tiny intervention is broadly optimal if the domestic financial sector is subject to repression. When the MLC holds, if shock is temporary and supply is directly affected by the real interest rate, the managed float is superior under an insolvent domestic financial sector and the fixed rate generally outperforms the others under solvency in the domestic financial sector. When the shock is permanent, the clean float is optimal if the domestic financial sector is nearly liberalized. However, if the domestic financial sector is highly repressed and aggregate supply is directly affected by the real interest rate, the managed float is broadly superior.

Supply Stabilization

When capital mobility is high, ambiguities generally arise in getting a conclusive result. However, one can perceive that the fixed rate is not among the optimal arrangements when the shock is permanent. Furthermore, for a temporary shock, if import and export demands are relatively inelastic and the domestic financial sector is completely repressed, a clean float is superior when supply is directly affected by the real interest rate. In this occasion the managed float is optimal if assets are imperfect substitutes. When imports and exports are relatively elastic, the clean float is generally optimal if assets are perfect substitutes and the aggregate supply is real interest rate sensitive.

When capital is mobile but not highly, the only common feature under a permanent shock is the absence of fixed rates among the optimal arrangements. Nonetheless, if the MLC is violated, one can perceive that more flexible arrangements are optimal when assets are imperfect substitutes. This is also true if assets are perfect substitutes and supply is directly affected by the real exchange rate. When the MLC holds and the domestic financial sector is nearly solvent, again more flexible arrangements are superior. But if the domestic financial sector is moderately repressed either the managed float or the managed float with tiny intervention outperforms the others. For a temporary shock if assets are perfect substitutes, the managed float and if assets are imperfect substitutes, the clean float are generally optimal when the domestic financial sector is almost lax. This is true irrespective of the MLC situation. When the domestic financial sector is not solvent and assets are imperfect substitutes the managed float, irrespective of the MLC situation, is optimal. When they are perfect substitutes the fixed rate, irrespective of the MLC situation, is generally superior. In this case, exceptions include the managed float arrangement.

Under highly restricted capital mobility, when the shock is permanent, again the fixed rate is inferior in comparison with the others. In this occasion, if the MLC does not hold and the shock is permanent, in general the managed float with tiny intervention is optimal. The only exception includes the managed float arrangement. When the MLC holds and aggregate supply is directly affected by the real interest rate, the managed float with tiny intervention is superior under solvency in the domestic financial sector. When the domestic financial sector is not solvent either the managed float or the managed float with a low degree of intervention outperforms others. Under a temporary shock, the fixed rate is optimal if the aggregate supply is sensitive to the real interest rate and the domestic financial sector is not solvent. But when solvency almost holds in the domestic financial sector, the managed float generally can be considered as an optimal arrangement.

2.3.5.3 Summary

Ambiguity in the superiority of a specific arrangement, even in case of high capital mobility for supply and price stabilization, is the prominent feature of the results. But why do we have this result? The reason is fairly simple. Under a high degree of capital mobility, this shock will almost fully be transmitted to the money demand and aggregate supply and demand at once by the interest rate term, and the steady state position will be determined by incorporating this shock. Accordingly, it is evident that the combined effects of this shock on all those three counts, and thereby on steady state output and price positions, would be ambiguous. This is so because, for instance, a positive shock requires a depreciation for aggregate demand and money demand to offset that effect while an appreciation is necessary for the supply side. Thus, the ultimate combinations of domestic prices and the exchange rate will be highly dependent on the relative values of the parameters, especially those reflecting the repression situation. Under imperfect capital mobility, the degree of transmission is highly determined by the degree of integration with the foreign capital markets. This clearly will add another source of ambiguity to the optimal arrangement.

2.3.6 Foreign Price Shock

Since the system is inherently nonstationary - due to its structure - under white noise disturbance, hence in the case of a foreign price shock, the simulation experiment will be focused only on the autoregressive disturbance.

Price Stabilization

When capital mobility is high, for a permanent shock, a clean float may be viewed generally as the optimal arrangement. However, this is not a conclusive outcome, viz, the managed float can be optimal for some cases especially when the domestic financial sector is completely repressed. When the shock is temporary and the domestic financial sector is completely repressed, the managed float generally is superior. Exceptions - i.e. a clean float - mainly emerge when demands for imports and exports are relatively inelastic, assets are imperfect substitutes and aggregate supply is not affected by the real interest rate, as well as the case in which assets are perfect substitutes and aggregate supply is not sensitive to either the real interest rate nor the real exchange rate. The interesting point is the presence of a fixed rate and managed with a high degree of intervention among the optimal arrangements as well.

When capital mobility is not highly restricted, again the clean float is generally the superior arrangement for a permanent shock. The only exception including the managed float is related to the highly financial repression case (Table SA112 in appendix A). For a temporary shock when the MLC holds, the clean float broadly outperforms the others if the domestic financial sector is highly repressed. In this occasion, the managed float is in general superior if solvency holds in the domestic financial sector. Once again, the fixed rate emerges among the optimal arrangements. When the MLC is violated, the managed float is broadly superior if the domestic financial sector is completely repressed. The only exception includes the managed float with a tiny intervention. Moreover, one can perceive that, when assets are imperfect substitutes, more flexible arrangements - mostly a clean float - is optimal if solvency holds in the domestic financial sector.

When capital mobility is highly restricted, if the shock is permanent, the clean float is definitely the superior arrangement. However, when the shock is temporary and supply is sensitive to the real interest rate, more fixed arrangements -mainly a fixed rate- outperform the others if the domestic financial sector is nearly lax. In this occasion, when the domestic financial sector is subject to a relatively significant repression, more flexible arrangements - a clean float if the MLC does not hold and mostly managed float if the MLC holds - are optimal.

Supply Stabilization

In case of high capital mobility, when the shock is permanent, more flexible arrangements are optimal if the domestic financial sector is subject to a relatively significant repression. When the domestic financial sector is almost liberalized, the managed float is in general superior if supply is real interest rate sensitive. The same result is broadly true when the shock is temporary and assets are imperfect substitutes. When assets are perfect substitutes, the optimal arrangement depends on the relative values of parameters reflecting the specified characterizations in the study.

When capital mobility is not highly restricted, for permanent shocks more flexible arrangements are optimal if the domestic financial sector is not solvent. The only exception includes the managed float when aggregate supply is real interest rate insensitive and assets are imperfect substitutes (Table SA222 in appendix A). When the domestic financial sector is nearly lax and aggregate supply is responsive to the real interest rate, the managed float with tiny intervention is optimal if assets are imperfect substitutes. When assets are perfect substitutes the clean float -if aggregate supply is responsive to the real exchange rate- and the managed float -if aggregate supply is not sensitive to the real exchange rate- are superior. When the shock is temporary and the MLC holds, the clean float is generally superior if the domestic financial sector is completely repressed. In this occasion, when the domestic financial sector is almost solvent and supply is directly affected by real interest rate, the managed float is superior if assets are perfect substitutes and the fixed rate is optimal if they are imperfect substitutes. When the domestic financial sector is not highly repressed and supply is real interest rate sensitive, the fixed rate is superior. When the MLC is violated and assets are imperfect substitutes the fixed rate outperforms the others if aggregate supply is real interest rate responsive and shock is temporary. In this circumstance, if assets are perfect substitutes and supply is directly affected by the real exchange and interest rates again the fixed rate is optimal when the domestic financial sector suffers from a relatively sensible degree of repression and the managed float is superior if the financial sector is almost liberalized. This pattern will be reversed when supply is not responsive to the real interest rate.

Under highly restricted capital mobility, when the shock is permanent more flexible arrangements - if the MLC is violated only clean float - are superior. When the shock is temporary, again a clean float is optimal if the domestic financial sector is not solvent and more fixed arrangements are superior if the domestic financial sector is solvent and supply is real interest rate sensitive.

Summary

Once again, there are ambiguities so that one is not generally able to assert anything definite about the superiority of a specific arrangement in terms of our characterizations. Although these ambiguities can broadly be justified under imperfect capital mobility by the presence of interest rate effects on output and price steady-state position as a result of following flexible arrangements as well as fix arrangement.

2.4 The Optimal π

Our analytical and numerical analysis has already demonstrated the important role of the financial repression for the optimal exchange rate regimes. An interesting question which might be raised in one's mind is: what would be the optimal level of the financial repression and the exchange rate flexibility for an economy? This issue, in fact, has taken up our main concern in the second part of this thesis within a more elaborated framework. However, it would be interesting to have a numerical investigation on this matter within our IS/LM setup too. The aim of this section is to address this issue very briefly. Accordingly, we have been selective and our discussion here has been limited to the white noise disturbances for only three sets of the model parameters values including the benchmark values. Also, here we have been concerned about the optimal level of π for a given level of the foreign capital mobility (i.e. φ=0.5). Tables 2.43-2.45 display the optimal level of π and ρ when the economy is buffeted only by one of the domestic (demand, supply, money demand) and foreign (price, interest rate) shocks.

We think the tables are expressive enough. The simulation results show almost the same pattern for the optimality of π for all the shocks except for the domestic supply shock. That is, if the economy is exposed to the domestic demand and price shocks, the higher values of the π (implying less degree of repression) would stabilize the domestic price and the aggregate supply better than the lower values of the π (implying high level of repression). The opposite holds true for the foreign price and interest rate shocks and the domestic demand shock. As observed, this results do not necessarily exhibit a trade off between the aggregate supply and domestic price stabilization with regard to the optimal choice of π. However, in case of the domestic supply shock a uniform pattern for the optimal π is not observed and it depends crucially on the specific values of the structural parameters. More specifically, though in the Tables 2.44 and 2.45 there seems to exist a trade off between the domestic price and the aggregate supply stabilization for the optimal choice of π, this is not true for the parameters values corresponding to the Table 2.43.

To summarize, on the basis of these findings one may suggest that the optimal value of the π depends, in general, on the type of the shock which the economy is susceptible to and the structural values of the parameters.

Table 2.43: The Optimal π

φ=0.5 β_1=1.1 β_2=0.6 β_3=0.0 γ=1 a_1=0.0 a_2=0.3 θ=0.5 h=0.4 -751.25≤ ρ≤751.25
sw_1=0.183 sw_2=0.135 k=0.4 d_1=0.5 d_2=0.125 d_3=0.7

Shocks	Domestic Price (μ=0)		Aggregate Supply (μ=1)		0<μ<1
	π	ρ	π	ρ	
Domestic Demand	0.9	T	0.9	T	The same for all values of μ regarding the optimal π.
Domestic Money Demand	0.0	T	0.0	T	The same for all values of μ regarding the optimal π.
Domestic Supply	0.0	T	0.0	T	The same for all values of μ regarding the optimal π
Domestic Price	0.9	T	0.9	T	The same for all values of μ regarding the optimal π.
Foreign Price	0.0	T	0.0	T	The same for all values of μ regarding the optimal π.
Foreign Interest Rate	0.0	T	0.0	T	The same for all values of μ regarding the optimal π

Table 2.44: The optimal π

φ=0.5 β_1=1.1 β_2=0.6 β_3=0.0 γ=1 a_1=0.2 a_2=0.3 θ=0.5 h=0.4 -751.25≤ ρ≤751.25
sw_1=0.183 sw_2=0.135 k=0.4 d_1=0.5 d_2=0.125 d_3=0.7

Shocks	Domestic Price (μ=0)		Aggregate Supply (μ=1)		0<μ<1
	π	ρ	π	ρ	
Domestic Demand	0.9	T	0.9	T	The same for all values of μ regarding the optimal π
Domestic Money Demand	0.0	T	0.0	T	The same for all values of μ regarding the optimal π
Domestic Supply	0.1	T	0.9	T	The optimal π monotonically increased from 0.1 to 0.9
Domestic Price	0.9	T	0.9	T	The same for all values of μ regarding the optimal π
Foreign Price	0.0	T	0.0	T	The same for all values of μ regarding the optimal .
Foreign Interest Rate	0.0	T	0.0	T	The same for all values of μ regarding the optimal

Table 2.45: The optimal π

φ=0.5 β_1=1.1 β_2=0.6 β_3=0.0 γ=1 a_1=0.3 a_2=0.2 θ=0.5 h=0.4 -751.25≤ ρ≤751.25
sw_1=0.183 sw_2=0.135 k=0.4 d_1=0.5 d_2=0.125 d_3=0.7

Shocks	Domestic Price (μ=0)		Aggregate Supply (μ=1)		0<μ<1
	π	ρ	π	ρ	
Domestic Demand	0.9	T	0.9	ML	The same for all values of μ regarding the optimal π.
Domestic Money Demand	0.0	T	0.0	T	The same for all values of μ regarding the optimal π.
Domestic Supply	0.1	T	0.9	FIX	The optimal π monotonically increased from 0.1 to o.9..
Domestic Price	0.9	T	0.9	ML	The same for all values of μ regarding the optimal π.
Foreign Price	0.0	T	0.0	T	The same for all values of μ regarding the optimal π.
Foreign Interest Rate	0.0	T	0.0	T	The same for all values of μ regarding the optimal π.

2.5 Conclusion

The purpose of this chapter was to examine whether a situation of financial repression in developing countries may affect the optimal exchange rate arrangements or not. In order to focus on the main related aspects and to get a more tractable insight, the model chosen is as simple as possible. Nonetheless, even for such a simple model there is not, in general, a conclusive outcome reflecting the elusive nature of the problem addressed in this study. In sum, our analysis indicates that as long as the authorities' basic objective is supply-price stabilization, not only the scale of flexibility of the exchange rate is influenced by different degrees of financial repression but also the type of the optimal arrangement may vary across various financial situations depending on the nature of shocks. The fundamental rationale behind that is the linkage between financial and real sectors created by the needs of fulfilling financial requirements of the economy's supply side. This may amplify or reduce the effects of any shock impinging on the economy and, hence, implies different degrees of intervention. In addition, one may broadly conclude the less is the degree of integration with foreign financial markets the more is the role of the domestic financial repression for the optimal degree of flexibility critical. In fact, superiority of any specific arrangement in the face of any shock may vary with various combinations of domestic financial repression and degree of capital mobility. Therefore, in our assumed structure, capital mobility has its own implications for the optimal degree of flexibility of the exchange rate not only in the face of foreign shock but also for domestic shocks.

Another general conclusion to be drawn is that the trade off between supply and price stabilization, often raised in the literature (Flood (1979), Artis & Currie (1981), Aizenman (1982) and others), does not necessarily apply for our setup and its emergence depends usually on relative values of the parameters and the type of shock. It is, therefore, perfectly consistent with these conclusions if one asserts that the major contribution of this study is increasing rather than decreasing the present ambiguities regarding the appropriate choice of optimal exchange rate arrangement in the context of short run stabilization target as a very delicate economic choice.

Notes

1.The main reason for changing the time frame of the model is the availability of a software for solving linear stochastic rational expectation models such as ours. However the author has already finished a programme for solving non-linear stochastic rational expectation models (discrete time) and calculating asymptotic variances for endogenous variables based on the Fair & Taylor (1983) method and a type of Monte-Carlo simulation in Gauss Matrix Programming Language. By this programme one can get optimal values of control variables as well.

2.The software has been devised for solving stochastic rational expectation models (continuous time) numerically. Solving the model, it computes the asymptotic variances of state and endogenous variables by applying an analytical algorithm which is essentially based on Kolmogorov's forward equation. Gaussian Elimination with Backward Substitution (for the inversion of the matrices) and Shur decomposition including transformation to Hessenberg form and the QR iteration algorithm for real Hessenberg Matrices (for computing eigenvalues and their corresponding eigenvectors of the system) constitute two main other algorithms in the software.

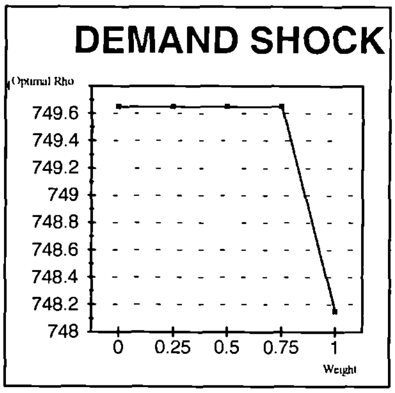
3.A feature of introduction this term into money demand equation is worthy of a note. That is, although we are not going to deal with the currency substitution case explicitly, this type of money demand specification might implicitly incorporate the notion of currency substitution in the model. More precisely, if we assume a fix ratio between money and bank deposit demands, expected change in exchange rate, given y^s, i^d, i^c and i^f, involves a difference between expected rates of returns on holding domestic money and foreign assets which can include exclusively foreign money in this occasion. Obviously by this interpretation of the money demand equation, an asymmetrical currency substitution notion -in the sense that nonresidents have not any demand for domestic money- will implicitly be introduced to the model. Tanzi and Blejer (1981) have pointed to the role of foreign currency and other assets denominated in foreign currency as substitutes for interest-bearing domestic stores of values as well as for transaction balances when nominal returns on less liquid assets are repressed.

4.These values are lower than those estimated by Van Wijnbergen(1982-85) for Korea. Since his estimations were related to only one country, they have not been exercised in the simulation. Also there are empirical evidence (such as Hauqe et al (1990-93)) regarding income elasticity of aggregate demand which are different from what has been mentioned in Table (2-2). As their values are significantly smaller than what has been chosen here and in the context of DCs the higher value, specially in comparison with real interest rate elasticity, seemed to be more reasonable, we have ignored them. In addition, since the Haque et al (1990) estimation regarding money demand elasticity of income was about (0.55), all the simulation carried out for this value as well. The results were not qualitatively different from what were obtained for the value(0.4). Therefore, we have focused only on the latter one.

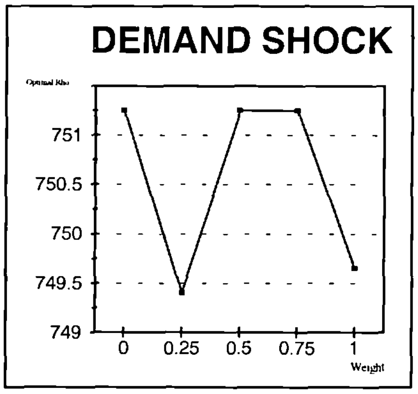
5.Branson and Kateseli Papaefstratiou (1981) have suggested that for those DCs' which are able to satisfy MLC, clean float, ceteris paribus, can be viewed as feasible arrangement even without integrated asset markets.

6.Tables with the prefix SW, LW, SA and LA illustrate the outcomes for, respectively, short run elasticity-white noise , long run elasticity-white noise, short run elasticity-autoregressive and long run- autoregressive disturbance.

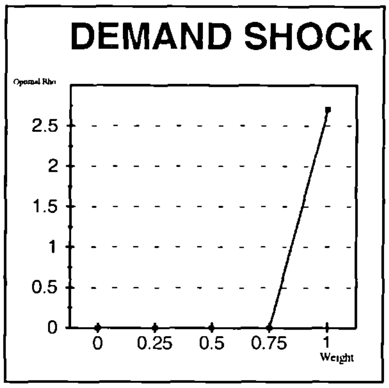
7.A graphical rendition incorporating the main dynamic and static mechanisms involved when an aggregate demand shock hits the economy has been developed by author. Due to space limitation we have not attached this analysis to the thesis. However, it is available upon request.



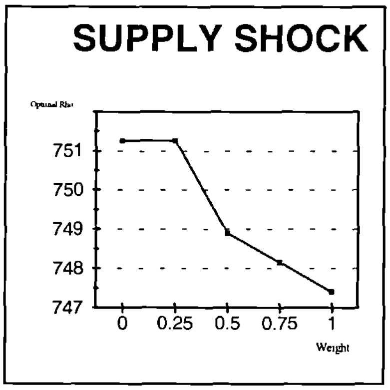
π=0.5, φ=0.05, α_3=0.2, β_3=0.5
Figure 2.1.1



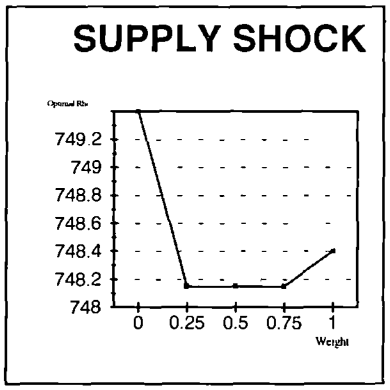
π=0.5, φ=0.05, α_3=0.3, β_3=0.5
Figure 2.1.2



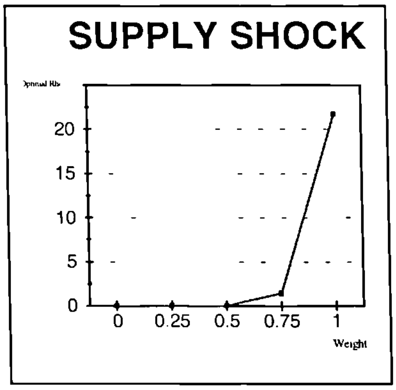
π=0.5, φ=1, α_3=0.3, β_3=0.5
Figure 2.1.3



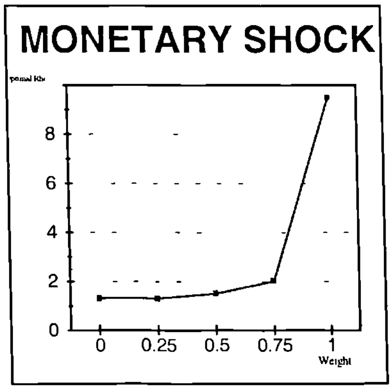
π=0.0, φ=0.05, α_3=0.3, β_3=0
Figure 2.1.4



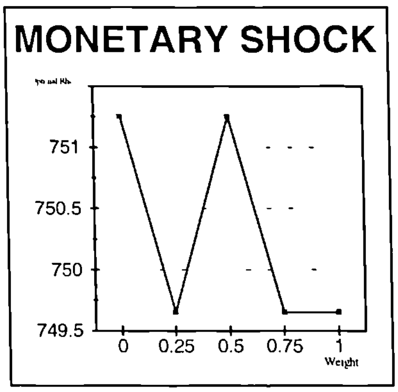
π=0.5, φ=0.05, α_3=0.2, β_3=0
Figure 2.1.5



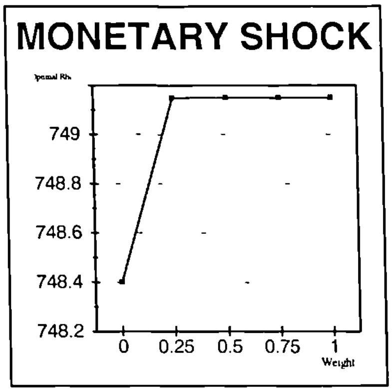
π=0.0, φ=0.05, α_3=0.5, β_3=0
Figure 2.1.6



π=0.9, φ=0.05, α_3=0.2, β_3=0
Figure 2.1.7



π=0.5, φ=0.05, α_3=0.2, β_3=0
Figure 2.1.8



π=0.0, φ=0.05, α_3=0.2, β_3=0
Figure 2.1.9

Part Two

Optimal Flexibility of Exchange Rates and Financial Repression in A General Equilibrium Setting

Prologue

Standard theory suggests that financial repression policies have a negative effect on economic growth by reducing the efficiency of capital (Goldsmith (1969), Greenwood & Jovanovic (1990), Saint-Paul (1992)) and their effects on the allocation of savings and investments (Mckinnon (1973), Shaw (1973), Fry (1988), Bencievenga & Smith (1991)). This, usually, sets forth the policy prescriptions involving the removal of any form of imperfection introduced by government policies in the financial sector. However, in the real world, there are many instances where governments have imposed regulations, restrictions, taxes and controls on the foreign and domestic financial intermediation together with measures restricting the development or introduction of new financial instruments and markets. This implies that there are some other considerations (distortions) at work which may justify the imposition of financial repression in a more complete evaluation of costs and benefits of financial liberalization policies. Particularly, the lack of efficient and sufficient sources of government budget financing led to the use of different forms of distortionary taxation, on the one hand, and the role of financial repression as a potential source of public budget financing, on the other hand, might provide adequate economic motivation for governments to have recourse to financial repression policies.(Chamely & Hussain (1988), Giovannini (1988), Easterly (1989), Dornbusch & Giovannini (1990), Roubini & Sala-i-Martin (1995)).

Through financial repression policies governments can finance their budgetary requirements at artificially low interest rates, by imposing a wedge between domestic and foreign financial intermediation and price and quantity restrictions on the domestic financial sector. In addition, governments can earn interest savings on their liabilities following an inflationary policy implying low real interest rates given the ceilings on nominal interest rate. Also, a limited array of financial instruments entailing higher transaction costs together with the imposition of high reserve requirements and low (negative) real interest rates increase the real money balances which is, ceteris paribus, the inflation tax base. The two latter cases reflect the complementary role of financial repression and seigniorage policies. However, they may be viewed as substitute taxation when the inflation rate is very high or when the government conducts its monetary (seigniorage) policies under different types of exchange rate regimes or more precisely under different degrees of sterilization policy. In the former case, the high level of depression in real returns on domestic investment entails a flight towards safety which dries out financial markets and results in a drop in money demand (Makinen & Woodward (1990)). In the latter case, since any exchange rate regime may be viewed as a special form of commitment on future seigniorage policies, authorities face different kinds of constraints in exercising seigniorage policies and, under specific circumstances may tend to impose a higher degree of financial repression under more fixed arrangements in order to avoid losses due to speculative activities or to the real costs of exchange rate volatility under more flexible arrangements.

Also, in spite of the recent tendencies in international financial markets integration, perfect integration seems to be still the exception rather than rule. Current evidence based on the *IMF's Annual Report on Exchange Arrangements and Exchange Restrictions* indicates that the majority of the IMF's member countries still retain some form of capital controls. Though the major bulk of these members are DCs, it is not restricted only to them and includes some OECD countries as well. At the theoretical level and policy discussion, there are debates about benefits and losses of capital controls among the international macro economists. One of the strands of arguments in favour of capital controls are based on the second best rationalization (e.g. Aizenman & Guidotti (1990)) which constitutes our main concern in this study.

We think that the standard literature related to financial repression lacks a general unifying framework for understanding the main contingent incentives in persistent use of financial repression in conjunction with capital controls and the inflation tax in developing countries. Moreover, to our knowledge, other studies have not taken into account the role of exchange rate regimes for the implications of financial repression on the real economic magnitudes, especially from a longer-run standpoint. Evidently, neither have they paid attention towards the consequences of financial repression for the optimal exchange rate flexibility. From a stylized view, the recent episodes of currency crisis in Latin American and East Asian countries, who are experiencing financial market liberalization policies, may reveal the importance of this mutual relationship, which, somewhat paradoxically, has not received proper attention in the literature heretofore. All this requires is a comprehensive framework taking a long run rather than short run perspective which incorporates fiscal considerations underlying the simultaneous presence of financial repression, capital control (taxation on foreign assets holdings), the regular taxes and inflation tax implied by any exchange rate regime and monetary authorities governing the central bank. This part of our study is an endeavour towards fulfilling this requirement. That is, bearing in mind the afore mentioned considerations, in this part we are going to analyse the long run implications of different types (degrees) of exchange rate regimes (flexibility) when the government has financial repression, bond issuing, taxation and seigniorage, whose magnitude depends on the type of central banker, instruments at its disposal and intends to finance a stochastic stream of real expenditure but at the same time is concerned about the welfare of a representative agent.

This, of course, invokes a suitable framework including the main relevant characteristics involved in addressing this issue. During 1970s and 1980s, the underlying behavioural relationships in most of the related literature were based on a type of static IS/LM model. This framework, though providing a tractable structure which might be good enough for analysing short run phenomena in the context of stabilization policies, suffers from the lack of any intertemporal optimizing behaviour of the economic agents which is of substantial importance for any coherent analysis of long run phenomena such as growth. In effect, as has been mentioned elsewhere, the IS/LM framework is not generally an appropriate framework to address economic phenomena with low-frequency such as long run effects of fiscal policy and physical capital accumulation. This, obviously, demands an appropriate framework which is able to incorporate financial repression into an intertemporal optimizing setting. Roubini & Sala-i-Martin (1992-1995) provide a tractable and inclusive way of modelling financial repression into such a framework. However, the incorporation of exchange rate regimes and the analysis of its welfare implications call also for a theoretical representation of uncertainty considerations in our framework. Moreover, we think the introduction of uncertainty is a substantial component of any welfare (growth) analysis of financial repression policies in DCs where the governmental induced imperfections in financial markets are prevalent. More strictly, a more consistent and comprehensive analysis requires an investigation of the financial repression policies for the risk associated with any type of asset transaction. This is an aspect which almost the entire financial repression literature ignores. Also, the incorporation of uncertainty with a risk averse intertemporal optimizing agent may enable us to evaluate the degree of speculation in the part of the agent or in more general sense the agent's response to (financial) policy changes (that is, the Lucas critique) which constitutes one of our main concern in this study. This, in turn, needs an endogenous determination of risk in a general equilibrium macro model. The Grinols & Turnovsky (1994) and Turnovsky (1995) put forward an analytical framework which incorporates these considerations.

Therefore in this study, following Grinols & Turnovsky (1994) and Turnovsky (1995), a stochastic general equilibrium model for a semi-small open economy consisting of risk-averse optimizing agent has been employed. The main innovation here is the introduction of financial repression in line with Roubini & Sala-i-Martin (1995), the real effects of inflation variance and the consequences of the seigniorage policy in conjunction with appointing different types of (ultra-conservative, conservative, opportunistic) central bankers which tie down the different degrees of exchange rates flexibility for consumers and the real side of the economy. Our study differs from Roubini & Sala-i-Martin (1995) mainly on the grounds of its portfolio approach in a stochastic semi-small open environment where the possibility of bond financing, foreign assets taxation and tax on wealth are available for the government. Therefore, our framework is more general than that of Roubini & Sala-i-Martin without any (convex) tax collection cost. Another difference is that government expenditure is a pure drain of resources in our setup while it takes the form of transfers to the households in Roubini & Sala-i-Martin's. They, among others, argue when the tax system is inefficient and tax evasion is high it would be optimal for the government to resort to financial repression as a complementary source for seigniorage revenues. More specifically, their numerical simulations suggest that only if tax evasion is higher than a certain critical value so that higher statutory tax rates cannot provide enough revenue for the government, it would then be optimal for the government to repress the financial sector in cost of hampering the economic growth. We think that while this argument may be very true, it is restrictive. This study, in this respect, takes a more general public finance framework with an international macro view in order to show why it might be optimal for a benevolent government whose expenditure is pure waste to deter the process of private financial evolution even when there is no tax evasion in the economy. We, also, argue that even with a linear production technology, the channel through which financial policy will transmit to the economy is important for not only their growth consequences but also their welfare implications and thereby policy recommendations.

In general, this part consists of four chapters. In chapter three, the structure of the model is sketched out and implications of new features introduced into the model are discussed briefly. Chapter four contains the solution of the model when financial repression hits the economy only through its effect on the marginal productivity of domestic capital (Goldsmith effect). Chapter five has been devoted to analysing different welfare (growth) implications of financial repression through the saving-investment (McKinnon-Shaw effect) and the marginal productivity (Goldsmith) channels. In order to get a more concrete impression about the welfare implication of policy changes for the complete version of the model, we have calibrated the model in chapter six.

Chapter 3

Exchange Rate Regimes and Financial Repression:
The General Setting

3.1 Introduction

This chapter develops a stochastic macroeconomic general equilibrium model of financial repression and exchange rate regimes to investigate the welfare implications pertaining to both fiscal and monetary policies by incorporating and developing features of the work of Grinols & Turnovsky (1994), Turnovsky (1995) and Roubini & Sala-i-Martin (1992-1995). The exposition of this development shows how the main proposition(s) of Turnovsky which are mainly based on the partially superneutrality of monetary (exchange rate) policy is (are) just a specific case of our general setting which seems to be closer in nature to the documented facts of real world experience, specially in part of the DCs' economies. In particular, Turnovsky suggests that optimal (fiscal and monetary) policy can be characterized by the attainment of an optimal (after tax) nominal interest rate as a single intermediate target. Thus, since there is only one target and many policy tools to achieve it, there could be infinite ways to set the optimal monetary and fiscal policies. While this infinite number of options in monetary and fiscal policies setting is very interesting and attractive, it seems at odds with the real world experience. In this respect our main argument is that the presence of imperfections in product and financial markets, as a common ingredient of the economic reality in almost all economies, should not be ignored especially in an endogenous growth model. In other words, if one is to take into account the existing imperfections in the product and financial markets, as we specify in our setting, those propositions do not seem to be convincing enough or at least one should be cautious in their generalizations. In this sense, our contribution should be considered as complementing rather than superseding Turnovsky's contributions.

In addition, as a stylized fact, episodes of hyper inflation have been documented in many countries located in the Western Hemisphere and a number of DCs. For instance, during 1987-1993 average inflation rates in the Western Hemisphere have ranged between 124.6-478.9 percent (IMF, *World Economic Outlook*, 1994). Overall, over the past two decades, DCs have experienced substantially higher inflation rates than those in the industrial world. These high inflation rates have been associated with high (Broad) money growth in DCs. For example, in the Western Hemisphere for the corresponding period the (Broad) money growth has ranged between 131.5-456.7 percent (IMF, *World Economic Outlook*, 1994).

In response to this high inflation rate tendency, several alternative approaches have been recommended. These mainly consist of orthodox money based programs (tight fiscal and monetary policies) and heterodox programs (tight aggregate demand policies accompanied by wage and price controls). In practice, this programs have not been completely successful yet. Recently, following Barro & Gordon (1983) and Rogoff (1985), in a number of OECD countries an explicit inflation targeting monetary regime has been practised. Rogoff (1985) has suggested that by the delegation of monetary policy to an independent appropriately conservative central banker who places higher weight on inflation (price) stabilization than on employment stabilization, society might be better off.

Hence, one of the proposals to the problem of high inflation rate in DCs might be the nomination of an independent, or at least more conservative, central banker who is free from political pressure for irresponsible use of inflation tax. Given this institutional disciplinary device, the government may not yield to the temptation of inflationary finance through eroding the real value of its debt services and cutting other (distortionary) direct taxation (see Barro 1983).

In this study, we also investigate the welfare (growth) implications of the proposal of delegation with different types of central bank restricting the scope of using inflation tax for the government in a stochastic general equilibrium endogenous growth model. More precisely, in this chapter, one of the issues taken up our concern is the analysis of a version of the independent central bank proposal in a more general -micro based- framework of optimal (dynamic) taxation with a long run perspective.

The chapter is organised as follows. The second section has been devoted to "setting the scene" by presenting the overall structure of the general model. In section three, we, partially, derive the equilibrium solution of the model. The attainment of the full reduced form solution of the model is subject to nonlinearity. Therefore, we have obtained a semi-reduced form solution of the endogenous variables in a mean-variance equilibrium manner. In order to evaluate the government policy implications for the economy, we have formally built up our welfare criterion in section four. Having constructed the welfare criterion, we will discuss at some length the implications of the new features introduced into the model for welfare analysis of the policy changes. This section concludes with our investigation of whether one can make any welfare (growth) case for appointing an independent central banker. Section five closes the chapter by summarizing our main findings.

At the end we should emphasize that our arguments in the last three remaining chapters have been driven on the basis of the general model presented in this chapter. Accordingly, understanding of the main structure of the model plays a crucial role for grasping our arguments in the remaining chapters. In fact, one may like to view this chapter as a building block for the next three chapters.

3.2 The Model

Our model analyses a semi-small, open, monetary economy which is a price taker. There is a single traded good and four assets including : domestic money (M), domestic government bonds (B), foreign assets (B*) and domestic capital (K). Money and domestic government bonds are denominated in terms of the domestic currency and are not traded internationally. However, B*, which is denominated in foreign currency, and K, denominated in terms of domestic output, are both internationally traded. Therefore, the risk parity condition between domestic and foreign assets is determined endogenously in the market of the semi-small open economy rather than exogenously in the rest of the world. The problem of the domestic representative agent is to choose consumption of a single traded good and a portfolio of his wealth at each instant of time. There are three prices including the domestic price of the traded good (P),which is endogenous, the nominal exchange rate (domestic currency per unit of foreign currency) (E) and the foreign price level of traded good (Q),which is exogenous. These prices follow Brownian motion processes as follows:

$$\frac{dP}{P}=\pi dt+du_p \quad , \quad du_p \sim IND(0,\sigma_p^2 dt) \qquad (3\text{-}1\text{-}1)$$

$$\frac{dQ}{Q}=qdt+du_q \quad , \quad du_q \sim IND(0,\sigma_q^2 dt) \qquad (3\text{-}1\text{-}2)$$

$$\frac{dE}{E}-edt+du_e \quad , \quad du_e \sim IND(0,\sigma_e^2 dt) \qquad (3\text{-}1\text{-}3)$$

where π, q and e are the expected instantaneous rates of change of P, Q and E, respectively, and du_p ,du_q and du_e are temporally independent, normally distributed random variables with zero means and instantaneous variances $\sigma_p^2 dt$, $\sigma_q^2 dt$ and $\sigma_e^2 d t$.

Considering the free trade assumption, the purchasing power parity (ppp) relationship holds. Therefore, we have:

$$\frac{dP}{P}=\frac{dQ}{Q}+\frac{dE}{E}+\frac{dQ}{Q}\frac{dE}{E} \tag{3-2}$$

Then, by (3-1-1)-(3-1-3), we obtain:

$$\pi=q+e+\sigma_{qe} \tag{3-3-1}$$

$$du_p=du_q+du_e \tag{3-3-2}$$

where σ_{qe} is the instantaneous covariance between du_q and du_e.

Government bonds are assumed to be short-term and their nominal returns over the period dt are nonstochastic. Using Ito calculus, real returns on M, B, and B* are:

$$dR_M=r_M dt-du_p \quad , \quad r_M\equiv-\pi+\sigma_p^2 \tag{3-4-1}$$

$$dR_B=r_B dt-du_p \quad , \quad r_B\equiv i-\pi+\sigma_p^2 \tag{3-4-2}$$

$$dR_{B^*}=r_{B^*}dt-du_q \quad , \quad r_{B^*}\equiv i^*(1-t^*)-q+\sigma_q^2 \tag{3-4-3}$$

The term t^* in equation (3-4-3) represents a tax levied on foreign asset holdings which, in turn, stands for the degree of financial integration with the rest of the world or foreign (international) capital controls. Since foreign capital controls can provide a wedge between foreign and domestic financial intermediaries, financial repression policies have usually been accompanied by foreign capital controls. Therefore, t^* might be viewed as a positive function of financial repression. However, here we consider it as an autonomous tax instrument and capture that incentive mainly, but not completely, by introducing the Mckinnon-Shaw effect into the model. *The McKinnon-Shaw effect emphasizes on how the efficient allocation of savings to investment purposes are affected by financial repression. This channel ,also, suggests that financial repression through its effect on overall (real) returns on assets will influence the equilibrium volume of savings and investment on financial assets.* There are some considerations which may justify this distinction between tax on foreign assets and financial repression policies. Although Obstfeld (1994) in a continuous-time stochastic model has shown financial openness through the international risk-sharing mechanism can yield substantial welfare (output growth) gains , Mathieson and Rojas-Suarez (1993) and Alesina et al(1993) have mentioned some main motivations for capital account controls such as: limiting volatile short-term capital flows (stability of foreign exchange markets), retention of domestic savings and help for stabilization and structural reform programs. Also, Razin & Sadka (1991) have suggested when there is no possibility of foreign-source capital taxation, capital controls should be imposed. Recently, Loungani et at (1997) have pointed to the role of capital mobility in altering the slope of the Philips curve. They have found countries with stricter capital controls had experienced a smaller output-inflation trade off, meaning less output loss as a result of anti inflationary policies[1]. In a sense, by introducing tax on foreign assets holdings when the McKinnon-Shaw effect is also in place, we want to emphasize the probable differences in the government's preferences regarding the external and internal financial sectors. Put differently, this can bring about the possibility of forcing a type of discrimination on policies related to external and internal financial sectors[2]. There is another technical consideration which has induced us to introduce a tax on foreign assets. As we will see, the introduction of the McKinnon-Shaw channel into the model leads to a multiplicity of analytical solutions with many ambiguities. In order to achieve a tractable analytical insight, in some parts of the welfare analysis (more specifically in chapter four) we are obliged to disregard the McKinnon-Shaw effect. This additional policy instrument allows us to trace the consequences of policies regarding the foreign capital controls which is a prominent feature of DCs' economies, in the absence of the McKinnon-Shaw channel.

The flow of output dY is produced from the (domestic) capital, which here is assumed to be a broad measure of capital stock, by means of the stochastic linear technology (constant returns technology):

$$dY=[\alpha(f)-\Gamma\sigma_p^2]Kdt+\alpha(f)Kdy, \quad dy\sim IND(0,\sigma_y^2) \qquad (3\text{-}5)$$

where $\alpha(f)$ is the marginal physical product of capital and, as in Goldsmith (1969), is a negative function of financial repression (i.e. $\alpha'(f) < 0$). This also stresses King & Levine's (1993) arguments about the active role of financial institutions in the process of evaluating, managing and funding the entrepreneurial activity leading to productivity growth. As we will see later in chapter four, for the sake of tractability, without losing generality, it will be assumed that: $\alpha(f)=\alpha(1-f)$,where f is an index of financial repression and can take values between zero and one. When f is equal to zero the financial sector of the economy is completely liberalized and the economy is working at its highest technologically feasible level of financial development. The term $\Gamma\sigma_p^2$ in (3-5) captures the cost of uncertainty about inflation rates which has been emphasised by Friedman (1977) and is distinct from the inflation-tax distortion of money demand. This might be accounted for by factors - such as: difficulty of entering into long-term contracts as a result of agents' uncertainty about future prices (Friedman (1977)), inefficient allocation of resources stemming from imperfect forecasting ability of producers relative to that which would occur if they could forecast better[3] (Cukierman (1984)), increasing variability of real wages (Katz & Rosenberg (1983)) and menu costs (pioneered by Sheshinski and Weiss (1977))- not explicitly modelled above in order to get a more tractable setup. The parameter $\Gamma(\geq 0$) is a constant coefficient reflecting, for simplicity and in accordance with our AK production technology, a linear reduction in production efficiency as a result of an increase in the variance of inflation. Put differently, Γ represents the marginal cost of inflation variance, here, assumed to be constant. Since , from (3-3-2), the variance of inflation is a positive function of the variance of exchange rates which, in equilibrium, is a function of the exchange rate policy parameter, Γ may be viewed as the output cost of different arrangements and can be considered as a function of the structural characteristics of the economy. Notice that the overall stochastic disturbance in output has been assumed to be proportional to the output and in which case the shocks are assumed to be multiplicative. This assumption, which is necessary for maintaining equilibrium in a stochastic endogenous growth model like this, seems to be more realistic than the additive one where the relationship between the size of the economy and the magnitude of the shocks impinging on it is ignored. In due course, it is illustrated that this specification has important implications for exchange rate and financial repression policies in the context of growth.

Hence, in the absence of adjustment costs to investment, the real rate of return on domestic capital is:

$$dR_k = r_k dt + dk \equiv [\alpha(f) - \Gamma\sigma_p^2]dt + \alpha(f)dy \qquad (3\text{-}4\text{-}4)$$

3.2.1 Consumer Optimization

The objective of the representative agent is to maximize his expected value of life time utility as:

$$Max: \quad E_0\int_0^\infty (1/\gamma)[c(t)^\theta (M(t)/P(t))^{\zeta(f)}]^\gamma e^{\ \mu t} dt \qquad -\infty \leq \gamma \leq 1 \quad , \quad \zeta'(f)\rangle 0 \qquad (3\text{-}6\text{-}1)$$

subject to the following stochastic wealth accumulation equation and wealth constraints:

$$\frac{dW}{W} = \varphi(f)[(n_M dR_M + n_B dR_B + n_k dR_k + n_{B^*} dR_{B^*}) - (\frac{c}{W})dt - (\frac{dT}{W})] \qquad (3\text{-}6\text{-}2)$$

$$n_M + n_B + n_k + n_{B^*} = 1 \qquad (3\text{-}6\text{-}3)$$

where:

$$dW = [d(B^*/Q) + dk + d(B/P)] + \varphi(f)d(M/P)$$

In (3-6-1), the instantaneous utility function is time-separable and the presence of money in the utility emphasizes welfare losses due to anticipated inflation or, in other words, "shoe-leather costs" which the representative agent incurs when s/he economizes her/his transactions costs (Bailey (1956)). The γ is the coefficient of risk aversion which, since we are concerned about only risk averse and risk neutral agent, has been defined for that range. The θ and $\zeta(f)$ parameters are the marginal utility of consumption and real money balances, respectively. In addition, following Roubini & Sala-i-Martin (1995), the marginal utility of money is an increasing function of f (i.e. financial repression index). In chapter six for convenience, we will assume: $\zeta(f)= \Xi(1+f)$, where: $\Xi>0$ is the (maximum) marginal utility of money in a completely liberalized economy. In (3-6-2), $\varphi(f)$ captures the McKinnon (1973) and Shaw(1973) effect and shows how more financially developed economies are able to transform a given amount of savings into more efficient units of financial assets. Put differently, we have assumed that while a unit of savings can be accumulated into a unit of money balances with zero cost, the portion of a unit of savings that will be transformed into non-monetary (real) wealth accumulation involves nonzero cost which is an increasing function of financial repression. This can be justified by high costs of financial intermediation caused by less variety of financial instruments, limited competition and creation of oligopolistic conditions as a result of an inefficient or repressed financial sector. This specification is not as odd as it may appear. Even though, according to this specification government through one policy instrument can influence both the utility function (objective function of the optimization) and the consumer's budget constraint, considering the impact on marginal utility of money reflecting changes in transaction costs of financial repression policy, these two effects are both ,in essence, of a budget constraint sort (of effects). In fact, this follows the Feenstra (1986) extension regarding (approximate) the functional equivalence between using real balances as an argument of the utility function (money in utility function) and introducing transaction costs (such as, Baumol-Tobin transaction technology) in the budget constraint (cash-in-advance). Since money in the utility function provides a more tractable structure for our analysis we have chosen this specification. It is worth noting this specification also implies that the greater the level of financial repression imposed by the government, the more restricted the scope for debt financing would be for the government if debt policy is independent of monetary (exchange rate) policy. Such a situation may be viewed as a justification for non-or-less limited (government) bond markets in DCs. In chapter six, for simplicity in carrying out our calibration (without losing generality), we have specified $\varphi(f)$ as:

$$\varphi(f)=1-f \qquad , \qquad 0\leq f\leq 1$$

Also, in (3-6-2), T shows the taxes on the agent's wealth which are assumed to be proportional to the wealth which here measures the size of the economy and evolves as:

$$dT = \tau W dt + W dv \quad , \quad dv \sim IND(0, \sigma_v^2 dt) \tag{3-7}$$

Therefore, taxes follow a stochastic process consisting of a deterministic component and an indeterministic one both to be determined endogenously so that in equilibrium they meet the government budget constraint. The stochastic component reflects the requirement that in a stochastic general equilibrium environment where the government's needs are subject to uncertainty (shocks), taxes should be adjusted (intertemporally independent) randomly in order to ensure a balanced budget. This type of tax, which can be positive or negative, has an important role in DCs which are more subject to (domestic and foreign) shocks and whose governments play a crucial role in the economy. Besides, the agent is assumed to perceive the mean tax rate (τ) and the variance and covariance of the stochastic component (dv) correctly, as s/he is assumed to be rational. In addition the specification (3-7) implies that in an (endogenously) growing economy taxes like other real variables grow proportional to the size of the economy.

For expositional convenience we define:

$$\Psi \equiv \varphi(f)[n_M r_M + n_B r_B + n_K r_K + n_{B\cdot} r_{B\cdot}] \tag{3-8-1}$$

$$dZ = \varphi(f)[-(n_M + n_B) du_p + n_k dk - n_{B\cdot} du_q - dv] \tag{3-8-2}$$

$$\sigma_Z^2 = \lim_{dt \to 0} E(dZ)^2/dt = \varphi(f)^2[(n_M+n_B)^2\sigma_p^2 + n_k^2\sigma_k^2 + n_{B\cdot}\sigma_q^2 + \sigma_v^2 - 2(n_M+n_B)n_K\sigma_{pk} + 2(n_M+n_B)n_{B\cdot}\sigma_{pq} + 2(n_M+n_B)\sigma_{pv} - 2n_k n_{B\cdot}\sigma_{kq} - 2n_k\sigma_{kv} + 2n_{B\cdot}\sigma_{qv}] \tag{3-8-3}$$

Hence, we have:

$$dW = [\Psi - \varphi(f)\frac{c}{W}]Wdt + WdZ \tag{3-8-4}$$

It is important to note that according to (3-8-3) there is not necessarily any conflict between inflation, fiscal policy (taxation) and growth stabilisation in this model.

$$dT = \tau W dt + W dv \quad , \quad dv \sim IND(0, \sigma_v^2 dt) \tag{3-7}$$

Therefore, taxes follow a stochastic process consisting of a deterministic component and an indeterministic one both to be determined endogenously so that in equilibrium they meet the government budget constraint. The stochastic component reflects the requirement that in a stochastic general equilibrium environment where the government's needs are subject to uncertainty (shocks), taxes should be adjusted (intertemporally independent) randomly in order to ensure a balanced budget. This type of tax, which can be positive or negative, has an important role in DCs which are more subject to (domestic and foreign) shocks and whose governments play a crucial role in the economy. Besides, the agent is assumed to perceive the mean tax rate (τ) and the variance and covariance of the stochastic component (dv) correctly, as s/he is assumed to be rational. In addition the specification (3-7) implies that in an (endogenously) growing economy taxes like other real variables grow proportional to the size of the economy.

For expositional convenience we define:

$$\Psi \equiv \varphi(f)[n_M r_M + n_B r_B + n_K r_K + n_{B^*} r_{B^*}] \tag{3-8-1}$$

$$dZ = \varphi(f)[-(n_M + n_B) du_p + n_k dk - n_{B^*} du_q - dv] \tag{3-8-2}$$

$$\begin{aligned} \sigma_Z^2 \lim_{dt \to 0} E(dZ)^2/dt = \varphi(f)^2 [&(n_M + n_B)^2 \sigma_p^2 + n_k^2 \sigma_k^2 + n_{B^*} \sigma_q^2 + \sigma_v^2 - 2(n_M + n_B) n_K \sigma_{pk} + \\ &2(n_M + n_B) n_{B^*} \sigma_{pq} + 2(n_M + n_B) \sigma_{pv} - 2 n_k n_{B^*} \sigma_{kq} - 2 n_k \sigma_{kv} + 2 n_{B^*} \sigma_{qv}] \end{aligned} \tag{3-8-3}$$

Hence, we have:

$$dW = [\Psi - \varphi(f)\frac{c}{W}] W dt + W dZ \tag{3-8-4}$$

It is important to note that according to (3-8-3) there is not necessarily any conflict between inflation, fiscal policy (taxation) and growth stabilisation in this model.

The resulting optimality conditions are as follows (refer to appendix (B)):

$$\frac{c}{W}=\frac{\theta[\mu-\Psi\gamma-(1/2)\sigma_Z^2\gamma(\gamma-1)]}{\varphi(f)(1-\gamma\theta)} \tag{3-9-1}$$

$$n_M=\frac{\zeta(f)(c/W)}{\theta i} \tag{3-9-2}$$

$$(r_k-r_B)dt=(1-\gamma)\ cov(dZ,dk+du_p) \tag{3-9-3}$$

$$(r_B^*-r_B)dt=(1-\gamma)\ cov(dZ,-du_q+du_p) \tag{3-9-4}$$

The right hand side of equations (3-9-3) and (3-9-4), referring to asset pricing relationships, are the real risk premia associated with K and B* respectively. They are equal to zero either in a deterministic case or for a risk neutral agent, involving equality among their real returns.

Although, the full reduced form of the above equations have yet to be determined, one may perceive some preliminary consequences of the characteristics introduced into the model. For instance, when $\gamma=0$ (i.e. logarithmic utility function), it can easily be seen how an increase in the degree of financial repression will raise the consumption-wealth ratio. This is brought about due to income and substitution effects of imposition resulting from the financial repression. On the one hand, financial repression reduces the returns on savings leading to consumption encouragement (substitution effect). On the other hand, financial repression, as in the standard literature, has been recognized, especially in a closed economy under certainty, as a wealth (income) depressing policy which, in turn, discourages consumption. Moreover, the demand for real balances (equation 3-9-2) follows the familiar Cagan (1956) money demand specification in which demand for real balances is a negative function of expected inflation and its elasticity, inter alia, depends on the relative importance of consumption in the utility function(θ). This is so because it is a negative function of the nominal interest rate which, in equilibrium, is a positive function of expected inflation. Also, it is clear that financial repression through increasing the transaction costs of transforming illiquid into liquid assets, reflected in the increase of the marginal utility of money ($\zeta(f)$) raises the real money balances. However, at this stage it is not possible to determine the net effect of financial repression on demand for real money balances.

3.2.2 Government Policy

Government policy consists of the choice of government expenditures, issue of bonds, the collection of taxes and imposition of financial repression, all of which must be specified subject to the government budget constraint as follows (refer to appendix (C)):

$$d(B/P)+\varphi(f)d(M/P)=\varphi(f)[dG-dT+(M/P)dR_M+(B/P)dR_B-dT^*] \qquad (3\text{-}10)$$

where dG denotes the stochastic rate of real government expenditure specified by:

$$dG=g[\alpha(f)-\Gamma\sigma_p^2]Kdt+\alpha(f)Kdu_g, \quad du_g\sim IND(0,\sigma_g^2) \qquad (3\text{-}11\text{-}1)$$

and :

$$dT^*=[t^*i^*(B^*/Q)]dt \qquad (3\text{-}11\text{-}2)$$

Equation (3-11-1) assumes an instantaneous mean level of government expenditure as a fraction g of mean level of output and its stochastic disturbance as a proportional one. The latter emphasizes the uncertainties involved in government expenditures. However, taxes on interest rate incomes from holding foreign assets are not subject to any uncertainty (equation (3-11-2)).

Monetary policy including exchange rate policies is conducted by the authorities of the central bank whose independence depends on the structure of the political economy of the semi-small open economy and, as will be discussed below, can be ranged between completely independent (ultra-conservative) and dependent (opportunist) central banker. Therefore, the government's ability in reaping seigniorage revenue is a function of the degree of flexibility of the exchange rate and the central banker independence. The delegation of central bank here may be characterized as follows. First, the society (the principle) through political appointment delegates the central bank (the agent) on the basis of the central bank's *explicit* announced mean and variance (bands) of money growth (inflation) targets[4]. Second, the central bank (the agent) is given independence to put in practice its money growth (inflation) targets without any interference from the government or other interests. Hence, with such a delegation, the central bank is given operational independence rather than target independence (Debelle & Fischer (1994)).

Bearing in mind the above considerations, monetary policy ties down the exchange rate and reflects different types of arrangements by the following reaction function;

$$(dM/M) = -\rho(dE/E) + (\Lambda/(1+\rho))(\delta dt + du_m), \quad -\infty \leq \rho \leq \infty \quad , \quad \rho \neq -1 \quad , \quad 0 \leq \Lambda \leq 1 \qquad (3\text{-}12)$$

Where δ is the mean (expected) money supply growth rate and du_m reflecting the unexpected component of money supply (money supply shock), is a temporarily independent, normally distributed random variable with mean zero and instantaneous variance $\sigma_m^2\, dt$. By regulating ρ, the monetary authorities may allow various rates of exchange rate changes. A negative ρ refers to the *leaning with wind policy,* while a positive value of ρ represents the *leaning against wind policy.* When ρ is zero, the monetary policy is independent of the exchange rate and, therefore, implies completely floating rates. In this case the monetary authorities depending on their type are able to put forward an easy source of seigniorage revenue for the government. However, when ρ tends to infinity, it does not allow any change in exchange rate parity and ,hence, corresponds to completely fixed rates. Under this exchange rate arrangement, money supply is completely restricted by the target parity and there would not be any room left for the monetary authorities to implement an independent monetary policy. This means the formal source of seigniorage is abandoned. Between zero and (minus and plus) infinity refers to a type of managed float and provides monetary authorities with an opportunity to reconcile seigniorage and exchange rate policies. Notice that ρ can not take the value minus one because it involves a zero equilibrium nominal interest rate which is a trivial solution, therefore, out of our concern. It should be mentioned that this reaction function is quite simple and involves intramarginal permanent costless credible intervention[5]. It also can be viewed as an approximation to exchange rate target zones in the case of managed rates[6] (Lindberg and Soderlind (1992), Sevensson (1992)). The simplicity of the reaction function has two main advantages for the present analysis. First, its linearity lets us avoid the nonlinearity involved in target zones exchange rates which would make our analysis intractable. Second, simpler rules are always preferable to more complicated ones, because they can be understood more easily by the public.

The above reaction function basically consists of two terms. The first term, which is endogenous, may be interpreted as the necessary changes in money supply due to changes in the fundamentals in order to realize the target exchange rate parities. The second term, which is exogenous, refers mainly to the changes in money supply associated with different seigniorage (monetary) policies and may be interpreted as the cost of intervention. This term is affected by not only exchange rate arrangements but also by the degree of independence of the central bank authorities. The term Λ captures the latter effect, that is, it takes on the value zero when the authorities of the central bank are completely independent (ultra-conservative) and are very strict in following their anti-inflationary policies. When it takes on the value one it refers to another extreme case involving completely dependent (opportunist) authorities who care much less about the inflationary effects of their policies (fully discretionary monetary policy). The case between zero and one shows different degrees of independence and may be considered as a conservative central banker. It means the closer Λ is to one, the less conservative is the central banker and vice versa when Λ is close to zero. Therefore, the reaction function indicates a continuum of the type of central bankers characterized by their money growth (inflation) targets.

There are some further considerations regarding this particular specification which is worth highlighting here. First, according to this reaction function we have assumed that there is no difference among the central bankers under two extreme cases where $\rho \to \infty$,referring to completely fixed rate arrangement, and $\rho \to -\infty$, implying a super leaning with the wind arrangement. Second, though under the exchange rate arrangements involving leaning against the wind the monetary authorities can not undermine their announced money growth targets through the choice of exchange rate flexibility, in the exchange rate arrangement involving leaning with the wind there would be a range in which this possibility might be available to the monetary authorities. For instance, if the monetary authorities choose a value for ρ between zero and minus one (i.e. $-1 < \rho < 0$), the second term in the reaction function, which is related to the type of central banker, will increase by more than what has been announced by the monetary authorities. This apparent inconsistency might be reconciled by noting that there is an endogenous punishment mechanism in our set up which might discourage the monetary authorities, who are mainly concerned about the agent's welfare, from choosing this range. More precisely, by the choice of ρ between zero and minus one, the unexpected rate of money growth will increase along with the expected rate. This in our stochastic general equilibrium framework will lead, in equilibrium, to a higher variance of domestic inflation which has a real effect on (cost for) the production side of the economy. That is, this will deteriorate the expected growth. In addition, though this expected growth deteriorating disincentive factor might be compensated by a likely increase in equilibrium nominal interest rates[7] which may be expected to be growth improving, since the share of real money balances is negatively related to the nominal interest rate, it may reduce the share of real money balances in the agent's portfolio. As long as the marginal utility of real money balances is not zero, this might be welfare deteriorating too. After all, what it implicitly assumed is just a different type of assumption about the money growth rate target announced by the monetary authorities governing the central bank. Having taken into account these considerations, we have carried out our analysis regarding the welfare implications of different degrees (types) of exchange rate flexibility (arrangements) and financial repression in chapter four and six, where the issue of the type of central banker might be viewed as a second order priority, on the basis of the reaction function specified in (3-12)[8]. However, in order to strength our arguments, in our discussion with regard to the welfare implications of the type of the central banker in this chapter, we have assumed that, like the two above mentioned extreme cases, there would not be any difference among the central bankers when the leaning with the wind policy is going to be in operation. Having considered the nature (definition) of the leaning with the wind policy, this assumption seems to be more realistic than unrealistic and restrictive. In terms of the reaction function (3-12), it implies Λ equal to zero for ρ less than zero. Therefore part two, as a whole, covers a relatively wide range of possibilities. Third, the specified reaction function implies a sort of symmetric possibility -with respect to the expected and unexpected parts of the second term in equation (3-12)- for the monetary authorities under different types of exchange rate arrangements in order to put forward seigniorage revenue for the (central) government. More precisely, it implies, on the one hand, given Λ, the more flexible is the exchange rate the more able is the central banker to generate seigniorage revenue by expected and unexpected parts of money supply for the government. On the other hand, given ρ, the more independent are the central bank authorities, the less access has the government to seigniorage revenue by expected and unexpected sources of money supply. However, this is not the only version and one may conceive other varieties of (policy) implications of different degrees of central bank independence and different types of exchange rate arrangements for unexpected part of money supply in the context of seigniorage revenue. The above mentioned reaction function can be considered as one option among some other possible options in this respect.

Debt policy is formulated as follows:

$$(B/M)=\Pi \quad \Rightarrow \quad (B/P)/(M/P)=\Pi \quad \Rightarrow \quad n_B=\Pi n_M \qquad (3\text{-}13)$$

where Π is a policy parameter set by the government. This specification implies that debt policy is associated with exchange rate policy. Needless to say, Π equal to zero can be considered as a lack of the possibility of bond financing for the government. Π less than zero implies the possibility of borrowing from the government by the private sector. In addition, when $\Pi \succ 0$ the constancy of Π through time implies the sterilization policy via open market operation. This type of debt policy has usually been adopted in monetary growth literature involving balanced growth equilibrium. Apart from these theoretical considerations, in order to keep stochastic dynamics in one state variable we had to tie down debt policy with one of the real variables in the model (Turnovsky (1995)).

3.2.3 Product Market Equilibrium and Balance of Payments

This is expressed in real terms by the following relationship:

$$d(B^*/Q)+dk=\varphi(f)[dY-dC-dG+(B^*/Q)dR_{B^*}+(B^*/Q)i^*t^*dt] \qquad (3\text{-}14)$$

This, also, describes the real rate of traded assets accumulation in the economy.

3.3 Macroeconomic Equilibrium

In order to yield the overall equilibrium of the economy, we first solve the model for four endogenous stochastic components consisting of du_p, du_e, dZ and dv in terms of exogenous factors including ρ, g, Π, t^*, μ, q, θ, γ, f, α, Λ as well as three mutually independent exogenous shocks, that is: government expenditure shocks du_g, productivity shocks dy and foreign inflation shocks dq. Having determined the endogenous stochastic components, the endogenous variances and covariances can be determined and the mean-variance equilibrium will be obtained.

The equilibrium solutions are as follows:

$$du_e=\frac{\{-\varphi(f)\Omega\alpha(f)(dy-du_g)+[\varphi(f)(1-\Omega)-1]du_q+[\Lambda/(1+\rho)]du_m\}}{(1+\rho)} \tag{3-15}$$

$$du_p=\frac{\{-\varphi(f)\Omega\alpha(f)(dy-du_g)+[\varphi(f)(1-\Omega)+\rho]du_q+[\Lambda/(1+\rho)]du_m\}}{(1+\rho)} \tag{3-16}$$

$$\begin{aligned} dv=&\alpha(f)n_k du_g-(1+\Pi/\varphi(f))n_M[\rho du_q+(\Lambda/(1+\rho))du_m]+n_M[(1+\rho)(1+\Pi/\varphi(f))\\ &-(1+\Pi)]\frac{\{-\varphi(f)\Omega\alpha(f)(dy-du_g)+[\Lambda/(1+\rho)]du_m+[\varphi(f)(1-\Omega)+\rho]du_q\}}{(1+\rho)} \end{aligned} \tag{3-17}$$

$$\begin{aligned} dZ=&[\varphi(f)(1+\Pi/\varphi(f))\Omega n_M+n_k]\varphi(f)\alpha(f)(dy-du_g)\\ &-[\varphi(f)(1+\Pi/\varphi(f))(1-\Omega)n_M+n_{B^*}]\varphi(f)du_q \end{aligned} \tag{3-18}$$

along with the following expected rate of domestic inflation and expected part of the government budget constraint to be financed (residually) through tax on wealth:

$$\begin{aligned} \pi=\{&-\rho e+[\Lambda/(1+\rho)]\delta-\varphi(f)\{\Omega[(1-g)(\alpha(f)-\Gamma\sigma_p^2)-c/Wn_k]+(1-\Omega)(i^*-q+\sigma_q^2)\}+\\ &\rho\varphi(f)\Omega\alpha(f)(\sigma_{ye}-\sigma_{ge})-\rho\varphi(f)(1-\Omega)\sigma_{qe}+\varphi(f)^2\Omega^2\alpha(f)^2(\sigma_y^2+\sigma_g^2)+\varphi(f)^2(1-\Omega)^2\sigma_q^2\} \end{aligned} \tag{3-19}$$

$$\tau = gn_k(\alpha(f)\ \ \Gamma\sigma_p^2) + n_M(1+\Pi/\varphi(f))[\rho e - (\Lambda/(1+\rho))\delta - \rho\sigma_{pe} + (\Lambda/(1+\rho))\sigma_{mp}]$$
$$-t^*i^*n_{B^*} + \Pi i n_M + n_M\Pi[1-(1/\varphi(f))](\sigma_p^2 - \pi) \qquad (3\text{-}20)$$

In the above equations Ω is the capital share in the traded portion of the consumer's portfolios and is defined as:

$$\Omega = n_k/(n_k+n_{B^*}) \qquad , \qquad (1-\Omega) = n_{B^*}/(n_k+n_{B^*})$$

Equations (3-15)-(3-18) ,which are independent, determine the stochastic adjustments in du_e ,du_p ,and dZ. Clearly, these are not full reduced form solutions, since they are functions of the portfolio shares which have yet to be determined. It is worth noting that in determining the equilibrium components we are concerned about those equilibrium components which imply constant portfolio shares through time. Put differently, we have assumed the means and variance-covariance matrix of asset returns are stationary[9]. Equations (3-19) and (3-20) show the implications of financial repression and different types of exchange rate arrangements for the expected domestic inflation rate and the mean tax rate on (real) wealth. Since there are several channels whereby they impact on π and τ, the directions of the effects are ambiguous at this stage. In general, their effects are transmitted to π and τ by the equilibrium portfolio shares, the equilibrium expected exchange rate depreciation and the risk sources in the model. Like the tax smoothing and optimal seigniorage literature, one may suppose a government with a loss function consisting of either τ, t^*, π and f, dv and dp or all of them. Here, the government would be willing to minimize its loss function with respect to f and ρ given the above equilibrium relationship. This line leads us to a situation where imposition of financial repression would be optimal from the government's point of view, irrespective of its consequences for economic growth or more precisely the representative agent's welfare.

There are some aspects of equation (3 20) which are worthy mentioning here. As written, the first term of the right hand side indicates the government expenditure share of wealth which in an endogenous growth model, such as this, is proportional to the (domestic) capital share of wealth through its tightness with the mean level of output. The second term is a compound of the government inflation tax (subsidy) and bond financing revenue (cost). As observed, it consists of three main (multiplicative) components. Of particular interest is the last component of this term which demonstrates the public finance role of exchange rate regimes and central bank independence. Evidently, due to our reaction function specification in (3-12), when the fixed rates arrangement is in operation, there would not be any scope for government to raise its revenue through money creation in the economy. In this instance, the ability of the government to earn revenue through monetization in the economy is restricted by the relative magnitudes of the equilibrium expected depreciation of the exchange rate and its covariance with domestic inflation (prices) which, in turn, are determined mainly by the fundamentals. This can easily be realized by noting that the last component under fixed rates is reduced to the following expression (refer to equation(3-19') below):

$$\lim_{\rho\to\infty}\ [\rho e-(\Lambda/(1+\rho))\delta-\rho\,\sigma_{pe}+(\Lambda/(1+\rho))\sigma_{mp}]=-\psi_{\infty}-q+\sigma_q^2$$

where, ψ_{∞} stands for the equilibrium expected growth under a fixed exchange rates arrangement. As it is seen, the government is able to reap off seigniorage revenue under the fixed rates as long as the equilibrium expected growth under the fixed rates is positive (negative) and the sum of the equilibrium expected growth and expected foreign inflation is greater than the variance of the foreign inflation. Also, special attention should be paid to the implications of financial repression policy for public finance. That is, supposing the financial repression policy, as has been recognized in the standard literature, implies a reduction in the (expected) growth. This means an increase in the degree of financial repression in the economy would involve, on the one hand, an increase in the share of real money balances and government bond commitment (i.e. the first and second components) and, on the other hand, a reduction in the absolute value of the third component. This implies it is possible under a fixed rates arrangement that the financial repression policy entails a reduction rather than an increase in the government (inflation tax and bond financing) revenues. This episode would be more illustrative, if we imagine the case where the equilibrium expected growth is negative. Therefore, it is most likely that the third (last) component of the second term is positive. That is, now the government exchange rate policy involves a contraction in money supply (demonetization the economy) implying an (dis)inflation subsidy to the economy. In this case a rise in the degree of financial repression will lead to an increase in the second term in total. That is, the financial repression policy under fixed rates would impose higher costs on the government. In summary, given the central bank independence, the government application of financial repression policy for public finance purposes seems to be more restrictive under a fixed rates arrangement than flexible arrangements, if fixed rates are to be completely credible as it is implied by our specified reaction function. This reveals the importance of stressing the close relationship between the financial repression policy and exchange rate regimes from a public finance point of view.

The third term on the right hand side of equation (3-20) shows the government revenue through taxation on the foreign asset holdings. The forth term refers to the interest rate burden of the government bond financing. The last term reflects one of the consequences of financial repression policy, or more precisely the McKinnon-Shaw effect, for the government bond financing. This is so because when there is no financial repression and the economy enjoys its maximum feasible financial technology, this term will disappear. It says when the real return on holding real money balances is positive, the financial repression policy will raise the government revenue through bond financing. However, the reverse is true when the real return on money balances is negative.

3.3.1 Core Equilibrium Relationships

In order to calculate the endogenous variances and covariances in optimality conditions we use equations (3-15)-(3-18). Hence we obtain:

$$\sigma_Z^2=\varphi(f)^2[A^2\sigma_y^2+B^2\sigma_g^2+C^2\sigma_q^2] \qquad (3\text{-}21\text{-}1)$$

where A, B and C are as follows:

$$A=\alpha(f)[(\varphi(f)+\Pi)\Omega n_M+n_k] \quad , \quad B=-A \quad , \quad C=-[(\varphi(f)+\Pi)(1-\Omega)n_M+n_{B^*}]$$

$$cov(dZ,dk+du_p)=\{\alpha(f)^2\varphi(f)[(\varphi(f)+\Pi)\Omega n_M+n_k](1-\varphi(f)\Omega)/(1+\rho)\}\sigma_y^2 \\ -[\varphi(f)^2\Omega\alpha(f)^2/(1+\rho)][(\varphi(f)+\Pi)\Omega n_M+n_k]\sigma_g^2 \\ +\{[\varphi(f)(1-\Omega)+\rho]/(1+\rho)\}[(\varphi(f)+\Pi)(1-\Omega)n_M+n_{B^*}]\varphi(f)\sigma_q^2 \tag{3-21-2}$$

$$cov(dZ,-du_q+du_p)=-[\varphi(f)^2\Omega\alpha(f)^2/(1+\rho)][(\varphi(f)+\Pi)\Omega n_M+n_k](\sigma_y^2+\sigma_g^2) \\ -\{[\varphi(f)(1-\Omega)-1]/(1+\rho)\}[(\varphi(f)+\Pi)(1-\Omega)n_M+n_{B^*}]\varphi(f)\sigma_q^2 \tag{3-21-3}$$

Substituting (3-21-2) and (3-21-3) into the (3-9-3) and (3-9-4), we end up with:

$$(r_k-r_B)=[\alpha(f)-\Gamma\sigma_p^2]-i+\pi-\sigma_p^2=(1-\gamma)\{A\alpha(f)[1-\varphi(f)\Omega/(1+\rho)]\sigma_y^2 \\ +B[\varphi(f)\Omega\alpha(f)/(1+\rho)]\sigma_g^2+C[(\varphi(f)(1-\Omega)+\rho)/(1+\rho)]\sigma_q^2\} \tag{3-22-1}$$

$$(r_{B^*}-r_B)=[i^*(1-t^*)-q+\sigma_q^2]-(i-\pi+\sigma_p^2)=(1-\gamma)\{A[-\varphi(f)\Omega\alpha(f)/(1+\rho)](\sigma_y^2+\sigma_g^2) \\ +C[(\varphi(f)(1-\Omega)-1)/(1+\rho)]\sigma_q^2\} \tag{3-22-2}$$

Before going further, it is worth noting that according to (3-21-1), monetary shocks do not affect the variance of (real) wealth (growth) directly. This is true irrespective of the presence of the McKinnon-Shaw effect and cost of inflation variance. However, as we will see later, it does not rule out the possibility of its indirect effect on the variance of wealth through either Ω in the absence of the McKinnon-Shaw effect or through Ω, n_M , n_k , n_{B^*} in the presence of the McKinnon-Shaw effect. Therefore, if the monetary shocks are to influence the variance of the wealth, the presence of at least either productivity shocks, government expenditure shocks or foreign inflation (price) shocks is necessary. Also, when there is no source of uncertainty in the model (i.e. the model is a deterministic one) we get the standard result. That is, in equilibrium, the real rate of return on (domestic) government bonds should be equal to the marginal productivity of capital and the after tax real return on foreign assets. Therefore, other things equal, the imposition of financial repression implies less cost for government bond financing. Moreover, it shows by raising seigniorage, if it is possible under a specific exchange rate arrangement, the government may save more in terms of real payments for bond financing.

Subtracting (3-22-1) from (3-22-2) and simplifying the result yields:

$$[i^*(1-t^*)-q]-[\alpha(f)-\Gamma\sigma_p^2]=-\sigma_q^2+(1-\gamma)\{-\alpha(f)^2\varphi(f)[(\varphi(f)+\Pi)\Omega n_M+n_k]\sigma_y^2 + \varphi(f)[(\varphi(f)+\Pi)(1-\Omega)n_M+n_{B^*}]\sigma_q^2\} \quad (3\text{-}23\text{-}1)$$

This expression shows us how the exchange rate arrangement, financial repression and debt policies, productivity shocks, mean and variance of government expenditure (through the variance of domestic inflation rate σ_p^2 and the capital share in the traded assets Ω) and the mean and variance of the foreign inflation rate affect the difference between returns on foreign assets and domestic capital.

3.3.2 Consumption, Growth and Portfolio Shares

The assumption of constant portfolio shares through time implies that:

$$d(M/P)/(M/P)=dK/K=dW/W\equiv\psi dt+dZ \quad (3\text{-}24)$$

Considering the above equation and the definition of Ω, the expectation of the product market equilibrium gives the mean real rate of growth as follows:

$$\psi=\frac{[d(B^*/Q)+dK]}{[(B^*/Q)+K]}= \varphi(f)\{\Omega[(1-g)(\alpha(f)-\Gamma\sigma_p^2)-(1/n_k)(c/W)]+(1-\Omega)(i^*-q+\sigma_q^2)\} \quad (3\text{-}23\text{-}2)$$

Note that, since the above relation is not a full reduced form one may not gain any preliminary insight into the direction of the effects of the determinants of expected growth. However, as we will discuss in more detail shortly, one may perceive the real effect of inflation (variance) and thereby the exchange rate arrangements, the government expenditure and the financial repression policies. Therefore, the exchange rate arrangement is not superneutral in this structure. Moreover, we see the negative effect of an increase in the mean of government expenditure on the expected growth in this structure where we have not considered any productivity role (positive externalities) for the government expenditure in the economy[10].

Having substituted for $\sigma_{/}^{2}$ into the (3-9-1), the equilibrium consumption wealth ratio is expressed as:

$$c/W=[\theta/\varphi(f)(1-\gamma\theta)]\{\mu-\Psi\gamma-(1/2)\gamma(1-\gamma)\varphi(f)^2[A^2\sigma_y^2+B^2\sigma_g^2+C^2\sigma_q^2]\} \qquad (3\text{-}23\text{-}3)$$

Where, from (3-8-4) and (3-24) we have:

$$\Psi=\psi+[\varphi(f)c/W] \qquad (3\text{-}23\text{-}4)$$

From (3-23-3), it is obvious (from equation (3-8-3)) that as long as γ is neither equal to zero (i.e. logarithmic utility function) nor equal to one (i.e. risk neutral agent), *dv* should be viewed as a distortionary taxation, because it has a real effect on consumption. More precisely, although it does not depend on the specific exogenous realization of *dv*, it is not independent of neither the variance of the tax rate d*v* nor its covariance with *p*, *q* and *k*.

Now equations (3-23-1)-(3-23-4), (3-9-2) and the normalized wealth constraint (3-6-3) can simultaneously determine the equilibrium solutions for c/W, Ψ,ψ,n_M, n_K, n_B. in terms of $\delta,\Gamma,\rho,\Pi,f,\ t^*,g,\ \rho^*,\gamma,\ \theta,\alpha,\sigma_y^2$, σ_g^2 and σ_q^2 which are all the exogenous or policy (real) parameters in this framework as well as domestic and foreign nominal interest rates, that is, *i* and *i** respectively, expected domestic inflation rate (π) and the expected change in the exchange rate (e).

3.3.3 Nominal Quantities

The two following relationships along with equation (3-19) jointly determine the nominal equilibrium quantities for i, π and e:

$$\pi = q + e + \sigma_q^2[\varphi(f)(1-\Omega)-1]/(1+\rho) \qquad (3\text{-}25\text{-}1)$$

$$\begin{aligned} i &= i^*(1-t^*)+e \\ &+\Big\{\{(1-\gamma)(1+\rho)\varphi(f)^2\alpha(f)^2\Omega^2[1-(1-\varphi(f))n_M]-\varphi(f)^2\Omega^2\alpha(f)^2\}/(1+\rho)^2\Big\}(\sigma_y^2+\sigma_g^2) \\ &+\Big\{\{(1+\rho)\{(\varphi(f)(1-\Omega)+\rho)+(1-\gamma)[\varphi(f)(1-\Omega)-1][1-(1-\varphi(f))n_M](1-\Omega)\varphi(f)\} \\ &\quad -[\varphi(f)(1-\Omega)+\rho]^2\}/(1+\rho)^2\Big\}\sigma_q^2-[\Lambda^2/(1+\rho)^4]\sigma_m^2 \end{aligned} \qquad (3\text{-}25\text{-}2)$$

Having solved (3-19) and (3-25-1) for e and π we derive the following two equations which are somewhat more illustrative:

$$e=\frac{1}{(1+\rho)}\{\frac{\Lambda\delta}{(1+\rho)}-\psi-q+\frac{\varphi(f)^2\Omega^2\alpha(f)^2(\sigma_y^2+\sigma_g^2)}{(1+\rho)} + \frac{[\varphi(f)^2(1-\Omega)^2+\rho\,\varphi(f)(1-\Omega)-\varphi(f)(1-\Omega)+1]\sigma_q^2}{(1+\rho)}\} \qquad (3\text{-}19')$$

$$\pi=q+\frac{1}{(1+\rho)}\{\frac{\Lambda\delta}{(1+\rho)}-\psi-q+\frac{\varphi(f)^2\Omega^2\alpha(f)^2(\sigma_y^2+\sigma_g^2)}{(1+\rho)} + \frac{[\varphi(f)^2(1-\Omega)^2+2\rho\,\varphi(f)(1-\Omega)-\rho]\sigma_q^2}{(1+\rho)}\} \qquad (3\text{-}25'\text{-}1)$$

In equations (3-19') and (3-25'-1) which are still semi-reduced forms, we see that the higher is the equilibrium expected growth rate the lower will be the equilibrium expected exchange rate and expected inflation rate as long as the exchange rate arrangement involves the leaning against the wind policy. Therefore, substituting for e from (3-19') into the (3-25-2), the same relationship is perceived between the expected growth and the nominal interest rate. Also, we see the more independent is the central banker the lower e and π will be. As a consequence of the PPP assumption, we observe the expected domestic inflation rate is equal to the expected foreign inflation rate in the case of a fixed exchange rate regime. Furthermore, one of the features of equation (3-19') is the possibility of having positive and negative equilibrium expected rates of exchange rate depreciation. According to this equation when the sum of the expected growth and expected foreign inflation is less (greater) than the sum of the expected money growth and the risk associated with holding foreign assets, government bonds and domestic capital all adjusted for the exchange rate arrangement, the equilibrium expected rates of exchange depreciation will be positive (negative, implying an equilibrium expected appreciation). Note that since the equilibrium interest rate can not be negative, the case where $e<0$ is restricted by its economic viability. In general, we expect an equilibrium expected appreciation for the economies which experience a higher rate of growth, low levels of money growth (or a more independent central banker for a given level of targeted money growth) and less instability in both the government expenditure and the production sector.

Moreover, it is clear from (3-25-2) that, in general, UIP does not hold. This is so even in the case of the logarithmic utility function ($\gamma=0$) and zero tax on holding foreign assets, which is different from Grinols and Turnovsky (1994),Turnovsky (1995) and Engel (1992). The presence of financial repression is the main element responsible for this result. All the same, in the absence of any source of uncertainty and tax on foreign assets, UIP holds. Incidentally, though in general the Fisher equation does not hold in this framework, because the real interest rate is not independent of money growth, in the absence of either McKinnon-Shaw effects and monetary shocks or any source of uncertainty, a version of the Fisher equation holds. This is so because considering equations (3-25'-1), (3-19') and (3-25-2), we see higher inflation rates are associated with higher nominal interest rate so that the real interest rate remains constant.

Also, if we combine equations (3-25'-1) and the equilibrium variance of domestic inflation derived from equation (3-16), we can work out the equilibrium (expected) real return on real money balances given as follows:

$$-\pi+\sigma_p^2=\frac{1}{(1+\rho)}\{\psi-\frac{\Lambda\delta}{(1+\rho)}+\frac{\Lambda^2\sigma_m^2}{(1+\rho)^3}+\rho(-q+\sigma_q^2)\} \qquad (3\text{-}4'\text{-}1)$$

In general, the elements of the above equation are so revealing that there is no need to go through detailed explanations. However, one important aspect of the above equation deserves to be highlighted here, that is, the crucial role of the exchange rate arrangement for the financial repression policy as a source of public finance. This can be illustrated more clearly by taking the derivative of (3-4'-1) with respect to financial repression given as:

$$\frac{\partial(-\pi+\sigma_p^2)}{\partial f}=\frac{\partial\psi}{\partial f}\frac{1}{(1+\rho)}$$

The expression suggests that if the financial repression policy implies a deterioration in the (equilibrium) expected growth, it will cause a reduction in the real return on real money balances as long as we have: $\rho>-1$. Accordingly, this leads to a reduction in the demand for real money balances and thereby a loss in the inflation tax base. While the reverse holds true if we have: $\rho<-1$ involving mainly a leaning with the wind arrangement. More technically speaking, the second term in the right hand side of the above expression can be viewed as an exchange rate arrangement multiplier for the financial repression effect on the real money balances and whereby the inflation tax revenue. As observed, the value of this multiplier can be either positive or negative with an absolute value greater than one for the arrangements involving $-2<\rho<0$. The closer ρ is to minus one the higher is the multiplier magnitude. It takes its minimum value in the fixed rates arrangement. That is, under a credible fixed rates, this channel will vanish implying that there would not be any endogenous hedging incentive in response to the financial repression policy from the rational agent side which might counteract the direct effect of the financial repression on raising the share of real money balances. It is worthwhile paying a little more attention to the case where the degree of exchange rate flexibility lies between the range (0,-1) and the financial repression policy results in growth reduction. In this circumstance, it is likely that the direct increasing real money balances effects of financial repression policy, through transaction costs and the McKinnon-Shaw channels (increase in consumption-wealth ratio), are endogenously undermined by its decreasing effect on the real return on real money balances through the equilibrium nominal interest rates[11] (recall equation (3-9-2)). This resembles Tobin's effect (1965) but now in the context of financial repression policy. That is, in this occasion the financial repression policy might imply a lower share of real money balances and thereby a higher share of traded assets in the agent's portfolio. However, special attention must be paid to the accompanying growth deterioration characteristic of the financial repression policy. This apparent inconsistency can be reconciled by noting that financial repression, simultaneously, involves an increase in consumption-wealth ratio, a reduction in the marginal productivity of (domestic) capital and in our framework a reallocation within the traded assets[12]. Hence, in this occasion, the financial repression policy may lead to a lower growth despite the increase in the share of traded assets. Note that the main cause of the switch away from real money balances is the increase in the (equilibrium) expected inflation as a consequence of the reduction in the (equilibrium) expected growth. Furthermore, notice that the reduction in real money balances (inflation tax base) in this case does not necessarily imply a reduction in the (equilibrium) inflation tax revenue because the (expected) inflation has increased at the same time.

Having determined the equilibrium values for these three nominal quantities, we are able to obtain the full reduced form for equilibrium real quantities. We should mention that the viability of the equilibrium has some implications for initial wealth, exchange rate and money supply. First we notice that in order to maintain a portfolio balance in stock terms, either the initial exchange rate $E(0)$ (floating exchange rate), the initial money supply M(0) (fix exchange rate) or both (managed float) should have a one time discrete jump so as to shift from one (initial) equilibrium to another new equilibrium. Hence, under a floating exchange rate regime we have:

$$\begin{aligned} E(0) &= [(n_K+n_B.)/(n_M+n_B)][(M_0+B_0)/(Q_0K_0+B_0^*)] \\ &= [n_K/\Omega(1+\Pi)n_M][(M_0+B_0)/(Q_0K_0+B_0^*)] \end{aligned} \qquad (3\text{-}26\text{-}1)$$

Where M_0, B_0, K_0 and B_0^* refer to initial stocks of assets and Q_0 is the initial foreign price level, which are all predetermined at any initial time. When the exchange rate is fixed, the initial money supply should jump so that the portfolio balance remains the same in the new equilibrium. That is, we have :

$$M(0)=[\Omega(1+\Pi)n_M/n_K][E_0(Q_0K_0+B_0^*)/(1+\Pi)] \qquad (3\text{-}26\text{-}2)$$

However, in this case, the initial exchange rate is predetermined. Also, for managed exchange rates we will have:

$$\frac{E(0)}{M(0)} = [n_K/\Omega(1+\Pi)n_M][(1+\Pi)/(Q_0K_0+B_0^*)] \qquad (3\text{-}26\text{-}3)$$

Likewise, the initial value of wealth W(0) is endogenously determined as:

$$W(0)=[K_0+(B_0*/Q_0)]/[n_{B^*}+n_K]=[K_0+(B_0*/Q_0)](\Omega/n_K) \qquad (3\text{-}27)$$

Since the initial exchange rate and money supply must be positive, holding positive stocks of money, domestic bonds and capital involves: $0<(n_K/\Omega)<1$, implying a positive share of traded assets in the portfolio. Notice that this condition doesn't reject the possibility of $\Omega>1$ which means $n_{B*}<0$, that is a situation which implies a net debtor country.

Moreover, given the constant elasticity utility function (3-6-1), in equilibrium the following transversality condition must hold:

$$\lim_{t\to\infty}[w^{\gamma}e^{-\mu t}]=0$$

This is necessary in order to guarantee that all the intertemporal budget constraints hold and given (3-24), it is met as long as the equilibrium consumption-wealth ratio is greater than zero[13]. In addition, it ensures the intertemporal solvency of the government.

3.4 The Welfare Criterion

In order to evaluate the government policy (exchange rate & financial repression) implications for the economy, we consider the value function applied for solving the intertemporal optimization problem as the welfare criterion[14]. Considering the iso-elastic utility function, we know (refer to appendix (D)) that with initial stock of wealth W(0), the optimal utility level is:

$$V(x(0))=(\theta/\varphi(f)\gamma)(c/W)^{\theta\gamma-1}n_M^{\gamma\zeta(f)}W(0)^{\gamma(\theta+\zeta(f))} \qquad (3\text{-}28)$$

or using (3-27):

$$V(x(0))=(\theta/\varphi(f)\gamma)(c/W)^{\theta\gamma-1}n_M^{\gamma\zeta(f)}[(K_0+(B_0*/Q_0))/(n_k+n_B*)]^{\gamma(\theta+\zeta(f))} \qquad (3\text{-}28')$$

where: c/W, n_M, n_K and n_{B*} are the equilibrium consumption-wealth and portfolio shares of assets derived from the procedure mentioned in the previous sections about the macroeconomic equilibrium. This value function indicates the intertemporal welfare level of the representative agent along the (equilibrium) optimal path. To see the main channels whereby the government's policy changes affect the welfare, we differentiate (3-28') as follows:

$$dV(X(0))/V=(\theta\gamma-1)d(c/W)/(c/W)+\gamma\zeta(f)dn_M/n_M-\gamma(\theta+\zeta(f))d[n_k+n_{B*}]/(n_k+n_{B*}) \quad (3\text{-}29)$$

or by making use of (3-6-3) and (3-13):

$$dV(X(0))/V=(\theta\gamma-1)d(c/W)/(c/W)+\gamma\zeta(f)dn_M/n_M+ \gamma(\theta+\zeta(f))(1+\Pi)dn_M/[1-(1+\Pi)n_M] \quad (3\text{-}29')$$

Hence, policy changes impact on welfare through two main -direct and indirect- channels interactively. The direct channels include the effect of the financial repression on the marginal utility of money and the effect of the debt policy. Indirect channels consist of the impact of policy changes on the consumption-wealth ratio (c/W) and the portfolio share of real money balances, n_M . The debt policy has a real effect on the welfare so long as money holding has utility (i.e. $\zeta(f)\neq 0$). This is due to the debt policy specification in this model which involves nonneutrality for monetary policy (Turnovsky (1995)). Generally speaking, according to (3-29') any policy changes (here, more strictly, exchange rate and financial repression policies) which stimulate consumption is welfare deteriorating (as long as $0\leq\theta\leq 1$). This is so because we have assumed $-\infty\leq\gamma\leq 1$. However, the effect of any policy changes which increase the share of real money balances in the portfolio of the representative agent on the welfare is ambiguous and it depends mainly on the degree of risk aversion (γ).

In order to have a more tractable and intuitive expression for the welfare effect of policy changes, in the rest of the analysis we focus on the logarithmic utility function (corresponding to $\gamma\to 0$) which yields the following welfare expression[15], the consumption-wealth ratio and the share of real money balances:

$$V(x(0))=(\theta/\mu)[\ln\theta+\ln\mu-\ln\varphi(f)]+(\zeta(f)/\mu)\ln n_M{}^*+(1/\mu^2)(\psi^*-(1/2)\sigma_z{}^{*2}) \\ +[(\theta+\zeta(f))/\mu]\ln W(0) \tag{3-30}$$

$$\frac{c}{W}=\frac{\theta\mu}{\varphi(f)} \tag{3-9'-1}$$

$$n_M=\frac{\zeta(f)\mu}{\varphi(f)\; i} \tag{3-9'-2}$$

where: n^*_M, ψ^* and $\sigma_z{}^{*2}$ in (3-30) are given by (3-9'-2), (3-23-2) and (3-21-1) respectively, after substituting for the macroeconomic equilibrium values which can be worked out by the approach mentioned in the previous sections. The value function (3-30) is viewed as a benchmark for evaluating the welfare implications of any policy changes. In order to guarantee that n_M stays within the zero and one range we should have $\varphi(f)\; i \geq \zeta(f)\mu$. This imposes a restriction on using the financial repression policy. Equation (3-30) implies the more policy changes stimulate (expected) growth, the more possibilities for future consumption would be available and, therefore, the more welfare improving they are. Likewise, those policies which increase instantaneously the real money balances would be welfare improving as long as $\zeta(f)>0$. By contrast, to the extent that the policy changes result in higher variance in growth (unexpected growth), they would be welfare deteriorating as higher variance of growth makes future consumption more uncertain for the risk averse agent. Also, the greater initial value of (real) wealth involves higher welfare. As we will show in the next chapters, the government's policy tools have sometimes opposite effects on the welfare arguments and that is why it should compromise (optimize) among the trade offs existing in the policy tools at its disposal.

Now we have reached the point where we can present a formal analysis of the welfare (growth) implications of different policy choices. However, we leave a detailed discussion about the welfare implications of exchange rate arrangements and financial repression to chapters four, five and six. In the following, first we show how the imperfections in product markets (cost of inflation variance) and financial markets (financial repression) through their implications for the agent's portfolio will cause different (monetary and fiscal) policy changes to affect the components of the welfare criterion directly and indirectly through the equilibrium interest rate. This means in our set up, unlike Turnovsky's (1994), there is not necessarily an infinite numbers of ways of achieving the optimal level of welfare by fine tuning one of the monetary or fiscal policy instruments. Also, in the remaining part of this section we address the welfare implications of appointing different types of central banker. At the end, we will investigate whether the new features of our set up have implications for optimal debt policy or not.

Proposition 3-1. *The non-zero cost of inflation variance is sufficient for the non-neutrality of the exchange rate regime.*

Proof. Substituting for σ_p^2 from (3-16) into the (3-23-1) and using (3-6-3), we end up with the following quadratic equation in the equilibrium share of traded assets for the logarithmic utility function:

$$\{\frac{\Gamma\varphi(f)^2[\alpha(f)^2(\sigma_y^2+\sigma_g^2)+\sigma_q^2]}{(1+\rho)^2}\}\Omega^2+$$
$$\{\varphi(f)\alpha(f)^2[1-\frac{(1-\varphi(f))\zeta(f)\mu}{\varphi(f)\ i}]\sigma_y^2+\varphi(f)[1-\frac{(1-\varphi(f))\zeta(f)\mu}{\varphi(f)\ i}-\frac{2\Gamma(\varphi(f)+\rho)}{(1+\rho)^2}]\sigma_q^2\}\Omega \tag{3-23'-1}$$
$$i^*(1-t^*)-q-\alpha(f)+\sigma_q^2+\frac{\Gamma[\frac{\Lambda^2\sigma_m^2}{(1+\rho)^2}+(\varphi(f)+\rho)^2\sigma_q^2]}{(1+\rho)^2}-\varphi(f)[1-\frac{(1-\varphi(f))\zeta(f)\mu}{\varphi(f)\ i}]\sigma_q^2\}$$

The above equation has one non-negative real root in terms of ρ, if we have[16]:

$$\{i^*(1-t^*)-q-\alpha(f)+\sigma_q^2+\frac{\Gamma[\frac{\Lambda^2\sigma_m^2}{(1+\rho)^2}+(\varphi(f)+\rho)\sigma_q^2]}{(1+\rho)^2}-\varphi(f)[1-\frac{(1-\varphi(f))\zeta(f)\mu}{\varphi(f)\ i}]\sigma_q^2\}\leq 0$$

This is so because the coefficient of Ω^2 is positive[17]. Having considered the fact that in the absence of financial repression $\varphi(f)=1$ and $\alpha(f), \zeta(f)$ are independent of f, we see this result is independent of the presence of financial repression. For the logarithmic utility function we have:

$$\psi=\varphi(f)\{\Omega(1-g)(\alpha(f)-\Gamma\sigma_p^2)-\frac{\theta\mu}{\varphi(f)[1-(1+\Pi)\frac{\zeta(f)\mu}{\varphi(f)\,i}]}+(1-\Omega)(i^*-q+\sigma_q^2)\} \tag{3-23'-2}$$

Therefore, the equilibrium expected growth rate depends on ρ directly and indirectly through the equilibrium interest rate (recall (3-25-2)). □

As it is observed from (3-23'-1), the Ω is a nonlinear function in i. Recalling the equation for the equilibrium nominal interest rate (3-25-2) for the logarithmic case (i.e. $\gamma\to 0$) (refer to equation (3-25'-2) below) and substituting for e from (3-19') into it, we realize that for the same values of policy and exogenous parameters in the model there might be more than one acceptable root for the equilibrium interest rate[18]. This means there might be more than one equilibrium share of traded assets, expected growth rate and exchange rate. Below we demonstrate the main cause of this possible multiplicity is the introduction of the McKinnon-Shaw effect into the model. More precisely, in a semi-open economy which is exposed to different types of domestic and foreign shocks and the exchange rate is not fixed, the McKinnon-Shaw effect adds to the existing imperfections in the financial markets and brings about the possibility of more than one equilibrium portfolio satisfying a fixed proportion of assets through time. Under the fixed exchange rate regime, the equilibrium expected exchange rate is zero and the associated risk premium term in equation (3-25-2) will vanish and therefore, there would be a unique nominal interest rate determined exogenously by the (after tax) nominal return on foreign assets. This is true irrespective of the presence of the McKinnon-Shaw effect.

Another important aspect of (3-23'-1) is when the McKinnon-Shaw effect is not in place, the equilibrium Ω is independent of the government expenditure and monetary shocks as long as the cost of inflation variance is zero (refer to propositions (3-1) and (3-2) below). This is so because in this case, the share of domestic capital in traded assets is affected only by productivity shocks or foreign inflation shocks. Therefore, in this circumstance, if there are no sources of risk (i.e. productivity and foreign inflation risks), the arbitrage equation (3-23'-1) involves equality between after tax real return on foreign assets and real return (adjusted for financial repression) on domestic capital. This means the risk premium would be equal to zero and , hence, on the part of the investors' portfolio decision there would not be any difference between these two assets and consequently there would not exist a unique equilibrium value for Ω. Moreover, another implication of that is the equilibrium Ω, whatever it is, will be perfectly elastic with respect to financial repression, taxation on foreign assets and expected foreign inflation. Put differently, any inequality between real returns on domestic capital and (after tax) foreign assets entails a corner solution for the equilibrium Ω. For instance, an increase in financial repression leads to a perfect switch away from domestic capital towards foreign assets, given the constant level of after tax real return on foreign assets, implying Ω=0.

If the solution for Ω from (3-23'-1) is plugged into (3-23'-2) and we substitute the result into (3-19') and then for e into (3-25-2), we see the full reduced form (equilibrium) nominal interest rate is a function of the policy parameters (i.e. Λ, ρ, δ, f, t^*, g) , shocks and exogenous parameters. Therefore, the nominal interest rate introduces another channel whereby policy parameters impact on the real part of the economy.

Proposition 3-2. *The equilibrium share of traded assets is independent of the nominal interest rate if there is no McKinnon-Shaw effect.*

Proof. Substituting $\varphi(f)=1$ in (3-23'-1) and simplifying. □

According to (3-23'-1), in general, Ω is a function of the nominal interest rate. However, the direction of the nominal interest rate effect on Ω is ambiguous. As we have:

$$\frac{\partial\Omega}{\partial i} = -\Big\{\Big[\frac{\alpha(f)^2(1-\varphi(f))\zeta(f)\mu\sigma_y^2+(1-\varphi(f))\zeta(f)\mu\sigma_q^2}{i^2}\Big]\Omega - \frac{(1-\varphi(f))\zeta(f)\mu\sigma_q^2}{i^2}\Big\} \Big/ \Big\{2\Omega\Big\{\frac{\Gamma\varphi(f)^2[\alpha(f)^2(\sigma_y^2+\sigma_g^2)+\sigma_q^2]}{(1+\rho)^2}\Big\}+\Big\{\varphi(f)\alpha(f)^2\Big[1-\frac{(1-\varphi(f))\zeta(f)\mu}{\varphi(f)\ i}\Big]\sigma_y^2+ \varphi(f)\Big[1-\frac{(1-\varphi(f))\zeta(f)\mu}{\varphi(f)\ i}-\frac{2\Gamma(\varphi(f)+\rho)}{(1+\rho)^2}\Big]\sigma_q^2\Big\}\Big\} \quad (3\text{-}31)$$

The denominator of the above equation is positive as long as there is neither an inflation variance cost nor a foreign inflation shock. In equation (3-31), the changes in Ω due to variation in the nominal interest rate depend on the degree of financial repression, t^*, i^*, q, α, ρ and the type and size of the variance of the shocks hitting the economy. For instance, when there is no foreign inflation (price) shock, Ω is a negative function of the interest rate. It means a rise in the interest rate will cause a reduction in the share of domestic capital in the traded assets when there exists domestic productivity and government expenditure shocks. A rise in the interest rate will cause a reduction in the share of real money balances in the agent's portfolio which correspondingly raises the share of traded assets in the portfolio. However, since domestic capital is riskier than foreign assets, due to the lack of foreign inflation (price) shocks, the share of foreign assets will increase relatively more than that of domestic capital. Likewise, when there is no domestic productivity shock and the cost of inflation variance is zero, Ω is a positive (negative) function of the interest rate as long as the economy is a net creditor (debtor). This is so due to the same mechanism described above. Therefore, one can say, in general, the Ω is a negative function of the nominal interest rate (irrespective of the types of the risks existing in the economy) as long as it is a net debtor and the inflation variance is not costly. While for a net creditor economy the direction of the effect is ambiguous even if the cost of inflation variance is zero. It is obvious that $(\partial\Omega/\partial i)=0$ if: $\varphi(f)=1$, which is what we have stated in proposition (3-2).

Corollary 3-1-1. *The type of the exchange rate regime and the central banker stance do not affect the equilibrium share of traded assets if there is neither the effect of McKinnon-Shaw nor the real effect of inflation variance.*

Proof. Substituting $\varphi(f)=1$ and $\Gamma=0$ in (3-23'-1). □

This, in a sense, follows Turnovsky (1994) and by recalling (3-23'-2) it suggests that, in the absence of the McKinnon-Shaw effect and inflation variance real effect, the only channel whereby the exchange rate arrangement and the central bank independence may have a real effect is through the nominal interest rate which for the logarithmic case is:

$$i=i^*(1-t')+e+\frac{\rho\,\alpha(f)^2\Omega^2(\sigma_y^2+\sigma_g^2)+\rho\,\Omega^2\sigma_q^2}{(1+\rho)^2}-\frac{\Lambda^2\sigma_m^2}{(1+\rho)^4} \qquad (3\text{-}25'\text{-}2)$$

Therefore, in general, when the McKinnon-Shaw and inflation variance effects exist, the delegation of monetary policy to the central bank has a real effect on the share of traded assets as long as the exchange rate regime is not fixed . Under a fixed exchange rate regime, the central banker stance has no real effect. This is so because from (3-25-2) we have: *if* $\rho\to\infty \Rightarrow i=i^*(1-t^*)$. Also, from (3-23'-1) it is clear that Ω is independent of Λ when $\rho\to\infty$. Hence, by recalling (3-23'-2) and with the nominal interest rate exogenously determined, there is no (expected) growth effect for the central banker position in the case of a fixed exchange rate regime. This is , in fact, the result of our particular specification of the reaction function[19]. The presence of the McKinnon-Shaw effect introduces ambiguity in the direction of the effect. However, when there is no McKinnon-Shaw effect, recalling the proposition (3-2) we have:

$$\frac{\partial\Omega}{\partial\Lambda}=-\frac{\dfrac{2\Gamma\Lambda\sigma_m^2}{(1+\rho)^4}}{\dfrac{2\Omega\Gamma[\alpha(f)^2(\sigma_y^2+\sigma_g^2)+\sigma_q^2]}{(1+\rho)^2}+\{\alpha(f)^2\sigma_y^2+[1-\dfrac{2\Gamma}{(1+\rho)}]\sigma_q^2\}} \qquad (3\text{-}32\text{-}1)$$

which can be positive or negative depending on the degree of exchange rate flexibility and particularly the type of shocks which the economy is subject to. Under the fixed exchange rate regime equation (3-32-1) is equal to zero. Likewise, when there is no inflation variance cost, (3-32-1) is zero which confirms corollary (3-1-1). When the economy is subject only to domestic (real and monetary) shocks, it is negative. In this case, it takes its maximum value when Λ=0. The negative relationship between Ω and Λ is due to the fact that the appointment of an opportunistic central banker will raise the variance of inflation entailing a reduction in the real return on (productivity of) domestic capital. Also, we observe that financial repression policy through the Goldsmith channel can influence the magnitude of the marginal reduction in the share of domestic capital in the traded assets. This channel might exacerbate the negative effect of appointing an opportunistic central banker in this occasion. However, when the economy is also exposed to foreign inflation shocks this clear cut relationship between Ω and Λ will disappear. In fact, the main source of the ambiguity is the possibility of the presence of foreign inflation shocks. Considering this fact and noting that equation (3-32-1) holds true irrespective of the presence or absence of financial repression (imperfection in the financial markets), one can establish the following:

Proposition 3-3. *Under flexible exchange rate regimes when the inflation variance is costly, given the domestic monetary risk, the geographical origin (domestic or foreign) of the (other) shocks hitting the economy plays a crucial role for the implication of the delegation of monetary policy to the central bank for the share of domestic capital in the traded assets and thereby the mean and variance of growth.*

Corollary 3-3-1. *Under flexible exchange rate regimes, if the economy is buffeted only by the domestic (productivity, government expenditure (demand side), monetary) shocks, the less conservative is the central banker, the smaller will be the share of domestic capital in the traded assets as long as inflation variance has a real effect.*

Corollary 3-3-2. *Under flexible exchange rate regimes, when the economy is exposed to domestic and foreign inflation shocks, a sufficient condition in order for a less conservative central banker to imply a smaller domestic capital share in traded assets is:* $2\Gamma(1 \quad \Omega+\rho) < (1+\rho)^2$.

The sufficient condition in corollary (3-3-2) also reveals the important role of the type of exchange rate regime and indebtedness stance of any economy for the implications of the delegation of monetary policy to the central bank for the real magnitudes in a semi-small open economy with imperfection(s) in product markets. For instance, this condition holds for a net creditor economy characterized by a managed float leaning against the wind and/or floating exchange rate regime if and only if we have: $\Gamma < \frac{(1+\rho)^2}{2(1 \quad \Omega+\rho)}$. Apparently, this condition never holds for a net debtor economy whose exchange rate arrangement is floating rates. However, if this condition does not hold, depending on the relative sizes of the domestic and foreign inflation shocks, a positive relationship between Ω and Λ might exist. In words, the relative magnitude of the marginal cost of inflation variance, which can be viewed as an institutional and structural characteristic of any economy, has a key role in this respect.

Proposition (3-3) has an important implication for the stabilization of growth and domestic inflation. That is, in the absence of the McKinnon-Shaw effect, from (3-21-1) and (3-16), one can see the implications of different types of central banker for the variance of growth and domestic inflation (prices) through the following expressions respectively:

$$\left(\frac{\partial\sigma_z^2}{\partial\Lambda}\right)_{\varphi(f)\ 1} = 2\alpha(f)^2\Omega\frac{\partial\Omega}{\partial\Lambda}(\sigma_y^2+\sigma_g^2)-2(1-\Omega)\frac{\partial\Omega}{\partial\Lambda}\sigma_q^2 \qquad (3\text{-}32\text{-}2)$$

$$\left(\frac{\partial\sigma_p^2}{\partial\Lambda}\right)_{\varphi(f)\ 1} = \frac{2\alpha(f)^2\Omega\frac{\partial\Omega}{\partial\Lambda}(\sigma_y^2+\sigma_g^2)-2(1-\Omega+\rho)\frac{\partial\Omega}{\partial\Lambda}\sigma_q^2}{(1+\rho)^2}+\frac{2\Lambda\sigma_m^2}{(1+\rho)^4} \qquad (3\text{-}32\text{-}3)$$

They assert if the economy is only subject to domestic shocks, the appointment of a less conservative central banker will bring more stability to the growth of the economy (if you like, less stabilization bias) but at the expense of destabilizing domestic inflation (prices) (if you like inflation bias). In this occasion, the domestic inflation is destabilized because, by substituting from (3-32-1) into (3-32-3) given that there is no foreign inflation shock in the economy, we have:

$$\left(\frac{\partial\sigma_p^2}{\partial\Lambda}\right)_{\varphi(f)\ 1}^{\sigma_q^2\ 0} = [1-\frac{2\Gamma\alpha(f)^2\Omega(\sigma_y^2+\sigma_g^2)}{2\Omega\Gamma\alpha(f)^2(\sigma_y^2+\sigma_g^2)+(1+\rho)^2\alpha(f)^2\sigma_y^2}]\frac{2\Lambda\sigma_m^2}{(1+\rho)^4} \succ 0$$

More strictly speaking, there is a trade off between the stabilization of growth and domestic inflation through appointing a less conservative central banker. Now, supposing the economy is exposed to both domestic monetary shocks and foreign (inflation) shocks and the (condition in) corollary (3-3-2) is in place. In this case, the appointment of a less conservative central banker will imply less volatility in growth only if the economy is a net debtor, again, at the expense of destabilizing domestic inflation (prices). The domestic inflation will, here, be destabilized as, from (3-32-1) and (3-32-3), we have[20]:

$$\left(\frac{\partial\sigma_p^2}{\partial\Lambda}\right)_{\varphi(f)\ \ 1}^{\sigma_y^2\ \ \sigma_g^2\ \ 0} = [1 - \frac{\Gamma(1-\Omega+\rho)}{(1+\rho)^2 - 2\Gamma(1-\Omega+\rho)}]\frac{2\Lambda\sigma_m^2}{(1+\rho)^4} \succ 0$$

Therefore, if the economy is a net creditor, a less conservative central banker, will involve a destabilization in growth and domestic inflation. By induction, one can easily perceive, when the economy is subject to all types of domestic and foreign (inflation) shocks, the less conservative is the central banker, the lower is the variance of growth for a net debtor economy and the higher is the domestic inflation variance if corollary (3-3-2) holds. However, in this circumstance, for a net creditor economy the relative sizes of the variance of domestic and foreign (inflation) shocks will determine whether or not the appointment of a less conservative central banker would be associated with higher volatility in growth. Needless to say, when corollary (3-3-2) does not hold, there will be ambiguities in this respect.

Proposition 3-4. *A sufficient condition for an increase in the nominal interest rate to be (expected) growth improving is the equality of the (expected) real return on foreign assets and the (expected) real return on domestic capital net of the output share of government expenditure.*

Proof. Differentiating from (3-23'-2) with respect to i, we obtain:

$$\frac{\partial\psi}{\partial i} = \varphi(f)\{\frac{\partial\Omega}{\partial i}[(1-g)(\alpha(f)-\Gamma\sigma_p^2)-(i^*-q+\sigma_q^2)] + \frac{\theta\mu^2\zeta(f)(1+\Pi)}{[\varphi(f)i-(1+\Pi)\zeta(f)\mu]^2}\} \qquad (3\text{-}33)$$

The second term in (3-33) is always positive (for $\Pi \succ 0$) and the first term is zero when the (expected) real returns are equal to each other. □

From (3-33) it is clear when there is no McKinnon-Shaw effect we have $(\partial\Omega/\partial i)=0$ and, therefore, a rise in the nominal interest rate is always growth improving. This improvement in growth is brought about by a reduction in the share of real money balances and thereby domestic bond holdings implying an increase in the share of traded assets. However, in the presence of the McKinnon-Shaw effect a rise in the interest rate is not necessarily growth improving.

Corollary 3-4-1. *In the presence of the McKinnon-Shaw effect a sufficient condition for a rise in the nominal interest rate to be (expected) growth improving is :*

a) the (expected) real return on foreign assets should be greater than or equal to the (expected) real return on domestic capital net of the government output share when there is no foreign inflation (price) shock.

b) the (expected) real return on domestic capital net of the government output share should be greater than or equal to the (expected) return on foreign assets when there is no inflation variance cost and domestic productivity shock and the economy is a net creditor.

Proof. Considering equation (3-33) and recalling that a) *if* $\sigma_q^2=0 \Rightarrow (\partial\Omega/\partial i)<0$

b) *if* $\sigma_y^2=0 \Rightarrow (\partial\Omega/\partial i)>0$ □

Proposition 3-5. *Under flexible exchange rate regimes, the appointment of a ultra-conservative central banker is not growth maximizing as long as there is no McKinnon-Shaw effect and the expected money supply growth is greater than zero.*

Proof. Recalling proposition (3-2) and taking derivatives from (3-23'-2) and (3-25'-2) with respect to Λ, then substituting the result of the latter into the former we end up with:

$$\frac{\partial\psi}{\partial\Lambda}=H(1+\rho)[i-(1+\Pi)\zeta(f)\mu]^2\{\frac{\partial\Omega}{\partial\Lambda}[(1-g)(\alpha(f)-\Gamma\sigma_p^2)-(i^*-q+\sigma_q^2)]$$
$$-2\Omega(1-g)\Gamma\{\frac{\Lambda\sigma_m^2}{(1+\rho)^4}+\frac{\partial\Omega}{\partial\Lambda}[\frac{\Omega\alpha(f)^2(\sigma_y^2+\sigma_g^2)-(1-\Omega+\rho)\sigma_q^2}{(1+\rho)^2}]\}\}$$
$$+\{\frac{\delta}{(1+\rho)}+\frac{\frac{\partial\Omega}{\partial\Lambda}\{2\alpha(f)^2(1+\rho)\Omega(\sigma_y^2+\sigma_g^2)+(1+\rho)(2\Omega-1)\sigma_q^2\}}{(1+\rho)} \qquad (3\text{-}34)$$
$$-\frac{2\Lambda\sigma_m^2}{(1+\rho)^3}\}(1+\Pi)\theta\mu^2\zeta(f)\}$$

where:
$$H=\frac{1}{(1+\rho)[i-(1+\Pi)\zeta(f)\mu]^2+(1+\Pi)\zeta(f)\mu^2\theta}\succ 0$$

Considering (3-32-1) we see the (3-34) is always greater than zero if Λ=0 and δ≻0. □

Corollary 3-5-1. *Under flexible exchange rate regimes, in the absence of monetary shocks one cannot make any growth case for appointing an ultra-conservative or a conservative central banker as long as there is no McKinnon-Shaw effect and the expected rate of money growth is greater than zero.*

Proof. If the conditions of the corollary are in place, from (3-34) we have:

$$\frac{\partial\psi}{\partial\Lambda}=\frac{H\delta(1+\Pi)\theta\mu^2\zeta(f)}{(1+\rho)}\succ 0$$

where use has been made of (3-32-1). □

Equation (3-34) reveals the pros and cons of appointing a conservative central banker. It shows that the central banker stance, taking other policy variables as given, will affect the expected growth of the economy directly through a change in the share of domestic capital in the traded assets due to the cost of inflation variance and indirectly through a change in the nominal interest rate as a result of changes in the expected exchange rate and the associated risk premium which the latter is affected by the cost of inflation as well (refer to (3-25'-2)). The terms in the first curly brackets in (3-34) denote the direct channel and the ones in the second curly brackets display the indirect channel. As we see when the economy is not subject to foreign inflation shocks, through the direct channel the appointment of a less conservative central banker is growth deteriorating so long as the expected real return on domestic capital net of the government output share is greater than or equal to that on the foreign assets holdings. In this case, the higher is the cost of inflation the higher will be the negative effect arising from this channel. This is so because considering (3-32-1) in the absence of foreign inflation shocks, we have: $|\frac{\partial \Omega}{\partial \Lambda}[\frac{\Omega \alpha(f)^2(\sigma_{\iota}^2+\sigma_{\varsigma}^2)}{(1+\rho)^2}] < \frac{\Lambda \sigma_m^2}{(1+\rho)^4}$ (recall corollary (3-3-1) as well). However, when the expected real return on foreign assets is higher than that on domestic capital net of the government output share[21], since the reduction of less productive assets in the equilibrium portfolio of the agent will be growth improving, the net effect of the direct channel is generally ambiguous. Likewise, the same ambiguity appears with regard to the interest rate channel. This is so because appointing a less conservative central banker, ceteris paribus, may lead to an exchange rate depreciation or appreciation depending on the relative size of the expected rate of money growth and the second moment of the monetary shocks impinging on the economy as well as its net effect on the equilibrium expected growth rate of the economy (refer to (3-19')). Note this ambiguity exists even though, on this occasion, there is an unambiguous reduction in the risk premium. The ambiguity will disappear only if the expected growth rate of money supply is equal to zero implying a negative effect through the indirect channel too. Nonetheless, this clear cut case will disappear once the economy is subject to foreign inflation shocks.

Proposition (3-5) is an interesting proposition in the context of the political economy of monetary policy. It lays stress on the important role of flexibility of the monetary authorities in conducting monetary policies even when there is a real cost for inflation variance. Van der Ploeg (1995) in a different framework and by using a deterministic structure has shown that there is no welfare case for appointing an independent (ultra-conservative) central banker. Here in a stochastic general equilibrium structure we have shown that there is no growth case for appointing such a very strict central banker. Yet, recalling the welfare function (3-30) containing the share of real money balances and the initial value of wealth, there might be a welfare case for an ultra-conservative central banker. This is so, because there is a trade off between growth improving and rise in real money balances and the initial value of wealth aspects of optimal delegation of monetary policy to the central bank. As we have discussed earlier, in the absence of the McKinnon-Shaw effect, the increase in the nominal interest rate is always growth improving. According to our explanations above, this is, in fact, the main channel whereby appointing a less conservative central banker has a positive effect on growth. In other words, the appointment of an opportunistic or less conservative central banker should raise the equilibrium nominal interest rate if it is supposed to promote growth. But from (3-9'-2), a rise in the nominal interest rate entails a reduction in the share of real balances which is welfare deteriorating[22]. Also, from (3-25'-1) the appointment of a less conservative central banker involves an increase in expected and unexpected equilibrium inflation causing a reduction in initial value of (real) wealth which is welfare deteriorating as well. Hence, one should not ignore the possibility of making a welfare case for appointing an ultra-conservative central banker which might be in contrast with proposition (3-5). In addition, this proposition does not necessarily mean one can not make any growth case for a conservative central banker. In order to show this possibility, it is necessary to solve (3-34) for Λ and see that the growth maximising level is not necessarily greater than or equal to one (i.e. opportunistic central banker). However, since (3-34) is a complicated nonlinear (of order higher than two) equation in Λ, this avenue is not followed here. Instead, we raise the following case:

Conjecture 3-1. *Under flexible regimes, when the inflation variance is costly and the real return on domestic capital net of the government output share is greater than that on the foreign assets, given corollary (3-3-2) the sufficient conditions for making a (expected) growth case for a conservative central banker are:*

$$\Omega \geq 1/2 \quad , \quad \frac{\delta}{2} < \frac{\Lambda\sigma_m^2}{(1+\rho)^2} \tag{3-35}$$

Proof. From (3-34), the above conditions imply ($\partial\psi/\partial\Lambda$)<0. □

Rogoff (1985), on the basis of a credibility consideration, suggests that the optimal central banker is a conservative one but not " too " conservative. Here, in a different framework, we have reached the same conclusion from an expected growth stand point. According to this conjecture one may conceive a growth improving role for appointing a conservative central banker under floating rates when the targeted (mean) growth rate of money supply is very low and the monetary authorities in the economy are highly apt to introduce sever monetary shocks. However, it is observed from (3-35) that under less flexible exchange rate regimes this condition is so restrictive that one can hardly make a growth case for a conservative central banker. Note that conjecture (3-1) raises just a sufficient condition, that is, there might be other circumstances in which one may make a growth case for a conservative central banker. In general, one may expect the higher cost of inflation variance provides relatively more incentive to appoint a more conservative central banker in the context of a growth stimulating objective. But as we discussed above, in this case, the above conjecture for making a growth improvement by appointing a conservative central banker can be less restrictive only under special circumstances. For instance, in equation (3-34) a clear case can be made by considering the situation where the direct channel is negative and there is no foreign inflation shock in the economy which guarantees the negative effect on risk premium. In this circumstance, the above condition is certainly less restrictive in the sense that for the same size of variance of monetary shocks the growth cost of appointing an opportunistic central banker is higher and therefore, one is more likely to make a growth case by appointing a conservative central banker. However, this would not necessarily be the case when the economy is buffeted by foreign price shocks and the real return on foreign assets is higher than that on domestic capital net of the government output share. This ambiguity is somehow the result of the stochastic general equilibrium approach taken here. It reflects the role of some structural characteristics of the economy in this context which has been somewhat ignored in the related literature. Among those, one can refer to the relative size of the government in the whole economy, here denoted by g, the magnitude of inflation variance cost, the productivity of domestic capital relative to that of foreign, the share of domestic capital in traded assets and above all the size and type of the shocks hitting the economy.

Earlier we argued for a net debtor economy when corollaries (3-3-2) and (3-3-1) hold the appointment of a less conservative central banker is more growth stabilizing but costly in terms of destabilizing domestic inflation. Therefore, having considered the above conjecture, we see a trade off between the role of central banker in stimulating the (mean) of growth and stabilizing it. One may imagine that for an economy the inflation costs (expected growth) consideration in appointing a conservative central banker to be first-order while its stabilization costs to be second-order. The reverse may hold true too. Lohmann(1992), in a different context, has suggested that at some large fixed costs, society would be better off to fire the conservative central banker when the economy is buffeted by very large supply shocks.

Proposition 3-6. *Under flexible exchange rate regimes, the presence of the McKinnon-Shaw effect is necessary in order to make a growth case for appointing an ultra-conservative central banker.*

Proof. In proposition (3-5), we have proved in the absence of the McKinnon-Shaw effect one can not make any growth case for an ultra-conservative central banker. Therefore, here we should prove that there are situations in which the appointment of an ultra-conservative central banker might be growth improving. In order to make the proof more tractable, here the cost of inflation variance and the possibility of foreign inflation (price) shocks are ignored. Hence, from (3-23'-2) we have:

$$\frac{\partial\psi}{\partial\Lambda}=\Delta[\delta-\frac{2\Lambda\sigma_m^2}{(1+\rho)}]$$

where:

$$\Delta=\frac{\Delta_1}{(1+\rho)[(1+\rho)\Delta_2+\Delta_1]}$$

$$\Delta_1=\varphi(f)\{\frac{\partial\Omega}{\partial i}[(1-g)\alpha(f)-(i^*-q)]+\frac{\mu^2\zeta(f)(1+\Pi)}{[\varphi i-(1+\Pi)\zeta(f)\mu]^2}\} \tag{3-36}$$

$$\Delta_2=1-\{\frac{2\Omega\frac{\partial\Omega}{\partial i}\varphi(f)^2\alpha(f)^2[1-(1-\varphi(f))n_M]}{(1+\rho)}+\frac{\varphi(f)^2\alpha(f)^2\Omega^2(1-\varphi(f))\zeta(f)\mu}{\varphi(f)i^2(1+\rho)}\}(\sigma_y^2+\sigma_g^2)>0$$

$$\frac{\partial\Omega}{\partial i}=-\frac{(1-\varphi(f))\zeta(f)\mu\Omega}{i[\varphi(f)i-(1-\varphi(f))\zeta(f)\mu]}<0$$

Substituting for $(\partial\Omega/\partial i)$ and n_M into Δ_2, we see that Δ_2 is always greater than zero because the absolute value of the first term in the bracket, whose real value is negative, is twice as great as the second term which is always positive. Also, Δ_1 is less than zero if the following holds:

$$[(1-g)\alpha(f)-(i^*-q)]>\frac{[1-(1-\varphi(f))n_M]\zeta(f)\mu^2(1+\Pi)\Omega}{n_k^2\varphi(f)(1-\varphi(f))n_M}$$

Since the right hand side of the above inequality is always positive, it can hold if and only if the real return on domestic capital net of the output share of government expenditure is higher than that on foreign assets (recall corollary (3-4-1-a)). Note that the denominator of Δ in (3-36) can be greater than zero even when $\Delta_1 \prec 0$. Therefore, one may conceive a case where Δ is negative which implies a negative relationship between growth and the dependency of the central banker even when Λ is equal to zero. □

In equation (3-36), the Δ_1 expression displays the changes in growth due to changes in the equilibrium nominal interest rate. It consists of two main components. The first component (term) denotes the change in growth through the change in the share of domestic capital in traded assets and the second one shows the change in growth due to a reduction in total consumption as a result of a change in the interest rate. The economic intuition of the above mentioned condition can be best understood by noticing that in this situation the nominal interest rate is a positive function of the central bank dependency. In the presence of the McKinnon-Shaw effect when there are no foreign inflation shocks and the cost of inflation variance, the share of domestic capital in traded assets is a negative function of the interest rate (recall (3-31)). When Δ_1 is less than zero it means the contribution of an increase in the nominal interest rate, through the appointment of a less conservative central banker, to growth (due to a reduction in the amount used for private and public consumption) is less than the depression in growth as a result of a reduction in the share of domestic capital, whose expected real return is relatively high, in the traded assets. Here, this reduction in the share of domestic capital is brought about through an increase in the risk associated with the domestic capital. Therefore, appointing an ultra conservative central banker in equilibrium would reduce the nominal interest rate which would deliver a higher growth rate in this occasion.

Comparing proposition (3-5) with (3-6), one may like to conclude that though the inflation variance cost (product market imperfection) may not provide sufficient incentive in order to appoint an ultra conservative central banker, the financial repression (financial market imperfection) might justify the delegation of monetary policy to an ultra conservative central banker for the purpose of an improvement in (expected) growth.

Proposition 3-7. *As long as there is no McKinnon-Shaw effect, the optimal (welfare maximising) level of government debt is zero.*

Proof. Recalling the proposition (3-2) and taking derivative of (3-23'-2) and (3-25-2) with respect to Π, we obtain:

$$\frac{\partial\psi}{\partial\Pi}=-\frac{\theta\zeta(f)\mu^2 i}{[i-(1+\Pi)\zeta(f)\mu]^2+\theta\zeta(f)\mu^2(1+\Pi)}\prec 0$$

where use has been made of $(\partial i/\partial\Pi)=-(\partial\psi/\partial\Pi)$. Hence, the level of government debt maximising growth is zero as long as we are concerned about $\Pi\succ 0$. At this level of debt, the nominal interest rate, which is a positive function of Π, takes its minimum value in comparison with any other value of Π when $\Pi\succ 0$. Therefore, from (3-9'-2) the share of real money balances is maximised and from (3-25'-1) the expected inflation rate is at its minimum implying the initial value of (real) wealth is at its maximum. Also, from (3-21-1) the variance of growth is independent of Π. □

In the presence of the McKinnon-Shaw effect, one can show that the above proposition under fixed rates still holds. This so because we have:

$$\left(\frac{\partial\sigma_z^2}{\partial\Pi}\right)_{\rho\to\infty}=0\ ,\ \left(\frac{\partial\psi}{\partial\Pi}\right)_{\rho\to\infty}\prec 0\ ,\ \left(\frac{\partial Nm}{\partial\Pi}\right)_{\rho\to\infty}=0\ \Rightarrow\ \left(\frac{\partial v(x)}{\partial\Pi}\right)_{\rho\to\infty}\prec 0$$

Since the above proposition holds when there are inflation variance and financial repression (Goldsmith and McKinnon-Shaw under fixed rates) effects, it can be viewed as a more generalized version of Turnovsky (1994 & 1995). In words, when there is no McKinnon-Shaw effect, the mechanism through which the changes in Π affects growth is as follows. When Π increases, on the one hand, under flexible rates the nominal interest rate will increase which is growth improving through an increase in the share of traded assets as a result of a reduction in the share of real money balances. On the other hand, it reduces the share of traded assets, due to a rise in the share of government's debt in the agent's portfolio, which is growth deteriorating. In equilibrium, the second effect outweighs the first one and therefore an increase in Π is not growth improving. However, in the presence of the McKinnon-Shaw effect under the flexible rates due to the violation of proposition (3-2), one can perceive that proposition (3-7) does not necessarily hold. That is, there might be cases in which the optimal level of government debt would be greater than zero. It depends on the size and type of the shocks, the relative (expected) real returns on domestic capital and foreign assets and the output share of government expenditure and the degrees of exchange rate flexibility and financial repression (imperfection) in the economy[23]. Note that in this case, the variance of growth is affected by the government debt policy which opens a new channel through which the Π might have (different) welfare implications.

3.5 Conclusion

In this chapter, we have built up a stochastic general equilibrium model for a semi-small open economy incorporating exchange rate arrangements, financial repression, government debt and foreign capital control policies and the type of monetary authorities governing the central bank so that it enables us to examine the implications of these policies for the welfare of the representative agent including the mean and variance of growth. We saw how in the presence of inflation variance cost and financial repression (product and financial markets imperfections), Turnovsky's (1994) proposition with regard to the possibility of having infinite options in reaching the same target does not necessarily hold. That is, the multiplicity might be the result of overlooking imperfections in the product and financial markets which are commonly observed in the real world. More precisely, we demonstrated the welfare consequences of changes in the exchange rate, financial repression, seigniorage and foreign assets taxation policies, all operate either directly or indirectly (through affecting the equilibrium nominal interest rate). Hence, in analysing the welfare effects of exchange rate and financial repression policies we should take into account these two channels at the same time.

We also showed how under flexible exchange rate arrangements one may be able to make a growth case for appointing a ultra-conservative central banker in the presence of the McKinnon-Shaw effect, in other circumstances, though the appointment of an independent central banker might be growth deteriorating, it may be optimal in terms of welfare. Finally, we observed that, irrespective of the cost of inflation variance and the financial repression

-through Goldsmith and/or McKinnon-Shaw channel under a fixed rates arrangement- imperfections, the optimal level of government bond is zero.

Notes

1. Checchi(1996) in a four types agent model has derived the optimal amount of capital control as a Nash perfect equilibrium of a non-cooperative game with imperfect information. He has taken a political economy approach in which capital controls are a reflection of the government's power in order to redistribute welfare among the agents. Rasmussen (1997) in a two-country setting has emphasized the role of restrictions on international capital flows as a remedy for undesirable features of tax competition and, hence, a potential alternative for tax cooperation under some circumstances.

2. Moreover, as we mentioned above, the t^* can basically be viewed as the degree of financial integration of the small open economy with the rest of the world. More specifically, the real world experience indicates that the transaction costs in foreign financial markets is, generally, different from that in domestic financial markets. This is true even for some OECD countries. In the context of developing countries' economy, there is strong evidence suggesting that the degree of disintegration between domestic and foreign financial markets are, to some extent, due to the lack of necessary institutional factors and the presence of structural obstacles in perfectly functioning foreign financial markets. These institutional and structural factors which are responsible for the present imperfections in foreign financial markets, though they may be affected by government interventions, are sometimes out of the governmental control at least in short and medium runs. Therefore, the separation between the t^* and financial repression policies may enable us to capture the implications of the structural and institutional factors for domestic financial repression (liberalization) policies too. Evidently, albeit the structural and institutional imperfections may not be government induced, they have their own implications for public finance. More strictly, these factors may help the government in financing its budgetary requirements less costly (through domestic and foreign interest rates differential). However, this needs a modification in the government budget constraint. That is, though the imperfections bring about an implicit tax revenue for the government, we should exclude the direct tax revenue through the foreign assets holdings from the government budget constraint. This modification is not very important for our results regarding the financial repression policies.

3. We may perceive more clearly the real cost of the variance of inflation in this set up by considering an economy where there are two types of producers one who is less efficient and the other who is more efficient and can produce with less cost and, therefore, can afford producing with lower prices. When the variance of inflation is high, it is possible that the less productive producer, due to forecasting error, enters into the market while in the absence of that forecasting error it would not. This would lead to less productivity for the economy as a whole. More formally, supposing $\alpha(f)^*$ is the marginal productivity of the less efficient producer and $\alpha(f)$ is the marginal productivity of the more efficient one so that we have: $\alpha(f)^{*}\ (1\ \Gamma)\alpha(f)$, where Γ is the marginal difference in efficiency between two producers. Therefore, the deterministic flow of the economy's output is characterized as follows:

$dY = [\alpha(f)^{*}\hat{\omega} + \alpha(f)(1-\hat{\omega})]kdt = [\alpha(f)(1-\Gamma)\hat{\omega} + \alpha(f)(1-\hat{\omega})]kdt$

In the above equation, $\hat{\omega}$ is the fraction of the economy's capital (resources) which is employed by the less productive producer. It is assumed to be an increasing function in forecast errors of domestic prices, here, and can be estimated by the domestic inflation variance. More precisely and for the sake of simplicity without losing generality, we have assumed that: $\alpha(f)\omega dt \; E\left(\frac{dp}{p}\right)^2 \rightarrow \hat{\omega} \; \frac{\sigma_p^2}{\alpha(f)}$. There are two considerations which made us to take the above specification. First, and the most important one, this specification allows us to avoid confounding the output effects of the financial repression (Goldsmith channel) and the inflation variance. Otherwise, our results would be more biased towards the financial repression. Second, it is plausible to assume the less an economy is financially developed the less efficient would be the informational system and, hence, the higher would be the forecast errors leading to higher $\hat{\omega}$.

4. For instance, one may like to imagine a society of heterogenous agents who can be aggregated through the assumption of linear preferences. In this society some agents may dislike more inflation, say, due to more vulnerability to inflation, than the other sources of taxation.

5. Since the model is of the endogenous growth sort, there is no transitional dynamics and consequently the problem of time inconsistency does not arise in this structure. In other words, if the chosen policy is optimal at this time it would be optimal at any other time in the time profile of the model. Hence the reaction function is credible. This is true with regard to not only the exchange rate (monetary) policy but also any other optimal policy decision making, such as foreign bond holding taxation or financial repression policy, in this model. This is in fact the most important advantage which this structure conveys to its users in the context of optimal policy decision making in an economy with forward looking agents. Furthermore, we could easily introduce a costly intervention version into the model. One suggestion is to implement it in the economy output flow equation as follow:

$$dY = [\alpha(f) - \Gamma\sigma_p^2][1-(\epsilon\rho/(1+\rho))]Kdt + \alpha(f)K[1-(\epsilon\rho/(1+\rho))]dy \qquad , \qquad 0 \leq \epsilon \leq 1$$

where ϵ captures the fixed marginal cost of intervention and the specification postulates a proportional intervention cost.

In order to make government more reluctant to intervene, we could introduce it in the government expenditure equation so as to increase the government expenditure which will ultimately raise its future commitment. Therefore, the text specification involves zero value for ϵ.

6. The latter statement can be justified by considering this practical fact that the exchange rate bands are usually defended by intra marginal -leaning against the wind- interventions rather than interventions only at the edges (marginal interventions). Also, taking into account that monetary authorities try to keep the exchange rate far from the edges, therefore, the probability of marginal interventions would be low and as a result of that the nonlinearity stemming from expectations of marginal interventions would not

be so significant anymore.

7. We have mentioned likely because, as we will see below, the equilibrium nominal interest rate is a negative function of the variance of money supply shocks.

8. One of the reasons which we have followed this way is because we did not want to ignore the implications of monetary shocks, which has been one of the main concerns in the related literature, for the exchange rate arrangements when the leaning with the wind policy is an option available to the policy makers.

9. Note that this does not eliminate the other possible rational expectations equilibria in which this property does not exist.

10. Here, it has been assumed that government expenditure is a pure drain of resources. However, changing this attitude towards the government expenditure and considering it as a welfare improving factor can be an interesting extension of the present model especially in the context of DCs.

11. It is likely, because the financial repression policy in the meantime will affect the real risk premium on the foreign assets and (domestic) capital. This channel may counteract the (expected) real return on real money balances effect. In addition, the indirect (expected) real return on real money balances effect must be so strong that it can dominate the direct effects of increasing the financial repression.

12. It is important to note that there would not be any inconsistency if our model had explicitly taken into account the possibility of holding safety assets such as gold and other sort of unproductive (unfinancial) savings. Gail E. Makinen and G. Thomas Woodward (1990) have documented this phenomena.

13. Merton (1969) has shown this equivalence. It is easy to realize it, as from (3-24) we have:

$$dW = \psi W dt + W dz$$

Following Arnold (1974), the solution of the above stochastic differential equation is as follows:

$$W(t) = W(0) e^{(\psi \; \frac{1}{2}\sigma_z^2)t} + z(t) - z(0)$$

Hence, the transversality condition holds *iff:* $[\gamma(\psi - \frac{1}{2}\sigma_z^2) - \mu] < 0$
Substituting (3-23-4) in (3-9-1), it is obvious as long as c/W is greater than zero, the above condition holds.

14. Needless to say, since we are dealing with a decentralized economy, the optimality issues should be considered as the second best optima as opposed to the first best one related to a central planner economy.

15. More precisely, we will end up with a logarithmic utility function when we subtract one from the numerator of the utility function (3-6-1). However, this does not change the welfare implications resulting from the two utility functions. This simplifying assumption about the functional form of utility function is of no very substantial importance for our qualitative results. Because the role of different values of γ on savings and investment and thereby economic growth is an established issue in the standard literature (e.g. Blanchard & Fischer (1989)). Also, the value function (3-30) can be obtained by following the same procedure as explained in the appendices (3-A) and (3-C). The only major difference is the solution form which must be postulated in order to solve the differential equation for x(w). That is, given the logarithmic utility function, the postulated solution form should be as follows:

$$X(w)=c_0+c_1 lnW$$

Here, we need to determine c_0 and c_1 parameters which can easily be obtained by applying the same procedure in appendix (3-A).

16. The economic intuition of this expression is best understood by noticing that in the presence of productivity shocks, the expected real return on domestic capital should be greater than that of foreign assets if risk averse agents are supposed to hold domestic capital in their equilibrium portfolio.

17. This is true irrespective of the presence or absence of the McKinnon-Shaw effect.

18. We are excluding the unstable, imaginary and negative roots which are not acceptable.

19. If we suppose intervention involves a real cost, one can conceive a trade off between central bank independence and choosing higher value of ρ. In the context of policy optimization, this might make a growth case for appointing a more conservative central banker instead of following a fixed exchange rate regime.

20. The $\left(\frac{\partial \sigma_\rho^2}{\partial \Lambda}\right)^{\sigma_\varepsilon^2=\sigma_z^2=0}_{\rho|\Omega-1}$ is greater than zero because one can easily show that given the condition in corollary (3-3-2), we always have:

$$\frac{\Gamma(1-\Omega+\rho)}{(1+\rho)^2-2\Gamma(1-\Omega+\rho)} < 1$$

21. Notice that in the absence of the McKinnon-Shaw effect, the agent does not take into account the government output share in her/his traded assets portfolio decision neither directly nor indirectly through the (equilibrium) nominal interest rate.

22. This, of course, will affect the variance of growth involving a change in welfare (ref. (3-32-2)). However, since the direction of effect is ambiguous, one can not give definite comment on this channel.

23. In order not to digress from the main issue, I have not discussed this case in any more detail here.

Chapter 4

Exchange Rate Regimes, Financial Repression, Real Business Cycles

4.1 Introduction

One of our findings in the previous chapter indicates that in the analysis of the welfare implications of exchange rate arrangements and financial repression one should take into account the direct and indirect (that is, via equilibrium nominal interest rate) channels through which these two policy measures affect the representative agent's welfare. As we saw, this is the result of taking a further step towards building up a framework closer, in nature, to the economic (structural and institutional) realities in DCs. This, of course, has its own cost. That is, it puts some restrictions on reaching more tractable analytical results. Hence, in this chapter, to analyse the welfare effects of exchange rate and financial repression policies we mainly focus on the cases where there is no McKinnon-Shaw effect (i.e. when $\varphi(f)=1$). The implications of the McKinnon-Shaw channel will be discussed separately in chapter five. Also, for the sake of tractability, we analyse the welfare consequences of exchange rate arrangements and financial repression policies when the economy is subject to only one type of shock.

In this chapter we argue that, in a second best environment involving risk, the removal of all forms of government intervention in financial markets is not always the best policy. In other words, the financial liberalization (policy) is not necessarily "*the only game in town*" [McKinnon (1989)]. In this relation we will show how any type of exchange rate arrangement which is in operation may have different implications for the welfare (growth) implications of different degrees of financial repression and vice versa. One of the implications of the mean-variance general equilibrium approach adopted in this study is its potentiality for overturning the conventional perceptions and theoretical predictions stemming from the standard framework. This is due to the endogenous determination of risk and the endogeinity of the structural change as a result of (policy) changes in this framework which have been overlooked in most related standard literature.

In addition, the new strand of macroeconomics literature, so called real business cycles (RBC), is concerned about the analysis of the co-movements between growth and other key macroeconomic variables when the economy is exposed to (stochastic) shocks. Al though for developed economies, there exists relatively rich and growing literature on this issue, to our knowledge, it has not received proper attention from development economists. The stochastic general equilibrium framework provides us with the opportunity to investigate, the implications of financial repression, exchange rate and foreign assets taxation policies for the real business cycles in DCs. This is considered in this chapter.

Before going through a formal presentation of our arguments, there are two points which should be explained at the outset. First, one of the features of the policy (structural) changes analysis in our study is the lack of the possibility of hedging against the probable policy (structural) changes for the agent in deriving her/his portfolio decisions. More precisely, from the agent's point of view, any policy change is considered as a completely unanticipated (zero probability) event. Second, since in this chapter we are dealing with the exchange rate arrangements involving leaning with and against the wind , to avoid any confusion, we must make it clear what we mean by the phrase "less/more flexible exchange rates". Throughout this chapter when ρ takes values higher than minus infinity towards plus infinity, the exchange rate arrangement is characterized as "less flexible arrangement". By contrast, when ρ takes values less than plus infinity towards minus infinity the exchange rate arrangement is characterized as " more flexible arrangement". Equivalently, one may interpret any movement from left (right) towards right (left) on the horizontal axis indicating ρ in the real space as a movement towards a less (more) flexible exchange rate arrangement.

The chapter proceeds as follows. Section one addresses the welfare implications of different exchange rate arrangements and financial repression when the economy is exposed to only domestic real (productivity, government expenditure (demand side) shocks. Section two studies the same issue when the economy is buffeted by only foreign inflation shocks. Section three has been devoted to investigating the consequences of the monetary shocks when it is accompanied by either domestic real shocks or foreign inflation shocks for the stabilization of growth and its expected value. Section four analyses the implications of financial repression and exchange rate arrangements for real business cycles. Section five concludes and summarizes our main findings in this chapter.

4.2 Real (Domestic) Shocks

4.2.1 Productivity Shocks

4.2.1.1 Exchange Rate Arrangement

The welfare implications of the exchange rate arrangements, when there exist only productivity shocks, can be detected by differentiating the value function (3-30) with respect to ρ. This leads to the following expression:

$$\left(\frac{dV}{d\rho}\right)_{\sigma_y^2\neq 0}=\frac{\zeta(f)}{\mu}\left(\frac{dln\ n_M}{d\rho}\right)_{\sigma_y^2\neq 0}+\frac{1}{\mu^2}\left(\frac{d\psi}{d\rho}\right)_{\sigma_y^2\neq 0}-\frac{1}{2\mu^2}\left(\frac{d\sigma_z^2}{d\rho}\right)_{\sigma_y^2\neq 0}$$
$$+\frac{[\theta+\zeta(f)]}{\mu}\left(\frac{dln\ W_0}{d\rho}\right)_{\sigma_y^2\neq 0} \quad (4\text{-}1)$$

As we see there are four main channels whereby the exchange rate arrangement will influence the welfare function.

The first channel is through the real money balances for which we have:

$$\left(\frac{dln\ n_M}{d\rho}\right)_{\sigma_y^2\neq 0}=\left(-i/\frac{\partial i}{\partial\rho}\right)_{\sigma_y^2\neq 0} \quad (4\text{-}2)$$

This means that the different degrees of flexibility of exchange rates impact on real money balances through the effect on equilibrium nominal interest rate. In general, the effect of exchange rate arrangement on the equilibrium interest rate is ambiguous. This ambiguity stems from the fact that the equilibrium expected rates of exchange depreciation can be positive or negative (recall equation (3-19')). However, when there is no cost of inflation variance, the following refers to circumstances under which clarifies the direction of such an effect can be determined.

Remark 4-1: *a) As long as the equilibrium expected rate of exchange depreciation is positive and $\rho \succ -1$, when the cost of inflation variance is zero, the equilibrium nominal interest rate is a (monotonic) decreasing function of ρ.*

b) As long as the equilibrium expected rate of exchange depreciation is negative and $\rho \succ -1$, when the cost of inflation variance is zero, the equilibrium nominal interest rate is an *(monotonic) increasing function of* ρ*, if:*

$$\psi + q \succ \frac{2\Lambda\delta}{(1+\rho)} + \Omega^2\alpha(f)^2\sigma_y^2 \qquad \forall\rho \succ -1$$

Proof: Differentiating from (3-25'-2) with respect to ρ given zero cost of inflation, we obtain:

$$\left(\frac{\partial i}{\partial\rho}\right)_{\sigma_y^2\neq 0} = \left[\frac{(1+\rho)[i-(1+\Pi)\zeta(f)\mu]^2}{(1+\rho)[i-(1+\Pi)\zeta(f)\mu]^2+(1+\Pi)\zeta(f)\theta\mu^2}\right]\left[\frac{\psi+q-\Omega^2\alpha(f)^2\sigma_y^2}{(1+\rho)^2}-\frac{2\Lambda\delta}{(1+\rho)^3}\right] \quad (4\text{-}3)$$

Now, recall the equation (3-19'). □

Needless to say, the above remark is not conclusive and should be considered as a sufficient condition. That is, one can imagine other situations in which the relationship between ρ and i are the same as above or not necessarily monotonic. For the exchange rate arrangements involving $\rho \prec -1$, we know $(\partial e/\partial\rho) \prec 0$ (note that ρ has a negative value in this case). Namely, a lower value of ρ (i.e. $\rho \to -\infty$) implies a higher depreciation in the expected exchange rate. Remembering (3-25'-2), this means a lower value of ρ entails a higher equilibrium nominal interest rate through its associated depreciation in expected the exchange rate. Since the risk premium in (3-25'-2) is always a negative function of ρ, a lower ρ implies a higher risk premium too. Hence, overall, we expect the equilibrium nominal interest rate to be a decreasing function of ρ. In other words, for $\rho \prec -1$ we have: $(\partial i/\partial|\rho|) \succ 0$. When the cost of inflation variance is not zero, the implications of different exchange rate arrangement for the share of domestic capital in traded assets must be taken into consideration in evaluating the above relationship. This will be discussed in more detail below.

Thus, in general, the less flexible are exchange rates, the more would be the share of real money balances if the equilibrium nominal interest rate is a decreasing function of ρ. In this case, the higher ρ entails a reduction in expected inflation and thereby an increase in the share of real money balances (nontraded assets). The reverse is true if the equilibrium nominal interest rate is an increasing function of ρ.

The second channel is through changes in expected growth whose value is as follows:

$$\left(\frac{d\psi}{d\rho}\right)_{\sigma_y^2\neq 0}=\left\{\frac{\partial\Omega}{\partial\rho}[(1-g)\{\alpha(f)-\frac{\Omega^2\alpha(f)^2\sigma_y^2\Gamma}{(1+\rho)^2}\}-(i^*-q)]\right.$$
$$\left.-\frac{2(1-g)\Omega^2\alpha(f)^2\sigma_y^2\Gamma\frac{\partial\Omega}{\partial\rho}}{(1+\rho)^2}+\frac{2(1-g)\Omega^3\alpha(f)^2\sigma_y^2\Gamma}{(1+\rho)^3}\right\}+\left\{\frac{\frac{\partial i}{\partial\rho}(1+\Pi)\theta\mu^2\zeta(f)}{[i-(1+\Pi)\zeta(f)\mu]^2}\right\} \tag{4-4}$$

This shows that any change in the exchange rate flexibility involves a substitution between domestic capital and foreign assets due to a change in the cost of inflation variance and an interchange between the share of real money balances and traded assets as a result of a change in the equilibrium nominal interest rate. Considering the following corollary for $\rho\succ-1$ $(\rho\prec-1)$, less (more) flexible exchange rates entail a more positive (a less negative) effect on growth through the first term in the first curly brackets as long as the real return on foreign assets is less than that on the domestic capital net of the government output. The reverse holds true if the real return on foreign assets is greater than that on the domestic capital net of the government output share.

Corollary 3-1-2: *As long as $\rho\succ-1$ $(\rho\prec-1)$, the less (more) flexible are exchange rates the more would be the share of domestic capital in the traded assets when the economy is exposed to productivity shocks.*

Proof: Solving the equation (3-23'-1) for Ω and taking derivative from it with respect to ρ, and after some manipulation we end up with:

$$\left(\frac{\partial\Omega}{\partial\rho}\right)_{\sigma_y^2\neq 0}=\frac{\Omega}{(1+\rho)}\left[1-\frac{1}{1+\frac{2\Gamma\Omega}{(1+\rho)^2}}\right]\begin{matrix}\succ 0 & if:\ \rho\succ-1\\ \prec 0 & if:\ \rho\prec-1\end{matrix}\Rightarrow\left(\frac{\partial\Omega}{\partial|\rho|}\right)_{\sigma_y^2\neq 0}\succ 0 \tag{4-5}$$ □

The above corollary follows, in fact, proposition (3-1). According to (4-5), it is clear that Ω takes its maximum value when $/\rho/\to\infty$. This is so because Ω is a concave function of $/\rho/$. The economic intuition behind this corollary is simple. For $\rho\succ-1$ $(\rho\prec-1)$, the less (more) flexible are exchange rates the less would be the cost of inflation variance. Hence, other things equal, the share of domestic capital is highest under either of the two extreme values of ρ and lowest when it is in neighbourhood of (-1). That is why, for $\rho \succ -1$ the first term involves a growth-enhancing effect when the net real return on domestic capital is higher than that on foreign assets. Also, the increase (decrease) in the share of domestic capital in traded assets for $\rho \succ -1$ ($\rho \prec -1$) leads to a rise (reduction) in the burden cost of inflation variance involving a negative (positive) effect on the growth (the second term of the first curly brackets in equation (4-4) refers to this effect). However, since the less flexible rates reduce (increase) the cost of inflation variance (the third term in the first curly brackets), less flexible rates will improve (deteriorate) growth through this avenue. From equation (4-5), it is clear that for $\rho \succ -1$ ($\rho \prec -1$) the net effect of a change in inflation cost on growth is always positive (negative) (i.e. the sum of the second and third terms). This channel reveals the welfare consequences of the variance of inflation constituting one of the main concerns in the context of optimal exchange rate arrangements. The overall value of the first curly brackets refers to the net (of the inflation variance cost) gain/loss achieved by substitution within the traded assets due to changing the degree of flexibility of exchange rates and we call it the *intra traded assets* effect. It is worth emphasizing that the intra traded assets effect must be attributed to the consequence of the exchange rate arrangements on the cost of inflation variance because once the inflation variance has no cost, we have $(\partial \Omega / \partial \rho) = 0$ and the first bracket in the equation (4-4) will disappear. Even so, exchange rate arrangements still affect growth through their effect on the equilibrium nominal interest rate, entailing an interchange between real money balances and traded assets in equilibrium. The second curly brackets in equation (4-3) captures this effect. We call this panel of exchange rate arrangements impact as the *inter traded-nontraded assets* effect. Therefore, as long as the marginal utility of money is not equal to zero, the exchange rate regime is not superneutral. This is also true in the case of optimal government debt policy (i.e. Π=0). In general, the magnitude of the inter traded-nontraded assets effect depends on the marginal utility of money, which is a function of the financial repression policy, agents' time preference, government debt policy and the level of the equilibrium nominal interest rate and $(\partial i / \partial \rho)$, while its sign is determined only by the sign of $\partial i / \partial \rho$, which is affected by the intra traded assets effect when the cost of inflation variance is not zero[1]. As mentioned above, in general, there is ambiguity about its sign. However, in the light of remark (4-1), the following remark helps to clarify the situations where there is a possibility of making a clear-cut distinction between different degrees of flexibility of exchange rates and the equilibrium nominal interest rate.

Remark 4-2: *a) As long as the equilibrium expected rates of exchange depreciation and the intra traded assets effect are positive and $\rho \succ -1$, the following condition is sufficient for the equilibrium nominal interest rate to be a (monotonic) decreasing function of ρ:*

$$(\rho^2-1)\geq 2\Gamma\Omega \qquad \forall\rho \succ -1 \qquad (a\text{-}4\text{-}2)$$

b) As long as the equilibrium expected rates of exchange depreciation and the intra traded assets effect are negative and $\rho \succ -1$, the following condition is sufficient in order for equilibrium nominal interest rate to be an (monotonic) increasing function of ρ:

$$(\psi+q) \succ \frac{2\Lambda\delta}{(1+\rho)}+\Omega\,\alpha(f)^2\sigma_y^2[\Omega-2\frac{\partial\Omega}{\partial\rho}(1+\rho)] \qquad \forall\rho\succ-1 \qquad (b\text{-}4\text{-}2)$$

c) As long as $\rho \prec -1$ and intra traded assets are negative, the following conditions are sufficient in order for equilibrium nominal interest rate to be an increasing function of ρ:

$$\psi+q-\frac{2\Lambda\delta}{(1+\rho)}+\frac{2\Omega\frac{\partial\Omega}{\partial\rho}\alpha(f)^2\sigma_y^2}{(1+\rho)} \succ \frac{\Omega^2\alpha(f)^2\sigma_y^2}{(1+\rho)^2} \qquad \forall\rho\prec-1$$
$$(1+\Pi)(1+\rho)\prec-\frac{\theta(1+\Pi)^2 n_M^2}{\zeta(f)[n_k+n_{B^*}]^2} \qquad (\text{c-4-2})$$

Proof. Differentiating from (3-25'-2) with respect to ρ, after some manipulations we obtain:

$$\left(\frac{\partial i}{\partial\rho}\right)_{\sigma_y^2\neq0}=\left(\frac{\partial e}{\partial\rho}\right)_{\sigma_y^2\neq0}+\frac{\alpha(f)^2\sigma_y^2\Omega^2}{(1+\rho)^2}[1-\frac{2\rho(1+\rho)}{(1+\rho)^2+2\Gamma\Omega}] \qquad (4\text{-}6)$$

where:
$$\left(\frac{\partial e}{\partial\rho}\right)_{\sigma_y^2\neq0}=\{\frac{\psi+q}{(1+\rho)^2}\}-\{\frac{2\Lambda\delta-2\alpha(f)^2\sigma_y^2\Omega[\frac{\partial\Omega}{\partial\rho}(1+\rho)-\Omega]}{(1+\rho)^3}\}-\{\frac{\left(\frac{\partial\psi}{\partial\rho}\right)_{\sigma_y^2\neq0}}{(1+\rho)}\}$$

The second term in the above equation is either negative or zero if $(\rho^2-1)\geq 2\Gamma\Omega$. When the equilibrium expected rate of exchange depreciation and the intra traded assets effect are positive, given the condition (*a-4-2*), the first term net of the inter traded-nontraded assets effect is negative (recall (3-19')). The reverse is true when the condition (*b-4-2*) holds.

Given the conditions (*c-4-2*), the right hand side of (4-6) is always positive. The first relationship ensures an increase in the equilibrium (nominal) risk premium net of the inter traded-nontraded assets effect over the (nominal) return on government bond as a result of less flexible exchange rates. The second relation guarantees an increase in the inter traded-nontraded assets multiplier adjusted for the exchange rate flexibility as a result of a less flexible exchange rates. □

Notice that the conditions (*a-4-2*), (*b-4-2*) and (*c-4-2*) are only sufficient conditions and not necessary ones. That is, for instance, one may conceive situations in which intra traded assets effect is negative (positive) and the expected rates of exchange depreciation positive (negative), yet the equilibrium nominal interest rate can be a decreasing (an increasing) function of ρ. Furthermore, the second term in the right hand side of (4-6) indicates the effect of the exchange rate arrangement on the risk associated with the domestic capital impacting on the equilibrium nominal interest rate. It is clear that in the case of floating rates the condition (*a-4-2*) never holds. However, for higher values of ρ (i.e. $\rho \succ 2$), that condition may hold. It means if the equilibrium expected rates of exchange depreciation is positive for high values of ρ we almost always expect the equilibrium nominal interest rate to be a decreasing function of ρ. Also when $\rho \prec -1$, one can see for low values of ρ (i.e. $\rho \to -\infty$), the condition (*c-4-2*) almost always holds. Evidently, under fixed rates, we have: $(\partial i/\partial \rho)=0$ which implies the equilibrium nominal interest rate is equal to the after tax nominal return on the foreign assets.

Therefore, in general, the intra traded assets effect impacts on the expected rate of growth directly and indirectly through the inter traded-nontraded assets effect. Considering these two sets of effects, we can conclude:

Proposition 4-1: *When the economy is susceptible to productivity shocks, the expected growth maximizing exchange rate arrangement depends, in general, upon the relative sizes and signs of the intra traded assets and inter traded-nontraded assets effects which are basically determined by the structural and policy variables given in equation (4-4).*

However, to be more specific, the following circumstances can be easily distinguished.

When there is no inflation variance cost (or it is relatively negligible), only the inter traded-nontraded assets effect will be in place and the sign of $(\partial i/\partial \rho)$, (refer to remark 4-1), will mainly determine which arrangement would yield the highest rate of growth. Hence, as long as we are concerned only about the exchange rate arrangements involving leaning against the wind, applying remark (4-1) (or 4-2), one can say that when the equilibrium nominal interest rate is an increasing function of ρ (i.e. $(\partial i/\partial \rho) \succ 0$), the fixed rate performs best in the context of expected rate of growth. That is, roughly speaking, for economies which experience a high rate of economic growth and have more disciplined monetary authorities (a more conservative central banker and a lower rate of money growth) and are not exposed to severe productivity shocks, we expect the fixed rate contributes more to their expected growth. (Is that why Germany is more keen on European Monetary Union!?). By contrast, when the equilibrium nominal interest rate is a decreasing function of ρ (i.e. $(\partial i/\partial \rho) \prec 0$), the floating rates will perform best from the expected growth point of view. Put differently, for the economies whose monetary authorities are less disciplined (a less conservative central banker and a high rate of money growth are in place) and their rate of growth is not high relative to their rate of money growth and are subject to severe productivity shocks, we expect the more flexible rates will render higher expected growth. (Can this justify the emergence of a new tendency towards more flexible exchange rate arrangements in DCs?) Otherwise, managed rates might be optimal in this respect. That is, if the conditions in remark (4-1) are not in place, though we know that in the context of expected growth, the fixed rates (floating rates) perform better than floating rates (fixed rates) when the equilibrium expected rates of exchange depreciation under the floating rates is negative (positive), we do not know whether it performs the best (in comparison with the managed rates). On the other hand, when the relative importance of money and/or agent's time preference are close to zero and the cost of inflation variance is not negligible, the inter traded-nontraded assets effect will be negligible in comparison to the intra traded assets effect. Accordingly, the fixed rates will perform best if the real return on foreign assets is less than that on the domestic assets net of the government output share. To be more concrete, for economies having a low level of government output share and where the marginal productivity of their domestic capital is high relative to the real return on foreign assets, we expect that the fixed rate entail a higher rate of growth. This is due to the fact that fixed rates cause a switch towards more growth-enhancing assets as a result of reducing the cost of inflation variance. While the floating rates will perform best only when the real return on foreign assets is greater than that of the domestic assets net of the government output share and the effect of substitution towards the domestic capital outweighs the inflation variance cost for all values of ρ. Otherwise, either fixed or managed rates are optimal in this case.

The third channel is through the variance of growth which is always negative as we have:

$$\left(\frac{d\sigma_z^2}{d\rho}\right)_{\sigma_y^2\neq 0} = 2\alpha(f)^2\sigma_y^2\Omega\frac{\partial\Omega}{\partial\rho} \quad \begin{matrix} \succ 0 & if: & \rho \succ -1 \\ \prec 0 & if: & \rho \prec -1 \end{matrix} \tag{4-7}$$

Where the $(\partial\Omega\ \partial\rho)$ has been given in (4-5). This suggests that, as long as we are concerned about the exchange rate arrangements involving leaning against the wind, in the case of productivity shocks floating rates performs best in stabilizing the growth, while, as was mentioned above, the fixed rate performs best in stabilizing (domestic) inflation. This result is independent of the elasticities of consumption and money demand with respect to the interest rate. Hence, despite the standard literature it can be considered as a clear-cut conclusion so long as there is no McKinnon-Shaw effect. However, since from (4-5) we have $\rho \to -1 \Rightarrow (\partial\Omega\ \partial|\rho|) \to \infty$, one can conclude that the optimal exchange rate arrangement in stabilizing growth is one of the leaning with the wind. Therefore, in general, we can establish the following proposition:

Proposition 4-2: *When there is no McKinnon-Shaw effect and the economy is exposed to productivity shocks, the optimal exchange rate arrangement for stabilization of growth is managed rates with leaning with the wind. When the leaning against the wind exchange rate arrangement is the main concern, the floating rates perform best in stabilizing growth and worst in stabilizing domestic inflation against productivity shocks. In this case, the reverse holds true for the fixed rates arrangement*[2].

Notice that considering proposition (3-1), once the inflation variance has no cost and there is no McKinnon-Shaw effect, the exchange rate arrangement would not have any role in stabilizing growth.

The fourth channel whereby the exchange rate arrangement will affect the welfare is through the initial value of wealth for which we have:

$$\left(\frac{dln\ W_0}{d\rho}\right)_{\sigma_y^2 \neq 0} = \left(-\frac{[1-(1+\Pi)n_M]i^2}{(1+\Pi)\mu\frac{\partial i}{\partial \rho}}\right)_{\sigma_y^2 \neq 0}$$

Like the first channel, the exchange rate arrangement impacts on the initial value of wealth by its effect on the equilibrium interest rate. As we see, though the magnitude of this effect is different from that of the real money balances channel, the direction of effects are the same. That is, when the equilibrium nominal interest rate is a decreasing function of ρ, a less flexible exchange rates lead to a higher initial value of wealth. The opposite is true when the equilibrium interest rate is an increasing function of ρ. This agreement in the effects originates from the fact that the initial value of wealth is endogenously determined (recall equation (3-27)). More precisely, since the initial values of traded assets are predetermined, the characteristic of recurring equilibrium involving a constant portfolio through the time implies the higher initial value of wealth for the higher share of real money balances entailing lower share of traded assets.

The above analysis shows there usually exist trade offs among the welfare components in exercising the different flexibility of exchange rates. That is why the polar cases (i.e. completely floating and fixed rates) do not seem to be always optimal in the context of our welfare criterion. Another important characteristic of the above analysis, which is the main concern of this study, is the role of the financial repression policy in between. As we have already seen, the degree of financial repression affects the magnitude and direction of the effect of the exchange rate arrangement on all the components of welfare. Thus, we can conclude that financial repression policy is one of the main factors which influences the optimal degree of flexibility of exchange rates in the case of productivity shocks. In order to show this fact more clearly, in the following we choose a more tractable framework and disregard the cost of inflation variance. Then we work out the optimal ρ for this case. Needless to say, that the proof of the importance of financial repression policy in this simpler structure can be considered as a sufficient argument for the more general setting including the cost of inflation variance.

When there is no cost of inflation variance, according to our explanation in corollary 3-1-2, the share of domestic capital in traded assets will become independent of the exchange rate arrangements. Therefore, the exchange rate arrangement can affect welfare only through its impact on the equilibrium nominal interest rate. Taking into account these considerations, the maximising welfare ρ is given as:

$$\rho^*_{\sigma_y^2\neq 0}=\frac{-[\hat{\psi}+q-\Omega^2\alpha(f)^2\sigma_y^2]\pm\sqrt{[\hat{\psi}+q-\Omega^2\alpha(f)^2\sigma_y^2]^2+4\Lambda\delta[\hat{\imath}-i^*(1-t^*)]}}{2[\hat{\imath}-i^*(1-t^*)]}-1$$

$$\textit{where:}\quad \hat{\psi}_{\sigma_y^2\neq 0}=\Omega(1-g)\alpha(f)+(1-\Omega)(i^*-q)-\frac{\hat{\imath}\theta\mu}{[\hat{\imath}-(1+\Pi)\zeta(f)\mu]}$$

$$\hat{\imath}=\frac{[\zeta(f)+\sqrt{\zeta(f)^2+4\zeta(f)\theta}](1+\Pi)\mu}{2}\geq 0 \qquad (4\text{-}8)$$

$$\Omega=\frac{\alpha(f)-[i^*(1-t^*)-q]}{\alpha(f)^2\sigma_y^2}$$

Note that ρ^*=-1 should be viewed as a trivial solution to the optimization because it involves a zero equilibrium nominal interest rate. One feature of the above equation is the nonoptimality of completely fixed rates for economies whose capital accounts are completely closed (t^*=1) and money has utility. In this situation, the denominator is always greater than zero and since we have ruled out the possibility of the economy being a perfectly net debtor (i.e. we have assumed $\Omega<\infty$), the optimal ρ is always less than infinity. Another feature is the existence of two solutions for the optimal degree of flexibility of exchange rates as long as an ultra conservative central banker is not appointed. Generally speaking, one of them may accord with the arrangements involving *leaning against the wind* (i.e. positive ρ^*) and the other with the arrangements involving *leaning with the wind* (i.e. negative ρ^*). This duality is the result of appointing a conservative central banker. As, once an ultra-conservative central banker is appointed, we will end up an unique optimal level of ρ, which can be either positive or negative, as follows:

$$\rho^*_{\sigma_y^2\neq 0}=\frac{[\Omega^2\alpha(f)^2\sigma_y^2-\hat{\psi}-q]}{[\hat{\imath}-i^*(1-t^*)]}-1 \qquad (4\text{-}8')$$

This equation though, is a particular case of equation (4-8') and contains the same intuition as what is operating in the general form. However, since it has a simpler specification, it is more illustrative. In words, the denominator of the first term indicates the optimal (welfare maximising) nominal risk premium on government bonds over the (after tax) foreign assets (ORP). This is so because the term $\hat{\imath}$ can be viewed as the optimal nominal interest rate involving the maximum welfare due to the equality in the marginal welfare of growth (loss/gain), the marginal welfare of real money balances and the initial value of wealth (gain/loss)[3]. It is clear the ORP is independent of the variance of the productivity shocks, the expected output share of the government expenditure and the marginal productivity of capital. More precisely, it depends on the financial repression (through marginal utility of money), foreign assets taxation (capital control) and government debt policies (among the policy variables), and marginal utility of consumption and money as well as the agent's time preference (among structural parameters). In addition, the ORP can be positive or negative depending on the relative size of the foregoing structural parameters and policy variables. The possibility of a positive risk premium is justified by the possibility of a positive expected rate of exchange depreciation and the presence of productivity shocks. Here, when the ORP is negative, it means the optimal expected rate of exchange depreciation is negative (i.e. the optimal equilibrium expected rate involves an appreciation). The numerator of the first term shows the optimal nominal risk premium on government bonds over the (after tax) foreign assets under floating rates (ORPF). Thus equation (4-8') shows that ρ^* depends on the relative magnitude of the ORP and the ORPF. If they are equal to each other, the floating rates is the optimal arrangement. If the welfare maximizing risk premium is zero, implying equality between the optimal nominal interest rate and the after tax nominal return on foreign assets, the optimal arrangement is fixed rates. Otherwise, managed rates would be optimal arrangement. From (4-8'), we see that if the ORPF is negative (positive) and the ORP is positive (negative), *leaning with wind* is the best arrangement. However, if they are both positive (negative) and their ratio is greater than one (that is $|\text{ORPF}| \succ |\text{ORP}|$, the *leaning against wind* can be considered as the best arrangement.

The same argument is in place in equation (4-8). The only difference is the assumption of appointing a conservative central banker providing more flexibility in conducting the monetary policy reflected in the nonlinearity in ρ in the arbitrage equation (3-25'-2) and as a result the double solutions for the optimal exchange rate arrangement.

Considering the above descriptions and the structure of the $\Omega, \psi^{``}, \hat{\imath}$ and $\alpha(f)$, we observe that financial repression policy plays an important role in determining the optimal ρ. That is, different levels of financial repression leads to different values for $\tilde{\iota}$ through its impact on the marginal utility of money and its concomitant welfare maximizing risk premium. Likewise, financial repression impacts on the ORPF through, mainly, its effect on $\tilde{\iota}$ and the marginal productivity of domestic capital influencing the optimal equilibrium expected growth (ψ^{*}) and the risk associated to the domestic capital. Note that even if the marginal utility of money is insensitive with respect to financial repression, the optimal ρ still depends on financial repression through the Goldsmith channel. Hence, we can establish the following:

Proposition 4-3: *The degree of financial repression is a crucial determinant of the optimal exchange rate arrangement when the economy is exposed to domestic real (productivity) shocks. This is true irrespective of the presence of McKinnon-Shaw effect, cost of inflation variance and sensitivity of the marginal utility of money with respect to financial repression.*

This proposition which, in a sense, establishes the main result of this study, is a very strong one. *Furthermore, the effect of financial repression on the optimal ρ is crucial in the sense that it influences the magnitude and even, in many occasions, the direction of the effects of the other factors on ρ^{*}*. In order to show this here, it would be sufficient to focus on the case where an ultra-conservative central banker is in office. First, we study the effect of a change in the variables which do not affect the ORP (i.e. g, q and σ_y^2). Then we investigate the implications of changes in the structural parameters and policy variables (i.e. t^{*}, θ, μ, Π and f) impacting on the ORP too. However, before getting involved in a more detailed analysis, we see from (4-8') that, in general, any policy changes which stimulate the optimal expected growth under floating rates have a decreasing effect on the optimal flexibility of exchange rates. Nevertheless, since any policy change has its own implications for the other components of (4-8'), this is not necessarily a definite conclusion and a more detailed investigation is required in this regard which is our main concern below. To be more precise, one of the main objectives of the following analysis is to provide a more thorough insight into the implications of an unanticipated change in the above mentioned policy and the structural variables for the optimal exchange rates arrangement when the economy is susceptible to domestic productivity shocks.

The following relationship indicates the consequence of a change in the share of government expenditure for the optimal ρ:

$$\left(\frac{\partial \rho^*}{\partial g}\right)^{\Lambda\ 0}_{\sigma_y^2\neq 0} = \frac{\Omega\alpha(f)}{[\hat{\imath}-i^*(1-t^*)]}$$

This suggests that as long as the ORP is positive, the higher is the output share of government, the less flexible exchange rates are optimal. An increase in the output share of government expenditure, other things equal, implies a reduction in the (optimal) expected growth rate and , hence, a depreciation in the (optimal) equilibrium floating rate. Given that the optimal risk premium is constant, a higher ρ is necessary to compensate that increase in the ORPF. The opposite is true when the ORP is negative (implying an appreciation). That is, the higher is the output share of government, the more flexible exchange rates are optimal. It is clear that the degree of financial repression can change the magnitude and the sign of this outcome. The same argument can be raised for the more general case where a conservative central banker is at work. However, in this case, one can imagine a negative (positive) relationship between ρ^* and g even when the ORP is positive (negative). The main factor responsible for this result is the relative size of the expected growth of money adjusted for the type of central banker (i.e. $\Lambda\delta$).

The effect of a change in the expected foreign inflation on the optimal ρ is given as:

$$\left(\frac{\partial \rho^*}{\partial q}\right)^{\Lambda=0}_{\sigma_y^2\neq 0} = \frac{g\alpha(f)+i^*t^*}{[\hat{\imath}-i^*(1-t^*)]\alpha(f)^2\sigma_y^2}$$

Since the numerator is always positive, the above expression is always positive (negative) so long as the ORP is positive (negative). This is so because a rise in the expected foreign inflation rate leads to an increase in the ORPF. Therefore, the higher is expected foreign inflation the less (more) flexible exchange rates are optimal. Again, financial repression affects both the magnitude and the sign of the above expression. In the case where a conservative central banker has been appointed, the same analysis can be carried out. The only difference is yet again the possibility of having a negative (positive) relationship between the expected foreign inflation rate and the optimal ρ for the positive (negative) ORP as a result of a relatively low (high) value of expected money growth adjusted for the type of central banker.

According to (4-8) and (4-8'), we observe that the optimal ρ is affected by the size of the (variance of) productivity shocks as well. The following relationship shows how it impacts on ρ^*:

$$\left(\frac{\partial\rho^*}{\partial\sigma_y^2}\right)^{\Lambda=0}_{\sigma_y^2\neq 0}=\frac{-\Omega[g\alpha(f)+i^*t^*]}{\sigma_y^2[\hat{\imath}-i^*(1-t^*)]}$$

This suggests that for the positive (negative) ORP, an increase in σ_y^2 entails more (less) flexible exchange rates to be optimal. This is so because an increase in the variance of the productivity shocks is accompanied by a switch away from domestic capital towards the foreign assets. This, on the one hand, will lead to a definite reduction in the risk associated with domestic capital and, on the other hand, will induce a change in the optimal expected growth under floating rates which can be positive or negative depending on the relative magnitudes of real return on foreign assets and that on the domestic capital net of the government expenditure. In any event, the former effect dominates the latter one, so that it results in a reduction in the ORPF as a result of an increase in the (variance of) productivity shocks. Thus, with the constant ORP a more (less) flexible exchange rate is needed to restore the optimal equilibrium risk premium. Once more, a variation in financial repression can bring about a corresponding change in both the magnitude and the sign of the above relationship. The same reasoning can be put forward for the case of a conservative central banker in office.

The consequence of a policy change regarding the taxation of foreign assets return for the optimal ρ is given as:

$$\left(\frac{\partial\rho^*}{\partial t^*}\right)^{\Lambda=0}_{\sigma_y^2\neq 0}=\frac{i^*[2\Omega-1-\rho^*-\frac{[(1-g)\alpha(f)-(i^*-q)]}{\alpha(f)^2\sigma_y^2}]}{[\hat{\imath}-i^*(1-t^*)]}$$

From this, we see that the initial optimal ρ, among the other factors, plays an important role as well. That is, if the fixed rate is the initial optimal arrangement, the optimal ρ will become perfectly elastic with respect to t^* and the more flexible rates will be optimal. This is due to the fact that the optimal fixed rates corresponds with the optimality of the zero risk premium. Thus, any change in tax on foreign assets return, since it does not affect the optimal nominal interest rate (i.e. $\hat{\imath}$), implies the optimality of a nonzero risk premium which can be achieved by a more flexible arrangement. On the other hand, when the initial optimal ρ is zero (i.e. floating rates are optimal) and the ORP is positive (negative), the higher taxation on foreign assets return requires less (more, leaning with wind) flexible rates if the real return on foreign assets is higher than that on the domestic capital net of the output share of government expenditure and $\Omega \geq 1/2$. This is so because a rise in tax on the nominal return of foreign assets entails a shift in traded assets towards the domestic capital [we know from (3-23'-1) that $(\partial\Omega/\partial t^{*}) \succ 0$] and, thus, it leads to a loss of growth which with a concomitant increase in risk associated to domestic capital results in a rise in the ORPF. However, if the real return on domestic capital net of the government output share is greater than the real return on foreign assets and $0 \leq \Omega \leq 1/2$, the ORPF will decrease, which requires a more (less) flexible exchange rates in order to compensate it. When the initial optimal arrangement is managed rates, the degree of flexibility must be taken into account as well. In general, we expect, the higher is the initial (positive) optimal ρ, more precisely when $\rho^{*} \succ 2\Omega \ 1 - \frac{[(1-g)\alpha(f)-(i^{*}-q)]}{\alpha(f)^{2}\sigma_{y'}^{2}}$, the more (less) flexible rates seems to be optimal for a positive (negative) ORP. To some extent this ambiguity stems from the fact that an increase in tax on foreign assets will lead to an unambiguous rise in domestic capital in the traded portion of the agent's portfolio which can stimulate (deteriorate) the optimal growth under floating rates if the real return on domestic capital net of the output share of the government expenditure is higher (lower) than that on the foreign assets. Like the other cases, here the effect of a change in the policy variable is influenced by the level of the ORP which is, in turn, a function of financial repression. Once again, a change in financial repression policy will lead to a change in the magnitude and sign of the relationship between the optimal ρ and t^{*}. A similar argument can be established for the case where a conservative central banker is appointed. Nevertheless, the above conditions for having a positive or negative relationship between t^{*} and ρ^{*} may not be sufficient anymore.

The effect of a change in the marginal utility of consumption on the optimal ρ is as follows:

$$\left(\frac{\partial \rho^*}{\partial \theta}\right)_{\sigma_y^2 \neq 0}^{\Lambda=0} = \frac{1}{[\hat{\imath} - i^*(1-t^*)]^2}\left(-\frac{\partial \psi^{\hat{}}}{\partial \theta}[\hat{\imath} - i^*(1-t^*)] - \frac{\partial \hat{\imath}}{\partial \theta}(1+\Pi)\mu[\Omega^2\alpha(f)^2\sigma_y^2 - \psi^{\hat{}} - q]\right)$$

$$\text{Where:} \qquad \frac{\partial \psi^{\hat{}}}{\partial \theta} = \frac{\theta\mu^2\zeta(f)(1+\Pi)\frac{\partial \hat{\imath}}{\partial \theta} - \hat{\imath}\mu[\hat{\imath} - (1+\Pi)\zeta(f)\mu]}{[\hat{\imath} - (1+\Pi)\mu\zeta(f)]^2} \prec 0$$

$$\frac{\partial \hat{\imath}}{\partial \theta} = \frac{(1+\Pi)\mu}{\sqrt{1+[4\theta/\zeta(f)]}} \succ 0$$

The first term of the bracket in the above equation refers to the change in the optimal ρ as a result of a change in the ORPF due to a variation in the marginal utility of consumption. The ORPF increases (we have: $\frac{\partial \psi^{\hat{}}}{\partial \theta} \succ o$) because the higher is the marginal utility of (future) consumption the less would be the optimal expected growth rate. On the one hand, an increase in the marginal utility of consumption leads to a boost in current consumption which is growth deteriorating (the second term in the numerator of the equation $\frac{\partial \psi^{\hat{}}}{\partial \theta}$ refers to this fact). On the other hand, an increase in θ leads to higher level of the optimal nominal interest rate which is growth enhancing (the first term in the numerator of the equation $\frac{\partial \psi^{\hat{}}}{\partial \theta}$ represents this effect). One can show that the former effect always outweighs the latter one so that the overall effect, as we expect, implies a reduction in the rate of growth and, hence, the higher would be the expected rate of exchange depreciation. However, since it is weighed by the initial ORP (i.e. ORP before any change in θ), its marginal effect on ρ^* can be positive or negative. The second term of the brackets indicates the change in ρ^* due to a change in the ORP stemming from a variation in the marginal utility of consumption. As we observe in the equation for $\hat{\imath}$, the optimal interest rate is a positive function of the marginal utility of consumption implying the higher is θ, the higher would be the ORP giving rise to a reduction in ρ^*. [4] Nonetheless, since it has been weighted by the ORPF, like the first term, it can be either positive or negative depending on the initial ORPF. Generally speaking, if the initial ORP is positive (negative) and the initial ORPF is negative (positive) we expect the higher is marginal utility of consumption, the less (more) flexible exchange rates are optimal. Otherwise, everything depends on the relative values of the first and second terms. The role of financial repression is much clearer here than in the previous cases. It affects both the magnitude and the direction of this structural change on optimal ρ. When a conservative central banker is appointed, the expected money growth adjusted for the type of central banker plays a role as well and the analysis would be more complicated. However, one can, in principle, raise the similar argument.

Likewise, the variation in agent's time preference brings about the following change in optimal ρ:

$$\left(\frac{\partial\rho^*}{\partial\mu}\right)^{\Lambda=0}_{\sigma_y^2\neq 0}=\frac{1}{[\hat{\imath}-i^*(1-t^*)]^2}\left(\frac{\hat{\imath}\theta[\hat{\imath}-i^*(1-t^*)]}{[\hat{\imath}-(1+\Pi)\zeta(f)\mu]}-\frac{\hat{\imath}[\Omega^2\alpha(f)^2\sigma_y^2-\psi^{*}-q]}{\mu}\right)$$

The same forces as the previous case for different level of marginal utility of consumption are operating. That is, a change in agent's time preference results into a change in ρ^* due to , on the one hand, a change (rise) in the ORPF weighted by the initial ORP (i.e. the first term in the bracket) and, on the other hand, a change in the ORP weighted by the initial ORPF. The ORPF increases (we have: $\frac{\hat{\imath}\theta}{[\hat{\imath}-(1+\Pi)\zeta(f)\mu]}>0$) because the more impatient are agents, the less would be the optimal expected growth rate and the higher is the expected rate of exchange depreciation. Also, the higher μ leads to the higher optimal interest rate implying a rise in the ORP. In general, the type of relationship between the optimal ρ and agent's time preference depends on the relative values of the first and second term in the brackets. However, one can conclude when the initial ORP is positive (negative) and the initial ORPF is negative (positive), the more impatient are agents, the less (more) flexible exchange rates are optimal. As above, financial repression can play a crucial role in the determination of the magnitude and sign of the above expression. The same analysis can be done for the case where a conservative central banker is in office. However, it is more involving due to the role of expected money growth adjusted for the type of central banker and its augmented nonlinearity.

A change in government debt policy has also some implications for the optimal ρ given as follows:

$$\left(\frac{\partial\rho^*}{\partial\Pi}\right)^{\Lambda=0}_{\sigma_y^2\neq 0}=-\frac{\hat{\imath}[\Omega^2\alpha(f)^2\sigma_y^2-\psi^{*}-q]}{[\hat{\imath}-i^*(1-t^*)]^2(1+\Pi)}$$

Any change in the government debt policy involves a change only in the ORP and leaves the ORPF unaffected. This is because although, a higher Π reduces the optimal expected growth under floating rates (through an increase in the share of nontraded assets), it also induces a concomitant rise in optimal interest rate, which is growth enhancing. These two forces offset each other completely so that the level of optimal expected growth under floating rates does not change at all. Accordingly, there would not exist any change in the ORPF. However, the rise in Π leads to an increase in the optimal nominal interest rate and thereby a higher ORP which stimulates an adjustment in the optimal ρ. If the initial ORPF is positive (negative), the higher government debt implies that more (less) flexibility in exchange rates to be optimal. As we see, financial repression plays an important role in this regard. The same, but more complicated, argument can be raised when a conservative central banker is appointed.

The following equation indicates the consequence of a change in financial repression on the optimal ρ:

$$\left(\frac{\partial \rho^*}{\partial f}\right)^{\Lambda=0}_{\sigma_y^2 \neq 0} = \frac{1}{[\hat{\imath} - i^*(1-t^*)]^2}$$

$$\left\{[\hat{\imath} - i^*(1-t^*)][2\Omega\alpha(f)\sigma_y^2(\alpha(f)\frac{\partial \Omega}{\partial f} + \alpha(f)'\Omega) - \frac{\partial \psi^{\hat{}}}{\partial f}] - \frac{\partial \hat{\imath}}{\partial f}[\Omega^2\alpha(f)^2\sigma_y^2 - \psi^{\hat{}} - q]\right\}$$

where: $$\frac{\partial \psi^{\hat{}}}{\partial f} = \frac{\partial \Omega}{\partial f}[(1-g)\alpha(f) - (i^* - q)] + \alpha(f)'(1-g)\Omega - \frac{(1+\Pi)\mu^2\theta[\zeta(f)'\hat{\imath} - \zeta(f)\frac{\partial \hat{\imath}}{\partial f}}{[\hat{\imath} - (1+\Pi)\zeta(f)\mu]^2}$$

$$\frac{\partial \hat{\imath}}{\partial f} = \frac{1}{2}\left(1 + \frac{\zeta(f) + 2\theta}{\sqrt{\zeta(f)^2 + 4\theta\zeta(f)}}\right)\zeta(f)'\mu(1+\Pi) \succ 0$$

$$\frac{\partial \Omega}{\partial f} = \frac{-\alpha(f)'\{\alpha(f) - 2[i^*(1-t^*) - q]\}}{\alpha(f)^3\sigma_y^2}$$

The first term in the bracket shows the change in the ORPF due to a variation in financial repression weighted by the initial the ORP. The second term refers to the change in the ORP as a result of a change in financial repression weighted by the initial ORPF. As we see it is difficult to define how exactly the type of relation between the optimal ρ and the financial repression policy. This is so because there are many forces involved. In fact, it demands a scrutiny of the financial repression effects on Ω and ψ, which is mainly the subject of the next section. However, roughly speaking, if financial repression causes a rise in the ORPF and the initial ORP is negative (positive) while the initial ORPF is positive (negative), a higher degree of financial repression implies that the more (less) flexible rate is optimal. By contrast, if financial repression leads to a reduction in the ORPF and the initial ORP is positive (negative) while the initial ORPF is negative (positive), the higher is the degree of financial repression, the less (more) flexible rates are optimal. Otherwise, the relative size of the two terms in the brackets will determine the type of relationship between ρ^* and f. Appointment of a conservative central banker through the expected money growth adds more complication and ambiguity to our conclusion.

Before leaving this section, it is worth studying the implications of appointing a more conservative central banker for the optimal ρ. It can be shown as follows:

$$\left(\frac{\partial \rho^*}{\partial \Lambda}\right)_{\sigma_y^2 \neq 0} = \frac{\pm\delta}{\sqrt{[\hat{\psi} + q - \Omega^2 \alpha(f)^2 \sigma_y^2]^2 + 4\Lambda\delta[\hat{\imath} - i^*(1-t^*)]}}$$

The above relationship suggests that when the initial optimal ρ corresponds to the positive (negative) square root the less central banker is conservative, the less (more) flexible exchange rates are optimal. This is due to this fact that a less conservative central banker implies higher expected money growth and, hence, a higher (lower) ORPF. With a constant ORP, the necessary reduction (increase) in risk premium is provided by a reduction (rise) in flexibility of exchange rates. Even here financial repression plays role in the determination of the initial ρ^* and thereby the type and magnitude of the relation between the optimal ρ and Λ.

4.2.1.2 Financial Repression

As we described in detail in the previous chapter, there is a close relationship between financial repression and the optimal flexibility of exchange rates. Though financial repression can be assigned to the structural characteristic of DCs' economies which is difficult, if not, to remove in the short or medium run, there is no doubt that governments usually possess the ability to liberalize more the financial sectors by deregulating measures. Therefore, at least to some extent, financial repression can be viewed as a governmental policy-induced imperfection which has some budgetary benefits too. From this perspective, and noting the results from the above analysis, the question that can be raised is: what would be the optimal combination of financial repression policy and flexibility of exchange rates? This requires us to maximize the welfare function (3-30) with respect to ρ and f both at the same time. However, a prerequisite is that one should show whether or not there would be any welfare (growth) case for a financial repression policy given the specific exchange rate arrangement.

In this section we try to address this issue for two polar cases completely fixed and floating rates. Since the same argument, though more sophisticated, can be raised for the managed rates, for the sake of brevity we disregard this case.

Fixed Exchange Rates

In terms of our value function, the study of the welfare implications of financial repression requires us to trace down the consequences of financial repression policy for real money balances, expected growth, the variance of growth and the initial value of wealth[5].

In general, any change in financial repression policy causes two main reallocations in the agent's portfolio. On the one hand, it motivates a shift within traded assets and, on the other hand, it results in a reallocation between traded and nontraded assets. These changes in portfolio may be growth deteriorating or enhancing. Below we specify the conditions under which financial repression policy might lead to an improvement in growth.

Proposition 4-4: *Under a fixed exchange rate regime when the economy is susceptible to productivity shocks, financial repression policy is growth improving if the real return on foreign assets is negative and the marginal utility of money is insensitive with respect to financial repression.*

Proof. Disregarding the McKinnon-Shaw effect, assuming $\alpha(f)=\alpha(1-f)$ and taking derivative from (23'-2) with respect to f when there are only productivity shocks and $\rho\to\infty$, we obtain:

$$\left(\frac{\partial\psi_\infty}{\partial f}\right)_{\sigma_y^2\neq0}=\frac{\partial\Omega_\infty}{\partial f}[(1-g)\alpha(1-f)-(i^*-q)]-\Omega_\infty(1-g)\alpha-\frac{\theta\mu\zeta'(f)(1+\Pi)i^*(1-t^*)}{[i^*(1-t^*)-(1+\Pi)\zeta(f)\mu]^2}$$

$$\text{where:}\qquad \left(\frac{\partial\Omega_\infty}{\partial f}\right)_{\sigma_y^2\neq0}=\frac{\alpha(1-f)-2[i^*(1-t^*)-q]}{\alpha^2(1-f)^3\sigma_y^2}\qquad(4\text{-}9)$$

$$\Omega_\infty=\frac{\alpha(1-f)-[i^*(1-t^*)-q]}{\alpha^2(1-f)^2\sigma_y^2}$$

When the marginal utility of money is not sensitive with respect to financial repression the third term in the above equation is zero and hence we always have: $(\partial\psi_{\infty}/\partial f)>0$ □

In general, this result is independent of our specification of $\alpha(f)$. We have chosen it just for the sake of more tractability and more convenient exposition. This proposition reveals the economic consequences of financial repression policy as a shock absorber which has been ignored in the related literature, and might provide an incentive for a (benevolent) government to follow a financial repression policy. That is, even if there is no budget financing incentive for the government under specified conditions, there might be an economic justification in pursuing a financial repression policy. The economic intuition behind this proposition is straightforward. If the risk averse agent hold a less productive asset (here a foreign asset) due to the risk attached to the more productive asset (here domestic capital), when government can reduce the magnitude of the risk, which is transmitted to the agent, by following the financial repression policy, this would lead to a shift in the agent's portfolio towards the more productive asset. However, as we will see shortly, this is not totally costless. That is, this improvement in mean of growth will be achieved by an increase in variance of growth (when the real return on foreign assets is negative). Note that proposition (4-4) does not necessarily exclude the growth improving role of financial repression when the marginal utility of money (the share of real money balances) is sensitive to the financial repression policy. To be more precise, as long as the growth loss of a reduction in the share of traded assets due to an increase in the share of real money balances as a result of following financial repression policy is less than the net growth gain due to a switch towards the more productive asset, the financial repression policy would be growth stimulating. Put differently, it is possible that financial repression policy up to some degree improves growth and after specific level its negative effects dominate to its positive effects on growth or vice versa. From the third term in (4-9), it is clear that the more is the representative agent patient and/or the less is the marginal utility of consumption, the less would be the elasticity of the share of real money balances. The same is true for the optimal government debt policy (i.e. Π=0). Also, when proposition (4-4)'s conditions are in place the economy is most likely to be a net debtor, the situation which is prevalent in many Developing Countries. Therefore, this might be viewed as another justification for the stylized facts regarding to the persistence of financial repression in those Developing Countries which are net debtor and highly susceptible to productivity shocks (due to e.g. unstable socio-political structure, natural catastrophes and so on).

Corollary 4-4-1. *Given that proposition (4-4), when the real return on foreign assets is greater than or equal to zero, a necessary condition for making a growth case for financial repression policy is the introduction of (foreign) capital taxation (control).*

Proof. From (4-9), in the absence of foreign capital control, we always have: $(\partial\psi_\infty/\partial f)\leq 0$
□

Considering the corollary (4-4-1), it is clear that in the presence of (foreign) capital control, financial repression can also improve growth when the real rate of return on foreign assets is equal to zero. Note that if the economy is exposed to foreign inflation (price) shocks as well, this corollary is not necessarily a necessary condition when the agent is more risk averse (i.e. $\gamma \prec 0$), which implies a non logarithmic utility function.

Corollary 4-4-2: *Given proposition (4-4) and the conditions specified in corollary 4-4-1, when the real return on foreign assets is greater than zero, the financial repression policy can be growth improving if and only if we have:*

$$[i^*(1-t^*)-q] \prec \alpha(1-f) \prec \frac{2[i^*(1-t^*)-q](i^*-q)}{(1-g)[i^*(1-t^*)-q]+(i^*-q)} \qquad (4\text{-}10)$$

Proof. Ignoring the third term in (4-9) and then substituting for $(\partial\Omega_\infty/\partial f)$ and Ω_∞ in it. □

In general, the condition (4-10) refers to the situation in which though the real return on domestic capital adjusted for financial repression is higher than the after tax real return on foreign assets, involving a positive share of traded assets, the real return on domestic capital net of the government output share is less than that on foreign assets. That is, what is important in making a growth case for financial repression is the relative values of the real return on domestic capital and foreign assets considering the government output share which is a pure drain of resources in our model. Needless to say, it covers cases where the real return on domestic capital excluding the government output share is higher than that on foreign assets too. Moreover, we will show that when the relationship (4-10) holds, the increase in the degree of financial repression involves a reduction in the variance of growth. Like proposition (4-4), the relationship (4-10) in the above corollary is more restrictive when the marginal utility of money is more sensitive to the financial repression policy. However, in this case, as we mentioned above, it is less restrictive if the representative agent is more patient and/or if the relative importance of consumption in utility is lower.

In the context of welfare analysis, the role of financial repression in the fixed exchange rate regime as a shock absorber is much clearer, once we examine the value function (3-30) and recall the equilibrium value of $\sigma_z^{\ 2}$ in the presence of only productivity shocks. That is, when there is no McKinnon-Shaw effect we have:

$$\left(\frac{\partial \sigma_z^{*2}}{\partial f}\right)_{\sigma_r^2 \neq 0} = -2\alpha^2(1-f)\Omega\sigma_y^2[\Omega - \frac{\partial \Omega}{\partial f}(1-f)]$$

which is greater than zero only if the after tax real return on foreign assets is less than zero and less than or equal to zero if it is greater than or equal to zero. In the latter case, the higher is the financial repression the less would be the variance of growth implying a higher level of welfare. This is true irrespective of the type of exchange rate arrangement because under both float and fixed rates when the after tax real return on foreign assets is greater than zero we have: $(1\text{-}f)\Omega_f < \Omega$,where Ω refers to the share of domestic capital in traded assets when there is no financial repression. Therefore, considering the terms in corollaries (4-4-1) and (4-4-2), the government may raise the welfare of the representative agent by increasing the expected growth and reducing its variance. If it is the case that the initial value of (real) wealth will increase due to a reduction in expected inflation as a result of an increase in expected growth (note that the variance of domestic inflation is zero under fixed rates). Moreover, when the marginal utility of money is sensitive to financial repression but not as much to wipe out its growth improving effect discussed above, the welfare of the representative agent will definitely increase by pursuing the financial repression policy. However, if the conditions raised in proposition (4-4) hold, there would be a trade off between increasing the expected growth and reducing the variance of growth as in this situation we have: $(1\text{-}f)\Omega_f > \Omega$ (refer to the relationship (4-9)). In general, when the terms in proposition 11 and corollaries (4-4-1) and (4-4-2) do not hold there would be trade offs among welfare arguments in following the financial repression policy. That is, it raises the share of real money balances and the initial value of wealth and it reduces the variance of growth in the cost of losing expected growth. Which one outweighs the other depends on the relative magnitudes of structural parameters and the variance of productivity shocks.

Floating Exchange Rates

Under floating exchange rates there are two channels whereby the financial repression policy might affect the share of traded assets. That is, financial repression policy can reduce the risk associated with domestic capital, which mimics the role of this policy under fixed rates, as well as the cost of inflation variance which has an increasing effect on the expected real return on domestic capital. However, since the financial repression policy also reduces the productivity of capital through the Goldsmith channel (α) its net effect on the real return on domestic capital is ambiguous and it highly depends on the size of the variance of productivity shocks and the marginal cost of inflation variance (i.e. Γ). Furthermore, under the floating rates financial repression policy, by influencing the expected rate of change of the exchange rate and the risk associated with domestic capital (recall the relationships (3-25-2) and (3-19'), will impact on the equilibrium nominal interest rate. As long as the financial repression policy entails an expected appreciation in the exchange rate it will decrease the nominal interest rate and stimulates the share of real money balances. This channel amplifies the increasing effect of the financial repression policy on real money balances through the rise in the transaction cost. As such, the mechanism through which the financial repression policy affects the growth is more complicated in the float regime than that in the fixed rate regime. Generally speaking, under a float regime like the fixed regime, one can not make a growth case for financial repression policy unless the growth gain due to a shift within the share of traded assets towards more productive assets outweighs the growth loss due to an increase in the share of real money balances and government debt in the cost of reduction in the share of traded assets. More precisely, the growth effect of the financial policy under floating rates is given as:

$$\left(\frac{\partial\psi_0}{\partial f}\right)_{\sigma_y^2\neq 0}=\Big\{\frac{\partial\Omega_0}{\partial f}[(1-g)\{\alpha(1-f)-\Omega_0^2\alpha^2(1-f)^2\sigma_y^2\Gamma\}-(i^*-q)]$$

$$-2\frac{\partial\Omega_0}{\partial f}(1-g)\Omega_0^2\alpha^2(1-f)^2\sigma_y^2\Gamma+2(1-g)\Omega_0^3\alpha^2(1-f)\sigma_y^2\Gamma-(1-g)\Omega_0\alpha\Big\}$$

$$+\Big\{\frac{-(1+\Pi)\mu^2\theta[i\zeta'(f)-\frac{\partial i}{\partial f}\zeta(f)]}{[i-(1+\Pi)\zeta(f)\mu]^2}\Big\} \qquad (4\text{-}11)$$

where:

$$\left(\frac{\partial\Omega_0}{\partial f}\right)_{\sigma_y^2\neq 0}=\frac{1}{2}\frac{\left[\frac{1}{\Gamma\sigma_y\alpha(1-f)^2}-\frac{2\{i^*(1-t^*)-q\}}{\Gamma\sigma_y\alpha^2(1-f)^3}\right]}{[\Omega_0+\frac{1}{2\Gamma}]}$$

$$\Omega_0=-\frac{1}{2\Gamma}+\left[\frac{1}{4\Gamma^2}+\frac{1}{\Gamma\sigma_y\alpha(1-f)}-\frac{i^*(1-t^*)-q}{\Gamma\sigma_y\alpha^2(1-f)^2}\right]^{1/2}$$

In equation (4-11) the terms in the first curly brackets indicate the effect of the substitution between domestic capital and foreign assets on growth as a result of exercising the financial repression policy. The first two terms refer to the growth gain/loss of substitution between domestic capital and foreign assets while the third term represents the growth gain due to the reduction in the inflation variance. The fourth term stands for the growth loss stemming from the decrease in the marginal productivity of domestic capital. The overall value of this bracket designates the intra traded assets effect of financial repression policy on the growth and can be negative or positive. The terms in the second curly brackets demonstrate the effect of switching from traded assets to real money balances and government bonds on growth. The total value of this term indicates the inter traded-nontraded assets effect and is always negative. The second term in the bracket shows the effect of financial repression policy on the share of real money balances and government bonds through the nominal interest rate. Again, the more the agent is patient and/or the less is the marginal utility of current consumption, the less would be the absolute value of the negative effect of financial repression through this channel. The same is true when the government follows the optimal debt policy. Put differently, the negative effect of financial repression policy on growth would be less if the share of real money balances is less elastic with respect to the financial repression policy or more precisely, if the marginal utility of money is not very sensitive with respect to the financial repression policy and the real money balances are not interest rate elastic. The polar case is when money has no utility involving no inter traded-nontraded assets effect. As such, whenever the intra traded assets effect is negative, imposition of financial repression has definitely a negative effect on growth. However, when the intra traded assets effect is positive and its absolute value is greater than that of the inter traded-nontraded assets effect, one may make a growth case for financial repression policy under floating rates. This enables us to state the following:

Proposition 4-5: *Under the floating rates, the necessary condition for financial repression policy to be growth improving is that the intra traded assets effect is positive and the sufficient condition is that its value is greater than the absolute value of inter traded-nontraded assets effect.*

The sufficient conditions for a positive intra traded assets effect are as follows:

A) If the real return on foreign assets is less than that on domestic capital net of the government output share, then:

$$Max\{\frac{1}{2[\Omega_0-\frac{\partial\Omega_0}{\partial f}(1-f)]\sigma_y^2\Omega_0\Gamma}\ ,\ 2[i^*(1-t^*)-q]\} \leq \alpha(1-f) < \frac{1}{\sigma_y^2\Omega_0^2\Gamma} \quad (4\text{-}12)$$

Proof A. Recalling the intra traded assets term in equation (4-11), given (A) conditions the first term is greater than or equal to zero as long as: $2[i^*(1-t^*)-q] \leq \alpha(1-f) < \frac{1}{\sigma_y^2\Omega_0^2\Gamma}$ and the sum of the rest of the terms is positive or zero if: $\alpha(1-f) \geq \frac{1}{2[\Omega_0-\frac{\partial\Omega_0}{\partial f}(1-f)]\sigma_y^2\Omega_0\Gamma}$ □

B) If the real return on foreign assets is greater than that on domestic capital net of the government output share, then:

$$\frac{1}{2[\Omega_0-\frac{\partial\Omega_0}{\partial f}(1-f)]\sigma_y^2\Omega_0\Gamma} \leq \alpha(1-f) < Min\{\frac{1}{\sigma_y^2\Omega_0^2\Gamma}\ ,\ 2[i^*(1-t^*)-q]\} \quad (4\text{-}13)$$

Proof B. From equation (4-11) we see, given the above (B) conditions the first term is greater than zero as long as: $\alpha(1-f) < Min\{\frac{1}{\sigma_y^2\Omega_0^2\Gamma}\ ,\ 2[i^*(1-t^*)-q]\}$ and the sum of the rest terms is greater than or equal to zero if: $\alpha(1-f) \geq \frac{1}{2[\Omega_0-\frac{\partial\Omega_0}{\partial f}(1-f)]\sigma_y^2\Omega_0\Gamma}$ □

Needless to say that case A contains situations where the real return on foreign assets is negative and zero as well. An interesting case is when the real return on foreign assets is negative and we have the following relationship: $r < -\sigma_y[i^*(1-t^*)-q]$. In this case the inequality (4-12) always holds. This is so because in this case we always obtain $\frac{\partial \Omega_0}{\partial f}(1-f) > \Omega_0$, which means the left hand side of the inequality (4-12) is always negative.

For the welfare consequences of financial repression policy, the same argument as that raised for the fixed rates case can be raised. The only new element is the effect of financial repression policy on the nominal interest rate which, on the one hand, will reinforce the transaction costs effect on real money balances and, on the other hand, will boost the initial value of wealth.

4.2.2 Government Expenditure (Demand Side) Shocks

4.2.2.1 Exchange Rate Arrangement

Like the productivity shocks, there are four main channels, that is, real money balances, expected growth, variance of growth and initial level of wealth, through which the different exchange rate arrangements will impact on the welfare.

The real money balances and the initial value of wealth channels operate through the effect of exchange rate arrangements on the equilibrium nominal interest rate for which we have:

$$sgn\left(\frac{dln\ n_M}{d\rho}\right)_{\sigma_g^2 \neq 0} = -sgn\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_g^2 \neq 0} \tag{4-14}$$

$$sgn\left(\frac{dln\ W_0}{d\rho}\right)_{\sigma_g^2 \neq 0} = -sgn\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_g^2 \neq 0} \tag{4-15}$$

According to (4-14) and (4-15), the effect of exchange rate arrangements on the real money balances and the initial value of wealth depends negatively on the quality of the relationship between the exchange rate arrangements and the equilibrium nominal interest rate which is, in general, ambiguous. However, below we will discuss the conditions under which the equilibrium nominal interest rate is a (monotonic) decreasing/increasing function of ρ.

The welfare implication of the exchange rate arrangements through the expected growth channel can be decomposed into two main components as follows:

$$\left(\frac{d\psi}{d\rho}\right)_{\sigma_g^2 \neq 0} = \left\{\frac{\partial\Omega}{\partial\rho}[(1-g)\{i^*(1-t^*)-q\}-(i^*-q)]\right\} + \left\{\frac{\frac{\partial i}{\partial\rho}(1+\Pi)\theta\mu^2\zeta(f)}{[i-(1+\Pi)\zeta(f)\mu]^2}\right\} \qquad (4\text{-}16)$$

The term in the first curly brackets represents the intra traded assets effect resulting from changing the flexibility of the exchange rates when the economy is buffeted by the government expenditure shocks. Considering the following corollary for the exchange rate arrangements involving $\rho \succ -1$ ($\rho \prec -1$), it is always negative (positive) as long as the output share of the government expenditure and/or tax on foreign assets return (capital control) are not zero.

Corollary 3-1-3: *As long as $\rho \succ -1$ ($\rho \prec -1$), the less (more) flexible are the exchange rates the more would be the share of domestic capital in the traded assets when the economy is exposed to the government expenditure shocks.*

Proof: Taking derivative from the equilibrium Ω obtained by solving the equation (3-23'-1), we will have:

$$\left(\frac{\partial\Omega}{\partial\rho}\right)_{\sigma_g^2 \neq 0} = \frac{\Omega}{(1+\rho)} \quad \begin{matrix} \succ 0 & if: & \rho \succ -1 \\ \prec 0 & if: & \rho \prec -1 \end{matrix} \quad \Rightarrow \quad \left(\frac{\partial\Omega}{\partial|\rho|}\right)_{\sigma_g^2 \neq 0} \succ 0 \qquad (4\text{-}17) \quad \square$$

According to the above corollary, $|\rho| \to \infty$ (i.e. two extreme cases fixed rates and super leaning with the wind) entails the maximum share of domestic capital in traded assets. Moreover, noting the equilibrium level of Ω, it is clear that the intra traded assets effect is independent of the exchange rate arrangements in this case and it can be assigned only to the implications of exchange rate arrangements for the equilibrium share of the traded assets through the cost of inflation variance. This can be viewed as a reflection of the fact that as long as the inflation variance is costly and the economy is buffeted only by government expenditure shocks, there is no exchange rate arrangement which can isolate the variance of domestic inflation from the government expenditure shocks. In other words, in a general equilibrium setting, the exchange rate arrangement through its consequence for the share of traded assets leaves the domestic inflation variance unaffected when the economy is hit only by government expenditure (demand side) shocks (refer to the equation (3-16)).

The second bracket in equation (4-16) refers to the inter traded-nontraded assets effect whose sign is determined by the sign of the $(\partial i/\partial \rho)$. The following remark reveals the conditions under which the less (more) flexibility in exchange rates will be accompanied by a lower (higher) nominal interest rate:

Remark 3: *a) As long as the equilibrium expected rates of exchange depreciation is negative and $\rho \succ -1$, the following is the sufficient condition in order for the equilibrium nominal interest rate to be a (monotonic) increasing function in ρ:*

$$\psi + q + \Omega^2 \alpha(f)^2 \sigma_g^2 \succ \frac{2\Lambda\delta}{(1+\rho)} \qquad \forall \rho \succ -1 \qquad (a\text{-}4\text{-}3)$$

b) As long as the equilibrium expected rates of exchange depreciation is positive and $\rho \succ -1$, the following is the sufficient condition in order for the equilibrium nominal interest rate to be a (monotonic) decreasing function in ρ:

$$\psi + q + \Omega^2 \alpha(f)^2 \sigma_g^2 + \Omega[(1-g)i^* t^* + g(i^* - q)] \prec \frac{2\Lambda\delta}{(1+\rho)} \qquad \forall \rho \succ -1 \qquad (b\text{-}4\text{-}3)$$

c) As long as $\rho \prec -1$, the following conditions are sufficient in order for equilibrium nominal interest rate to be an increasing function in ρ:

$$\psi + q + \frac{2\Lambda\delta}{(1+\rho)} \succ \Omega[(1-g)i^* t^* + g(i^* - q)]$$
$$(1+\Pi)(1+\rho) \prec -\frac{\theta(1+\Pi)^2 n_M^2}{\zeta(f)[n_k + n_{B^*}]^2} \qquad \text{(c-4-3)}$$

Proof: Taking the derivative of (3-25'-2) with respect to ρ, we obtain:

$$\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_g^2 \neq 0} = \left(\frac{\partial e}{\partial \rho}\right)_{\sigma_g^2 \neq 0} + \frac{\alpha(f)^2 \sigma_g^2 \Omega^2}{(1+\rho)^2} \qquad (4\text{-}18)$$

$$\textit{where:} \quad \left(\frac{\partial e}{\partial \rho}\right)_{\sigma_g^2 \neq 0} = \left\{\frac{\psi + q}{(1+\rho)^2}\right\} - \left\{\frac{2\Lambda\delta}{(1+\rho)^3}\right\} - \left\{\frac{\left(\frac{\partial \psi}{\partial \rho}\right)_{\sigma_g^2 \neq 0}}{(1+\rho)}\right\}$$

The second term in the above equation is always positive. When the equilibrium expected rates of exchange depreciation is positive (negative) and the condition (*4-b-3*) ((4-*a-3*)) holds, the sum of the first and second terms is always negative (positive). Also, the conditions (c-4-3) ensure the right hand side of (4-18) is positive. □

Clearly, the above remark is inconclusive and in general the direction of a change in the degree of flexibility of exchange rates on the nominal interest rate is ambiguous and is determined by the relative magnitudes of the structural and policy parameters as well as the size of the variance of government expenditure shocks all have been given in equation (4-18).

Hence, equation (4-16) suggests, in general, the optimality of the exchange rate arrangements in the context of the expected growth is determined by the relative sizes of the intra traded and inter traded-nontraded assets effects depending upon the structural and policy variables. Intuitively, when $\rho \succ -1$, an immediate impact of less flexible rates is reducing the cost of inflation variance associated with the domestic capital and thereby increasing the real return on domestic capital and, other things equal, leading to a switch towards domestic capital. Since domestic capital net of the output share of government expenditure is less growth enhancing relative to foreign assets, this shift in the agent's portfolio will certainly deteriorate the expected growth, meaning a negative intra traded assets effect. The reverse holds for the $\rho \prec -1$. However, in order to maintain the assets market equilibrium, this pushes the equilibrium nominal interest rate up. On the other hand, less flexible rates involve a higher expected rate of exchange depreciation if the equilibrium expected rate is negative. This, with a rise in risk premium associated with government bonds resulting from less flexibility in exchange rates, will reinforce the foregoing intra traded assets effect on forcing up the equilibrium nominal interest rate and, hence, result in a positive inter traded-nontraded assets effect which is growth enhancing. Which one of these two offsetting effects outweighs the other depends mainly on the relative values of the agent's time preference, marginal utility of money and future consumption, government debt policy and the cost of inflation variance. For instance, we expect the less (more) is the marginal utility of money and/or the more (less) is the agent patient and the higher (lower) is the cost of inflation variance, the intra traded (inter traded-nontraded) assets effect outweighs the inter traded-nontraded (intra traded) assets effect and thus less flexible rates are growth deteriorating (enhancing) if the conditions in remark 4-3 hold. The same forces come into play for the other cases. If we take the extreme position, when the cost of inflation variance is zero and the leaning against the wind is of the main concern, roughly speaking, we expect that economies which enjoy (suffer) from more (less) disciplined monetary authorities and higher (lower) levels of growth relative to the domestic rate of money growth and the less (more) severe government expenditure shocks, the floating (fixed) rates performs worse against the government expenditure shocks in the context of expected growth. In this case if the condition in remark 4-3 holds fixed (floating) rates is optimal. Otherwise, either managed or fixed (floating) rates will perform best. On the other extreme side, if the marginal utility of money and/or agent's time preference are close to zero (real money balances is not elastic with respect to interest rate) while the inflation variance is costly for the economy, floating rates performs best as long as the government expenditure share and/or tax on foreign assets return (capital control) are not zero.

The implication of exchange rate arrangements for the variance of the growth is given as:

$$\left(\frac{d\sigma_z^2}{d\rho}\right)_{\sigma_g^2 \neq 0} = \frac{2\alpha(f)^2\sigma_g^2\Omega^2}{(1+\rho)} \quad \begin{matrix} \succ 0 & if: & \rho \succ -1 \\ \prec 0 & if: & \rho \prec -1 \end{matrix} \qquad (4-19)$$

According to the above equation, as long as we are concerned about the exchange rate arrangements involving leaning against the wind, the floating rates performs best in isolating the growth from the government expenditure (demand side) shocks, whereas, as described above, the variance of domestic inflation is independent of exchange rate arrangements as long as there is no McKinnon-Shaw effect and the inflation variance is costly. This means there would not be any trade off between stabilization of domestic inflation and economic growth for the economies which are susceptible to government expenditure shocks. However, since from (4-19) we know: $|\rho| \to -1 \Rightarrow (d\sigma_z^2/d\rho) \to \infty$, one can argue that the optimal exchange rate arrangement for the purpose of growth stabilization is one of the managed float with leaning with the wind. Hence, generally, we can establish the following:

Proposition 4-7: *In the absence of the McKinnon-Shaw effect when the economy is buffeted by government expenditure (demand side) shocks, the optimal exchange rate arrangement for growth stabilization is managed float with leaning with the wind. This* *optimal growth stabilization is achieved without any (domestic) inflation destabilization cost. The floating rates perform best in this respect as long as we are concerned about the exchange rate arrangements involving leaning against the wind.*

Nonetheless, once the inflation variance is not costly, this result will change. That is, in the absence of the McKinnon-Shaw effect and the cost of inflation, there is no room for exchange rate arrangements in stabilizing the variance of growth while fixed rates performs best in stabilizing the domestic inflation against the government expenditure shocks within the arrangements involving leaning against the wind, which is in contrast with the classical literature in this respect. For the arrangements involving leaning with the wind, the minimum variance of domestic inflation is obtained when $\rho \to -\infty$ (i.e. super leaning against the wind). Considering the proposition (4-2) and (4-6), one can conclude, by induction, that in the absence of McKinnon-Shaw effect, *the managed float with leaning with the wind performs best in stabilization of growth against domestic (real) shocks.*

Furthermore, taking into account the above analysis with regard to expected growth, we can conclude that when the elasticity of real money balances with respect to the interest rate is low and the cost of inflation variance is so high that the intra traded assets effect outweighs the inter traded-nontraded assets effect, there would not be any conflict between expected and variance of growth and domestic inflation objectives with respect to the optimality of the exchange rate arrangements, which in this case is managed float with leaning with the wind (and within the leaning against the wind arrangements, it is floating rates). Nonetheless, there still may exist trade offs among the real money balances and the initial value of wealth on the one hand, and expected growth and variance of growth, on the other hand.

Again, financial repression policy plays an important role in determination of the optimal degree of flexibility. This can be realized by considering the implications of financial repression for the marginal productivity of domestic capital and the marginal utility of money, which play a crucial role in many occasions raised above. In order to show this more clearly, the same strategy as that followed for productivity shocks is carried out here. That is, we will work out the optimal level of ρ when there is no McKinnon-Shaw effect and cost of inflation variance. However, for the sake of brevity, the analysis is as concise as possible.

The optimal level of ρ when the economy is hit by the government expenditure shocks is as follows:

$$\rho^*_{\sigma_g^2 \neq 0} = \frac{-[\psi^{\hat{}} + q - \Omega^2 \alpha(f)^2 \sigma_y^2] \pm \sqrt{[\psi^{\hat{}} + q - \Omega^2 \alpha(f)^2 \sigma_g^2]^2 + 4\Lambda\delta[\hat{\imath} - i^*(1-t^*)]}}{2[\hat{\imath} - i^*(1-t^*)]} - 1$$

$$\text{where:} \quad \psi^{\hat{}}_{\sigma_g^2 \neq 0} = \Omega(1-g)\alpha(f) + (1-\Omega)(i^* - q) - \frac{\hat{\imath}\theta\mu}{[\hat{\imath} - (1+\Pi)\zeta(f)\mu]} \tag{4-20}$$

$$\hat{\imath} = \frac{[\zeta(f) + \sqrt{\zeta(f)^2 + 4\zeta(f)\theta}](1+\Pi)\mu}{2}$$

As we observe, like productivity shocks, fixed rates are not optimal for the economies whose capital accounts are completely closed, as long as the marginal utility of money is greater than zero. Comparing this with the optimal ρ when there are productivity shocks, we find that the only difference is due to the equilibrium share of the traded assets. This is so because the ORP, as mentioned earlier, is independent of the variance of any sort of shocks and the other components are the same structural parameters and policy variables except for Ω and thereby the optimal expected growth (i.e. $\psi^{\hat{}}$). When there is no inflation variance cost, the arbitrage equation (3-23-1) implies equality between the real return on domestic capital, which is a function of the financial repression policy, and after tax (capital control) real return on the foreign assets. Therefore, from the investors' point of view, there would not be any difference between these two types of assets as long as the return on them are equal to each other (recall that here we have assumed there is no foreign inflation and productivity shocks). However, any inequality in the real return on these assets leads to an extreme value for Ω (i.e. either zero or one). This is so because of, on the one hand, the AK production technology and, on the other hand, the small open economy assumptions. In addition, it stresses that the share of traded assets, in this occasion, is perfectly elastic with respect to either financial repression or foreign assets taxation policies. Put differently, this reflects the complete interdependence of these two policy instruments as long as an interior equilibrium share of domestic capital in traded assets is the main concern (which is not necessarily the case here).

Although, this characteristic imposes a restriction on reaching a definite conclusion, it does not necessarily undermine our qualitative analysis. In fact, as far as it goes back to the importance of financial repression policy for the optimal degree of flexibility of exchange rates, it emphasizes more the role of financial repression through the Goldsmith channel, since any change in the degree of financial repression involves a dramatic reallocation in the share of traded assets. However, it is not the only channel through which financial repression policy does matter for growth, the effect of that on transaction costs and thereby $\tilde{\imath}$ and ψ^{*} provides another channel which can affect even the ORP. *This enables us to generalize our conclusion in the proposition (4-3) to the government expenditure (demand side) shocks.*

In order to study the consequences of a (unanticipated) change in policy variables and structural parameters for the optimal ρ, like the productivity shocks case, we only focus on the more tractable and illustrative situation where a ultra-conservative central banker is in office. Also, due to the above mentioned feature of Ω, the following analysis, without losing the generality of results, is carried out based on the assumption that the initial situation involves equality between the real return on domestic and foreign assets.

The immediate effect of an increase in government expenditure is a reduction in optimal growth under floating rates which implies an increase (a decrease) in the optimal ρ if the ORP is positive (negative). This can be realized by looking at the following expression:

$$\left(\frac{\partial \rho^{*}}{\partial g}\right)_{\sigma_g^2\neq 0}^{\Lambda=0} = \frac{\Omega\,\alpha(f)}{[\tilde{\imath}-i^{*}(1-t^{*})]}.$$

As we see, financial repression policy plays an important role in the determination of the magnitude and direction of this policy change on the optimal ρ.

An increase in expected foreign inflation, though it leaves the ORP unaffected, induces a shift towards domestic capital in the traded assets thereby raising the risk associated with domestic government bonds and altering the optimal expected growth under floating rates which can be positive or negative depending upon the relative magnitude of the real return on domestic capital net of the government expenditure and that on foreign assets. Briefly, it entails just a change in the ORPF whose sign is ambiguous. The following shows this sequence of effects on the optimal ρ:

$$\left(\frac{\partial\rho^*}{\partial q}\right)^{\Lambda\ 0}_{\sigma_g^2\neq 0}=\frac{\frac{\partial\Omega}{\partial q}[2\Omega\alpha(f)^2\sigma_g^2-(1-g)\alpha(f)+(i^*-q)]-\Omega}{[\hat{\imath}-i^*(1-t^*)]}$$

As written, there is no clear-cut conclusion here and everything depends on the sign of the ORP, the size of the variance of government expenditure shocks, the initial level of the share of domestic capital in traded assets, the relative magnitude of the real return on domestic capital net of the government expenditure and that on the foreign assets and above all the degree of financial repression.

According to equation (4-20), the optimal ρ is affected by the size of the variance of government expenditure shocks through the risk associated to the government bonds. More precisely, an increase in the variance of government expenditure will raise the ORPF without any changes in the ORP. Therefore, if the optimal risk premium is positive (negative), a reduction (rise) in the flexibility of the exchange rates is necessary in order to force down (up) the ORPF and to restore the maximum level of welfare. The following expression exhibits this fact:

$$\left(\frac{\partial\rho^*}{\partial\sigma_g^2}\right)^{\Lambda=0}_{\sigma_g^2\neq 0}=\frac{\Omega^2\alpha(f)^2}{[\hat{\imath}-i^*(1-t^*)]}$$

As we see, the degree of financial repression plays an important role in this regard.

A change in tax on foreign assets (capital control) sparks off changes in the ORP and ORPF thereby entailing a change in the optimal ρ. This has been denoted in the following expression:

$$\left(\frac{\partial\rho^*}{\partial t^*}\right)^{\Lambda-0}_{\sigma_g^2\neq 0}=\frac{\frac{\partial\Omega}{\partial t^*}[2\Omega\alpha(f)^2\sigma_g^2-(1-g)\alpha(f)+(i^*-q)]-i^*\rho^*}{[\hat{\imath}-i^*(1-t^*)]}$$

It suggests that the initial level of optimal ρ, besides the other factors, is involved too. That is, if fixed rates is the initial optimal arrangement, more flexible rates will be optimal for a higher level of foreign assets tax. However, when floating rates is the initial optimal arrangement and the ORP is positive (negative), the more-leaning with wind- (less) flexible rates are optimal if the real return on domestic capital net of the output share of government expenditure is greater than the sum of the real return on foreign assets and the increase in risk to domestic capital. In the managed rates case, the initial level of the optimal ρ will play a role as well. That is, whenever we have: $\rho^* \succ \frac{i^* + \frac{\partial\Omega}{\partial t^*}[2\Omega\alpha(f)^2\sigma_g^2 - (1-g)\alpha(f) + (i^* - q)]}{i^*}$, for the positive (negative) ORP it is expected that the more (less) flexible rates be optimal. In any event, financial repression policy is a crucial determinant of the size and sign of the relationship between t^* and the optimal ρ.

A rise in the marginal utility of consumption raises the ORPF, due to a reduction in optimal growth under floating rates, and the ORP thereby giving rise to a change in optimal flexibility of exchange rates as follows:

$$\left(\frac{\partial\rho^*}{\partial\theta}\right)^{\Lambda-0}_{\sigma_g^2\neq 0} = \frac{1}{[\hat{\imath} - i^*(1-t^*)]^2}\left(-\frac{\partial\psi^{`}}{\partial\theta}[\hat{\imath} - i^*(1-t^*)] - \frac{\partial\hat{\imath}}{\partial\theta}(1+\Pi)\mu[\Omega^2\alpha(f)^2\sigma_g^2 - \psi^{`} - q]\right)$$

$$\textit{where:} \quad \frac{\partial\psi^{`}}{\partial\theta} = \frac{\theta\mu^2\zeta(f)(1+\Pi)\frac{\partial\hat{\imath}}{\partial\theta} - \hat{\imath}\mu[\hat{\imath} - (1+\Pi)\zeta(f)\mu]}{[\hat{\imath} - (1+\Pi)\mu\zeta(f)]^2} \prec 0$$

$$\frac{\partial\hat{\imath}}{\partial\theta} = \frac{(1+\Pi)\mu}{\sqrt{1+[4\theta/\zeta(f)]}} \succ 0$$

The first term in brackets indicates the change in optimal ρ due to a change in the ORPF which can be positive or negative depending on the sign of the initial ORP and the second term represents the change in the optimal ρ through the change in the ORP which also can be positive or negative depending on the initial ORPF. Thus, its sign and magnitude, in general, are subject to ambiguity and financial repression has got an important role in this respect.

All the same, an increase in an agent's rate of time preference results in a proportional (to initial ORP) change in ρ^* as a result of a change in the ORPF and another proportional (to initial ORPF) change in the optimal ρ due to a concomitant change in the ORP both given in the following:

$$\left(\frac{\partial\rho^*}{\partial\mu}\right)^{\Lambda=0}_{\sigma_g^2\neq 0} = \frac{1}{[\hat{\imath} - i^*(1-t^*)]^2}\left(\frac{\hat{\imath}\theta[\hat{\imath} - i^*(1-t^*)]}{[\hat{\imath} - (1+\Pi)\zeta(f)\mu]} - \frac{\hat{\imath}[\Omega^2\alpha(f)^2\sigma_g^2 - \psi^{`} - q]}{\mu}\right)$$

Again the type of relationship depends on the relative sizes and signs of the two terms in the brackets which stand for the changes in the ORPF and ORP. The role of financial repression in this respect is apparent too.

An increase in government debt gives rise to an increase in the ORPF and leaves the ORPF unchanged. This has been shown in the following:

$$\left(\frac{\partial\rho^*}{\partial\Pi}\right)^{\Lambda\ 0}_{\sigma_g^2\neq 0}=-\frac{\hat{\imath}[\Omega^2\alpha(f)^2\sigma_g^2-\psi^{\hat{}}-q]}{[\hat{\imath}-i^*(1-t^*)]^2(1+\Pi)}$$

According to the above expression, we can say that when the initial ORPF is positive (negative), the higher is the government debt the more (less) flexible rates is optimal. Once again, financial repression is a crucial determinant in this respect.

A change in the degree of financial repression policy leads to a change in the ORPF and ORP causing a change in the optimal degree of flexibility of exchange rates given as follows:

$$\left(\frac{\partial\rho^*}{\partial f}\right)^{\Lambda=0}_{\sigma_g^2\neq 0}=\frac{1}{[\hat{\imath}-i^*(1-t^*)]^2}$$

$$\left\{[\hat{\imath}-i^*(1-t^*)][2\Omega\alpha(f)\sigma_y^2(\alpha(f)\frac{\partial\Omega}{\partial f}+\alpha(f)'\Omega)-\frac{\partial\psi^{\hat{}}}{\partial f}]-\frac{\partial\hat{\imath}}{\partial f}[\Omega^2\alpha(f)^2\sigma_g^2-\psi^{\hat{}}-q]\right\}$$

where: $$\frac{\partial\psi^{\hat{}}}{\partial f}=\frac{\partial\Omega}{\partial f}[(1-g)\alpha(f)-(i^*-q)]+\alpha(f)'(1-g)\Omega-\frac{(1+\Pi)\mu^2\theta[\zeta(f)'\hat{\imath}-\zeta(f)\frac{\partial}{\partial}}{[\hat{\imath}-(1+\Pi)\zeta(f)\mu]^2}$$

$$\frac{\partial\hat{\imath}}{\partial f}=\frac{1}{2}\left(1+\frac{\zeta(f)+2\theta}{\sqrt{\zeta(f)^2+4\theta\zeta(f)}}\right)\zeta(f)'\mu(1+\Pi)\succ 0$$

As written, the type of relationship between financial repression and the optimal ρ, can not easily be realized. Despite the productivity shocks, here we know that an increase in financial repression leads to a reduction in Ω. This, with a reduction in the real return on domestic capital will be definitely (optimal) growth deteriorating if the real return on foreign assets is less than that on domestic capital net of the government expenditure. This is so because the last term is always negative as one can show that: $[\zeta(f)'\hat{\imath}\ \ \zeta(f)\frac{\partial\hat{\imath}}{\partial f}]\ \frac{\zeta(f)'\zeta(f)(1+\Pi)\mu\theta}{\sqrt{\zeta(f)^2+4\theta\zeta(f)}}\succ 0$.
However, since an increase in financial repression motivates the other forces, such as a reduction in risk associated to domestic capital and an increase in the ORP, the overall outcome is ambiguous.

The relationship between the optimal ρ and the type of central banker in office is given as:

$$\left(\frac{\partial \rho^*}{\partial \Lambda}\right)_{\sigma_g^2 \neq 0} = \frac{\pm\delta}{\sqrt{[\psi^{\hat{}} + q - \Omega^2 \alpha(f)^2 \sigma_g^2]^2 + 4\Lambda\delta[\hat{\imath} - i^*(1-t^*)]}}$$

From this, the positive (negative) optimal ρ implies the less conservative central banker requires the less (more) flexible rates to be optimal. Even here, financial repression policy plays a role in between.

4.2.2.2 Financial Repression

In order to study if there is any welfare (growth) case for financial repression policy given the specific exchange rate arrangement, the same strategy as productivity shocks will be followed here. The only difference is the generalization of our analysis regarding the floating rates to the flexible rates including managed and floating rates. We do this here due to more structural tractability in the case of government expenditure shocks.

Fixed Exchange Rates

From the expected growth point of view, any change in financial repression policy involves a reallocation within the traded assets (intra traded assets effect) and a reallocation between traded and nontraded assets (inter traded-nontraded assets effect). Under the fixed rates, though the inter traded -nontraded assets effect is always growth deteriorating, the intra traded assets effect can be positive (growth enhancing) or negative (growth deteriorating). Therefore, the overall growth effect of financial repression under fixed rates depends on the relative values and signs of these two effects. Accordingly, we can establish the following:

Proposition 4-7: *under fixed rates when the economy is exposed to government expenditure shocks, the necessary condition for financial repression to be growth enhancing is that the real return on foreign assets be positive and the sufficient condition is that the absolute value of inter traded-nontraded assets effect, originating from financial repression policy, be less than the value of the intra traded assets effect.*

Proof: In the absence of the McKinnon-Shaw effect, from (3-23'-2) we have:

$$\left(\frac{\partial\psi_{\infty}}{\partial f}\right)_{\sigma_g^2\neq 0}=\frac{\partial\Omega_{\infty}}{\partial f}\{(1-g)[i^*(1-t^*)-q]-(i^*-q)\}-\frac{\theta\mu\zeta'(f)(1+\Pi)i^*(1-t^*)}{[i^*(1-t^*)-(1+\Pi)\zeta(f)\mu]^2} \qquad (4\text{-}21)$$

Under fixed rates an increase in the degree of financial repression will always lead to a decrease in the share of domestic capital in the traded assets (i.e. $(\partial\Omega_{\infty}/\partial f)<0$). As long as the output share of government expenditure and/or tax on foreign assets (capital control) are greater than zero, the overall value in curly brackets is negative if the real return on foreign assets is greater than zero. Hence, the intra traded assets effect is positive. The second term in (4-21) represents the inter traded-nontraded assets effect which is always negative. □

The economic viability criterion assures that the necessary condition in the above proposition always holds[6]. Intuitively, as for the positive share of the government expenditure, here the domestic capital contributes to growth relatively less than foreign assets, an increase in financial repression leading to a switch towards the foreign assets will improve growth as long as the real return on foreign assets is positive. Needless to say, if the marginal utility of money is independent of financial repression, the second term is always zero. However, if it is sensitive to financial repression it is possible that the financial repression policy up to some level improves the growth and beyond some threshold its negative effect overcomes its growth enhancing effect. Also, the less is the marginal utility of consumption and/or money and/or government debt and the more is the agent patient, the less would be the absolute value of inter traded-nontraded assets effect.

The effect of financial repression policy on the variance of the growth is as follows:

$$\left(\frac{\partial\sigma_z^{*2}}{\partial f}\right)_{\sigma_g^2\neq 0}=-2\alpha^2(1-f)\Omega\sigma_g^2[\Omega-\frac{\partial\Omega}{\partial f}(1-f)]<0$$

As written, the financial repression policy has a decreasing effect on the variance of growth through a change in the real return on domestic capital and thereby a reallocation within the portfolio of traded assets. Since we have: $\Omega>(\partial\Omega/\partial f)\,(1-f)$ for all types of exchange rate arrangements, this result holds for all degrees of exchange rates flexibility. Hence, financial repression policy has a welfare improving impact through a reduction in the variance of growth. Moreover, financial repression can boost welfare through an increase in the share of real money balances as a result of a rise in transaction costs. Therefore, if the conditions in proposition (4-7) are in place, financial repression policy can improve the welfare through an improvement in the expected growth leading to a reduction in expected inflation (note that the variance of domestic inflation is zero under fixed rates). This can raise the initial real wealth. Also, when the marginal utility of money is sensitive to financial repression, it can be welfare enhancing through a raising the real money balances as long as it does not lead to a deterioration in expected growth. Thus, under the fixed rates one can conceive occasions in which financial repression policy might be welfare (growth) improving.

Flexible Exchange Rates

Like the fixed rates, an increase in the degree of financial repression under flexible rates induces a revision in the agent's traded assets portfolio and a switch from traded towards nontraded assets. As before, the latter is definitely growth deteriorating and the former might be either growth enhancing or growth improving. This is so because an increase in the degree of financial repression may cause a switch either away or towards the domestic capital in traded assets. When the real return on foreign assets is positive (negative) a switch away from (towards) domestic capital leads to a positive intra traded assets effect which is growth enhancing. In general, whenever the real return on domestic capital (adjusted for the financial repression) is less (greater) than twice of the after tax real return on foreign assets there would be a switch away from (towards) the domestic capital in traded assets. The following proposition clarifies the occasions in which there might be a growth case for the financial repression policy:

proposition 4-8: *Under flexible rates (managed and floating rates) when the economy is susceptible to government expenditure shocks, the necessary condition for financial repression policy to be growth enhancing is that the intra traded assets effect be positive and the sufficient condition is that the absolute value of the inter traded-nontraded assets effect be less than the value of intra traded assets one.*

Proof: In the absence of McKinnon-Shaw effect, from (3-23'-2) we obtain:

$$\left(\frac{\partial\psi}{\partial f}\right)_{\sigma_g^2\neq 0} = \frac{\partial\Omega}{\partial f}\left\{(1-g)[i^*(1-t^*)-q]-(i^*-q)\right\}+\left\{\frac{-(1+\Pi)\mu^2\theta[i\zeta'(f)-\frac{\partial i}{\partial f}\zeta(f)]}{[i-(1+\Pi)\zeta(f)\mu]^2}\right\} \qquad (4\text{-}22)$$

$$where: \quad \left(\frac{\partial\Omega}{\partial f}\right)_{\sigma_g^2\neq 0} = \frac{-\alpha(1+\rho)^2}{2\Gamma\Omega\alpha^2(1-f)^2\sigma_g^2}+\frac{\Omega}{(1-f)}$$

The term in the second curly brackets represents the inter traded-nontraded assets effect which is always negative. While the first term represents the intra traded assets effect which for positive (negative) real return on foreign assets is positive if:

$$\alpha(1-f) \prec(\succ)\ 2[i^*(1-t^*)-q] \qquad \square$$

From this, we see that a negative real return on foreign assets definitely involves a switch towards domestic capital within the traded assets following an increase in the degree of financial repression. The occasions in which the inter traded-nontraded assets is low have already been described.

For the welfare implications of the financial repression policy, the same analysis as the fixed rates regime can be raised with this consideration that here the nominal interest rate will be affected by the financial repression policy and thereby sparking off an increase in real money balances and initial value of wealth. In addition, according to the following expression based on equation (3-16), the variance of domestic inflation will decline as a result of the increase in the degree of financial repression:

$$\left(\frac{\partial\sigma_p^2}{\partial f}\right)_{\sigma_g^2\neq 0} = -\frac{\alpha(1+\rho)^2}{\Gamma(1-f)} \prec 0$$

This, again, emphasizes on the role of financial repression as a shock absorber from a different point of view.

4.3 Foreign Inflation Shocks

4.3.1 Exchange Rate Arrangement

When the economy is susceptible to foreign inflation shocks, different degrees of flexibility of exchange rates introduce welfare implications through the share of real money balances, expected growth, the variance of growth and the initial value of wealth. It affects the real money balances and the initial value of wealth through its implications for the equilibrium nominal interest rate, which can be positive or negative depending on the relative magnitudes of the structural and policy variables, as we have:

$$sgn\left(\frac{dln\ n_M}{d\rho}\right)_{\sigma_q^2 \neq 0} = -sgn\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_q^2 \neq 0} \tag{4-23}$$

$$sgn\left(\frac{dln\ W_0}{d\rho}\right)_{\sigma_q^2 \neq 0} = -sgn\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_q^2 \neq 0} \tag{4-24}$$

Any change in the degree of flexibility of exchange rates will again motivate two main, already familiar, runs of reallocations in the agent's portfolio given as follows:

$$\left(\frac{d\psi}{d\rho}\right)_{\sigma_q^2 \neq 0} = \left\{\frac{\partial \Omega}{\partial \rho}[(1-g)\{\alpha(f) - \frac{(1+\rho-\Omega)^2\sigma_q^2\Gamma}{(1+\rho)^2}\} - (i^* - q + \sigma_q^2)] - \frac{2(1-g)\Omega^2(1+\rho-\Omega)\sigma_q^2\Gamma}{(1+\rho)[(1+\rho)^2+2\Gamma(\Omega-1-\rho)]}\right\} + \left\{\frac{\frac{\partial i}{\partial \rho}(1+\Pi)\theta\mu^2\zeta(f)}{[i-(1+\Pi)\zeta(f)\mu]^2}\right\} \tag{4-25}$$

In the above equation, the term in the first curly brackets represents the intra traded assets effect while that in the second one stands for the inter traded-nontraded assets effect. According to the following corollary, for the low values of the marginal cost of inflation variance (e.g. $\Gamma \prec 1$), less flexible rates imply a lower share of domestic capital in traded assets and an increase in the cost of inflation variance which is growth deteriorating (the second term in the first curly brackets). The latter is the result of the increasing effect of the less flexible rates on the variance of the domestic inflation in this occasion. Under this circumstance, the necessary condition for the intra traded assets effect to be positive is that the real return on foreign assets be greater than that on the domestic capital net of the government expenditure. Otherwise, it is always negative.

Corollary 3-1-4: *a) When the economy is susceptible to foreign inflation shocks and $\rho \succ -1$, the less flexible are exchange rates the less would be the share of domestic capital in the traded assets as long as the following holds for the marginal cost of inflation variance:*

$$2\Gamma(1+\rho-\Omega) \prec (1+\rho)^2$$

b) When the economy is susceptible to foreign inflation shocks and $\rho \prec -1$, the more flexible *are exchange rates the higher is the share of domestic capital in the traded assets.*

Proof: From (3-23'-1), we have:

$$\left(\frac{\partial\Omega}{\partial\rho}\right)_{\sigma_q^2\neq 0}=\frac{\Omega}{(1+\rho)}\left[1-\frac{(1+\rho)^2}{(1+\rho)^2+2\Gamma(\Omega-1-\rho)}\right] \qquad (4\text{-}26\text{-}1)$$

□

Though the above condition for relatively high values of ρ when ρ is greater than minus one almost always holds, for the low values of ρ and Ω one can conceive a situation in which that condition is violated. Accordingly, for economies in which the marginal cost of inflation variance is high, moderate managed rates in comparison with the floating rates may involve a higher share of domestic capital in the traded portion of the agent's portfolio. The implication of this case for the variance of domestic inflation is the superiority of the (moderate) managed rates to floating rates in stabilizing domestic inflation. Therefore, we can state the following:

Proposition 4-9: *In the absence of a McKinnon-Shaw effect, the managed float with leaning with the wind performs best in the stabilization of domestic inflation against the foreign inflation shocks. When the leaning against the wind arrangement is of the main concern, floating rates is superior in this respect as long as the following holds:* $2\Gamma(1+\rho-\Omega) \prec (1+\rho)^2$. *Otherwise, (moderate) managed rates is superior.*

Proof. From (3-16), we obtain:

$$\left(\frac{d\sigma_p^2}{d\rho}\right)_{\sigma_q^2\neq 0}=\frac{2\Omega(1+\rho-\Omega)\sigma_q^2}{(1+\rho)[(1+\rho)^2+2\Gamma(\Omega-1-\rho)]}$$

□

From (3-16), we observe there is a negative relationship between the variance of domestic inflation and the share of domestic capital in traded assets. That is why, when $\rho \succ -1$ the same condition is at work in corollary (3-1-4) and proposition (4-9). Note that in any case fixed rates performs worse in this respect. Also, when the Γ is zero, that is the inflation variance is not costly, the above condition holds as long as Ω is less than or equal to one (i.e. the country is not a net debtor). However, when the economy is a net debtor, even if inflation variance is not costly, (moderate) managed rates are superior as long as the arrangement involving leaning against the wind is concerned.

The inter traded-nontraded assets effect is a positive function in $(\partial i/\partial \rho)$ whose value and sign are determined as follows:

$$\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_q^2 \neq 0} = \frac{-2\Lambda\delta}{(1+\rho)^3} + \frac{\psi + q + [\frac{\partial \Omega}{\partial \rho}(2\Omega - 1)(1+\rho) - (1-\Omega+\Omega^2)]\sigma_q^2}{(1+\rho)^2} - \frac{\left(\frac{\partial \psi}{\partial \rho}\right)_{\sigma_q^2 \neq 0}}{(1+\rho)} \qquad (4\text{-}26\text{-}2)$$

As before, the direction of effect of any change in degree of flexibility of exchange rates on the equilibrium interest rate is ambiguous. However, for $\rho \succ -1$ when the condition in proposition (4-9) holds and intra traded assets effect and equilibrium expected rates of exchange depreciation are positive, we expect a (monotonic) decreasing relationship between ρ and i for $1/2 \prec \Omega \prec 1$. While under proposition (4-9) condition for $0 \prec \Omega \prec 1/2$ with negative intra traded assets effect and equilibrium expected rates of exchange depreciation, an increasing relationship is expected when $\psi + q \succ \frac{2\Lambda\delta}{(1+\rho)}$. Hence, the relative sizes of inter traded-nontraded and intra traded assets effects are critical in designation of the optimal exchange rate arrangements for expected growth. Generally speaking, as long as we are concerned about the leaning against the wind arrangements, when the condition in proposition (4-9) holds, a reduction in the degree of flexibility of exchange rates will increase the cost of inflation variance thereby decreasing the real return on domestic capital, entailing a switch away from domestic capital towards foreign assets. If the real return on foreign assets is less than that on domestic capital net of the output share of government expenditure, this leads to a negative intra traded assets effect which is growth deteriorating and forces the equilibrium interest rate up in order to maintain the assets market in equilibrium. On the other hand, according to equation (4-26-2) the less flexible rates will induce a change in the equilibrium interest rate which can be increasing or decreasing. If it ends to an increase in the interest rate, the positive inter traded-nontraded assets effect has an offsetting effect and the overall outcome of less flexible rates can be either growth enhancing or growth deteriorating. However, if it is accompanied by a reduction in the equilibrium interest rate, the less flexible rates results in a decline in expected growth. In polar cases where the marginal cost of inflation variance is zero we expect the fixed (floating) rates performs worse for the economies which suffer (enjoy) from less (more) disciplined monetary authorities and lower (higher) level of growth relative to the rate of money growth and experience more (less) sever foreign inflation shocks. In this occasion the optimal arrangement is either floating (fixed) or managed rates. For the other polar case where the marginal utility of money and/or consumption, and /or agent's time preference are close to zero, while the marginal cost of inflation variance is high we expect the floating rates performs best if the real return on foreign assets is less than that on the domestic capital net of the output share of government expenditure and the condition in proposition (4-9) holds. For other occasions a definite conclusion can not be drawn.

In the context of variance of growth, the implications of exchange rate arrangements for the share of domestic capital in the traded assets (corollary 1-3) plays a crucial role as we have:

$$\left(\frac{d\sigma_z^2}{d\rho}\right)_{\sigma_q^2 \neq 0} = -2(1-\Omega)\frac{\partial\Omega}{\partial\rho}\sigma_q^2 \qquad (4\text{-}27)$$

Thus, for arrangements involving $\rho \succ -1$, the economy's indebtedness stance has a key role. Namely, if the economy is not (is) a net debtor, the more (less) flexible rates -super leaning with the wind- performs best in stabilizing growth. However, in the case of arrangements involving leaning against the wind, if the condition in corollary (3-1-4) holds and the economy is not (is) a net debtor the floating (fixed) rates is optimal in insulating the growth against the foreign inflation disturbances. In this case, if the condition does not hold and the economy is not (is) a net debtor (moderate) managed (fixed) rates performs best in stabilizing the growth. As we see, when the economy is a net debtor, fixed rates, irrespective of condition in corollary (3-1-4), perform best in this respect. Therefore, we can establish the following:

Proposition 4-10: *In the absence of the McKinnon-Shaw effect, as long as the leaning against the wind arrangement is concerned, when the economy is a net debtor fixed rates are superior in insulating growth against the foreign inflation shocks. When the economy is not a net debtor either floating , if the marginal cost of inflation variance is fairly low, or (moderate) managed rates, if the marginal cost of inflation variance is relatively high, performs best in this respect. For the arrangements involving* $\rho \succ -1 (\rho \prec -1)$*, the more (less) flexible rates performs best for a net creditor (debtor) economy in stabilizing growth.*

Comparing the above proposition with proposition (4-9), we realize that when the economy is not a net debtor, there is no clash between the objectives of stabilizing the growth and domestic inflation against the foreign inflation shocks.

The above analysis has already revealed the important role of the financial repression policy in the implications of exchange rate arrangements for the main arguments of the welfare function through the transaction costs and Goldsmith channels. In order to make it clearer in the context of the optimal degree of flexibility, below we disregard the cost of inflation variance as well as the McKinnon-Shaw effect and obtain the optimal level of ρ.

When the economy is susceptible to only foreign inflation shocks the optimal level of ρ is as follows:

$$\rho^{*}_{\sigma_q^2\neq 0}=\frac{-[\hat{\psi}+q-(1-\Omega+\Omega^2)\sigma_q^2]\pm\sqrt{[\hat{\psi}+q-(1-\Omega+\Omega^2)\sigma_q^2]^2+4\Lambda\delta[\hat{\imath}-i^{*}(1-t^{*})]}}{2[\hat{\imath}-i^{*}(1-t^{*})]}-1$$

$$\textit{where:}\quad \hat{\psi}_{\sigma_q^2\neq 0}=\Omega(1-g)\alpha(f)+(1-\Omega)(i^{*}-q+\sigma_q^2)-\frac{\hat{\imath}\theta\mu}{[\hat{\imath}-(1+\Pi)\zeta(f)\mu]}$$

$$\hat{\imath}=\frac{[\zeta(f)+\sqrt{\zeta(f)^2+4\zeta(f)\theta}](1+\Pi)\mu}{2}\geq 0 \qquad (4\text{-}28)$$

$$\Omega=\frac{\alpha(f)-[i^{*}(1-t^{*})-q]}{\sigma_q^2}$$

As written, the relative magnitudes of the ORPF (the numerator) and the ORP determine the optimal ρ. Any change in financial repression involves a corresponding change in the ORPF through its effect on the marginal productivity of capital, thereby Ω and $\hat{\psi}$, and $\hat{\imath}$, whereby $\hat{\psi}$ and ORP. Hence, when the marginal utility of money is independent of financial repression (that is, there are no transaction costs associated with financial repression), the ORP is neutral with respect to financial repression, the presence of the Goldsmith channel ensures the nonneutrality of the optimal ρ with respect to the financial repression policy. *This makes us able to generalize proposition (4-3) to foreign inflation shocks as well.* Accordingly, as we expressed earlier, proposition (4-3) is a robust and strong one which confirms our main concern in this study.

Furthermore, like the domestic real shocks, we see that fixed rates are not optimal for economies whose capital accounts are completely closed and money involves utility for the agents. In general, we can state the following:

Proposition 4-11: *In the absence of the McKinnon-Shaw effect and when the inflation variance is not costly, for the economies which are susceptible to domestic real and foreign inflation shocks, the necessary condition in order for the fixed rates to be optimal is that the ORP, which is determined by utility parameters, financial repression, government debt policy, taxation on foreign assets (capital control) and the level of nominal foreign interest rate, to be zero.*

Corollary 4-11-1: *For the economies whose capital accounts are completely closed and are susceptible to domestic real and foreign inflation shocks, the fixed exchange rates regime is not optimal as long as the marginal utility of money is greater than zero.*

Below, the consequences of a (unanticipated) change in policy variables and structural parameters for the optimal ρ is analysed in a more tractable structure where an ultra conservative central banker has been delegated as monetary authority. Evidently, the same argument, though more complicated, can be raised, for the case where a conservative central banker is appointed.

A change in output share of government expenditure results in the following corresponding change in the optimal ρ:

$$\left(\frac{\partial \rho^*}{\partial g}\right)^{\Lambda=0}_{\sigma^2_q \neq 0} = \frac{\Omega \alpha(f)}{[\hat{\imath} - i^*(1-t^*)]}$$

An increase in the mean of the government expenditure entails a reduction in the optimal expected growth under floating rates and thereby an increase in the ORPF calling for less (more) flexibility in exchange rates so long as the ORP is positive (negative). As it is seen, financial repression can affect the magnitude and sign of the above relationship.

Comparing this result with those obtained in the domestic real shocks, we can conclude that *as long as the share of domestic capital in the agent's portfolio is not zero, the higher the output share of government expenditure, irrespective of the type of shocks, involves less* *(more) flexible rates to be optimal provided that the ORP is positive (negative).* Namely:

$$sgn\left(\frac{\partial\rho^*}{\partial g}\right)^{\Lambda=0}_{\sigma_q^2\neq 0} = sgn\left(\hat{\imath} - i^*(1-t^*)\right)$$

A change in the expected foreign inflation induces a change in the ORPF requiring an adjustment in the optimal ρ as follows:

$$\left(\frac{\partial\rho^*}{\partial q}\right)^{\Lambda=0}_{\sigma_q^2\neq 0} = \frac{g\alpha(f)+i^*t^*}{[\hat{\imath}-i^*(1-t^*)]\sigma_q^2}$$

According to the above expression, an increase in expected foreign inflation makes less (more) flexible rates optimal as long as the ORP is positive (negative). Higher foreign inflation entails a reallocation in traded assets towards domestic capital due to a reduction in the real return on foreign assets and subsequently an increase in the ORPF. This with a positive (negative) constant ORP calls for an adjustment in the optimal ρ towards less (more) flexibility. As before, financial repression policy plays an important role in this respect. This result is similar to the productivity shocks case. This is so because in both cases the higher foreign inflation leads to a higher share of domestic capital in the traded assets and an increase in the ORPF.

One of the characteristics of floating rates which has attracted the attention of the previous literature is the extent to which it can insulate the domestic economy from the foreign inflation unanticipated changes. Considering equations (3-23'-1), (3-23'-2), (3-25'-1), (3-25'-2), (3-19'), (3-9'-1), (3-9'-2) and (3-6-3), we see that the necessary and sufficient condition in order for floating rates to insulate the domestic economy perfectly against the unanticipated changes in the foreign inflation is: $di^* = (1-t^*)dq$. Given this condition, we would have: $de=-dq$,meaning a rise in foreign inflation entails an equivalent reduction in the expected rate of exchange depreciation and, hence, the domestic economy will become completely isolated from the foreign inflation changes. This implies that, if the rest of the world is Fisherian, the floating rates fail to insulate fully the domestic economy from foreign inflation shocks as long as there is imperfection in (taxation on) the foreign capital market (accounts) of the economy. This suggests Turnovsky's (1977, 1985,1995) necessary and sufficient condition holds as long as the foreign capital market is perfect.

A change in the variance of foreign inflation shocks involves only a change in the ORPF and leaves the ORP unaffected. The following denotes this fact:

$$\left(\frac{\partial\rho^*}{\partial\sigma_q^2}\right)^{\Lambda=0}_{\sigma_q^2\neq 0}=\frac{-\Omega[g\alpha(f)+i^*t^*]}{\sigma_q^2[\hat{\imath}-i^*(1-t^*)]}$$

Since the numerator is always negative, the sign of the ORP will determine whether an increase in the variance of foreign inflation will end up to optimality of more or less flexibility in exchange rates. In general, an immediate effect of an increase in the variance of foreign inflation is to raise the real return on foreign assets inducing a switch towards foreign assets. This results in an increase in risk associated to foreign assets. On the other hand, that reallocation in traded assets can be growth enhancing if the real return on foreign assets is higher than that on the domestic capital net of the output share of government expenditure. If not, its growth effect might be negative. In any case, it leads to a reduction in the ORPF, calling for more (less) flexibility in exchange rates, if the ORP is positive (negative), in order to retain the optimal risk premium. Apparently, financial repression can affect the magnitude and direction of this relationship. Comparing this result with the productivity shocks' result, we realize that they are qualitatively similar to each other. That is, the consequence of an increase in the variance of the productivity and foreign inflation shocks for the optimal ρ depends inversely on the sign of the ORP.

A change in foreign assets tax involves a change in the ORPF and ORP which is given as:

$$\left(\frac{\partial\rho^*}{\partial t^*}\right)^{\Lambda=0}_{\sigma_q^2\neq 0}=\frac{i^*[2(\Omega-1)-\rho^*-\frac{[(1-g)\alpha(f)-(i^*-q+\sigma_q^2)]}{\sigma_q^2}]}{[\hat{\imath}-i^*(1-t^*)]}$$

From this we observe, the initial optimal ρ has an important role in any policy prescription. For instance, when the fixed exchange rates regime is initially optimal arrangement based on equation (4-28), higher tax on foreign assets requires more flexible rates in order to retain the optimal ration of the ORPF and the ORP. On the other extreme, if the floating exchange rates regime is the initial optimal regime, for a negative (positive) ORP, less (more) flexible rates perform better when the real return on foreign assets are less than that on domestic capital net of the output share of government expenditure. The opposite holds if we have: $(i^*-q+\sigma_q^2) > 2(\Omega-1)+(1-g)\alpha(f)$. In general, a higher initial level of optimal ρ is expected to entail less (more) flexible rates become optimal for the negative (positive) ORP. Financial repression through its effect on optimal interest rate and real return on domestic capital is able to change the magnitude and sign of the above expression. A comparative study of our results here with those for the domestic real shocks cases, enables us to conclude that, irrespective of the type of the shocks, if the fixed exchange rates regime is initially optimal arrangement, a higher tax on foreign assets makes more flexible rates optimal.

The following expression displays the consequences of a change in the marginal utility of consumption for the optimal ρ:

$$\left(\frac{\partial\rho^*}{\partial\theta}\right)^{\Lambda-0}_{\sigma_q^2\neq 0}=\frac{1}{[\hat{\imath}-i^*(1-t^*)]^2}\left(-\frac{\partial\psi^{\hat{}}}{\partial\theta}[\hat{\imath}-i^*(1-t^*)]-\frac{\partial\hat{\imath}}{\partial\theta}(1+\Pi)\mu[(1-\Omega+\Omega^2)\sigma_q^2-\psi^{\hat{}}-q]\right)$$

where:

$$\frac{\partial\psi^{\hat{}}}{\partial\theta}=\frac{\theta\mu^2\zeta(f)(1+\Pi)\frac{\partial\hat{\imath}}{\partial\theta}-\hat{\imath}\mu[\hat{\imath}-(1+\Pi)\zeta(f)\mu]}{[\hat{\imath}-(1+\Pi)\mu\zeta(f)]^2}\prec 0$$

$$\frac{\partial\hat{\imath}}{\partial\theta}=\frac{(1+\Pi)\mu}{\sqrt{1+[4\theta/\zeta(f)]}}\succ 0$$

A rise in the marginal utility of consumption reduces the optimal growth under floating rates and thereby increases the ORPF. The first term in the brackets represents this effect which is positive (negative) if the ORP is positive (negative). Also, a higher marginal utility of consumption leads to a rise in the ORP thereby increasing (decreasing) the optimal ρ for negative (positive) initial ORPF. Thus, its sign and magnitude depends on the relative values of these two effects.

Likewise, an increase in the agent's time preference leads to two similar sets of effects through changes in the ORPF and the ORP necessitating an adjustment in the optimal ρ as follows:

$$\left(\frac{\partial\rho^*}{\partial\mu}\right)^{\Lambda=0}_{\sigma_q^2\neq 0}=\frac{1}{[\hat{\imath}-i^*(1-t^*)]^2}\left(\frac{\hat{\imath}\theta[\hat{\imath}-i^*(1-t^*)]}{[\hat{\imath}-(1+\Pi)\zeta(f)\mu]}-\frac{\hat{\imath}[(1-\Omega+\Omega^2)\sigma_q^2-\psi^{\hat{}}-q]}{\mu}\right)$$

The first term in the brackets denotes a proportional (to initial ORP) change in the optimal ρ originating from an increase in the ORPF and the second term represents a proportional (to initial ORPF) change in the optimal ρ stemming from an increase in the ORP. In general, the direction of the effect is ambiguous and depends on the signs and relative magnitudes of these two effects which are highly affected by the financial repression policy.

A change in government debt policy motivates two completely offsetting changes in optimal growth under floating rates through changes in consumption and the optimal share of domestic capital ratio so that the ORPF remains unchanged. However, it increases the ORP and thereby adjusting the optimal ρ proportional to initial ORPF is given as:

$$\left(\frac{\partial \rho^*}{\partial \Pi}\right)^{\Lambda=0}_{\sigma_q^2 \neq 0} = -\frac{\hat{\imath}[(1-\Omega+\Omega^2)\sigma_q^2-\psi^{\hat{}}-q]}{[\hat{\imath}-i^*(1-t^*)]^2(1+\Pi)}$$

From this, we see the positive (negative) initial ORPF involves more (less) flexible rates to be optimal for a rise in government debt.

As a result of a change in the financial repression policy the ORPF and ORP change calling for an adjustment in optimal ρ as follows:

$$\left(\frac{\partial \rho^*}{\partial f}\right)^{\Lambda=0}_{\sigma_q^2 \neq 0} = \frac{1}{[\hat{\imath}-i^*(1-t^*)]^2}$$

$$\left\{[\hat{\imath}-i^*(1-t^*)][\alpha(f)'(2\Omega-1)-\frac{\partial \psi^{\hat{}}}{\partial f}]-\frac{\partial \hat{\imath}}{\partial f}[(1-\Omega+\Omega^2)\sigma_q^2-\psi^{\hat{}}-q]\right\}$$

where: $$\frac{\partial \psi^{\hat{}}}{\partial f} = \frac{\partial \Omega}{\partial f}[(1-g)\alpha(f)-(i^*-q+\sigma_q^2)]+\alpha(f)'(1-g)\Omega-\frac{(1+\Pi)\mu^2\theta[\zeta(f)'\hat{\imath}-\zeta(f)\frac{\partial \hat{\imath}}{\partial j}}{[\hat{\imath}-(1+\Pi)\zeta(f)\mu]^2}$$

$$\frac{\partial \hat{\imath}}{\partial f} = \frac{1}{2}\left(1+\frac{\zeta(f)+2\theta}{\sqrt{\zeta(f)^2+4\theta\zeta(f)}}\right)\zeta(f)'\mu(1+\Pi) \succ 0$$

$$\frac{\partial \Omega}{\partial f} = \frac{\alpha(f)'}{\sigma_q^2} \prec 0$$

This states that one cannot infer a clear-cut conclusion regarding the relationship between optimal ρ and the financial repression policy. The first term in the numerator displays the change in optimal ρ as a result of a change in the ORPF weighted by the initial ORP. The second term indicates the adjustment in the optimal ρ due to a change in the ORP weighed by the initial ORPF. An increase in financial repression results in a reduction in the share of the capital in traded assets $[(\partial \Omega / \partial f) \prec 0]$. This leads to an unambiguous reduction in optimal growth under floating rates when the real return on foreign assets is less than that on domestic capital net of the government output share. Though this may end in an increase in the ORPF, as there are other factors at play, the overall outcome cannot be detected completely.

The following shows the relationship between the optimal ρ and the type of central banker in office:

$$\left(\frac{\partial \rho^*}{\partial \Lambda}\right)_{\sigma_q^2 \neq 0} = \frac{\pm\delta}{\sqrt{[\hat{\psi} + q - (1-\Omega+\Omega^2)\sigma_q^2]^2 + 4\Lambda\delta[\hat{\imath} - i^*(1-t^*)]}}$$

As written, the less conservative central banker implies the optimality of less (more) flexible rates when the optimal ρ is positive (negative). Evidently, financial repression has its own implications for this relationship.

4.3.2 Financial Repression

In this section, our main concern is to explore whether one can make a welfare (growth) case for financial repression policy under a specific exchange rate arrangement and the economy is susceptible to foreign inflation disturbances or not. Below, like the productivity case, for the simplicity of exposition, we only focus on the fixed and floating rates and disregard the managed rates. However, the similar reasoning, though more sophisticated, can be carried out for the managed rates.

Fixed Exchange Rates

In the context of expected growth, an increase in the degree of financial repression entails one unambiguous negative effect through a switch away from the traded assets towards nontraded assets (inter traded-nontraded assets effect) and one ambiguous effect through a readjustment in the traded portion of agent's portfolio in favour of foreign assets against the domestic capital (intra traded assets effect). The latter one might aggravate, mitigate, offset or even dominate the former effect. The following proposition demonstrates the conditions in which financial repression policy might be growth enhancing:

Proposition 4-12: *Under fixed rates when the economy is susceptible to foreign inflation shocks, the following constitutes the necessary condition in order for financial repression policy to be growth enhancing:*

$$[i^*(1-t^*)-q] \prec \alpha(1-f)-\Gamma\sigma_q^2 \prec \frac{[i^*-q+\sigma_q^2]}{2(1-g)}+\frac{[i^*(1-t^*)-q]}{2}$$

The sufficient condition is that the absolute value of inter traded-nontraded assets effect be less than the value of intra traded assets effect.

Proof: Disregarding the McKinnon-Shaw effect and assuming $\alpha(f)=\alpha(1-f)$, from (3-23'-2) after some manipulations we obtain:

$$\left(\frac{\partial\psi_\infty}{\partial f}\right)_{\sigma_q^2\neq 0}=\{\frac{\alpha}{\sigma_q^2}\{(i^*-q+\sigma_q^2)+(1-g)[i^*(1-t^*)-q]-2(1-g)[\alpha(1-f)-\Gamma\sigma_q^2]\}\}$$
$$+\{\frac{-\theta\mu\zeta'(f)(1+\Pi)i^*(1-t^*)}{[i^*(1-t^*)-(1+\Pi)\zeta(f)\mu]^2}\} \qquad (4\text{-}29)$$

The term in the second curly brackets represents the inter traded-nontraded assets effect and the term in the first one shows the intra traded assets effect. The left hand side of the inequality comes from necessity of having a nonnegative Ω. □

In words, the above inequality makes a comparison between the real return on domestic capital net of the output share of government expenditure and the real return on foreign assets. As can be seen, the higher are the variance of foreign inflation and the government output share, the more likely is the necessary condition to come into effect. The economic intuition behind this proposition is simple. If the investors dislike holding more productive assets (here foreign assets) due to the (higher) the risk associated with that, financial repression can induce a reallocation in the investor's portfolio towards more growth enhancing assets. Therefore, one can imagine, up to some level financial repression to be growth stimulating and beyond some threshold its negative effect outweighs its positive effect. This emphasizes on this fact that, in these occasions, the important issue is the optimal management of financial repression policy instead of removing it completely. Needless to say, if the conditions in proposition 4-12 do not hold, financial repression policy will be definitely growth deteriorating.

Despite the domestic real shocks, here, financial repression will raise the variance of growth as long as the economy is not a net debtor. This is so, because as we have explained above, financial repression will unambiguously end in an increase in the share of the riskier assets in the agent's portfolio. This can be demonstrated in the following:

$$\left(\frac{\partial \sigma_z^{*2}}{\partial f}\right)_{\sigma_q^2 \neq 0} = -2(1-\Omega)\sigma_q^2 \frac{\partial \Omega}{\partial f}$$

The above expression is positive as we know $(\partial\Omega/\partial f) < 0$. This result is independent of the type of exchange rate arrangements and, hence, it can be generalized to all economies which are not net debtors. But for the economies which are net debtor the above mentioned conclusion will dramatically change. That is, for this set of economies, which accords with the situation in many Developing Countries, the financial repression policy is able to diminish the variance of growth which, in contrast to previous occasions, is welfare improving. Therefore, in the context of the variance of growth the characteristic of being a net debtor is very critical and introduces ambiguity to our conclusion when the economy is susceptible to foreign inflation shocks. In this respect, it is worth noting that the situation of being a net debtor has an adverse effect for the implication of an increase in tax on foreign assets. That is, the increase in the tax will reduce the variance of growth as long as the economy is not a net debtor. By contrast, it will increase it for the net debtor economies. This can be seen easily in the following relationship:

$$\left(\frac{\partial \sigma_z^{*2}}{\partial t^*}\right)_{\sigma_q^2 \neq 0} = -2(1-\Omega)\sigma_q^2 \frac{\partial \Omega}{\partial t^*}, \quad \textit{where:} \quad \frac{\partial \Omega}{\partial t^*} > 0$$

This is so because a higher tax on foreign assets motivates the opposite forces involved in this regard. In short, it raises the share of non (less) risky asset in the agent's portfolio.

If the conditions in proposition 4-12 hold, the financial repression policy leads to an improvement in expected growth thereby reducing the expected domestic inflation. This can boost the initial value of (real) wealth which is growth improving (note that the variance of domestic inflation is independent of financial repression under fixed rates). Also, financial repression can raise the share of real money balances which is welfare enhancing. In general, there are trade offs in the welfare analysis of financial repression policy under fixed rates.

However, when the economy is a net debtor and the proposition (4-12) conditions are in place, financial repression policy will be welfare (growth) improving.

Floating Exchange Rates

An increase in the degree of financial repression under floating rates will also generate two sets of effects including inter traded-nontraded assets and intra traded assets effects with regard to expected growth. The former one, like fixed rates, entails a switch away from traded towards nontraded assets which is unambiguously growth deteriorating. On the one hand, under a floating regime, financial repression leads to a reallocation in the traded portion of the agent's portfolio from domestic capital towards foreign assets due to a reduction in the real return on domestic capital. The real return on domestic capital will decline because of a reduction in marginal productivity of capital through the Goldsmith channel and an increase in the cost of inflation variance as long as the economy is not a net debtor. The overall effect of this reallocation in traded assets on expected growth can be positive or negative depending on the relative values of real returns on foreign assets and domestic capital net of the output share of government expenditure. That is, if the real return on foreign assets is less than that on domestic capital net of the government share of output, the intra traded assets effect is negative which, with negative inter traded-nontraded assets effect, is definitely growth deteriorating. However, if it is not the case, financial repression might stimulate growth. Therefore, we can establish the following:

Proposition 4-13: *Under floating rates when the economy is susceptible to foreign inflation shocks, the necessary condition in order for financial repression to be growth enhancing is that the intra traded assets effect, stemming from financial repression, be positive and the sufficient condition is that its value be greater than the absolute value of the inter traded-nontraded assets effect.*

Proof. Assuming $\alpha(f)=\alpha(1-f)$, from (23'-2) we obtain:

$$\left(\frac{\partial\psi_0}{\partial f}\right)_{\sigma_q^2\neq 0}=\Big\{\frac{\partial\Omega_0}{\partial f}[(1-g)\{\alpha(1-f)-(1-\Omega_0)^2\sigma_q^2\Gamma\}-(i^*-q+\sigma_q^2)]$$

$$+2\frac{\partial\Omega_0}{\partial f}(1-g)(1-\Omega_0)\Omega_0\sigma_q^2\Gamma-(1-g)\Omega_0\alpha\Big\}+\Big\{\frac{-(1+\Pi)\mu^2\theta[i\zeta'(f)-\frac{\partial i}{\partial f}\zeta(f)]}{[i-(1+\Pi)\zeta(f)\mu]^2}\Big\} \tag{4-30}$$

$$where:\quad \left(\frac{\partial\Omega_0}{\partial f}\right)_{\sigma_q^2\neq 0}=\frac{\alpha}{X}\quad,\qquad \Omega_0=1-\frac{1}{2\Gamma}\left(1-\frac{X}{\sigma_q^2}\right)$$

$$X=\sqrt{(1-2\Gamma)^2\sigma_q^4+4\Gamma\sigma_q^2\{\alpha(1-f)-\Gamma\sigma_q^2-[i^*(1-t^*)-q]\}}$$

The term in the second curly brackets refers to inter traded-nontraded assets effect which is always negative. While the term in the first one displays the intra traded assets effect which is positive if:

$$[i^*-q+\sigma_q^2]\ >\ (1-g)[\alpha(1-f)-\Gamma(1-\Omega_0)^2\sigma_q^2]+X\Omega_0[2-g-\frac{\sigma_q^2}{X}] \qquad \square$$

The above condition for having a positive intra traded assets effect is not so restrictive as it may seem. To show this more clearly, it suffices to disregard the cost of inflation variance. In this circumstance, the above condition will reduce to the following more illustrative condition:

$$[i^*(1-t^*)-q]\ <\ \alpha(1-f)\ <\ \frac{[i^*-q+\sigma_q^2]}{2(1-g)}+\frac{[i^*(1-t^*)-q]}{2}$$

As we see, this condition is not so restrictive.

An analysis similar to fixed rates for the welfare implications of the financial repression policy under floating rates can be raised. However, we must add that the effect of financial repression on the equilibrium nominal interest rate which can increase the real money balances and the initial value of wealth in our welfare function. Moreover, as we mentioned above, financial repression under floating rates will increase the domestic inflation variance as long as the economy is not a net debtor, while it reduces the inflation variance if the economy is a net debtor. This is so because from (3-16) we have:

$$\left(\frac{\partial\sigma_p^2}{\partial f}\right)_{\sigma_q^2\neq 0}=-2(1-\Omega)\sigma_q^2\frac{\partial\Omega}{\partial f}$$

4.4 Domestic Monetary Shocks

4.4.1 Exchange Rate Arrangement

When the economy is susceptible to only monetary shocks, irrespective of the presence of the McKinnon-Shaw effect and the cost of inflation variance, equation (3-23'-1) involves the equality between the real rate of return on domestic capital and (after tax) foreign assets. That is we have:

$$\alpha(f) - \frac{\Gamma\Lambda^2\sigma_m^2}{(1+\rho)^4} = i^*(1-t^*) - q \tag{4-31}$$

This makes investors indifferent between domestic capital and foreign assets as far as their returns are equal to each other. Also, any inequality between the returns of these two assets leads to extreme values for Ω (i.e. either zero or one). In other words, the share of traded assets will become perfectly elastic with respect to any change in either financial repression, exchange rates or foreign assets taxation policies. A way out of this indeterminacy is the introduction of other types of shocks simultaneously. Moreover, according to (3-21-1), when there are no other shocks but monetary ones, the variance of growth gets to zero. That is there would not be any room for exchange rate arrangements to stabilize the real growth. This is the repercussion of the fact that the variance of growth is neutral with respect to monetary shocks when there are no other shocks in the economy. However, it would not be the case if any other types of aforementioned shocks impinge on the economy. Below our analysis basically is based on these characteristics, though in some part we will depart from that by introducing the other shocks in conjunction with the monetary shocks. That is, we have assumed initial conditions involving the equality of real returns on domestic capital and foreign assets.

The welfare implications of the exchange rate arrangements in this case is limited to three main channels. The first two are the real money balances and initial value of wealth for which we have:

$$sgn\left(\frac{dln\ n_M}{d\rho}\right)_{\sigma_m^2 \neq 0} = -sgn\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_m^2 \neq 0} \tag{4-32}$$

$$sgn\left(\frac{dln\ W_0}{d\rho}\right)_{\sigma_m^2 \neq 0} = -sgn\left(\frac{\partial i}{\partial \rho}\right)_{\sigma_m^2 \neq 0} \tag{4-33}$$

This suggests that, if the less flexible rates involves a higher equilibrium nominal interest rate, there would be a welfare deteriorating case associated with less flexible rates through a reduction in real money balances and the initial value of wealth. The opposite holds if the less flexible rates imply lower interest rates. In general, the implications of different degrees of flexibility of exchange rates for the equilibrium nominal interest rate are ambiguous. However, below the occasions in which it is a (monotonic) decreasing/ increasing function in ρ is demonstrated.

Another channel is through the expected growth implications of exchange rate arrangements which is decomposed into intra traded (the term in the first curly brackets) and inter traded-nontraded (the term in the second curly brackets) assets effects as follows:

$$\left(\frac{d\psi}{d\rho}\right)_{\sigma_m^2 \neq 0} = \left\{\frac{\partial\Omega}{\partial\rho}[(1-g)\{i^*(1-t^*)-q\}-(i^*-q)] + \frac{4\Lambda^2\sigma_m^2\Gamma(1-g)\Omega}{(1+\rho)^5}\right\} + \left\{\frac{\frac{\partial i}{\partial\rho}(1+\Pi)\theta\mu^2\zeta(f)}{[i-(1+\Pi)\zeta(f)\mu]^2}\right\} \quad (4\text{-}34)$$

According to (4-31), for the arrangements involving $\rho \succ -1$ ($\rho \prec -1$) the less (more) flexible rates entail the higher share of domestic capital in the traded assets [i.e. $(\partial\Omega/\partial|\rho|) \succeq 0$]. This reflects the classical feature of fixed rates in stabilizing the domestic inflation against the monetary shocks. Recalling equation (3-16), the variance of domestic inflation is zero when $|\rho| \to \infty$ and it takes its maximum value when $\rho \to -1$. Therefore, for $\rho \succ -1$ ($\rho \prec -1$) the first term in the intra traded assets effect is negative (positive) as long as the output share of government and/or tax on foreign assets are not zero and the real return on foreign assets is greater than zero. Since the second term for $\rho \succ -1$ ($\rho \prec -1$), which denotes the reduction in the cost of inflation variance, is always positive (negative), this means that the intra traded assets effect can be positive or negative depending on the relative absolute values of the *growth* deteriorating (improving) effect of a switch towards domestic capital and growth contributing (loss) effect of a reduction (increase) in the cost of inflation. All the same, the inter traded-nontraded assets effect is subject to ambiguity involved in the consequences of exchange rate arrangements for the equilibrium nominal interest rate. The following remark clarifies situations under which there is no ambiguity in this respect.

Remark 4-4: *When there is no McKinnon-Shaw effect:*

a) As long as $\rho \succ -1$ and the intra traded assets effect is positive the following is the *sufficient condition for the equilibrium nominal interest rate to be a (monotonic) decreasing function in ρ:*

$$\psi + q + \frac{4\Lambda^2\sigma_m^2}{(1+\rho)^2} \preceq \frac{2\Lambda\delta}{(1+\rho)} \qquad \forall\rho \succ -1 \qquad (a\text{-}4\text{-}4)$$

b) As long as $\rho \prec -1$ and the intra traded assets effect is negative, the following is the sufficient condition for the equilibrium nominal interest rate to be an (monotonic) increasing function in ρ:

$$\psi + q \succeq \frac{2\Lambda\delta}{(1+\rho)} \qquad \forall\rho \succ -1 \qquad (b\text{-}4\text{-}4)$$

c) As long as $\rho \prec -1$ and the intra traded assets positive following are the sufficient conditions for the equilibrium nominal interest rate to be an increasing function in ρ:

$$\psi + q - \frac{2\Lambda\delta}{(1+\rho)} \succ \frac{4\Lambda^2\sigma_m^2}{(1+\rho)} \qquad \forall\rho \prec -1$$

$$(1+\Pi)(1+\rho) \prec -\frac{\theta(1+\Pi)^2 n_M^2}{\zeta(f)[n_k + n_{B^*}]^2} \qquad \text{(c-4-4)}$$

Proof: From (3-25'-2), we obtain:

$$\left(\frac{\partial i}{\partial\rho}\right)_{\sigma_m^2 \neq 0} = \left(\frac{\partial e}{\partial\rho}\right)_{\sigma_m^2 \neq 0} + \frac{4\Lambda^2\sigma_m^2}{(1+\rho)^5} \qquad (4\text{-}35)$$

where:
$$\left(\frac{\partial e}{\partial\rho}\right)_{\sigma_m^2 \neq 0} = \{\frac{\psi + q}{(1+\rho)^2}\} - \{\frac{2\Lambda\delta}{(1+\rho)^3}\} - \{\frac{\left(\frac{\partial\psi}{\partial\rho}\right)_{\sigma_m^2 \neq 0}}{(1+\rho)}\}$$

The second term in the above equation is always positive. The first term is negative and its absolute value is greater than the second term under condition (*a-4-4*). While it is positive when the condition (*b-4-4*) holds. Also, given the conditions (*c-4-4*) the right hand side of (4-35) is always positive. □

As before, it must be emphasized that the above remark is not conclusive. Therefore, in general, the signs and relative values of intra traded and inter traded-nontraded assets effects determine the optimal degree of flexibility of exchange rates from the expected growth point of view. In summary, as long as we are concerned with the arrangements involving leaning against the wind, we see that less flexible rates induce a switch towards domestic capital as a result of a reduction in the cost of inflation variance which forces the real return on capital up. This reallocation in the agent's portfolio is growth deteriorating because the contribution of domestic source of growth is in general less than the foreign one. However, as the less flexible rates are associated with a reduction in the cost of inflation, the overall outcome can be either growth enhancing or growth depressing. On the other hand, according to remark (4-4), the less flexible rates stimulate (deteriorate) the growth through their increasing (decreasing) effect on the equilibrium nominal interest rate. It is evident that when the inflation variance is costless, there would not be any intra traded assets effect and we will end up to the following:

$$sgn\left(\frac{\partial\psi}{\partial\rho}\right)_{\sigma_m^2\neq 0} = sgn\left(\frac{\partial i}{\partial\rho}\right)_{\sigma_m^2\neq 0}$$

Comparing this with the (4-32) and (4-33), the trade offs in the arguments of our welfare function as a result of different degrees of flexibility in exchange rates is clearly realized. Thus, despite the classical policy prescription for the economies which are susceptible to monetary shocks, here, in terms of our welfare function, the optimal exchange rate arrangement is not necessarily fixed rates and can be other types of arrangements including even floating rates.

Once more, financial repression policy through its effect on equilibrium Ω, ψ, e and i has a critical role in determination of the optimal ρ. Before going through a more detail analysis of financial repression policy as mentioned above, it is important to investigate the property of different arrangements in stabilizing growth when the economy is susceptible to monetary shocks and simultaneously there are some other shocks at work. This is important because in the presence of the other shocks, variance of growth is not neutral anymore with respect to monetary shocks. As we will see shortly this situation requires a modification of our analysis regarding the optimal arrangement for the stabilization of domestic inflation.

When there are productivity and monetary shocks in the economy, under arrangements involving $\rho \succ -1$, the less flexible rates are associated with the higher share of domestic capital in traded assets, as from (3-23'-1) we have:

$$\left(\frac{\partial\Omega}{\partial\rho}\right)_{\substack{\sigma_y^2\neq 0\\ \sigma_m^2\neq 0}} = \frac{\Omega}{(1+\rho)}\left[1-\frac{1}{1+\dfrac{2\Gamma\Omega}{(1+\rho)^2}}\right] + \frac{\dfrac{4\Gamma\Lambda^2\sigma_m^2}{\sigma_y^2\alpha(f)^2(1+\rho)^6}}{1+\dfrac{2\Gamma\Omega}{(1+\rho)^2}} \succ 0 \qquad (4\text{-}36)$$

Intuitively, less flexible rates involve a higher real rate of return for domestic capital and, hence, raise its share in the traded assets. This leads to the optimality of more flexible rates in stabilization of growth, since we know:

$$\left(\frac{d\sigma_z^2}{d\rho}\right)_{\substack{\sigma_y^2\neq 0\\ \sigma_m^2\neq 0}} = 2\alpha(f)^2\sigma_y^2\Omega\frac{\partial\Omega}{\partial\rho} \succ 0 \qquad (4\text{-}37)$$

On the other hand, this results in optimality of less flexible rates for stabilization of the domestic inflation, because from (3-16) we obtain:

$$\left(\frac{d\sigma_p^2}{d\rho}\right)_{\substack{\sigma_y^2\neq 0\\ \sigma_m^2\neq 0}} = \frac{2}{(1+\rho)^4}\left\{\frac{-\Omega^2\sigma_y^2\alpha(f)^2(1+\rho)}{[1+\dfrac{2\Gamma\Omega}{(1+\rho)^2}]} + \frac{4\Gamma\Omega\Lambda^2\sigma_m^2}{(1+\rho)^4[1+\dfrac{2\Gamma\Omega}{(1+\rho)^2}]} - \frac{2\Lambda\sigma_m^2}{(1+\rho)}\right\} \prec 0$$

These results are independent of the size of shocks or more precisely the variance of the monetary and productivity shocks. Hence, we can establish the following robust proposition:

Proposition 4-14: *In the absence of the McKinnon-Shaw effect, when the economy is susceptible to monetary and productivity shocks, the managed float with leaning with the wind is the optimal arrangement in stabilizing growth. As far as we are concerned about the arrangements involving against the wind, the floating (fixed) exchange rates regimes preforms best (worse) in stabilizing growth and worse (best) in stabilizing domestic inflation.*

However, for the arrangements involving $\rho \prec -1$, ambiguity arises. This is so because from (4-36), a less flexible rates involves a decreasing effect through the first term and an offsetting increasing effect through the second term on the share of domestic capital. Thus, the net effect depends on mainly the size of variance of the monetary shocks which is, in turn, a function of the type of monetary authorities governing the central bank. This ambiguity is the main source of ambiguity in the consequence of different degrees of exchange rate flexibility for the variance of growth. Nevertheless, under this type of arrangement, the less flexible rates imply an unambiguous reduction in variance of domestic inflation.

When the monetary shocks are accompanied with government expenditure (demand) shocks for $\rho \succ -1$ ($\rho \prec -1$), less (more) flexible rates will reduce (increase) the cost of inflation variance and thereby induce a higher (lower) share of domestic capital in the agent's portfolio. This can be observed in the following based on the (3-23'-1):

$$\left(\frac{\partial\Omega}{\partial\rho}\right)_{\substack{\sigma_g^2\neq 0\\ \sigma_m^2\neq 0}} = \frac{\Omega}{(1+\rho)} + \frac{2\Lambda^2\sigma_m^2}{\Omega\sigma_g^2\alpha(f)^2(1+\rho)^3} \begin{matrix} \succ 0 & if: & \rho\succ -1 \\ \prec 0 & if: & \rho\prec -1 \end{matrix} \tag{4-38}$$

From this as long as $\rho \succ -1$ ($\rho \prec -1$), the stabilization of growth calls for the optimality of more (less) flexible rates, as we have:

$$\left(\frac{d\sigma_z^2}{d\rho}\right)_{\substack{\sigma_g^2\neq 0\\ \sigma_m^2\neq 0}} = 2\alpha(f)^2\sigma_g^2\Omega\frac{\partial\Omega}{\partial|\rho|} \succ 0 \tag{4-39}$$

While the exchange rate arrangement has no role in stabilizing the domestic inflation (i.e. $\left(\frac{d\sigma_p^2}{d\rho}\right)_{\substack{\sigma_g^2\neq 0\\ \sigma_m^2\neq 0}} = 0$). In words, all the adjustments stemming from exercising different exchange rate arrangements are carried out in the real part of the economy so as to leave the variance of domestic inflation unchanged. Thus, we can state:

Proposition 4-15: *In the absence of the McKinnon-Shaw effect, when the economy is susceptible to monetary and government expenditure (demand) shocks, managed float with leaning with the wind is the optimal arrangement in stabilizing the (growth of) economy. Within the arrangements involving leaning against the wind, the floating rates are the most appropriate arrangement in stabilization of growth.*

Sutherland (1995) in an ad hoc structure has shown that under specific circumstances, though not analytically very well defined, target zones might perform better than fixed and floating rates in stabilizing the output and domestic price when there are demand and monetary shocks in the economy. Due to the problem of nonlinearity he was not able to address the issue of optimal arrangement when there are productivity (supply) and monetary shocks in the economy. Here, in a general equilibrium structure we have demonstrated in an analytically well defined circumstance that if the economy suffers from domestic real (supply and demand) and monetary shocks simultaneously and the stabilization of growth constitutes the main concern of policy makers, managed float with leaning with the wind is optimal. Within the leaning against the wind arrangements, we explored the floating rates performs best. This conclusion is robust in the sense that it does not depend on the relative variances of the shocks which economy is susceptible to. This policy prescription, though, *in a sense* corroborates the Fischer (1977) and Frenkel & Aizenman (1979), is in contrast to Artis & Currie (1981) and Fukuda & Hamada (1987).

However, the above clear-cut situation somewhat fades once we allow for the foreign inflation shocks. It is due to this fact that the less flexible rates have two offsetting effects on the cost of inflation variance. As our earlier discussion revealed, the less flexible rates will reduce the cost of inflation variance attributed to the domestic monetary shocks while it will raise the cost of inflation variance originating from foreign inflation shocks. Accordingly, it is not clear whether the less flexible rates involve a higher share of domestic capital in the agent's portfolio or whether the converse will be the case. In general, the overall outcome depends on the relative variances of the two types of the shocks, the marginal cost of inflation variance and the degree of flexibility of the rates. This has been demonstrated in the following:

$$\left(\frac{\partial\Omega}{\partial\rho}\right)_{\substack{\sigma_q^2\neq 0\\ \sigma_m^2\neq 0}}=\frac{\Omega}{(1+\rho)}\left[1-\frac{1}{1-\frac{2\Gamma(1+\rho-\Omega)}{(1+\rho)^2}}+\frac{\frac{\Lambda^2\sigma_m^2}{\Gamma\Omega\sigma_q^2(1+\rho)^4}}{1-\frac{2\Gamma(1+\rho-\Omega)}{(1+\rho)^2}}\right] \tag{4-40}$$

As we see the sign of the above expression is ambiguous. This ambiguity passes through the variance of growth and domestic inflation so that it makes a definite conclusion hardly possible. The following shows this fact regarding to stabilization of growth:

$$\left(\frac{d\sigma_z^2}{d\rho}\right)_{\substack{\sigma_q^2\neq 0\\ \sigma_m^2\neq 0}}=-2\sigma_q^2(1-\Omega)\frac{\partial\Omega}{\partial\rho} \tag{4-41}$$

According to the above equation, if the economy is a net creditor and $(\partial\Omega/\partial\rho)\succ(\prec)0$ we expect that the less (more) flexible rates performs best in stabilizing growth. The opposite holds if the economy is a net debtor. However, it is most likely that up to some degree of flexibility the share of domestic capital increases and beyond that it decreases. In this occasion, managed rates would be the most appropriate arrangement, if the economy is a net creditor. When the economy is a net debtor, this situation implies the optimality of either of two polar arrangements in this regard. Managed rates would perform worse in this case.

In the context of stabilization of domestic inflation, the following shows the sources of ambiguity:

$$\left(\frac{d\sigma_p^2}{d\rho}\right)_{\substack{\sigma_q^2\neq 0\\ \sigma_m^2\neq 0}} = \frac{2\Omega\sigma_q^2(1+\rho-\Omega)[\Omega-(1+\rho)\frac{\partial\Omega}{\partial\rho}]}{(1+\rho)^3} - \frac{4\Lambda^2\sigma_m^2}{(1+\rho)^5}$$

This suggests the relative variances of the foreign inflation and domestic monetary shocks, the change in the share of capital in the traded assets as a result of changes in degree of flexibility of exchange rates and the level of exchange rate flexibility, in general, will determine the appropriate arrangement for the stabilization of domestic inflation. It is very likely that up to some level of flexibility the variance of inflation decreases and beyond that it starts increasing. This occasion will imply the appropriateness of the managed rates in this respect. Hence, we can say:

Conjecture 4-1: *In the absence of McKinnon-Shaw effect, when the economy is buffeted by foreign inflation and domestic monetary shocks simultaneously, managed rates seems to be superior to floating and fixed rates in stabilization of domestic inflation and growth if the economy is a net creditor. When the economy is a net debtor either of two polar arrangements may be the most appropriate arrangement in stabilizing the growth.*

4.4.2 Financial Repression

Here our main concern is to find out when the economy is susceptible only to monetary shocks whether there is any welfare (growth) case for financial repression policy given the exchange rate arrangement or not. Due to similarity and generality of our results the analysis is carried out for whole the range of arrangements.

Generally, from the expected growth view, a higher degree of financial repression will result in a shift from traded towards nontraded assets (inter traded-nontraded assets effect) which is growth deteriorating and a reallocation in traded portion of agent's portfolio (intra traded assets effect) in favour of foreign assets which here is growth enhancing. Hence, the relative sizes of these two effects will determine whether financial repression is growth enhancing or deteriorating. More precisely, we can state the following:

Proposition 4-16: *When the economy is susceptible to monetary shocks, the necessary condition for financial repression be growth improving is the real return on foreign assets be positive and the sufficient condition is the absolute value of inter traded-nontraded assets effect be less than the value of intra traded assets effect.*

Proof. Ignoring the McKinnon-Shaw effect, from (3-23'-2) after some manipulations we end up with :

$$\left(\frac{\partial\psi}{\partial f}\right)_{\sigma_m^2\neq 0} = \frac{\partial\Omega}{\partial f}\left\{(1-g)[i^*(1-t^*)-q]-(i^*-q)\right\}+\left\{\frac{-(1+\Pi)\mu^2\theta[i\zeta'(f)-\frac{\partial i}{\partial f}\zeta(f)]}{[i-(1+\Pi)\zeta(f)\mu]^2}\right\} \qquad (4\text{-}42)$$

$$where: \quad \left(\frac{\partial\Omega}{\partial f}\right)_{\sigma_m^2\neq 0} \prec 0$$

Since an increase in financial repression will reduce the share of domestic capital in traded assets, as long as the output share and/or tax on foreign assets and the real return on foreign assets are greater than zero, the overall value of the first term in (4-42) is positive. The second term in the above equation shows the inter traded-nontraded assets effect which is always negative. □

The economic intuition behind this proposition is simple. As long as the output share of government is not zero and the real return on foreign assets is positive, financial repression can be growth improving because it reduces the share of domestic capital in traded assets which, relative to foreign assets, contributes less to the growth. Hence, if this growth gain outweighs the growth loss stemming from increase in the share of nontraded assets, financial repression can stimulate growth.

For the reasons which we explained before, in the absence of real domestic and foreign inflation shocks, financial repression policy like exchange rate arrangements has no effect on the variance of growth. Also, from equation (3-16) it is evident that it does not play any role in stabilizing the variance of domestic inflation either. Under the fixed rates regime, financial repression does not influence the equilibrium nominal interest rate and, therefore, it will only raise the demand for real balances through a rise in transaction costs. In this circumstance, if financial repression involves a boost in expected growth, one can conceive a welfare case at least up to some degree of financial repression. However, in the flexible arrangements, financial repression will affect the nominal interest rate which has its own implications for the real money balances and the initial value of wealth.

4.5 Real Business Cycles (RBC)

One of the features of the model with which we are dealing with is its ability to address some of the RBC issues. This is so because it permits an explicit calculation of variances and covariances of endogenous variables in terms of underlying exogenous variables. Since our main concern in this study is optimal policy analysis which is different from the mainstream of the RBC[7], here our investigation will be very concise. In addition, throughout this section our arguments are based on exchange rate arrangements involving leaning against the wind which are the most widely followed arrangements in the real world experience.

Turnovsky (1995) has discussed the fitness and drawbacks of his model in replicating the movements and comovements of some relevant aggregates attracted attentions in RBC. Here we are going to raise the relevance of some features of our model with regard to the RBC.

One of the striking features of our model is the consequences of different exchange rate arrangements for the RBC. Baxter & Stockman (1989) and Gerlach (1988) findings regarding the question of whether flexible rates involve more volatile business cycles, are not conclusive. That is, though, according to their study, the exchange rate regime seems to impact on trade, it leaves the other aggregates rather unaffected. Zimmermann (1996) finds general tendencies in the RBC's stylized facts across the exchange rate regimes with some quite significant and the others not. He tries to build up a model to replicate the RBC's stylized facts by foreign trade considerations or more precisely by inclusion the timing of import decisions. Schlagenhauf & Wrase (1992, 1995), on the other hand, by building an open economy monetary model mainly based on the Lucas's (1990) liquidity model, have tried to analyse the nominal and real exchange rate volatilities following a domestic monetary shock in a real business cycle setting.

When there is no financial repression in the economy, our model, which in spirit is closer to the monetary ones rather than the Zimmermann's, implies that as long as the economy is a net creditor or the domestic monetary and real shocks are the sources of volatility in growth, we expect less volatility in growth under floating rates than fixed rates. The opposite happens if the economy is a net debtor and the main source of volatility is foreign inflation (recall (4-7), (4-19), (4-27), (4-37), (4-39) and (4-41)). Put differently, our model predicts that the growth response to productivity shocks is positive and higher under fixed rates than flexible rates. Its response to government expenditure shocks is negative but again more sensitive under fixed rates than flexible rates. Likewise, in the case of foreign inflation shocks the growth response is negative (positive) but less (more) sensitive under floating rates than fixed rates if the economy is a net creditor (debtor) (refer to (3-18)). Recalling (4-7), (4-19) and (4-27), the followings highlight these facts:

$$\frac{\partial cov(dZ,dy)}{\partial \rho} = \frac{\partial \Omega}{\partial \rho} \alpha \sigma_y^2 \succ 0$$

$$\frac{\partial cov(dZ,du_g)}{\partial \rho} = -\frac{\partial \Omega}{\partial \rho} \alpha \sigma_g^2 \prec 0$$

$$\frac{\partial cov(dZ,du_q)}{\partial \rho} = \frac{\partial \Omega}{\partial \rho} \sigma_q^2 \prec 0$$

According to the stylized facts mentioned in Table 1, the volatility of investment in Germany and Japan had been significantly lower under flexible rates than fixed rates which accords with the prediction of our model. However, the opposite has happened in Australia and for the other countries there was no statistically significant difference across two regimes. Of course, the exchange rate has not been the only factor determining the volatility of investment during the period (1960-91).

Another magnitude which has been asserted to be affected by exchange rate regimes is trade balance. The variance of trade balance in our model when there is no financial repression can be obtained from (3-14) as:

$$\sigma_{TB}^{2}=(1-\Omega)^{2}k^{2}[\alpha^{2}(\sigma_{y}^{2}+\sigma_{g}^{2})+\sigma_{q}^{2}] \qquad (4-43)$$

One of the features of equation (4-43) is the positive impact of a measure of the size of the economy (i.e. capital stock) on the volatility of the trade balance. Another feature is the importance of the main source of the volatility in relation to the effects of the exchange rate arrangements in this respect. Given the equations (4-7), (4-17), (4-26-1), (4-35), (4-37) and (4-40), our model implies a more (less) volatile trade balance under floating rates than fixed rates if the economy is a net creditor (debtor) and the main origins of the volatility are domestic real and monetary shocks. When the main source of volatility is foreign inflation (price) shocks, according to our model, we expect less (more) volatility under floating rates than fixed rates if the economy is a net creditor (debtor). Put differently, the response of trade balance to the shocks is highly dependent upon the indebtedness situation of the economy. In general, if the economy is a net creditor in terms of our model, the trade balance response is positive and higher under floating rates than fixed rates in the productivity and foreign inflation shocks cases. In the case of government expenditure shocks, its response is negative and again more sensitive. The reverse occurs if the economy is a net debtor. This can be seen as follows:

$$\frac{\partial cov(dTB,dy)}{\partial\rho}=-\frac{\partial\Omega}{\partial\rho}k\alpha\sigma_{y}^{2}\prec 0$$

$$\frac{\partial cov(dTB,du_{g})}{\partial\rho}=\frac{\partial\Omega}{\partial\rho}k\alpha\sigma_{g}^{2}\succ 0$$

$$\frac{\partial cov(dTB,du_{q})}{\partial\rho}=-\frac{\partial\Omega}{\partial\rho}k\sigma_{q}^{2}\succ 0$$

Referring to Table (4-1), we find that at the country level, the USA's trade balance had been significantly more volatile under floating rates and the opposite holds for the Japan's Trade balance. For the other countries there is no uniform pattern and all have displayed a non significant change in volatility of trade balance across the exchange rate regimes. At the bloc level, though we observe more volatility under floating rates in both Europe and North America blocs, only USA shows a significant nonneutrality of exchange rates in this respect. At the aggregate level, the same pattern as USA is observed.

The covariance between current account and the rate of domestic capital accumulation is one of the issues which part of the (empirical and analytical) RBC literature has been devoted to it (Obstfeld & Stockman (1985), Stulz (1985), Stockman & Svensson (1987)). Here we are going to analyse the implications of the exchange rate arrangements for this relationship in our model. The endogenous growth model which we are dealing with involves the same unexpected and expected rate of growth for all the real assets including the domestic capital accumulation. Also, the variance of the changes in the real foreign assets net of the capital gains and losses due to foreign inflation has been taken as a measure of volatility of current account. Hence, considering (3-18) and (3-14), the consequences of exchange rate regimes for the covariance of these two quantities are given as follows:

$$\left(\frac{\partial cov(dCA,dZ)}{\partial \rho}\right)_{\substack{\sigma_y^2\neq 0\\ \sigma_g^2\neq 0\ ,\ \sigma_m^2\neq 0}} = \frac{\partial \Omega}{\partial \rho}(1-2\Omega)k\alpha^2(\sigma_y^2+\sigma_g^2)$$

$$\left(\frac{\partial cov(dCA,dZ)}{\partial \rho}\right)_{\sigma_q^2\neq 0} = 2\frac{\partial \Omega}{\partial \rho}(1-\Omega)k\sigma_q^2$$

The above expressions suggests that, if the source of the volatility is foreign inflation shocks and the economy is a net creditor (debtor), the degree of (negative) correlation between these two magnitudes would be higher (lower) under fixed rates than flexible rates. If the economy is a net debtor and the origin of the volatility are the domestic monetary and real shocks the degree of (negative) correlation between current account surplus and the rate of domestic capital accumulation is higher under fixed rates than flexible rates. In this case, if the economy is a net creditor, ambiguity in the role of exchange rate arrangements will emerge and generally everything depends on the initial share of domestic capital in the traded assets. Notice that it is possible that the type of exchange rate arrangements changes even the direction of the covariance between these two quantities if the domestic monetary and real shocks are the origin of the variability.

The covariance between current account and the rate of change of exchange rates is another magnitude attracted attentions in RBC literature (Stockman & Svensson (1987)). From (3-14) and (3-15), this is given as follows:

$$Cov(dCA,du_e)=-\frac{\Omega(1-\Omega)k[\alpha^2(\sigma_y^2+\sigma_g^2)+\sigma_q^2]}{(1+\rho)} \qquad (4-44)$$

It states that, if the economy is a net creditor (debtor), irrespective of the origin of the disturbance into the economy, a depreciation of currency is accompanied by a current account deficit (surplus). This is due to the fact that a currency depreciation as a result of an unexpected decrease in (domestic) output or an unexpected increase in government expenditure (recall 3-15) will reduce the rate of capital accumulation by less amount than the reduction in domestic output or rise in government expenditure as long as the economy is a net creditor (refer to (3-14) and (3-18)). Given the constancy of consumption, this leads to a reduction in the current account surplus. In the case of a currency depreciation as a result of foreign inflation shocks, there would be only a reduction in the rate of capital accumulation as long as the economy is a net creditor (recall (3-18)). This again involves a reduction in the current account surplus. The opposite forces will come into play when the economy is a net debtor. Referring to (4-44), one can clearly see the role of exchange rate regimes in this respect.

In the presence of financial repression, or more specifically the McKinnon-Shaw effect, which in the present context (i.e. RBC) might be viewed as a way of taking into account the situations where there are frictions in the financial markets such as the continuous portfolio reallocation might be costly for the households corresponding to the assumptions in the Lucas (1990) and Fuerst (1991) for a closed economy and Schlagenhauf & Wrase (1995) for an open economy, the exchange rate regimes are not neutral. In this case, at the analytical level the implications of exchange rate regimes for the variability of growth and trade balance are much more complicated than the previous relatively clear-cut situations. A more detailed analysis of the implications of the exchange rate regimes for the former one has been carried out in chapter six through a numerical method.

The implications of foreign assets taxation (capital control) for the volatility of growth, when there is no McKinnon-Shaw effect in the economy, can be simply realized by taking into account its effect on the share of domestic capital in traded assets. It is evident that an increase in tax on foreign assets holdings will induce a switch away from the foreign assets towards the domestic capital. Thus, from (3-21-1), we obtain:

$$\left(\frac{\partial\sigma_z^2}{\partial t^*}\right)_{\substack{\sigma_y^2\neq 0\\ \sigma_g^2\neq 0}} = 2\frac{\partial\Omega}{\partial t^*}\Omega\alpha^2(\sigma_y^2+\sigma_g^2) \succ 0 \qquad (4\text{-}45)$$

$$\left(\frac{\partial\sigma_z^2}{\partial t^*}\right)_{\sigma_q^2\neq 0} = -2\frac{\partial\Omega}{\partial t^*}(1-\Omega)\sigma_q^2 \qquad (4\text{-}46)$$

$$where: \quad \frac{\partial\Omega}{\partial t^*} \succ 0$$

According to (4-45), if the source of the volatility of growth is domestic monetary and real shocks the higher tax on foreign assets involves more volatility in growth. The same happens in the case of foreign inflation shocks if the economy is a net debtor. These results lay stress on the benefits of an increase in financial market integration allowing agents to deal more effectively with the shocks stressed by Frenkel and Razin (1987) and Obstfeld (1994), though from different viewpoint and reason[8]. However, in the latter case when the economy is a net creditor, our model implies the higher tax on foreign assets holding entails less volatility in growth. Accordingly, the main source of uncertainty in conjunction with the indebtedness situation of the economy are important here.

Our model's prediction for the consequence of an increase in tax on foreign assets holdings (capital control or less financially integrated markets with the rest of the world) for the volatility of current account is crucially dependent upon the indebtedness situation of the economy and is independent of the sources of the volatility. This is so as we have:

$$\frac{\partial\sigma_{CA}^2}{\partial t^*} = -2\frac{\partial\Omega}{\partial t^*}(1-\Omega)k^2[\alpha^2(\sigma_y^2+\sigma_g^2)+\sigma_q^2] \qquad (4\text{-}47)$$

The expression (4-47) shows for the less financially integrated economies with the rest of the world which are net creditors (debtors), we expect less (more) volatility in their current account. Sutherland (1996) in a micro foundation sticky price structure inspired by Obstfeld & Rogof's (1995) model has tried to address the role of financial market integration (capital mobility) in the volatility of nominal exchange rates and some other economic magnitudes. Since his model does not take account of capital accumulation considerations he leaves the issue of the implications of financial market integration for the comovements of the current account and the rate of capital accumulation as an open issue to be addressed. Here, in a semi-small open economy structure we try somehow to address the issue. First, in terms of our model, the tax on foreign assets holdings (the degree of foreign financial market integration/capital mobility) can mitigate or aggravate the degree of comovement between current account and the rate of capital accumulation depending on the sources of the volatility and the economy's indebtedness situation. The following highlights this matter:

$$\frac{\partial cov(dCA,dZ)}{\partial t^*}=\frac{\partial \Omega}{\partial t^*}k[(1-2\Omega)\alpha^2(\sigma_y^2+\sigma_g^2)+2(1-\Omega)k\sigma_q^2]$$

According to the above expression, in general, our model suggests, for a net creditor (debtor) economy, the degree of (negative) comovement between these two magnitudes will decrease (increase) by a rise in tax on foreign assets (lower degree of financial integration) if the main source of the volatility is foreign inflation (price). If the origin of the volatility is domestic and real and the economy is a net debtor, our model predicts a higher degree of (negative) correlation for a higher rate of tax on foreign assets holdings. However, in this case if the economy is a net creditor the effect of higher tax on foreign assets holdings on the degree of correlation between the current account surplus and the rate of capital accumulation is ambiguous and in general depends on the initial share of domestic capital in the traded portion of the agent's portfolio.

Also, in the following expression, one can see that irrespective of the origin of the volatility, the higher taxes on foreign assets (foreign capital control) will raise the volatility of the rate of change of exchange rates: $$\frac{\partial \sigma_{u_e}^2}{\partial t^*}=\frac{2\frac{\partial \Omega}{\partial t^*}\Omega[\alpha^2(\sigma_y^2+\sigma_g^2)+\sigma_q^2]}{(1+\rho)^2}\succ 0$$
As far as the origin of the volatility are the productivity and government expenditure shocks, this result, though for different reason, is similar to Sutherland's (1996) finding which indicates that higher capital mobility will result in a reduction in the volatility of the nominal exchange rate. In a close relation, we can trace down the implication of higher tax on foreign assets (lower capital mobility) for the volatility of domestic inflation (price). From (3-16), we can obtain: $$\frac{\partial \sigma_p^2}{\partial t^*}=\frac{2\frac{\partial \Omega}{\partial t^*}\Omega[\alpha^2(\sigma_y^2+\sigma_g^2)-(1-\Omega+\rho)\sigma_q^2]}{(1+\rho)^2}$$
This suggests that as long as the origins of the volatility are domestic real and monetary shocks higher capital mobility will decrease the volatility of domestic inflation. However,

if the origin of the volatility is foreign inflation (price), the economy's indebtedness situation in conjunction with the exchange rate arrangement will play a crucial role. That is, if the economy is a net creditor, the higher tax on foreign assets implies lower volatility in domestic inflation. But, if the economy is a net debtor and follows a floating rate regime, lower capital mobility leads to more volatility in domestic inflation. In the latter case, if the economy does not follow floating rates, ambiguity arises.

The consequence of foreign assets taxation for the covariance of the current account and exchange rate can be observed as follows:

$$\frac{\partial Cov(dCA,du_e)}{\partial t^*}=\frac{\frac{\partial\Omega}{\partial t^*}(2\Omega-1)k[\alpha^2(\sigma_y^2+\sigma_g^2)+\sigma_q^2]}{(1+\rho)}$$

This suggests that the initial share of domestic capital in traded assets is a critical element. In general, it says that for $\Omega > 1/2$, we expect that the higher tax on foreign assets holdings will raise the degree of comovement between these two quantities. Notice that the tax on foreign assets might even change the qualitative relationship between the current account and the rate of change of exchange rates.

Also, it is worthy to study what would be the implications of foreign assets taxation for the comovement of the rate of change of exchange rates and rate of growth. The following indicates this matter:

$$\frac{\partial Cov(dZ,du_e)}{\partial t^*}=\frac{\frac{\partial\Omega}{\partial t^*}(2\Omega-1)[-2\alpha(\sigma_y^2+\sigma_g^2)+(1-2\Omega)\sigma_q^2]}{(1+\rho)}$$

Therefore, the tax on foreign assets will raise the degree of (negative) comovements between currency depreciation and the growth rate if the origin of currency depreciation is an unexpected reduction in domestic output or a rise in government expenditure. However, if the origin of currency depreciation is an unexpected reduction in foreign inflation, the effect of tax on foreign assets on the degree and direction of comovement of these two quantities depends mainly on the initial share of domestic capital in traded assets.

In the presence of the McKinnon-Shaw effect which somehow takes into account of the imperfections in domestic financial markets as well, getting any definite conclusion will become so difficult that a more detailed analysis needs using numerical methods.

The implications of financial repression through the Goldsmith channel for the volatility of growth has already been studied in our discussion regarding the welfare effect of financial repression policy. Our model, in summary, predicts that, if the origins of volatility are the domestic real and monetary shocks, the volatility of growth would be lower, the higher is the financial repression. The same happens in the case of foreign inflation shocks if the economy is a net debtor. However, the opposite is true if the economy is a net creditor.

The consequence of financial repression for the volatility of the current account is given as follows:

$$\frac{\partial\sigma^2_{CA}}{\partial f}=2(1-\Omega)k^2\alpha(f)[-\frac{\partial\Omega}{\partial f}\alpha(f)+\alpha(f)'(1-\Omega)](\sigma_y^2+\sigma_g^2)-2\frac{\partial\Omega}{\partial f}(1-\Omega)k^2\sigma_q^2$$

It states that as long as the economy is a net creditor (debtor) and the foreign inflation is the origin of the volatility, higher financial repression implies a higher (lower) volatility in the current account. However, if the origin of the volatility are government expenditure and productivity shocks, ambiguity arises. In general, we can say that, if the economy is a net creditor (debtor) and the source of volatility in the current account is domestic real shocks, a higher degree of financial repression will be accompanied by less (more) volatility in the current account if: $[-\frac{\partial\Omega}{\partial f}\alpha(f)+\alpha(f)'(1-\Omega)] < 0$. Otherwise, it will raise the volatility of the current account. As we see, the main critical elements in this regard are the relative values of the real returns on domestic capital and foreign assets and the indebtedness situation of the economy.

The following denote the implications of financial repression for the comovements of the current account and the rate of domestic capital accumulation:

$$\left(\frac{\partial cov(dCA,dZ)}{\partial f}\right)_{\substack{\sigma_y^2\neq0\\ \sigma_g^2\neq0\ ,\ \sigma_m^2\neq0}}=k\alpha(f)(\sigma_y^2+\sigma_g^2)[2\alpha(f)'\Omega(1-\Omega)+\frac{\partial\Omega}{\partial f}(1-2\Omega)\alpha(f)]$$

$$\left(\frac{\partial cov(dCA,dZ)}{\partial f}\right)_{\sigma_q^2\neq0}=2\frac{\partial\Omega}{\partial f}(1-\Omega)k\sigma_q^2$$

According to the above expressions, clear-cut conclusions exist only in the case of foreign inflation shocks. That is, higher financial repression will increase (decrease) the degree of (negative) comovements between these two quantities if the economy is a net creditor (debtor). In the case of domestic shocks, the consequence of financial repression for the degree of covariation between these two magnitudes is subject to ambiguity. Note that, in the case of domestic shocks it is possible that the financial repression policy changes the qualitative comovements between these two quantities.

The implications of financial repression for the comovement of the current account and exchange rates has been demonstrated in the following:

$$\frac{\partial cov(dCA,du_e)}{\partial f}=\frac{-k\alpha(f)(\sigma_y^2+\sigma_g^2)[2\alpha(f)'\Omega(1-\Omega)+\frac{\partial\Omega}{\partial f}(1-2\Omega)\alpha(f)]+\frac{\partial\Omega}{\partial f}(2\Omega-1)k\sigma_q^2}{(1+\rho)}$$

As is evident, in the case of domestic shocks there is an ambiguity in the effect of financial repression on the magnitude and direction of the covariance between the two quantities. However, if the source of the disturbance is foreign inflation and the economy is either a net debtor or a net creditor with an initial share of domestic capital in the traded assets greater than that of foreign assets (that is: $\Omega \succ 1/2$), financial repression will decline the degree of comovement between the current account and the rate of change of exchange rates. Otherwise, the reverse holds true.

Financial repression has also implications for the volatility of the rate of change of exchange rates as follows:

$$\frac{\partial\sigma_{u_e}^2}{\partial f}=\frac{2\Omega\alpha(f)[\frac{\partial\Omega}{\partial f}\alpha(f)+\alpha(f)'\Omega](\sigma_y^2+\sigma_g^2)+2\frac{\partial\Omega}{\partial f}\Omega\sigma_q^2}{(1+\rho)^2}$$

It is observed that the origin of the volatility plays an important role here. That is, if the origin of the volatility is foreign inflation, financial repression will decline the volatility of the rate of change of exchange rates. However, in case of domestic shocks, there exists ambiguity. In general, financial repression will reduce the volatility of the rate of change of exchange rates if the origins of the volatility are domestic shocks and we have: $[\frac{\partial\Omega}{\partial f}\alpha(f)+\alpha(f)'\Omega] \prec 0$. Otherwise, financial repression will raise the volatility of this magnitude.

Financial repression will influence the magnitude and direction of the comovement of the rate of change of exchange rates and growth. This has been denoted as follows:

$$\frac{\partial cov(dZ,du_e)}{\partial f}=\frac{-2\Omega\alpha(f)[\frac{\partial\Omega}{\partial f}\alpha(f)+\alpha(f)'\Omega](\sigma_y^2+\sigma_g^2)+\frac{\partial\Omega}{\partial f}(1-2\Omega)\sigma_q^2}{(1+\rho)}$$

According to the above relationship, as long as the share of domestic capital in traded assets is higher than that of foreign assets (that is: $\Omega \succ 1/2$) or the economy is a net debtor, financial repression will increase the degree of comovement of the growth rate and the rate of change of exchange rates if the source of variability is foreign inflation shocks. Otherwise, the opposite holds. However, if the source of variability is domestic shocks, an ambiguity will emerge. In this case, generally speaking, financial repression will raise (decline) the degree of (negative) comovement of these two quantities, if: $[\frac{\partial\Omega}{\partial f}\alpha(f)+\alpha(f)'\Omega] \prec(\succ)\ 0$. Note that, though financial repression might affect the magnitude and direction of the comovement in the case of foreign inflation shocks, it can not influence the direction of the comovement in the case of domestic shocks.

4.6 Conclusion

In this chapter, on the basis of a stochastic general equilibrium model for a semi-small open economy developed in chapter three, we have studied the economic reasons which may induce a (benevolent) government to resort to financial repression given the specific exchange rate arrangement in order to render a higher level of welfare for the agent. We think that, apart from budget financing incentives, optimal risk management considerations might give rise to the use of the financial repression policy in the economy. Our main findings can be summed up as follows.

First, whatever is the type of the shock to which the economy is subject, financial repression has a critical role in the determination of the optimal degree of exchange rates flexibility. This poses the question: what are the optimal degrees of financial repression and flexibility of exchange rates? Our analysis shows that in view of our welfare function, the relative magnitudes of the structural parameters and the other policy variables are generally the main determinants.

Second, in the absence of the McKinnon-Shaw effect, if the economy is subject to domestic (real and monetary) shocks, the managed float with leaning with the wind is optimal in the stabilization of growth. If the economy is susceptible to foreign inflation and domestic monetary shocks, either of two polar cases performs best in stabilizing growth as long as the economy is a net debtor. In general, when the economy is exposed to all types of the shocks, the relative sizes of the second moments of the shocks and the economy's indebtness stance are key determinants in the optimality of any exchange rate arrangement.

Third, financial repression can work as a shock absorber in the economy. This characteristic may provide an additional incentive for the governments in the economies which are exposed to nonmonetary and monetary shocks to appeal to financial repression in order to stabilize the economy. This stabilization might be growth enhancing as well if the financial repression is managed wisely. Here is where in our theoretical framework the key role of good government comes into play.

Fourth, if government intervention in the financial sectors (financial repression) is not necessarily always economic growth hampering, Roubini & Sala-i-Martin's (1995) suggestion that the negative (partial) correlation between inflation and growth is likely to be spurious, is not necessarily supported by our analytical arguments on the basis of a (more elaborated) general equilibrium model. De Gregorio & Guidotti's (1995) empirical findings is in accordance with this conclusion. Their regression results show that, after controlling for financial repression, there still exists scope for a negative role of inflation on growth.

Table 4.1: Standard Deviations of Various Investment and Trade Balance Under Fixed Exchange Rates (1960.I-1972.IV) and *Under Flexible Exchange Rates (1973.I-1991.II)*

	Investment	**Trade Balance**
Australia	4.21 (0.56) *7.21 (0.83)* **8.98**	1.45 (0.16) *1.11 (0.13)* **2.72**
Canada	4.24 (061) *5.57 (0.80)* **1.75**	0.77 (0.09) *0.76 (0.09)* **0.01**
Finland	5.46 (0.85) *5.87 (0.78)* **0.13**	3.25 (1.32) *2.09 (0.27)* **0.74**
Germany	5.87 (0.71) *3.93 (0.57)* **4.54**	0.85 (0.09) *0.78 (0.11)* **0.24**
Japan	4.23 (0.62) *2.69 (0.29)* **5.06**	2.25 (0.42) *0.76 (0.13)* **11.49**
South Africa	5.64 (0.88) *6.61 (0.66)* **0.78**	3.00 (0.29) *3.42 (0.43)* **0.66**
U.K.	3.44 (0.73) *4.66 (0.55)* **1.78**	1.09 (0.16) *1.20 (0.12)* **0.30**
U.S.A	4.30 (0.72) *6.19 (0.85)* **2.88**	0.27 (0.05) *0.53 (0.05)* **13.52**
Europe[1]	3.95 (0.76) *3.06 (0.43)* **1.04**	0.52 (0.07) *0.60 (0.05)* **0.86**
North America[2]	4.08 (0.65) *5.66 (0.77)* **2.46**	0.28 (0.05) *0.48 (0.04)* **10.26**
Aggregate[3]	2.98 (0.58) *3.91 (0.50)* **1.47**	0.13 (0.01) *0.27 (0.03)* **19.60**

1 Aggregation of Finland, Germany and the United Kingdom.

2 Aggregation of Canada and the United States

3 Aggregation of all economies above

Data is Hodrick & Prescott-Filtered

Standard deviations of statistics are in parentheses

The significance test is in bold. 90% level is at 3.48, 95% at 5.02, 99% at 7.88

Source: Adopted from Zimmermann, C., November 1996

Notes

1. Notice that though the intra traded assets effect has implications for the inter traded-nontraded assets effect, the reverse is not true.

2. Note that since the state variables in this structure follow a Geometric Brownian motion process which is nonstationary with infinite asymptotic (unconditional) variance, throughout our study regarding the stabilization property of different types of exchange rate arrangements and financial repression policy, we have focused on the instantaneous (conditional) equilibrium variances.

3. This can be viewed as the counterpart of the Turnovsky (1994) generalized to (semi) open economy suffering from financial repression.

4. When θ is zero, the optimal interest rate takes its minimum value which accords with the Friedman rule.

5. Note that since we are ignoring the McKinnon-Shaw effect in this section, the financial repression has no consequence for the consumption.

6. As we know despite the productivity shocks, under the fixed rates the equilibrium level of the share of domestic capital in traded assets is independent of government expenditure shocks. That is why the (initial) equilibrium share of traded assets involves the equality between real return on domestic capital (adjusted for financial repression) and after tax real return on foreign assets. Thus, the negative and zero return on foreign assets implies a negative marginal productivity for domestic capital which does not make sense with an AK production technology.

7. The main objective in RBC literature is to replicate the stylized facts of the business cycles by building an artificial economy model whose equilibrium outcome is the optimal solution of an intertemporal maximization problem carried out by rational agents.

8. For instance, in Obstfeld (1994) the reduction in variance of growth is yielded by a shift to prefect risk-pooling in a cost less financial transactions environment and appealing to a mutual fund theorem identical to what has been raised in Merton (1971).

Chapter 5

The McKinnon-Shaw Effect and Exchange Rate Arrangements

5.1 Introduction

In the previous chapter, the importance of financial repression for the optimal degree of exchange rate flexibility and the circumstances under which one can make a welfare and growth case for financial repression in the absence of McKinnon-Shaw (MS) effect were discussed. That is, we analysed the welfare implications of financial repression policies when they lead to a distortion in marginal productivity of (domestic) capital through a reduction in quality of investment projects as a result of, for instance, following directed credit and concessionary lending rates policies (Goldsmith channel). As such, our analysis did not take into account the welfare (growth) implications of financial repression for the savings-investment incentives which, for example, through an increase in transaction costs or reduction in real returns on savings, will reduce the volume of savings and thereby the level of investment and/or the efficiency of allocation of savings to investment purposes (i.e. McKinnon-Shaw channel). This would be a trivial task if there is no welfare (growth) difference between these two channels. However, this will have an important policy implication if the reverse turns out to be true.

Recently, De Gregorio (1993) and Jappelli & Pagano (1994) by focusing on the side of consumer rather than production have analytically concluded that financial deepening through loosening consumer borrowing constraints will not necessarily be conducive for raising the saving rates. This accords with Latin American financial liberalization experience in this regard. They argue that in a financially repressed economy, since agents are not able to borrow (either fully or partially) against future income, they must accumulate financial wealth by increasing savings in order to finance their current consumption. This questions the veracity (efficacy) of the MS channel. Also, there is literature casting doubts on the empirical validity of the MS hypothesis regarding to the level of savings-investment. They, in general, suggest it is unlikely that financial liberalization leads to a rise in savings. For instance, while Fry (1988) and King & Levine (1993 a, b, c) find strong evidence for the financial repression effect on the overall quantity of investment (financial savings), Giovannini (1985), Diaz-Alejandero (1985) and Dornbusch (1990) find either small or no effect of real returns on the level of savings.

De Gregorio & Guidotti (1993) estimations, besides, show that the financial development effect on the quantity of investment is, in general, small relative to its effect on the efficiency of investment. One interesting result of their study is a robust negative effect of their financial intermediation indicator (i.e. the ratio between domestic credit to the private sector and GDP) on the growth for a sample of Latin American countries. They suggest this negative effect emanates from a negative effect on the efficiency of investment rather than volume of investment. In analysing the cause of the negative effect, they attribute it to the problem of over lending or, more precisely, moral hazard as a result of the financial intermediaries' expectations of the government incentives to bail them out in the face of running into crisis which was the commonly experienced episode in most emerging stock markets in Latin American countries during the 1970s and 1980s. Therefore, this implies the process of deepening the financial intermediatory (Goldsmith channel) might be helpful for growth only so far as the financial intermediaries' are well regulated by the government.

What the sceptics claim about the MS channel can be summed up as the efficiency effect is more influential than the level effect of investment for economic growth. Thus, policies entailing a reduction in the level of savings, to some extent, are less harmful than those bear loss of efficiency. More specifically, they, on the basis of the foregoing analytical and empirical arguments, suggest though financial liberalization might involve a reduction in the level of financial savings, since it improves the efficiency of investment it would be growth enhancing and recommendable for the economies suffering from financial repression.

No doubt, when financial repression implies an increase in the level of financial savings it will promote welfare (growth) in the situations explored in the previous chapter and, hence, provides more support for our previous arguments. However, this episode does not take up our main concern in this chapter. Let us, in line with Fry (1988) and the others, suppose the MS channel is effective, that is, it causes a reduction in the level of savings-investment. Then, we question whether it is yet possible to make a welfare (growth) case for financial repression!? If yes, what are the main factors that bear any relation in this respect? In particular, what is the role of exchange rate regimes for welfare (growth) consequences of MS channel? Our argument can be simply summarized as follows. Given the financial repression through MS channel reduces the level of savings-investment it might involve an improvement in welfare (growth), since at the same time it impacts on the agent's speculative behaviour, under specified circumstances, to be sketched out in this chapter. Exchange rate regimes through their specific implications for nominal and real interest rates and particularly risk premia associated with domestic and foreign financial assets will embody more/less restrictive clauses for welfare (growth) cases.

The chapter consists of three sections. In the first section, we examine the welfare (growth) implications of financial repression when there is only MS effect in the model. The abstraction of the Goldsmith effect renders clearer insight about the welfare effects of the MS channel within our model. In the first part of this section we analyse the welfare consequences of financial repression when a fixed rates regime is in operation. While in the second part, we focus on the mechanism of the effects under the floating rates regime. The second section has been devoted to the study of welfare (growth) implications of financial repression when both the MS and Goldsmith effects are present. The third section summarizes our main findings in this chapter.

5.2 The McKinnon-Shaw Effect

The welfare implications of financial repression through MS effect seem to be more complicated than when there is only the Goldsmith effect at work. The MS effect, on the one hand, implicates higher transformation cost of savings into income earning financial assets which stimulates a higher level of share of real money balances and consumption, both can be restrictive for economic growth. However, the economic implications of financial repression through the MS channel are not limited to this sequence. That is, on the other hand, it will induce a reallocation within the portfolio of income earning assets which might work in contrast to the saving-investment effect in terms of growth performance of the economy. Although, the former channel, through a reduction in the agent's (shoe leather) inflation cost as a result of an increase in the share of real money balances and thereby also an increase in the initial value of wealth, has a direct welfare improving role, it will indirectly undermine welfare through the growth deteriorating effect. The latter channel giving rise to a reallocation within the traded assets, when it involves improvement in economic growth will contribute to the welfare of the representative agent and the reverse will be true when it is growth deteriorating. Which one of these forces outweighs the other, in general, depends upon the relative values of the parameters involved in the welfare function. Like the Goldsmith effect, one of the important factors in this respect is the type of exchange rate arrangement which is in operation in the economy. In the following, we try to study the economic situations in which making a welfare (growth) case for financial repression through the MS channel might be accomplished. As in the previous chapter, we start our discussion by investigating the forces which are interacting under fixed rates and then we carry out the same task for floating rates. The managed rate arrangements would be something between these two polar cases. Since the MS channel introduces non-linearity in the system for the flexible exchange rate arrangements so that we cannot obtain a full reduced form solution for magnitudes involved, our analysis in the case of floating rates will be limited to a type of implicit form analysis. Also, to be more illustrative and distinctive, in our analytical discussion here we will disregard the Goldsmith effect and focus only on the MS effect.

5.2.1 The Fixed Exchange Rate Regime

Under fixed rates, financial repression, apart from the taxation on nominal return of foreign assets (capital control), has no effect on welfare through the nominal interest rate, as the nominal interest rate is determined exogenously by the after tax foreign interest rate. Therefore, financial repression will stimulate consumption-wealth ratio and the share of real money balances as a result of an increase in the cost of investment on income earning financial assets (recall equations (3-9'-1) and (3-9'-2)). Notice that when the MS effect is at work the financial repression will raise the share of real money balances in the agent's portfolio even if the marginal utility of money is independent of financial repression. Needless to say, when the marginal utility of money is influenced by financial repression, any unit increase in the degree of financial repression will raise the share of real money balances more than when it is not the case. The rise in consumption and real money balances will reduce the level of investment on traded assets which will tighten the economic growth. Nonetheless, since financial repression will impact on the risk associated with traded assets, it induces a readjustment within the portfolio of traded assets which, under specified circumstances, may lead to an improvement in economic growth. This can easily be found out as we have:

$$\Omega_{\infty} = \frac{(\alpha - \Gamma\sigma_q^2) - [i^*(1-t^*) - q + \sigma_q^2]}{\{\varphi[1 - \frac{(1-\varphi)\zeta(f)\mu}{\varphi i^*(1-t^*)}]\}[\alpha^2\sigma_y^2 + \sigma_q^2]} + \frac{\sigma_q^2}{\alpha^2\sigma_y^2 + \sigma_q^2} \tag{5-1}$$

This states, the share of domestic capital in traded assets is determined by two main elements. The first one presented by the first term in (5-1) depends on the differential real rate of return on domestic capital and foreign assets describing the speculative behaviour. The second one shown by the second term is the relative variances of domestic capital and foreign assets reflecting the agent's hedging behaviour. As can be seen in (5-1), financial repression through MS channel impacts on the speculative part (i.e. the term in the first curly brackets of the denominator) and leaves the hedging part unaffected. More precisely, the financial repression will reduce the risk associated with the domestic capital and foreign assets equiproportionally and hence, leaves the hedging behaviour unaffected. However, when the expected real return on domestic capital is higher (less) than that on (after tax) foreign assets, this reduction in risk, though equiproportionally, will raise (decrease) the real return on domestic capital more than that on foreign assets for the representative agent. This will cause a switch within the agent's traded assets portfolio which has its own implications for the mean and variance of growth. In summary, on the one hand, the MS channel will reduce the level of savings in the form of investment on income earning assets, henceforth, called saving-investment effect. On the other hand, it causes a change within the agent's traded assets portfolio, henceforth, called intra traded assets effect. The overall result for expected growth depends on the relative values of these two effects. These two sets of effects can be simply verified by taking derivative of the expected growth with respect to financial repression given as follows:

$$\frac{\partial\psi_\infty}{\partial f}=\{[\varphi'\Omega_\infty+\varphi\frac{\partial\Omega_\infty}{\partial f}][(1-g)(\alpha-\Gamma\sigma_q^2)-(i^*-q+\sigma_q^2)]+\varphi'(i^*-q+\sigma_q^2)\}$$
$$-\frac{\theta\mu^2(1+\Pi)[\zeta(f)'\varphi-\varphi'\zeta(f)]}{[1-\frac{(1+\Pi)\zeta(f)\mu}{\varphi i^*(1-t^*)}]\varphi^2 i^*(1-t^*)} \qquad (5\text{-}2)$$
$$\text{where:}\quad \frac{\partial\Omega_\infty}{\partial f}=\left[\frac{\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f}}{\varphi[1-(1-\varphi)n_M]}\right][\frac{\sigma_q^2}{\alpha^2\sigma_y^2+\sigma_q^2}-\Omega_\infty]$$

In equation (5-2), the terms in the first curly brackets show the intra traded assets effect which can be positive or negative and the second term refers to the saving-investment effect which is always negative. As shown, the differential real rate of return on domestic capital net of the government output share and foreign assets in the intra traded assets part has been weighed by a factor representing the total share of domestic capital in traded assets effect of a change in the transformation cost of saving into investment (i.e. $[\varphi'\Omega_\infty+\varphi\frac{\partial\Omega_\infty}{\partial f}]=\varphi'\Omega_\infty(1+\eta_\Omega)$). This factor includes the elasticity of the share of domestic capital in the traded assets with respect to (changes in) the transformation cost of saving into investment (i.e. η_Ω) which plays a crucial role in determining the net outcome of financial repression for growth. This is so as it can take on values greater, equal or less than zero depending on the values of structural parameters, the relative sizes of the second moments of the shocks which the economy is susceptible to and the relative (expected) real return on traded assets. Also, with regard to the saving-investment channel the higher the marginal utility of consumption and/or the less patient the representative agent and/or the higher the level of the government debt policy (i.e. Π), the greater would be the saving-investment effect. Incidentally, under fixed rates the higher the tax on the (nominal) rate of return on foreign assets (capital control), the higher would be the share of real money balances and thereby the higher would be the negative role of saving-investment effect on the (expected) growth.

Comparing equation (5-2) with its counterpart(s) in case of the Goldsmith channel (equations (4-9), (4-21) and (4-29)), the similarities and differences between the consequences of financial repression for the expected growth through the Goldsmith and MS channels can be realized. First, the saving-investment effect in the MS case can be considered as the counterpart of the inter traded-nontraded assets effect in the Goldsmith case. However, in the MS case by contrast to the Goldsmith case, the negative role of financial repression will not disappear when the marginal utility of money is completely insensitive with respect to financial repression. This lays stress on the fact that in the case of the MS channel, the share of real money balances, thereby government bonds, as well as consumption will increase due to a rise in the cost of transforming savings into investment and not only through the increasing effect of financial repression on transaction costs. Nonetheless, as written, the negative effect of the saving-investment channel will be higher when the marginal utility of real money balances is sensitive to financial repression. Second, the intra traded assets effect in the MS case mimics exactly the same role as the Goldsmith channel. That is, both emphasize the role of financial repression in reallocation within the portfolio of traded assets. Nevertheless, the mechanism of effects and their consequences for economic growth are different. For instance, any increase in financial repression through the MS channel involves a direct negative effect on economic growth due to a reduction in total investment on both domestic capital and foreign assets (the terms multiplied by φ' in the curly brackets refer to this fact). Whereas in the Goldsmith case this negative effect is restricted to a loss in (the productivity of) the domestic capital.

According to equation (5-2), in order for financial repression to be (expected) growth improving it is necessary that the intra traded assets effect to be positive and its value must be greater than the absolute value of the saving-investment effect. As mentioned, the intra traded assets effect consists of two main components. The first one indicates the net contribution/ depression of portfolio adjustment to/of growth emanating from the differential real rate of return on domestic capital net of the government output share and foreign assets. The second one, which is negative as long as the real return on foreign assets is positive, refers to the growth loss as a result of the reduction in investment on foreign assets. However, when the real return on foreign assets is negative, the reduction in investment on foreign assets, which in this case might be kept by the agent due to the risk associated to domestic capital, will improve the (expected) growth. This emphasizes the possibility of a positive effect of financial repression through the MS channel on the speculative behaviour of the representative agent. When this occurs, the following relationship can be considered as a sufficient condition to have a positive intra traded assets effect when the real return on foreign assets is negative:

$$\frac{i^{*}-q+\sigma_q^2}{(1-g)(\alpha-\Gamma\sigma_q^2)-(i^{*}-q+\sigma_q^2)} \prec -[\Omega_\infty+\frac{\varphi}{\varphi'}\frac{\partial\Omega_\infty}{\partial f}] \tag{5-3}$$

The left hand side term in the above inequality, showing the relative value of real return on foreign assets to differential real return on traded assets, is between zero and minus one. Note that the higher g is, other things being equal, the closer it is to minus one making the above restriction less binding. In passing, when the real return on foreign assets is negative, the financial repression always implies higher share of domestic capital in the agent's traded assets portfolio (i.e. $\frac{\partial\Omega_\infty}{\partial f}>0$). In economic terms, the above inequality guarantees the benefits from the adjustment in the agent's portfolio due to financial repression will exceed the loss emanating from less investment on traded assets which is a fraction of the saving-investment loss. This condition is not so restrictive as we can write down the right hand side of the above inequality as follows:

$$[\Omega_\infty+\frac{\varphi}{\varphi'}\frac{\partial\Omega_\infty}{\partial f}]=[\Omega_\infty+\eta_\infty(\frac{\sigma_q^2}{\alpha^2\sigma_y^2+\sigma_q^2}-\Omega_\infty)]$$

$$where: \qquad \eta_\infty=\left[\frac{\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f}}{\varphi[1-(1-\varphi)n_M]}\right](\frac{\varphi}{\varphi'}) \geq 1$$

The term η in the above relationship can be interpreted as the elasticity of the investment on income earning (traded) assets with respect to (changes in) transformation cost of saving into investment. Therefore, it means one percentage increase in the transformation cost of saving into investment leads to at least one percentage decrease in investment on the traded assets. As we can see, when there is no foreign inflation shock in the economy, condition (5-3) always holds. This is so because we have: $[\Omega_\infty+\frac{\varphi}{\varphi'}\frac{\partial\Omega_\infty}{\partial f}]=(1-\eta)\Omega_\infty \leq 0$. Needless to say this *does not mean* the absence of foreign inflation shocks is necessary to satisfy the above condition. For instance, when the η_∞ takes its minimum level, occurring in the case of zero value for marginal utility of real money balances, we obtain:

$$\frac{i^{*}-q+\sigma_q^2}{(1-g)(\alpha-\Gamma\sigma_q^2)-(i^{*}-q+\sigma_q^2)} \prec -[\Omega_\infty+\frac{\varphi}{\varphi'}\frac{\partial\Omega_\infty}{\partial f}]=-\frac{\sigma_q^2}{\alpha^2\sigma_y^2+\sigma_q^2}$$

That is, when the real money balances has no utility, the intra traded assets effect would be positive and, thus, financial repression can be (expected) growth improving if the absolute value of real return on foreign assets relative to differential real return on domestic capital net of the government output share and the foreign assets is greater than the relative variances of the two assets. Note that, as long as $g \prec 1$, this condition never holds if there is no productivity shock in the economy. *Namely, when the marginal utility of money is zero and real return on foreign assets is negative, the presence of productivity shocks is necessary in order to make a growth case for financial repression.* On the contrary, when there is no foreign inflation shock, the financial repression will definitely be growth enhancing on this occasion. However, when the marginal utility of money is not zero, the η is always greater than one and condition (5-3) is not sufficient to ensure the improvement in growth. This is due to the fact that any increase in the transformation cost of saving to investment will induce a reduction in the level of investment on traded assets and thus there would be a trade off between benefits of financial repression obtained from switching toward more productive assets (here domestic capital) and its losses through the saving-investment effect.

Proposition 5-1: *Under the fixed rates when the real return on foreign assets is positive, one can not make any growth case for financial repression through the MS channel as long as the marginal utility of real money balances is equal to zero.*

Proof: From equation (5-2), when the marginal utility of real money balances is zero, we have:

$$\frac{\partial \psi_\infty}{\partial f} = \frac{\varphi' \sigma_q^2}{\alpha^2 \sigma_y^2 + \sigma_q^2}[(1-g)(\alpha - \Gamma\sigma_q^2) - (i^* - q + \sigma_q^2)] + \varphi'(i^* - q + \sigma_q^2) \prec 0 \qquad \square$$

As we will show this proposition holds irrespective of the type of exchange rate arrangement provided that the inflation variance is costless (i.e. Γ=0) (refer to proposition 5-5). It, in a sense, lays stress on the fact that in a second best environment there is not necessarily a conflict between the financial repression as a source of public budget financing and economic growth. Namely, by increasing the financial repression the government can raise the real money balances as inflation tax base and, in specified occasions, it might achieve an improvement in economic growth too. The economic intuition behind the above proposition is this: when the marginal utility of money is zero the intra traded assets effect is at its minimum level so that it cannot dominate the saving-investment effect. While, when the financial repression leads to an increase in real money balances, though the saving-investment effect will rise, the intra traded assets effect would rise as well. As we will see below, under specified circumstances, the intra traded assets effect will outweigh that of the saving-investment so that it will involve an improvement in economic growth. More specifically, when the marginal utility of money is zero, the reduction in risk associated with domestic capital as a result of a rise in financial repression would not be sufficient to induce enough reallocation within the traded assets towards more productive assets so that it boosts the economic growth (refer to equation (5-1)). Therefore, on the basis of the above proposition, the nonzero marginal utility of real money balances (transaction costs) is a necessary condition for making a growth case for financial repression through the MS channel. This stresses one of the other differences in growth consequences between the Goldsmith and MS channels.

Considering proposition (5-1), below we work out the economic instances where financial repression through the MS channel may involve a contribution to (expected) growth. However, in order to make our arguments simpler and have a more illustrative presentation in the following, we first examine occasions where the economy is not exposed to one of the shocks and then carry on our discussion to the general case.

5.2.1.1 No Foreign Inflation Shocks

When the economy is not exposed to foreign inflation shocks, one may make a growth case for financial repression only if the real return on domestic capital net of the government output share is greater than that on foreign assets. Given this fact, the necessary condition ensuring a (positive) contribution from differential real rate of traded assets' returns on growth due to an increase in financial repression is as: $\{\alpha - [i^*(1-t^*) - q]\} \succ 0$. The sufficient condition which guarantees a positive intra traded assets effect can be characterized as follows: $\alpha \succ \frac{(i^* - q)}{(1-g)}[1 + \frac{1}{\Omega_\infty(\eta_\infty - 1)}]$. As written, when the marginal utility of money is zero (*i.e.*

η_∞=1) the sufficient condition does not hold. In addition, it implies for a given level of the marginal productivity of capital, the higher government output share, which in our model is a pure drain of economic resources, makes it less possible to have a growth case for financial repression. This fact carries over to any type of shock which the economy is exposed to. However, the reverse is true, the higher is the share of domestic capital in the traded assets and/or the higher is the elasticity of investment on traded assets with respect to transformation cost of saving into investment. The latter turns out to be true, since it implicates that any percentage change in the transformation costs entails a greater contribution to the (expected) growth due to a greater shift towards the more productive asset. The growth enhancing role of financial repression, clearly, involves the positive intra traded assets effect dominates the negative saving-investment one (that is, the second term in equation (5-2)).

5.2.1.2 No Productivity Shocks

Despite the previous case, when the economy is not buffeted by domestic productivity shocks, one may make a growth case for financial repression through the MS channel even if the real return on domestic capital net of the government output share is less than that on foreign assets. This may happen *iff* the economy is a net creditor. In this case, the necessary condition for having a positive intra traded assets effect requires the real return on domestic capital to be less than the after tax real return on foreign assets. More precisely, the economic instance must be such that we have: $[i^*(1-t^*)-q+\sigma_q^2]\ \sigma_q^2\varphi[1-(1-\varphi)n_M] \prec (\alpha-\Gamma\sigma_q^2) \prec [i^*(1-t^*)-q+\sigma_q^2]$. The lower limit of this interval is a necessary condition to have a positive share of domestic capital in the traded assets. This implies for the maximum level of financial repression the necessary condition never holds. The sufficient condition which insures a positive intra traded assets effect can be stated as : $(\alpha-\Gamma\sigma_q^2) \prec \frac{(i^*\ q+\sigma_q^2)}{(1\ g)}[1+\frac{1}{\Omega_\infty(\eta_\infty-1)-\eta_\infty}]$. Given the necessary condition and the fact that it applies for the net creditor economies, the denominator term in the brackets is always negative and it must be less than minus one. As is obvious, the sufficient condition is binding only if the right hand side of the inequality is less than the after tax real return on foreign assets. Also, it expresses that the higher is the government output share and/or the higher is the elasticity of investment on traded assets with respect to the transformation cost of saving into investment and/or the lower is the share of domestic capital in the traded assets, the less would be the sufficient condition binding.

When the real return on domestic capital net of the government output share is greater than that on the foreign assets, the necessary and sufficient conditions in order that the intra traded assets effect shall be positive, are as follows:

$$\textit{Necessary condition:} \qquad \{(\alpha-\Gamma\sigma_q^2)-[i^*(1-t^*)-q+\sigma_q^2]\} > \frac{\sigma_q^2\varphi[1-(1-\varphi)n_M]}{(\eta_\infty-1)}$$

$$\textit{Sufficient condition:} \qquad (\alpha-\Gamma\sigma_q^2) > \frac{(i^*-q+\sigma_q^2)}{(1-g)}[1+\frac{1}{\Omega_\infty(\eta_\infty-1)-\eta_\infty}]$$

These conditions have the same role as the case of productivity shocks. Note that given the necessary condition, the denominator term in the brackets of the sufficient condition is negative positive implying the necessity of higher differential rate of returns between domestic capital (net of the government output share) and foreign assets in order to have a positive intra traded assets effect. However, in spite of the previous case, the higher is the government output share and/or the higher is the elasticity of investment on traded assets with respect to the transformation cost of saving into the investment and/or the lower is the share of domestic capital in the traded assets, the more binding would be the sufficient condition.

Incidently, when $\eta_\infty=1$, neither of the above sufficient conditions holds making impossible to have a growth case in either of the occasions which follows proposition (5-1). Again, given the positive intra traded assets effects financial repression can be growth improving only if the negative saving-investment effect can not wipe out all the intra traded assets contribution to growth.

5.2.1.3 Productivity and Foreign Inflation Shocks

When the economy is susceptible to both types of shocks, the necessary conditions to have a positive intra traded assets effect are exactly the same as what has been mentioned in the previous case. However the sufficient conditions, where the real return on domestic capital net of the government output share is less (greater) than that on the foreign assets are as:

$$(\alpha \ \Gamma\sigma_q^2) \prec (\succ) \ \frac{(i^* - q + \sigma_q^2)}{(1-g)}[1 + \frac{1}{\Omega_\infty(\eta_\infty - 1) - \eta_\infty \frac{\sigma_q^2}{\alpha^2\sigma_y^2 + \sigma_q^2}}]$$

In general, the necessary and sufficient conditions have the same interpretations as the previous cases. The only difference is that here we face a more restrictive sufficient conditions when the economy is buffeted by both types of shocks. More specifically, in the presence of the two types of shocks the relative variances of the shocks reflecting the agent's hedging behaviour comes into play so that it makes more restrictive the possibility of growth enhancing characteristic of financial repression through the MS channel for a given level of the marginal productivity of domestic capital. Needless to say, the growth enhancing role of financial repression is pending on whether the positive intra traded assets effect outweighs the negative saving-investment one or not.

Another aspect of financial repression through the MS channel is its implications for the variance of growth which is one of the important components of our welfare function. That is, even though the financial repression policy might in specified occasions lead to an improvement in expected growth, there might be occasions in which that contribution is bought at the expense of higher volatility in growth. However, in the following we will show that it is not always the case and the type and relative sizes of the second moments of the shocks hitting the economy are among the most important factors in this respect. Furthermore, we try to demonstrate that even though there might be no (expected) growth case for financial repression it may stabilize the growth of economy against the shocks impinging on the economy and thereby provide another incentive for a benevolent government to resort to financial repression.

Proposition 5-2: *Under the fixed rates, the variance of growth is independent of financial repression through the MS channel if and only if either the economy is not exposed to foreign inflation shocks or it is buffeted only with foreign inflation shocks.*

Proof. Disregarding the Goldsmith effect, from (3-21-1) we have:

$$\left(\sigma_w^2\right)_{\sigma_q^2\ 0}=\frac{\{\alpha-[i^*(1-t^*)-q]\}^2(\sigma_y^2+\sigma_g^2)}{\alpha^2\sigma_y^4} \qquad (5\text{-}3\text{-}1)$$

$$\left(\sigma_w^2\right)_{\sigma_q^2\neq 0}=\frac{\{(\alpha-\Gamma\sigma_q^2)-[i^*(1-t^*)-q+\sigma_q^2]\}^2}{\sigma_q^2} \qquad (5\text{-}3\text{-}2)$$

□

There are some points regarding to the above equations which are worthy of emphasis here. First, as we mentioned in the previous chapter, as long as the economy is a net debtor irrespective of the type of the shocks which the economy is exposed to, a higher tax rate on foreign assets (capital control) always involves a higher volatility of growth. This is true since any increase in the tax rate (capital control) makes less the opportunity of the risk pooling for the representative agent. More specifically, it distorts the agent's optimal risk sharing portfolio due to the lack of access to a completely perfect financial market. Therefore, though the government is able to raise its revenue through introducing imperfection into the foreign capital markets, this policy can be distortionary not only in terms of (expected) growth but also in terms of the volatility of growth. By contrast, when the economy is a net creditor a higher tax on foreign assets leads to holding less risky assets so that it reduces the volatility of growth. This accords with our findings in the Goldsmith case. Second, the higher is the differential real rate of return on domestic capital and that on after tax foreign assets, the higher is the variance of growth. In fact, any increase in tax rate on foreign assets (capital control) will lead to a higher level of the differential real rates and thereby a higher level of growth variance. This can provide another way of looking at the growth volatility raising aspect of increasing the tax rate (capital control) on foreign assets. Third, when the economy is not exposed to foreign inflation shocks, other things being equal, the lower the variance of productivity shocks is the higher is the variance of growth (refer to equation (5-3-1)). This is so as the lower productivity shock variance, ceteris paribus, implicates higher share of domestic capital in the traded assets (recall equation (21-1) as well). By contrast, the higher is the variance of government expenditure (demand side) shock, other things equal, the higher is the variance of growth. However, in case of foreign inflation shocks, ambiguity arises due to the role of the economy's indebtedness situation. These considerations must be kept in mind because of their important implications in our calibration exercise. More specifically, they impose some restrictions on replicating the variance of growth which the economies are experiencing in reality via our model.

Hence, when financial repression is growth improving, under the above conditions this improvement would be costless in terms of variance of growth. In other words, if the conditions in proposition 2 hold there would not be any justification for financial repression in the context of growth whenever it is (expected) growth deteriorating. Nonetheless, if it is not the case and the economy is exposed to foreign inflation shocks as well as either productivity or government expenditure shocks, according to the proposition below, financial repression will reduce the variance of growth.

Proposition 5-3: *Under the fixed rates, if the economy is susceptible to foreign inflation shocks as well as productivity and/or government expenditure shocks, the financial repression through MS channel will always implicate a reduction in the variance of growth.*

Proof. Disregarding the Goldsmith effect and differentiating from (21-1), we obtain:

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right)_{\sigma_g^2=0} = \frac{2\alpha^2\sigma_y^2\sigma_q^2}{(\alpha^2\sigma_y^2+\sigma_q^2)}\varphi[1-(1-\varphi)n_M]\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f} \prec 0$$

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right)_{\sigma_y^2\ 0} = \frac{2\alpha^2\sigma_g^2}{\sigma_q^2}\{(\alpha-\Gamma\sigma_q^2)-[i^*(1-t^*)-q+\sigma_q^2]+\varphi[1-(1-\varphi)n_M]\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f}\} \prec ($$

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right) = 2\sigma_w^2\frac{\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f}}{\varphi[1-(1-\varphi)n_M]}(1-L) \prec 0$$

where: $$L=\frac{[\Omega_\infty\alpha^2\sigma_y^2-(1-\Omega_\infty)\sigma_q^2][\Omega_\infty\alpha^2(\sigma_y^2+\sigma_g^2)-(1-\Omega_\infty)\sigma_q^2]}{(\alpha^2\sigma_y^2+\sigma_q^2)[\Omega_\infty^2\alpha^2(\sigma_y^2+\sigma_g^2)+(1-\Omega_\infty)^2\sigma_q^2]} \prec 1$$

$$\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f} = [\varphi'(1+\frac{\zeta(f)\mu}{i^*(1-t^*)})-(1-\varphi)\frac{\zeta(f)'\mu}{i^*(1-t^*)}] \prec 0 \qquad \sqsubset$$

This proposition reemphasizes the role of financial repression as a shock absorber. Hence, in those economies where the volatility of growth is high, even though financial repression might be (expected) growth deteriorating, when the conditions of the proposition 3 hold, it can provide additional incentive for a benevolent government to use the financial repression policy as a stabilization instrument. Evidently, when financial repression through the MS channel is growth improving, it will contribute to welfare by raising consumption, the share of real money balances, the expected growth and thereby the initial value of wealth and by reducing the variance of growth. However, when it is not the case, there would be trade offs among welfare arguments in using financial repression.

5.2.2 The Floating Rate Regime

Under floating arrangement, due to non linearity involved in obtaining a reduced form solution for Ω and thereby ψ, n_M, σ_w^2 and i, it is not possible to go through an analytical discussion as thoroughly as we did for fixed rates. Thus, we will carry out a sort of implicit analysis for the floating rates. Our analysis is started with a study of the implications of financial repression for real money balances. Then based on our inferences we carry on the growth and welfare implications of financial repression through the MS channel.

We know, from the equation (9'-2), that:

$$\frac{\partial n_M}{\partial f} = \frac{i\mu[\varphi\zeta(f)' - \varphi'\zeta(f)] - \frac{\partial i}{\partial f}\varphi\zeta(f)\mu}{\varphi^2 i^2} \tag{5-4}$$

In (5-4), though the first term is always positive, the sign of the second term depends upon the sign of $\frac{\partial i}{\partial f}$ which can be determined by obtaining the full reduced form solution of the model. However, we know that equation (5-4) should always be greater than or at least equal to zero. Otherwise, there would not be any justification for financial repression from a public finance point of view. Put differently, in this study we are mainly concerned with the implications of financial repression as a source of public budget financing. This implies the following relationship for $\frac{\partial i}{\partial f}$:

$$\left(\frac{\frac{\partial i}{\partial f}}{i}\right) \leq \frac{[\varphi\zeta(f)' - \varphi'\zeta(f)]}{\zeta(f)\varphi} \tag{5-4'}$$

Also, from (5-4) we have:

$$\frac{\partial(1-\varphi)n_M}{\partial f} \succ 0 \qquad (5\text{-}5\text{-}1)$$

$$\frac{\partial[1-(1-\varphi)n_M]}{\partial f} \prec 0 \qquad (5\text{-}5\text{-}2)$$

$$\eta = \frac{\varphi}{\varphi'} \frac{\frac{\partial \varphi[1-(1-\varphi)n_M]}{\partial f}}{\varphi[1-(1-\varphi)n_M]} = \frac{[i+\zeta(f)'\mu - \frac{(1-\varphi)\zeta(f)'\mu}{\varphi'}] + \frac{\frac{\partial i}{\partial f}}{i}\frac{(1-\varphi)\zeta(f)\mu}{\varphi'}}{i[1-(1-\varphi)\frac{\zeta(f)\mu}{\varphi i}]} \geq 1 \quad (5\text{-}5\text{-}3)$$

Given the relationship (5-4'), the η in (5-5-3) is greater than or at least (i.e. when $\zeta(f)=0$) equal to one. This information allows us to study the growth (mean-variance) implications of financial repression under floating rates. However, in order to get a more tractable structure and thereby neater analytical insight we suppose the economy is buffeted only by one type of shocks, namely, either domestic (productivity and government expenditure) shocks or foreign inflation shocks.

5.2.2.1 Domestic (Real and Monetary) Shocks

According to equation (3-23'-1), the consequence of financial repression for the share of domestic capital in the traded assets when the economy is exposed to domestic shocks can be expressed as:

$$\frac{\partial \Omega_0}{\partial f} = \frac{-\Gamma(\frac{\partial \sigma_p^2}{\partial f})}{\varphi[1-(1-\varphi)n_M]\alpha^2\sigma_y^2} - \frac{\varphi'}{\varphi}\eta_0\Omega_0$$

$$where: \quad \frac{\partial \sigma_p^2}{\partial f} = \frac{2\varphi\Omega_0^2\alpha^2\varphi'(\sigma_y^2+\sigma_g^2)(1-\eta_0)}{[1+\frac{2\varphi^2\Omega_0^2\alpha^2\Gamma(\sigma_y^2+\sigma_g^2)}{\varphi[1-(1-\varphi)n_M]\alpha^2\sigma_y^2}]} \geq 0 \qquad (5\text{-}6)$$

As we see the nonzero cost of inflation variance leads to an ambiguity in the implication of financial repression for the share of domestic capital in the agent's traded assets. This is so because under floating rates, financial repression will raise the variance of (domestic) inflation implying a reduction in the marginal productivity of domestic capital. On this occasion, one can show the sufficient condition in order for financial repression to boost the share of domestic capital in the traded assets is $\Omega_0\varphi \geq 1$ or more precisely $\Omega_0 \geq \frac{\eta_0-\varphi}{\eta_0\varphi}$. However, when Γ=0, the financial repression involves a definite increase in the share of domestic capital in the traded assets due to a reduction in the risk associated with domestic capital. These relationships permit us to discuss the growth implications of financial repression under floating rates.

Like fixed rates, under floating rates the increase in financial repression entails a saving-investment and an intra traded assets effect. Again, a positive intra traded assets effect dominating the negative saving-investment effect is required in order for the financial repression to be growth enhancing. Nonetheless, the implications of financial repression for nominal interest rate and inflation variance cost create more involving conditions in order to make a growth case for financial repression under floating rates. Considering equation (3-23'-2), the following relationship demonstrates this fact:

$$\frac{\partial\psi_0}{\partial f}=\{[\varphi'\Omega_0+\varphi\frac{\partial\Omega_0}{\partial f}][(1-g)(\alpha-\Gamma\sigma_p^2)-(i^*-q)]+\varphi'(i^*-q)-\Gamma\varphi\Omega(1-g)\frac{\partial\sigma_p^2}{\partial f}\}$$
$$-\frac{\theta\mu^2(1+\Pi)[\zeta(f)'\varphi i-(\varphi' i+\varphi\frac{\partial i}{\partial f})\zeta(f)]}{[\varphi i-(1+\Pi)\zeta(f)\mu]^2} \qquad (5\text{-}7)$$

where: $$[\varphi'\Omega_0+\varphi\frac{\partial\Omega_0}{\partial f}]=\frac{-\Gamma(\frac{\partial\sigma_p^2}{\partial f})}{[1-(1-\varphi)n_M]\alpha^2\sigma_y^2}+\varphi'(1-\eta_0)\Omega_0$$

The terms in the curly brackets stand for intra traded assets effect and the second term indicates the negative saving-investment effect. Comparing the intra traded assets effect with its counterpart under fixed rates, we realize that under floating rates the inflation variance cost adds an additional depressing channel to the implications of financial repression for growth. As such, the following is the sufficient condition in order for financial repression to involve a positive intra traded assets effect:

$$[\varphi'(i^*-q)+\Omega\Gamma\varphi(1-g)\frac{\partial\sigma_p^2}{\partial f}] \prec$$

$$[\varphi'(1-\eta_0)\Omega_0-\frac{\Gamma(\frac{\partial\sigma_p^2}{\partial f})}{[1-(1-\varphi)n_M]\alpha^2\sigma_y^2}][(1-g)(\alpha-\Gamma\sigma_p^2)-(i^*-q)] \qquad (5\text{-}7\text{-}1)$$

which for higher real return on domestic capital than that on foreign assets holds only if we have:

$$\varphi'(1-\eta_0)\Omega_0 \succ \frac{\Gamma(\frac{\partial\sigma_p^2}{\partial f})}{[1-(1-\varphi)n_M]\alpha^2\sigma_y^2} \qquad (5\text{-}7\text{-}2)$$

Condition (5-7-2) stating the necessary condition for a positive intra traded assets effect is always satisfied for a net debtor economy. However, it does not necessary imply it cannot hold for a net creditor economy. Also, it implies when the inflation variance is costless condition (5-7-2) is always met. One can easily see that condition (5-7-1) is much less restrictive when the real return on foreign assets is negative and it is always satisfied when the cost of inflation variance is zero. In other words, under floating rates the intra traded assets effect is always positive if there is no inflation variance cost and real return on foreign assets is negative. Considering the right hand side of (5-7-1) is zero when the marginal utility of money is zero, one can conclude under floating rates like fixed rates , as stated by proposition (5-1), the nonzero marginal utility of real money balances is a necessary condition for making a growth case for financial repression. Note that this conclusion is valid even if the inflation variance is costly.

The implication of financial repression for the variance of growth when there is no foreign inflation shock can be traced down by differentiating from the equation (21-1) given as follows:

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right)_{\sigma_*^2=0} = -2\sigma_w^2\frac{\Gamma\frac{\partial\sigma_p^2}{\partial f}}{\varphi[1-(1-\varphi)n_M]} \prec 0$$

Hence, as long as the inflation variance is costly, financial repression can stabilize the variance of growth. However, this is true only if the marginal utility of money is not zero (refer to equation (5-6)). Evidently, when either the inflation variance is costless or money does not have any utility, the variance of growth is independent of financial repression which accords with the proposition (5-2). Therefore, we can establish the following:

Proposition 5-4: *Under floating rates when the economy is exposed to domestic shocks, financial repression through the MS channel stabilizes the growth of the economy as long as either the inflation variance is costly or the marginal utility of real money balances is greater than zero.*

Comparing this result with our findings in the case of the Goldsmith channel, we realize the differences in the implications of financial repression through the MS and Goldsmith channel for the variance of growth under floating rates as well.

5.2.2.2 Foreign Inflation Shocks

When the economy is exposed to only foreign inflation shocks, the financial repression leads to a change within the agent's traded assets portfolio as follows:

$$\frac{\partial\Omega_0}{\partial f}=\frac{-\Gamma(\frac{\partial\sigma_p^2}{\partial f})}{\varphi[1-(1-\varphi)n_M]\sigma_q^2}-\frac{\varphi'}{\varphi}\eta_0(1-\Omega_0)$$

$$\text{where:}\quad \frac{\partial\sigma_p^2}{\partial f}=\frac{2\varphi(1-\Omega_0)^2\sigma_q^2(\varphi'-\frac{\varphi'}{\varphi}\eta_0)}{[1-\frac{2\varphi^2(1-\Omega_0)\Gamma}{\varphi[1-(1-\varphi)n_M]}]} \tag{5-8}$$

As written, in this case the degree of ambiguity in the implications of financial repression for the share of domestic capital in the traded assets is higher than the presence of domestic shocks. This is due to the fact that here the indebtedness situation of the economy plays a role too. That is, it influences the share of domestic capital directly through its implication for risk associated to traded assets (the second term in (5-8)) and indirectly through its impact on the variance of domestic inflation. In general, if the economy is a net debtor financial repression reduces the variance of the (domestic) inflation and thereby it raises the marginal productivity of domestic capital. This as well as its diminishing effect on the risk associated to domestic capital entails a switch away from foreign assets towards domestic capital. However, when the economy is a net creditor the situation is not as clear as the net debtor economy. On this occasion, the financial repression increases the risk associated with domestic capital relative to that to foreign assets inducing a switch away from domestic capital towards foreign assets (the second term in (5-8) represents this effect). When this effect is accompanied with an increase in the domestic inflation variance, which happens if we have: $2\Gamma\varphi(1-\Omega_0) > [1-(1-\varphi)n_M]$, financial repression will definitely lead to a reduction in the share of domestic capital in the traded assets. Otherwise, the positive or negative effect of financial repression on the share of domestic capital depends upon the relative values of its direct and indirect effects. It goes without saying, when the inflation variance is costless this ambiguity disappears and the financial repression will reduce the share of domestic capital for the net creditor economies. Note that when: $\Omega_0=1$, the situation which refers to neither a net creditor nor a net debtor economy, the $(\frac{\partial\Omega_0}{\partial f})$ gets to zero implying the financial repression has no effect on the share of domestic capital.

Bearing in mind these considerations, the growth implication of financial repression for the economies which are subject to inflation shocks is given as:

$$\frac{\partial\psi_0}{\partial f}=\{[\varphi'\Omega_0+\varphi\frac{\partial\Omega_0}{\partial f}][(1-g)(\alpha-\Gamma\sigma_p^2)-(i^*-q+\sigma_q^2)]$$
$$+\varphi'(i^*-q+\sigma_q^2)-\Gamma\varphi\Omega_0(1-g)\frac{\partial\sigma_p^2}{\partial f}\}-\frac{\theta\mu^2(1+\Pi)[\zeta(f)'\varphi i-(\varphi' i+\varphi\frac{\partial i}{\partial f})\zeta(f)]}{[\varphi i-(1+\Pi)\zeta(f)\mu]^2} \qquad (5\text{-}9)$$
$$where: \quad [\varphi'\Omega_0+\varphi\frac{\partial\Omega_0}{\partial f}]=\frac{-\Gamma(\frac{\partial\sigma_p^2}{\partial f})}{[1-(1-\varphi)n_M]\sigma_q^2}+\varphi'[(1-\eta_0)\Omega_0+\eta_0]$$

Again, the terms in the curly brackets represent the intra traded assets effect which can be positive or negative. The second term stands for the saving-investment effect which is always negative. It is obvious for a net creditor economy we have: $[\varphi'\Omega_0+\varphi\frac{\partial\Omega_0}{\partial f}] < 0$ if either there is no inflation variance cost or the following holds when $\Gamma\neq 0$:

$$2\Gamma\varphi(1-\Omega_0) > [1-(1-\varphi)n_M] \qquad (5\text{-}9\text{-}1)$$

While for a net debtor economy we have:

$$[\varphi'\Omega_0+\varphi\frac{\partial\Omega_0}{\partial f}] > 0 \text{ if: } \Omega_0 > -\frac{\eta_0}{1-\eta_0} \qquad (5\text{-}9\text{-}2)$$

The conditions (5-9-1) and (5-9-2) are the necessary conditions for having a positive intra traded assets effect when the economy is a net creditor or a net debtor respectively. They , in fact, guarantee a positive contribution from differential real rate of return on domestic capital net of the government output share and foreign assets, originating from an increase in financial repression, to the (expected) growth. The sufficient condition in this respect is as:

$$[\varphi'(i^{*}-q+\sigma_q^2)+\Omega\Gamma\varphi(1-g)\frac{\partial\sigma_p^2}{\partial f}] \prec$$
$$[\varphi'[(1-\eta_0)\Omega_0+\eta_0]-\frac{\Gamma(\frac{\partial\sigma_p^2}{\partial f})}{[1-(1-\varphi)n_M]\sigma_q^2}][(1-g)(\alpha-\Gamma\sigma_p^2)-(i^{*}-q+\sigma_q^2)] \qquad (5\text{-}9\text{-}3)$$

Hence, one may be able to make a growth case for the financial repression irrespective of the indebtedness situation of the economy so long as the condition (5-9-3) holds. As we see, this condition is less restrictive when the real return on foreign assets is negative and almost always hold when the inflation variance is costless. Moreover, despite the domestic shocks case, one may be able to make a growth case for financial repression when the marginal utility of money is zero and the financial repression involves a reduction in the domestic inflation variance. This is so because any reduction in domestic inflation variance leads to an increase in the marginal productivity of capital provided that $\Gamma\neq 0$. This may end in the situation where condition (5-9-3) is met and thereby the (expected) growth improves. It lays stress somewhat on the (positive) role of financial repression as inflation stabilizer, though as we will discuss below that would not always be costless in terms of the variance of growth. However, like the domestic shocks case, it is not possible to make any growth case when: $\Gamma=0$ and/or $\eta_0=1$. Therefore, we can establish the following:

Proposition 5-5: *Under the floating (flexible) rates, when the real return on foreign assets is positive and the (domestic) inflation variance is costless, the necessary condition in order for financial repression through the MS channel to be growth enhancing is the marginal utility of real money balances to be greater than zero.*

The following indicates the implication of financial repression for the variance of growth when the economy is exposed to only foreign inflation shocks:

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right)_{\sigma_q^2\neq 0}=2\sigma_w^2\frac{\Gamma\frac{\partial\sigma_p^2}{\partial f}}{\varphi[1-(1-\varphi)n_M(1-\Omega_0)\sigma_q^2]}$$

Therefore, under floating rates the financial repression is able to stabilize/destabilize the growth of the economy provided that the variance of inflation is costly. This , somehow, follows the same role as the domestic shocks case (refer to proposition (5-4)). As written, the indebtedness situation of the economy plays an important role in this regard. In general, the financial repression destabilizes the economic growth as long as the economy is either a net debtor or a net creditor and for the cost of inflation variance we have: $2\Gamma\varphi(1\ \Omega_0) < [1\ (1-\varphi)n_M]$. However, it stabilizes the economic growth only if the economy is a net creditor and we have: $2\Gamma\varphi(1-\Omega_0) > [1\ (1-\varphi)n_M]$. This result differs from our findings regarding the implications of financial repression through the Goldsmith channel.

According to the above mentioned discussions, the effect of financial repression through the MS channel depends upon the cost of inflation variance. That is, if the inflation variance is costless the variance of growth under floating rates (like fixed rates) is independent of financial repression as long as the economy is exposed to either only domestic shocks or only foreign inflation shocks. Nonetheless, this result does not hold when all the shocks are present. That is, the variance of growth under floating rates (like fixed rates) is influenced by the financial repression irrespective of the inflation variance cost level. However, here in spite of the fixed rates, there is no clear cut conclusion and the relative size of the variances and the indebtedness situation of the economy, amongst other structural parameters, play an important role in this respect. This is so as we have the following:

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right)_{\Gamma=0} = 2\sigma_w^2 \frac{\dfrac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f}}{\varphi[1-(1-\varphi)n_M]}(1-L')$$

$$\text{where:} \qquad L' = \frac{[\Omega_0\alpha^2\sigma_y^2 - \dfrac{\sigma_q^2}{\alpha^2\sigma_y^2+\sigma_q^2}][\Omega_0\alpha^2(\sigma_y^2+\sigma_g^2)-(1-\Omega_0)\sigma_q^2]}{[\Omega_0^2\alpha^2(\sigma_y^2+\sigma_g^2)+(1-\Omega_0)^2\sigma_q^2]}$$

5.3 The McKinnon-Shaw and The Goldsmith Effects

We have already demonstrated that there are differences in the implications of financial repression through the MS and Goldsmith channels for the mean and the variance of growth. As we discussed, sometimes they work in the same directions and ,hence, reinforce (back up) each other's effects and sometimes they are counteracting and, thus, weakening each others' effects. Therefore, we have not gone too far if we assert this can be viewed as one of the main findings of this study. That is, in analysing the economic implications of financial repression it is crucial to diagnose what channel through which the financial repression affects the economy or if both channels are involved which one is more influential. Evidently, different types of instruments or, broadly speaking, financial policies employed to put into effect the financial repression policy will engender one or the other channel to become more influential. Even the same instrument or policies may work differently depending on the institutional and structural characteristics of any economy. Bearing in mind these considerations, in this section we are going to address the issue of what would be the growth implications of financial repression if the economic setting is such that the financial repression launches both the MS and Goldsmith channels. Generally speaking, the relative importance of these two channels will determine the ultimate growth outcomes of the financial repression. As a high level of ambiguity is involved in addressing this issue via an analytical approach, we leave the main task to our numerical exercise in subsequent sections. However, it would be worthwhile mentioning some tractable cases in order to attain a clearer understanding of the mechanism of effects when both channels are at operation. To this end, here, our discussion is restricted only to fixed rates arrangement, which is more tractable than flexible rates arrangement, and the presentation will be as concise as possible.

The (expected) growth implication of financial repression under the fixed rates when it runs both the MS and Goldsmith channels, can be summarized as follows:

$$\frac{\partial\psi_\infty}{\partial f}=\{[\varphi'\Omega_\infty+\varphi\frac{\partial\Omega_\infty}{\partial f}][(1-g)(\alpha(f)-\Gamma\sigma_q^2)-(i^*-q+\sigma_q^2)]+\varphi'(i^*-q+\sigma_q^2)$$

$$+\alpha(f)'\varphi\Omega_\infty(1-g)\}-\frac{\theta\mu^2(1+\Pi)[\zeta(f)'\varphi-\varphi'\zeta(f)]}{[1-\frac{(1+\Pi)\zeta(f)\mu}{\varphi i^*(1-t^*)}]\varphi^2 i^*(1-t^*)} \qquad (5\text{-}10)$$

where: $$[\Omega_\infty+\frac{\varphi}{\varphi'}\frac{\partial\Omega_\infty}{\partial f}]=\Omega_\infty\varphi'\{1-\eta_\infty-\frac{2\alpha(f)'\alpha(f)\sigma_y^2\varphi}{[\alpha(f)^2\sigma_y^2+\sigma_q^2]\varphi'}\}$$

$$+\frac{\varphi'\eta_\infty\sigma_q^2}{\alpha(f)^2\sigma_y^2+\sigma_q^2}-\frac{\alpha(f)'\varphi}{\varphi[1-(1-\varphi)n_M](\alpha(f)^2\sigma_y^2+\sigma_q^2)}$$

The intra traded assets effect is given by the terms in the curly brackets. The second term shows the negative effect of financial repression through an increase in the share of real money balances and consumption. Though the last two terms in the intra traded assets' effect, representing the negative effect of financial repression on growth as a result of the reduction in investment on foreign assets (through the MS channel) and marginal productivity of domestic capital (through the Goldsmith channel), are always negative, the first term, indicating the contribution to/loss of growth due to a reallocation within the traded assets, can be positive so that it wipes out all the negative effects of financial repression on the expected growth. As written, the sign and size of the differential real rate of returns on traded assets play a crucial role in this regard. That is, the necessary and sufficient conditions in order to have a positive intra traded assets effect, when the real return on domestic capital net of the government output share is greater (less) than that on foreign assets, are given as:

Necessary condition : $$\Omega_\infty\varphi'\{1-\eta-\frac{2\alpha(f)'\alpha(f)\sigma_y^2\varphi}{[\alpha(f)^2\sigma_y^2+\sigma_q^2]\varphi'}\} \succ (\prec)$$

$$\frac{\varphi'\eta\sigma_q^2}{\alpha(f)^2\sigma_y^2+\sigma_q^2}+\frac{\alpha(f)'\varphi}{\varphi[1-(1-\varphi)n_M](\alpha(f)^2\sigma_y^2+\sigma_q^2)}$$

Sufficient condition : $$[\varphi'\Omega_\infty+\varphi\frac{\partial\Omega_\infty}{\partial f}][(1-g)(\alpha(f)-\Gamma\sigma_q^2)-(i^*-q+\sigma_q^2)]\succ$$

$$-[\varphi'(i^*-q+\sigma_q^2)+\alpha(f)'\varphi\Omega_\infty(1-g)]$$

In general, the necessary condition implies a total positive (negative) share of domestic capital in the traded assets effect of financial repression and the sufficient condition ensures a positive intra traded assets effect. As such, the relative sizes of the second moments of the shocks impinging on the economy, the relative values of the (expected) real returns on traded assets and structural parameters will determine the net (expected) growth outcome of financial repression. For instance, when the economy is exposed to only foreign inflation shocks and the economy is a net creditor, one may make a growth case for financial repression *iff* the real return on foreign assets is higher than that on domestic capital net of the government output share. However, for a net debtor economy this condition is not necessarily binding.

In relation to the variance of growth, when the economy is exposed to only domestic shocks, our results in case of the Goldsmith channel turn out to be true here too. That is, the financial repression will decline (raise) the variance of growth if the (after tax) real return on foreign assets is greater (less) than zero. It is independent of the financial repression if the after tax real return on foreign assets is zero. This is so because we have:

$$\left(\frac{\partial \sigma_w^2}{\partial f}\right)_{\sigma_q^2=0} = \frac{2\alpha(f)'\{\alpha(f)-[i^*(1-t^*)-q]\}(\sigma_y^2+\sigma_g^2)[i^*(1-t^*)-q]}{\alpha(f)^3\sigma_y^4}$$

When the economy is buffeted only with foreign inflation shocks, the financial repression will reduce (increase) the variance of growth if the real return on domestic capital is greater (less) than the after tax real return on foreign assets. Again, it is independent of financial repression *iff* the real returns are equal. The following indicates this fact:

$$\left(\frac{\partial \sigma_w^2}{\partial f}\right)_{\sigma_q^2\neq 0} = \frac{2\alpha(f)'\{[\alpha(f)-\Gamma\sigma_q^2]-[i^*(1-t^*)-q+\sigma_q^2]\}}{\sigma_q^2}$$

If the economy is a net debtor and there are foreign inflation and government expenditure shocks in the economy, the financial repression will always reduce the variance of growth. However, ambiguity arises for a net creditor economy in this respect. This comes about as we have:

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right)_{\sigma_y^2=0} = \frac{2\alpha(f)^2\sigma_g^2}{\sigma_q^2} \times$$

$$\{(\alpha(f)-\Gamma\sigma_q^2)-[i^*(1-t^*)-q+\sigma_q^2]+\varphi[1-(1-\varphi)n_M]\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f}\}$$

$$+\varphi[1-(1-\varphi)n_M]\alpha(f)'\{\alpha(f)\Omega_\infty\sigma_g^2[\Omega_\infty+\frac{\alpha(f)}{\varphi[1-(1-\varphi)n_M]\sigma_q^2}]-\frac{(1-\Omega_\infty)}{\varphi[1-(1-\varphi)n_M]}\}$$

Also, when the economy is exposed to all types of the shocks, there would be ambiguity in the implication of financial repression for the variance of growth. In this case, the relative sizes of the second moments of the shocks, the relative values of real return on the traded assets and the structural parameters will determine the final outcome. This is so since from (3-21-1) we obtain:

$$\left(\frac{\partial\sigma_w^2}{\partial f}\right) = 2\sigma_w^2\frac{\frac{\partial\varphi[1-(1-\varphi)n_M]}{\partial f}}{\varphi[1-(1-\varphi)n_M]}(1-\digamma)+$$

$$\varphi[1-(1-\varphi)n_M]\alpha(f)'\{\alpha(f)\Omega_\infty(\sigma_y^2+\sigma_g^2)[\Omega_\infty+\frac{\alpha(f)}{\varphi[1-(1-\varphi)n_M](\sigma_y^2+\sigma_g^2)}-\frac{2\alpha(f)^2\Omega_\infty\sigma_y^2}{(\alpha(f)^2\sigma_y^2+\sigma_q^2)}]$$

$$-\sigma_q^2(1-\Omega_\infty)[\frac{1}{\varphi[1-(1-\varphi)n_M](\sigma_y^2+\sigma_g^2)}-\frac{2\alpha(f)\Omega_\infty\sigma_y^2}{\alpha(f)^2\sigma_y^2+\sigma_q^2}]\}$$

where: $$\digamma = \frac{[\Omega_\infty\alpha(f)^2\sigma_y^2-(1-\Omega_\infty)\sigma_q^2][\Omega_\infty\alpha(f)^2(\sigma_y^2+\sigma_g^2)-(1-\Omega_\infty)\sigma_q^2]}{(\alpha(f)^2\sigma_y^2+\sigma_q^2)[\Omega_\infty^2\alpha(f)^2(\sigma_y^2+\sigma_g^2)+(1-\Omega_\infty)^2\sigma_q^2]}$$

For the flexible rate arrangements, the degree of ambiguities discussed above will be higher due to the important implications of financial repression for the expected rate of change of exchange rates which has its own repercussions on the mean and variance of the growth via the interest rate parity and inflation variance cost. That is why , here, we have not embarked upon addressing this issue at the analytical level.

5.4 Conclusion

In summary, all the above mentioned considerations point to the importance of the accurate recognition of the channels through which financial repression passes through the economy.

That is, our arguments indicated the MS and Goldsmith channels have different implications for the welfare and growth of the economies which are subject to financial repression. This opens a new horizon for future empirical studies regarding the growth implications of financial repression with this main diagnostic objective at a macro level. Though, in the next chapter we have tried, somewhat, to address this question by a simulation (calibration) method for our theoretical framework, we do not think this would be the most appropriate approach in tackling this issue. Particularly, in the context of shock identification and shock therapy, we think the most formal and suitable approach would be the VAR analysis for a wide range of economies which have experienced different degrees and types of financial repression policies which, in turn, can be the subject of new research.

Chapter 6

Welfare and Public Finance Aspects of Exchange Rate and Financial Repression Policies: A Numerical Illustration

6.1 Introduction

The objective of this chapter is twofold. First, we try to address the question of whether from the complete version of the model one can make any welfare or growth case for financial repression when the government is, given the degree of the central banker independence, able to determine the degree of exchange rate flexibility and financial repression as two policy instruments at its disposal. More precisely, we are mainly concerned about the welfare (growth) consequences of different mixture of exchange rate flexibility and financial repression when the McKinnon-Shaw and Goldsmith effects are both at work and the economy is buffeted by all types of domestic (productivity, government expenditure (demand side), money growth) and foreign (inflation) shocks. As we saw in the previous chapters, due to non-linearity in the FOC system of equations we were not able to address this question analytically. This chapter takes a numerical approach in order to tackle the problem through calibrating the model for a plausible range of magnitudes involved in this respect. In addition, our arguments in this chapter will be more public finance oriented. That is, we will examine more thoroughly how financial repression may lead to a reduction in the need of resorting to more distortionary sources of public finance and thereby providing higher welfare for the representative agent.

Second, this numerical illustration, incidentally, will enable us to demonstrate the propositions which we raised in the previous chapters are not just idiosyncratic. Of particular interest is to see the empirical justifiability of those propositions related to the mean and variance of growth implications of financial repression under pegged rate arrangement which has been the most common exchange rate arrangement in DCs during the past two decades. Moreover, it is important to notice that in our simulation based arguments, we do not abstract from any of the two main broadly recognized channels through which the financial repression policy transmits into the real parts of the economy. That is, our demonstration is on the basis of a simulated paradigm which seems to be now more general and closer to the reality. We will show how, even with a specific exchange rate arrangement in operation, the types of shocks impinging on the economy and the relative sizes of their second moments in conjunction with the relative real returns on (domestic) capital and foreign assets among the structural parameters play a key role for the welfare and growth implications of the financial repression policy.

One striking feature of this chapter is its simplicity. That is, we have tried to keep the presentation so simple that even an undergraduate economics student can follow the main arguments which were technical and relatively abstract in the previous chapters. The structure of the chapter is organized as follows. In first section we will set up the benchmark values in which the main body of our simulations have been based and carried out. This contains an overview of the relevance of our benchmark values with stylized facts and the modifications incorporated in order to make them more compatible with the economic realities in DCs and our theoretical framework. The second section is an attempt towards fulfilling our second objective in this chapter. That is, it has been devoted to a numerical review of our main propositions regarding the welfare and growth implications of financial repression policies under a fix rate arrangement from a pragmatic point of view. In the third section, we present our simulation results with regard to the relationship between financial repression and superior (optimal) exchange rate arrangement. In this part, we examine the behaviour of the mean and variance of growth, the (mean) tax rate on wealth, the shares of real money balances and domestic capital in the wealth, the variance of domestic inflation, the total (mean minus variance of) growth contribution to/loss of welfare and at last the welfare function for different degrees of exchange rates flexibility and financial repression. Since the issue of superiority of fix and floating rate arrangements has motivated long-standing controversial debates in the related literature and for the sake of expositional purposes, we have devoted the first part of this section to study of the welfare consequences of the financial repression policy under the two types of arrangements. In the second part of this section we will introduce the managed rate arrangements (leaning with and against the wind) into the first part episode and investigate the welfare behaviour of the financial repression policy under different types of exchange rate arrangements in comparison with the optimal benchmark arrangement when there is not any sort of imperfection in the financial sector of the economy but a low rate of tax on foreign assets holdings. The last section summarizes our main findings in this chapter.

6.2 Preliminary Considerations

6.2.1 The Empirical Restrictions

In an optimal situation, one would like to study the welfare (growth) consequences of financial repression in a circumstance where Goldsmith and MS effects coexist, through a formal estimation of the structural parameters of the model based on a real data set. Also one is willing to identify the type and size of the shocks which any economy has been exposed to when the financial repression policies in conjunction with the other relevant monetary and fiscal policies have been implemented in the economy. Then via controlling for the other factors , one can statistically evaluate the relative sizes and directions of the consequences of financial repression policies for the arguments of our welfare criterion. However, in the absence of this possibility, a pragmatic practitioner should compromise between his/her first best option and a minimum acceptable one, that is to say, to become a minimalist rather than a perfectionist! To speak more exactly, the unavailability of the adequate long and coherent (enough) macroeconomic time series for most DCs did not allow us to estimate the model (with discrete time specification) in line with Christiano and Eichenbaum (1992). In addition, the lack of estimated values for the underlying parameters of the model resulting from microeconomic empirical studies which are compatible with our framework did not permit us to follow the calibration procedures such as those of Kydland and Prescott (1982). Therefore, we have tried to check the plausibility of the chosen values through their fitness in, roughly, reproducing the mean and variance of the economic growth in DCs during the 1972-1992 period . However, some features of our study have prevented us from achieving this end appropriately.

First, as our main concern in this study is optimal policy analysis rather than replicating real economies' magnitudes like econometrics or RBC type models, for the sake of tractability, we have ignored some aspects of real economies in constructing our model. Among those we can point to the lack of any explicit account for the structure of the labour market and supply, human capital accumulation, adjustment cost, nontraded goods market structure, diversity in (traded-nontraded) consumption goods and the agents' time preferences and the like.

Second, the (endogenous-exogenous) stochastic processes in our setting are assumed to be nonstationary of the continuous time geometric Brownian motion type where the first and second moments of the stochastic processes play a crucial role. This differs from what is usually assumed in the main stream empirical (RBC-VAR) studies. Therefore, those findings, which are mainly focused on developed economies, can not be applied properly or at least should be considered cautiously in our theoretical framework for the purpose of replicating the real economies' magnitudes.

Third, and somewhat as a result of the foregoing reasons, this study is mainly concerned about DCs' economies which as a block contain heterogenous units with major differences in their socio-economic characteristics. This fact, in a sense, has been mirrored in considerable differences in DCs' (mean-variance) growth performance during period 1972-1992. Two figures (6.1) and (6.2) show the means and standard deviations of real per capita GDP growth for a bulk of 65 developing countries for the period.

Figure-(6-1)

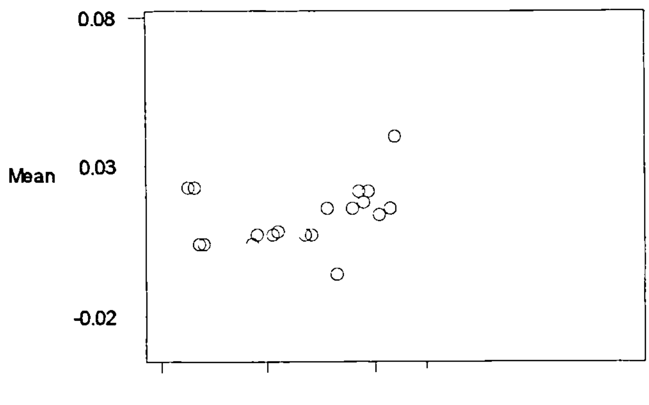
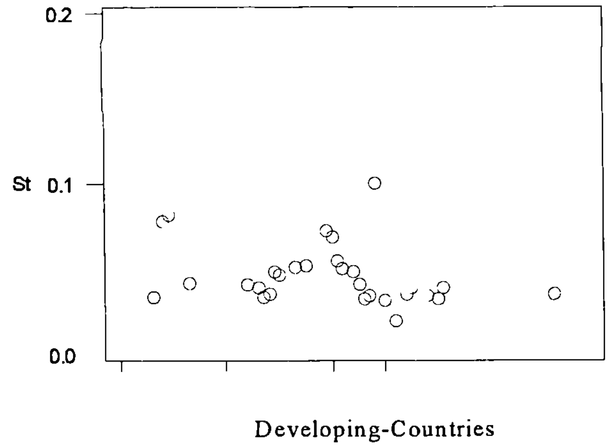


Figure-(6-2)



As observed, in contrast with high level income (developed) countries (figures (6.3) and (6.4) below), developing countries have experienced more mixed patterns in their means - ranged from (-3) upto (7) percent- and standard deviations -ranged from (0.019) upto (0.181)- economic growth. This makes it difficult, if not impossible, to build up a model which enables us to cover all of these empirical varieties.

Figure-(6-3)

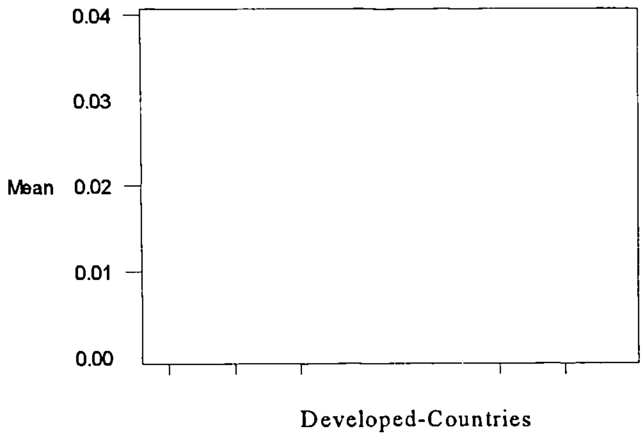
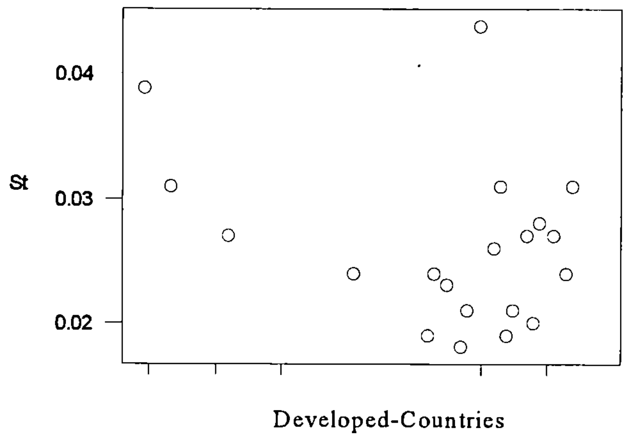


Figure-(6-4)



Accordingly, we should, at the outset, emphasize that in the following simulation examples our main objective is not to replicate the real economic magnitudes. What they adduce is a set of plausible (simulated) examples which makes us able to demonstrate numerically the empirical legitimacy of our controversial (or if you like challenging) hypotheses, discussed analytically in more detail in the previous chapters, regarding the welfare (growth) implications of financial repression policies, namely, the second objective of this chapter.

6.2.2 An Overview of Benchmark Values Relevance with Stylized Facts

Bearing in mind these considerations and noting that despite the prominent tendency towards more flexible arrangements among DCs since the collapse of Bretton Woods system, the majority of them have followed fixed (pegged) rate arrangement during the 1972-1992[1], we have built up our benchmark (values) on the basis of a managed rate very close to fixed rate arrangement. The values for which the model has been simulated have been displayed in Table 6.1.

Table 6.1-Benchmark Values
σ_y=0.01225 σ_q=0.005 σ_g=0.0316 σ_m=0.0089 g=0.119 δ=0.664 μ=0.02 Π=0.05
Λ=1 γ=0 q=0.055 i^*-q=0.30 t^*=0.035 Ξ=0.1 θ=0.7 $\zeta(f)=\Xi(1+f)$ α=0.2877857

Some of these values are similar to those used elsewhere in the literature (with some modifications in some cases) and their choice, in general, is motivated as follows. Regarding the variance of the present shocks to our setting, since there is no relevant estimation for DCs, we try to get an idea about their relative sizes through the empirical studies carried out for developed countries. In general, the existing estimations are mixed and depend inter alia upon the structural specification and identification restrictions. For instance, Schlagenhauf & Wrase (1995) estimation of standard deviation of productivity shocks in a two country model for US and five OECD countries based on the solow residuals are respectively 0.01359 and 0.01261 with correlation between innovations around 0.26. While like Prescott (1986) who presents empirical evidence consistent with the estimation of the standard deviation of productivity innovations for US around 0.007, Hansen (1985), Gomme (1993), Ambler and Paquate (1994) among others use almost the same value in their business cycle studies. Also, Ambler and Paquet (1996) estimate the standard deviation of the technology shocks for US around 0.0114 for the period 1959-1992. In the context of developing countries as they are mostly at the earlier stages of development and thus, the risky and low productivity technologies are most likely to be accessible for them[2], the Prescott's estimation for US seems to underestimate the standard deviation of the productivity shocks in DCs. Therefore, we think the Ambler and Paquet (1996) and Schlagenhauf & Wrase (1995) estimations may provide better approximation for productivity shocks in DCs. Accordingly, we chose the value 0.01225 as standard deviation of productivity shocks which is very close to Schlagenhauf et al estimation for OECD countries. However, as it will be shown below, we have run simulations for the range 0.01-0.0141 in order to track down the sensitivity of our findings with respect to changes in the variance of productivity shocks. With regard to government expenditure (demand) shocks , Ambler and Paquet (1996) estimate a standard deviation about 0.0237 for US during the 1959-1992 period. Since there are many evidence suggesting higher volatility of government expenditure in DCs in comparison with that in developed countries, we think our benchmark value is a better approximation for the standard deviation of government expenditure shocks for DCs. Nonetheless, we have carried out our simulations for the range 0.0235 0.036 which includes the US experience as well. The standard deviations of money growth innovations for the period 1972-1990 in US and OECD have been estimated respectively around 0.000397 and

0.00623 with innovation's covariance about 0.00025 by Schlagenhauf & Wrase (1995). Also, Cooley and Hansen (1995) estimate the standard deviation of the money supply innovations for US about 0.0089. Though, the former estimation accords conceptually better with our setting, we have assigned a value closer to the latter finding because high volatility of money growth has been documented as one of the prevalent characteristics of DCs. Our benchmark value related to foreign (price) inflation innovations has been adopted from Kollmann's (1996) estimation. He on the basis of US CPI series as a measure of the foreign price estimates the standard deviation of foreign price shocks about 0.005 for the period 1973-1994. In order to study the consequence of different levels of risk associated with foreign inflation (price) shocks for our findings, we have also performed our simulations within the range 0.00447-0.00548 standard deviations of foreign inflation shocks.

The share of government expenditure (g) is the average share of the government final consumption in DCs for the 1971-1992 period adopted from World Economic Outlook (1993, P. 47). We have chosen it rather than total government expenditure because it is closer in spirit to our model's specification of government output share which is a pure drain of economic resources. Besides, the means of (broad) money growth in DCs have been ranged between 45-81 percent during the 1987-1993 period with average about 66.4 percent per annum (IMF, World Economic Outlook (1993)). Since these numbers have been highly affected by Western Hemisphere countries, we have run all the simulations for the mean of broad money growth in DCs excluding Western Hemisphere countries too. However, as the main results which we were concerned more in this chapter were not dramatically different and due to space limitations, we have not reported those here. The mean of broad money growth for DCs in Africa, Asia, Middle East and Europe countries is about 22 percent for the corresponding period while this value for Western Hemisphere countries is amounted to 305 percent. The average inflation rate in industrial countries for the period 1976-1995 on the basis of GDP deflator and consumer prices has been about 5.5 percent which almost is about the same rate as that in US (World Economic Outlook, may 94, p119). The time preference parameter (μ) has been adopted from Barro & Salai-Martin's (1995) baseline values. The government's debt monetization parameter (Π) has been assigned a small value because debt public financing is not very common in most DCs. The parameter Λ showing the Central Bank independence instance has taken value one because most of the DCs' Central Bankers are almost completely dependent. Albeit, we performed our simulations for different degrees of the agent's risk aversion, as the results were not qualitatively very different, we will report our simulation examples for $\gamma=0$ implying a logarithmic utility function. This, after all, makes our simulation results more easily comparable with our theoretical benchmark in the previous chapters.

The rate of tax on foreign assets holding was set equal to 3.5 percent. It, in fact, represents the minimum level of foreign assets holding taxation (capital control) in the absence of any other distortionary intervention in (domestic and foreign) financial markets in terms of our model specification. Since we wanted to cover the maximum number of observed varieties and in accordance with our model specification of tax on foreign assets holding, we have chosen that value implying about 1.25 percent (nominal) interest rate differential for our benchmark values[3]. The Giovannini & De Melo (1993) results have mainly motivated us to adopt this value. Their results suggest that the positive (nominal) interest rate differential across developing countries varies from 0.04 percent (in Korea) to 11.67 percent (in Indonesia).

The parameter Ξ indicates the relative importance of real money balances in utility function when there is no financial repression in the economy and, thus, the transaction cost is at its minimum. It implies a maximum value for the relative importance of real money balances equal to 0.2 when the financial sector of the economy is highly repressed or, looking at it differently, the transaction cost is at its maximum. Aside from aspects related to better fitness with real magnitudes, there were two other main considerations in choosing that value for Ξ . First, a large body of empirical estimated values, of course with different structural specifications from ours, suggest a low value for the marginal propensity of demand for real money balances out of interest rate in developing countries. Second, since our welfare criterion is a positive function of real money balances, due to the transaction costs, the value for Ξ has been chosen relatively much lower than that for the parameter θ, showing the relative importance of consumption in utility function. By doing that we wanted not to bias our welfare analysis in favour of those policies involving higher share of real money balances.

The two remaining free structural parameters are the coefficient of relative importance of consumption in the utility function and the marginal productivity of (domestic) capital. These values have been chosen so that they reproduce the present evidence related to the mean and variance of economic growth for the period 1972-1992 in DCs as close as possible. Our simulation results indicate that the range between 0.7-0.8 for the coefficient of relative importance of consumption provides reasonable outcomes. Though we ran all the simulations for at least two extreme values within this range, since the results were not qualitatively very different from one another and for the expositional purposes, we will report the results based on the 0.7 value which turned up to be more illustrative.

The marginal productivity of (domestic) capital (a), in our calibration exercise has been considered as residual (choice) parameter due to couple of reasons. As we know, in any (linear-balanced) growth model there is a close relationship between economic growth and real return on (marginal productivity of) capital. If the financial markets work perfectly, the real interest rate (in steady state) would reflect the marginal productivity of capital. However, it is not the case at least for a large body of developing countries. The empirical evidence regarding to real interest rates not only among DCs but also within any developing country during 1972-1992 are so mixed that it is hardly believable the calculated real interest rates to be a suitable indicator for marginal productivity of capital in DCs. For example, in Liviatan (1984) the real interest rate (based on real deposit rates) have been ranged about (-7)-(+7) percent in Korea (for the period 1980-1990), (-15)-(+50) percent in Brazil (1980-1988), (-1)-(+35) percent in Chile (1980-1988), (-32)-(+25) percent in Argentina (1980-1988), (-25)-(+13) percent in Mexico (1980-1988), (-45)-(+10) percent in Turkey, (-1)-(+34) percent in Thailand (1980-1990) and (-20)-(+10) percent in Philippines. While in Vegh (1992) the real interest rates (based on lending rates) have fluctuated between about (-20)-(+800) percent in Argentina (1978-1989), (+5)-(+110) percent in Chile (1977-1983), (-30)-(+40) percent in Uraguay (1978-1983), (-50)-(+200) percent in Brazil (1985-1988), (+5)-(+410) percent in Israel (1984-1990) and (-42)-(+50) percent in Mexico (1987-1991).

Also, in Agarwala (1985) the real interest rates (based on central Bank discount rate/Bank rate and one-year time deposit rate) for a sample of DCs have ranged from (-38.6) to (+1.8) percent in 1970s. These mixed patterns, particularly high positive real interest rate episodes, may lay stress on sceptical views about the appropriate relationship between real interest rate and marginal productivity of capital on the policy credibility and risk exposure grounds (e.g. Calvo (1988), Persson & Tabellini (1990), Guidotti & Kumar (1991), Calvo & Coricelli (1992)). This skeptism is based on the exposition of real interest rates to the policy factors such as outright repudiation of government obligations and public inflation expectations and in general incredibility of (some) economic policies and/or risk premia as a result of fragility of financial sector, lack of well established property rights and poorly regulated environment.

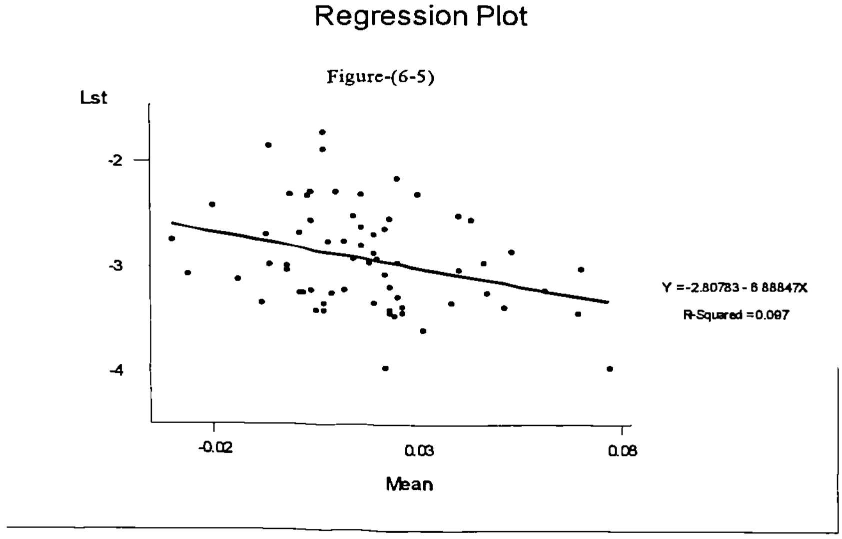
On the other hand, in a growth model with an AK type technology, such as ours, one can simply show that there is a direct correspondence between marginal productivity of capital and the Incremental Capital-Output Ratio (ICOR) usually used by international financial institutes (organizations) as an indicator for evaluating the performance of economic programs in DCs[4]. More precisely, when the rate of capital depreciation is zero, the real return on capital is simply the inverse of ICOR. This may justify the application of the available data related to ICOR as a better approximation of marginal productivity of capital in our setting. However, there are two considerations calling for more caution in application of ICOR as an indicator of marginal productivity of (domestic) capital for our model. First, in any (semi) small open economy there is a close relationship between real return on domestic capital (domestic real interest rate) and foreign real interest rate in the steady state. Therefore, there must be a minimal agreement - adjusted for different level of risk associated with domestic capital and foreign assets- between those two returns. According to available data the real interest rates (based on average of ten-year -or nearest maturity- government bond yield) for the major industrial countries during the period 1970-1995 have been ranged between about (-0.04)-(+0.075) reflecting relatively high volatility too (World Economic outlook, Oct.94, P.3). Second, the available data on ICOR in DCs for the corresponding period have ranged from 4.9 (in low growth DCs countries) to 2.5 (in high growth DCs) with an average about 3.2 per year (World Economic Outlook, May 93, P. 44). In view of our preceding discussion, these values imply a marginal productivity of (domestic) capital ranged between 20.4-40 percent per year in DCs. This range includes the Agarwala (1985) findings for the (real) return on investment ranged between 22-24.6 with an average about 23.2 percent in 1970s too. Comparing these two observations, we see a considerable gap between the foreign real interest rates and the marginal productivity of capital which is difficult to be assigned to only differences in the level of risk embodied into these assets. This is so even if we consider the average real rate of return associated with common stock in the US, which for the period 1928-1988 is about 6.5 percent (Ibbotson and Sinquefield (1988)), rather than average yields on ten-year government bonds. However, the De Long and Summers (1991) estimation of return on equipment investment which is about 30 percent falls within the ICOR observations and, thus, may provide a compromise in this respect.

These considerations made us to calibrate the model for two set of values for the marginal productivity of (domestic) capital and real return on foreign assets. This, in a sense, follows Jones & Manuelli's (1995) strategy in their calibration exercises. In the first panel, we build up our simulation examples on the inverse of ICOR range of observations as an indicator of marginal productivity of (domestic) capital and De Long and Summers' estimation as the real return on foreign assets. Whereas, in the second panel, our simulation strategy was based on observations related to foreign real interest rates calculated on the basis of yields on ten-year government bonds (mainly published by IMF). Though in the second panel we carried out our simulations for different values within the range (-0.04)-(0.075), the simulations were mainly focused on the basis of the 6.5 percent real interest rate that provided more consistent results for the mean and variance of growth and is equal to the average real rate of return associated with common stock in the US for the period 1928-1988. That is, an index which, we think, fits conceptually much better to our setting than only average of ten-year government bond yields (or nearest maturity).

Between these two panels, our findings indicate the first one replicates relatively better the observed data with regard to the mean and variance of growth in DCs for our benchmark values of variances of shocks inspired mainly from developed countries experiences than what was replicated by the second panel. To be more specific, though both panels replicate fairly well the mean of growth, the second one could replicate the observed variance of growth in DCs for high level of variance of government expenditure (demand) shocks and/or variance of foreign inflation (price) shocks. Namely, the second panel generally underestimated the variance of growth for our benchmark values of variances of the shocks. Accordingly, here we will report our simulation examples based on the first panel values and our findings based on the second panel values have not been reported only due to the space limitation. However, we must express that, as it will be shortly clear, our qualitative results are not sensitive to the choice of each panel, and as we explained above, this choice has merely been made on the ground of better fitness of the targeted real economic magnitudes.

6.2.3 The Mean and Variance of Growth Relationship

Before setting out our simulation results there are some points regarding our observations about the general pattern of means and variances of growth in the period 1972-1992 which are worthy mentioning at the outset. First, the standard deviations of growth in high level income countries on average have been remarkably lower than that in DCs. As it is seen in figures (6.4) and (6.2), the scatter of standard deviations of growth for the developed countries panel has mainly been dense around (about) 0.026, while it is about 0.06 for DCs' panel. This , roughly, accords with the Renelt (1991) who on the basis of Summers and Heston (1988) data set concludes the variance of real GDP for one third of poorest countries is twice that in one third of richest countries. In addition, his study implies a *standard deviation equal to 0.057 for the poorest* countries which is close to our finding for DCs on average. Second, and somewhat more interesting, having plotted the standard deviations observations against the means, we see this feature seems to exist even within the DCs as well. Figure (6.5) shows this fact vividly. That is, countries with higher GDP per capita growth, on average, have experienced less volatility in their growth too.



Regression Equation (6-1)

Variable	Coefficient	Std.Error	t-value	t-prob
Constant	-2.8078	0.073953	-37.968	0.0000
M	-6.8885	2.6438	-2.606	0.0114

$R^2 = 0.0972763$ $F(1, 63) = 6.7888$ [0.0114] $\sigma = 0.460043$ DW = 2.23

RSS = 13.33330003 for 2 variables and 65 observations

Regression Equation (6-2)

Variable	Coefficient	Std.Error	t-value	t-prob
Constant	-2.9053	0.067353	-43.135	0.0000
M	-4.8077	2.3328	-2.061	0.0435
DUNREST	0.98173	0.20952	4.686	0.0000

$R^2 = 0.33335$ $F(2, 62) = 15.501$ [0.0000] $\sigma = 0.398515$ DW = 2.09

RSS = 9.846471983 for 3 variables and 65 observations

According to simple regression equation (6-1), the negative correlation between the mean of growth and (logarithm of) its standard deviation is statistically significant. Also, as regression equation (6-2) indicates this negative correlation remains statistically significant, at more than 95 percent significance level, after introducing the dummy variable DUNREST in order to capture the effect of political instability in four countries (i.e. Somalia, Uganda, Iran, Iraq) in the sample which were highly exposed to political unrest during the major part of the period 1972-1992[5]. Ramey & Ramey (1995) have reached at the same conclusion for different sample size and period in their recent empirical work[6]. Third, as we see in figure (6-1), the density of growth means in our sample has occurred within the range (1)-(3) percent. This is almost in accordance with IMF's published statistics regarding the average real per capita GDP growth in all the DCs during the period 1971-1992. The following table represents a more detailed and formal information about the mean of per capita GDP growth in DCs for the period.

Table 6.2-Growth Performance in Developing Countries (Annual Percentage Change)

Real per capita GDP	1971-1992	1971-1981	1982-1992
All Developing Countries	2.4	3.1	1.7
Net Creditor Counteries	1.1	2.8	-0.5
Net Debtor Countries	2.5	3.2	1.9
Fuel Exporter Countries	1.1	2.8	-0.6
Nonfuel Exporter Countries	2.9	3.3	2.6
African Countries	-	0.9	0.9
Asian Countries	4.4	4.0	4.8
Middle East and EuropeanCountries	1.0	2.6	-0.6

Table 6.2-Growth Performance in Developing Countries (Annual Percentage Change)			
Western Hemi-sphere Countreis	1.3	3.2	-0.5

Source: International Monetary Fund, *World Economic Outlook*, May 1993, P.44

The data in this table show how much the (mean) growth performance in DCs within the two decades (implying a sizeable reduction in second decade) and in terms of their financial situation, export composition and region has been mixed even at an aggregate level. This supports our individual country observations in figure (6.1) and emphasizes on the fact that the individual countries' characteristics (institutional and structural factors) play an important role in this regard. Therefore, this relatively high dispersion of the mean-variance pattern of growth in the real world have motivated us in our simulation examples to focus on replication of the plausible *range* of mean and variance of growth rather than *point* replication.

6.3 The Empirical Plausibility of Financial Repression's Hypotheses Under a Pegged Arrangement: A Simulated Paradigm

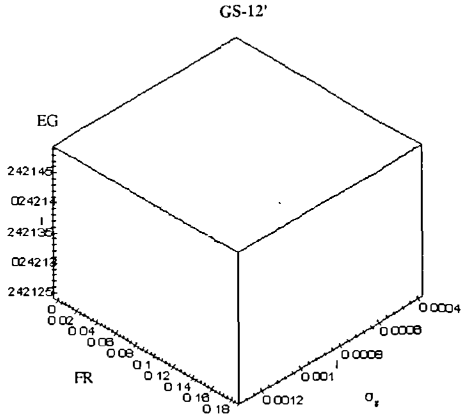
Considering the fact that there is no consensus regarding the relative sizes of the Goldsmith and MS effects and in view of our concluding remarks in the last chapter in relation to the importance of relative sizes of the MS and Goldsmith effects for welfare and growth implications of financial repression policies, we have run all the simulations with two assumptions about the marginal effect of financial repression through Goldsmith channel given the MS effect. The first three panel graphs FS-11 (figure 6.6, p. 310), PS-11 (figure 6.7, P. 311) and GS-11 (figure 6.8, P. 312) (see end of the chapter) correspond to the low level of marginal effect of Goldsmith channel (that is a value about 0.0005[7]) and the second three panel graphs FS-12 (figure 6.9, P. 313), PS-12 (figure 6.10, P. 314) and GS-12 (figure 6.11, P. 315) represent the simulation results for higher value of marginal effect of Goldsmith channel (that is a value about 0.00076). The main consideration in choosing these values was the minimum level of differential interest rate which constitutes the maximum threshold for the total reduction in the marginal productivity of (domestic) capital through the Goldsmith channel. Strictly speaking, we were concerned not to impose higher cost of intermediation in domestic financial markets than that in the foreign financial markets. Stated differently, we tried to choose values so as not to violate the implicit (legitimate) assumption implying the cost of access to (transactions in) foreign financial markets is higher than that in domestic ones. Also, the reason for the introduction of different degrees of financial repression in the two episodes of Goldsmith effects is either the economic viability of the equilibrium level of the endogenous variables and their consistency with the stylized facts. For instance, in the panel (1) version, higher degree of financial repression (that is more than 20 percent) implied a very low negative rate of expected growth which does not match with the real world economic experiences. However, this value is not low because the 20 percent degree of financial repression is higher than the estimated mean of the financial repression tax rates by Giovannini & De Melo (1993). In addition, in order not to confuse our argument with those ensuing from the real effects of variance of (domestic) inflation, we have assumed a zero productivity cost of inflation variance in all the calibration examples throughout this section. Since here we are dealing with a pegged arrangement this assumption does not seem to be very restrictive and crucial for our simulation based conclusions.

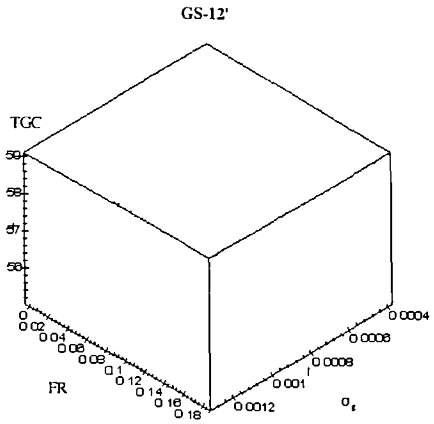
We think the graphs are revealing enough. As depicted for the chosen range of the variance of different types of shocks, the expected (mean) growth has varied within the range (-3)-(+5.4) percent which includes, by and large, all the experienced episodes in DCs for the period. All the same, the simulation results have covered the range (0.001)-(0.068) for the standard deviations of growth which again is in accordance with many observed episodes in DCs. Another remarkable aspect related to the equilibrium growth pattern of our calibrated model, which somewhat accords with the stylized facts, is the negative relationship between mean and standard deviation of growth at least as long as the financial repression implies a deterioration in the (expected) growth. This can easily be found out by a look at the expected growth (EG) and the standard deviation of growth (σ_g) graphs depicted in panel (1): FS-11and PS-11. Notice that the government expenditure shocks do not affect the expected growth due to the type of exchange rate arrangement assumed to be at operation. That is why we do not see the same pattern in panel (1): SG-11 graphs.

One striking feature of financial repression which is observed as a common feature in all the simulated episodes is the role of financial repression as a shock absorber. That is, irrespective of the types of the shocks and the level of the marginal effect of the financial repression through Goldsmith channel, a high degree of financial repression has led to reduction in the volatility of the growth. Besides, as another common characteristic we see in all cases, an increase in financial repression entails a rise in the share of the real money balances in the wealth (Nm). Also, as a consequence of a higher share of real money balances, there is a reduction in the total share of traded assets (i.e. Nk+Nf, which has not been depicted in any of the panels graphs). The rational behind these common patterns have already been explained in the previous chapters.

However, apart from these similarities, we see two considerable distinctive behaviour in the expected growth (EG), the share of (domestic) capital (Nk) and foreign assets (Nf) in the wealth, total growth contribution (mean minus variance adjusted for the agent's time preference) to the welfare (TGC) and the welfare function following an increase in the degree of financial repression as a policy instrument at the government disposal.

Let us first focus on the expected growth (EG). As graphs in panel (1) show vividly, for the low marginal effect of Goldsmith channel, the expected growth declines monotonically as financial repression increases. This is true irrespective of the type and size of the variance of the shocks introduced into the model. However, this is not always the case for a higher level of the Goldsmith effect. That is, different types and sizes of the variance of the shocks have different implications for the expected growth depending on the degree of financial repression. For instance, according to the panel (2): FS-12 and PS-12 graphs for a low level of variance of foreign inflation and productivity shocks, higher degree of financial repression implicates a higher (expected) growth rate. Therefore, financial repression policy is growth improving! Nonetheless, beyond certain level of risk associated with (domestic) capital and foreign assets, there would not be any growth case for financial repression and it will deteriorate the growth. Yet, in the event of government expenditure shocks, financial repression beyond a certain level implies an improvement in the expected growth for all the specified range of variance of the shocks. This has been depicted more clearly in graph GS-12'.

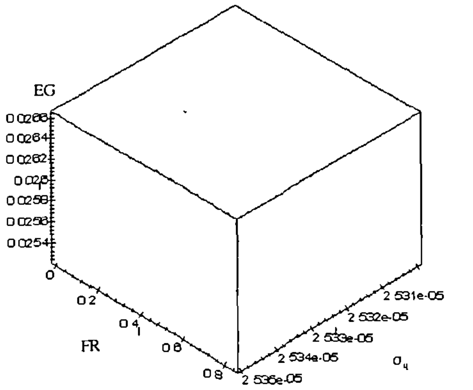




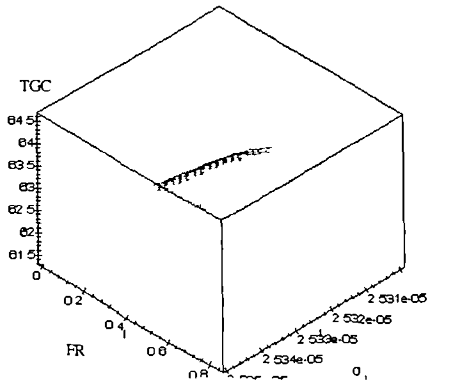
The behaviour of the total growth contribution to/loss of welfare (TGC) which is closely related to the behaviour of the expected and variance of growth reveals an interesting aspect of growth implications of financial repression. According to panel (2): FS-12 and PS-12 graphs, this variable, indicating the net welfare effect emanating from the growth, seems to demonstrate almost the same pattern as the expected growth. However, a closer investigation shows that this is not the case for all the specified range of the variance of foreign inflation and productivity shocks. That is, there is some range of the variance of the shocks in which the expected growth is a decreasing function of the financial repression, but the TGC is an increasing function of financial repression within that range. This might be seen much more clearly in the case of government expenditure shocks. As it is evident from the EG and TGC graphs in panel (2): GS-12, the TGC is increasing in financial repression from very low levels of financial repression, even though the expected growth is decreasing in this range. The above GS-12' graph is more revealing in this case.

In the case of productivity and foreign inflation shocks, the two comparable graphs below convey the same idea.

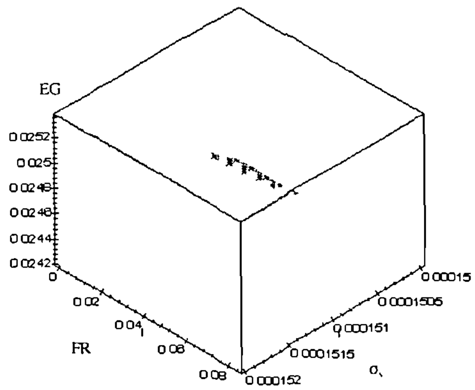
FS-12'



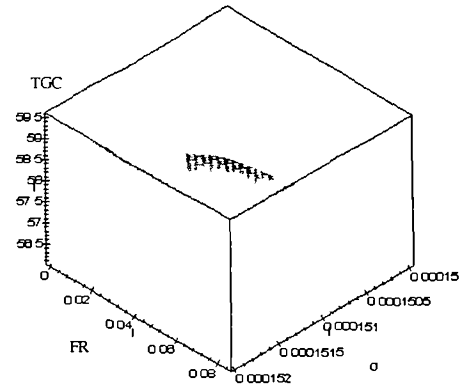
FS-12'



PS-12'



PS-12'



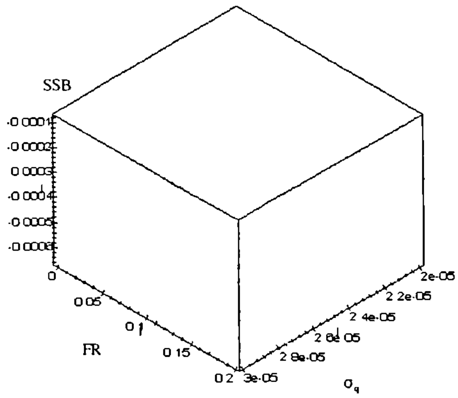
The reason behind this behaviour is obvious. Throughout the range of financial repression in which it is growth deteriorating, as in the meantime it reduces the variance of growth, the net welfare contribution from growth (i.e. TGC) is positive.

A comparative study of the two distinctive behaviour of the share of domestic capital (Nk) and foreign assets (Nf) for the two exemplified episodes may clarify why the expected growth has behaved differently in these two circumstances. According to the panel (1): FS-11, PS-11 and GS-11, an increase in financial repression has led to a rise in the share of domestic capital, which is a low return asset here, with a corresponding reduction in the share of foreign assets (Note that the economy is always a net-debtor in this case). Whereas, panel (2): FS-12, PS-12 and GS-12 graphs imply a reduction in the domestic capital with a corresponding increase in the share of foreign assets, which is high return asset here. This offsetting switches between two assets provides a general economic rational behind the two distinctive behaviour of the expected growth discussed analytically in detail in previous chapters. More specifically, in the former case the intra traded assets and inter traded-nontraded assets effects of the financial repression policy will support each other and, hence, leading to a reduction in the expected growth. However, in the latter case the growth promoting effect of the intra traded assets channel will dominate the growth hampering effect of inter traded-nontraded assets channel so that it ends up to an improvement in the expected growth. Notice that in the latter case the economy facing a very high degree of financial repression turns from a net debtor to a net creditor one[8].

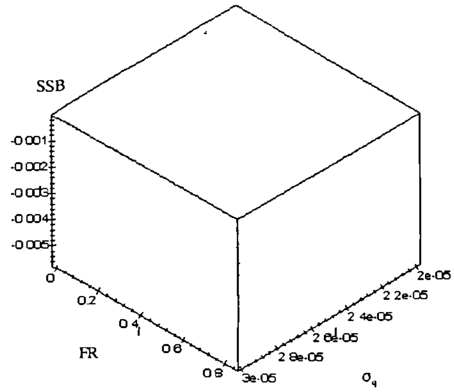
Having understood the above explanations, it is now easy to find out the reasons for the distinctive behaviour of our welfare function in the two different episodes. In the first episode (panel (1) graphs), we see , despite an increase in the share of real money balances and current consumption and a reduction in the variance of growth as a result of exercising the financial repression policy, one can not make any welfare case for the financial repression policy in this occasion. (Recall that these three are the three arguments of our welfare criterion whose directions of effects are positively related to our welfare function.) The main cause for this result is the high cost of growth deterioration due to applying the financial repression policy[9]. By contrast, in the second episode, though for the low degrees of financial repression and high values of variance of different shocks, the financial repression has been welfare deteriorating, for the high degree of financial repression it has been always welfare improving within the specified range of variance of the shocks. This welfare promotion has occurred due to an increase in the share of real money balances, current consumption and expected growth and a reduction in the variance of growth.

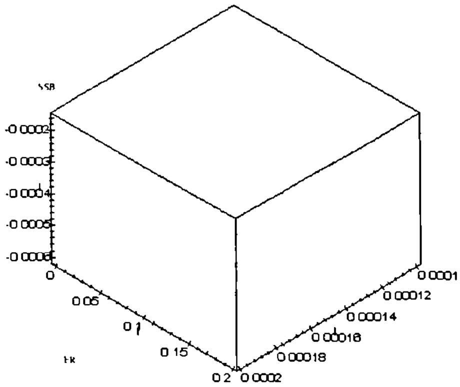
In our simulation examples, so far we did not pay attention to the implications of financial repression for the government budget constraint under a fully credible pegged regime. However, it is worthwhile to examine briefly these implications from a public finance point of view. The behaviour of the (mean) tax rate on the wealth (TW) required for a balanced budget policy following an increase in the degree of financial repression has been depicted in panel (1) and panel (2) graphs. Evidently, we find two extremely different equilibrium pattern for tax rates on wealth. That is the low marginal cost of the financial repression through the Goldsmith channel corresponds to increasing equilibrium tax rates on wealth. While, the reverse holds true for the high marginal cost episode. This is so mainly due to the lower inflation tax revenue and bond financing cost and higher level of the government expenditure in the low marginal cost episode in comparison with those in the high marginal cost episode. The following graphs demonstrate the equilibrium pattern of sum of the inflation tax revenue and bond financing cost for different degrees of financial repression:

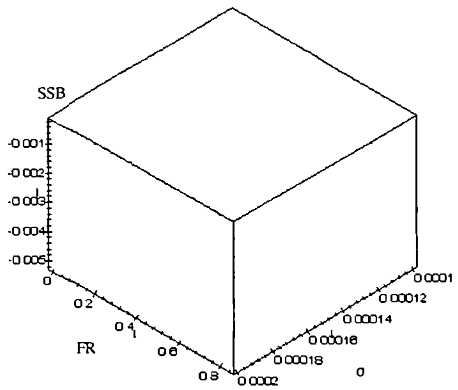
Panel (1): FS-11



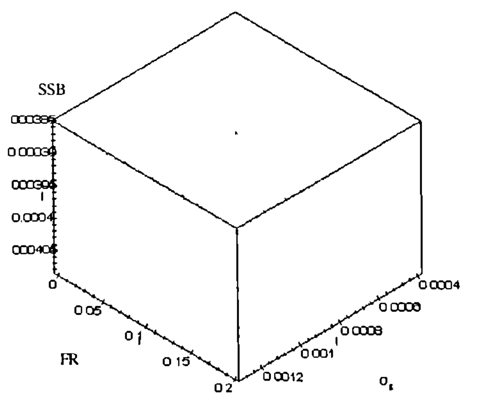
Panel (2): FS-12



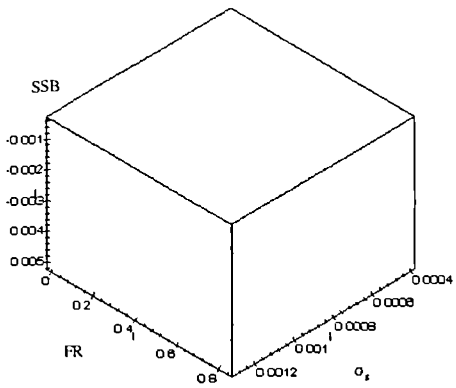




Panel (1): GS-11



Panel (2): GS-12



Clearly, the graphs highlight the fact that the inflation tax revenue in the high marginal cost episode is much higher than that in the low marginal cost episode within all the specified range of various types of shocks. More attention is worth being paid towards the low marginal cost of financial repression episode. In the case of productivity and foreign inflation shocks we observe for the low level of the variances of the shocks, the sum of the inflation tax revenue and government bond financing cost is an increasing function of the financial repression. This is so because the inflation tax revenue is not enough to cover the increase in government bond interest payment commitment as a result of an increase in the degree of financial repression. Note that since the government bond policy has been tied down with the real money balances, any increase in real money balances will involve a rise in the government bond financing and thereby a rise in its interest payment (recall equation 3.20). This reveals the limitation of the application of financial repression as a source of public finance under a pegged exchange rate regime. More precisely, under a fully credible pegged regime the fundamentals ultimately determine to what extent the government can reap higher revenue through using a financial repression policy. This needs more clarification. As in the first episode, the higher financial repression leads to a deterioration in expected growth, the equilibrium expected (domestic) inflation will be higher, the higher is the financial repression. This, on the other hand, implies that now the financial repression will involve an expected depreciation in the initial equilibrium (expected) exchange rate. It means there would be now less scope for the government to collect inflation tax revenue, as a fully credible pegged regime requires a more tight (i.e. disinflationary) monetary policy.

In summary, our simulation example implies an increase in the degree of financial repression results in a deterioration in the expected and variance of growth, a reduction in the representative agent's welfare, an increase in the ratio of current consumption to wealth, a rise in the share of real money balances in the wealth and a higher (expected) tax rate on wealth for the low marginal effect of financial repression through the Goldsmith channel. Whereas, in the high marginal effect episode, a higher degree of financial repression is accompanied with an improvement in the expected growth and the agent's welfare, a rise in the ratio of consumption to the wealth and the share of real money balances in the wealth and a lower (expected) tax rate on wealth.

Before leaving this section, we should mention that although we carried out our simulations based on the two different episodes regarding the marginal effect of financial repression on the productivity of (domestic) capital, it is quite plausible to imagine the same marginal effect of financial repression in two economies whose (marginal) productivity of domestic capital differ from each other due to either structural factors or institutional factors (such as different marginal cost of inflation variance and the like). In this case, one may easily reach the same conclusions. Put differently, we want to emphasize that the application of the same package of financial repression policies in two different economic structures might have two different welfare, growth and even public finance implications.

6.4 Superior Exchange Rate Arrangement and Financial Repression

6.4.1 Floating vs Fix Arrangement

In this section our main objective is to study whether, given our benchmark values, floating rates perform better than fixed rates in terms of our welfare criterion. Therefore, we ignore the other alternative exchange rate arrangements and focus only on the completely float and fix rates. Also, we will address the question of, given the experienced mean and variance of the money supply growth during the past two decades (1972-1992), what would be the welfare implications of having a ultra conservative, conservative and an opportunist central banker at office under a floating arrangement. To do this, we follow our previous section simulation strategy and examine the welfare performance of the two arrangements for the two episodes of marginal productivity effect of the financial repression policy through the Goldsmith channel. The crucial point which must be kept in mind throughout this section and the two following sections is this, our arguments are all restricted to the specific level of the variance of the shocks which makes the degree of their generalizations limited. For more general arguments one may refer to the analytical (previous) chapters. As before, panel (1) graphs correspond to the low marginal productivity cost through the Goldsmith channel while panel (2) graphs display the high marginal productivity cost.

According to the panel (1)-FL vs FI (11) graphs (figure 6.12, P. 316), representing the equilibrium behaviour of variables of interest when an opportunistic central banker is in office (i.e. Λ=1), the financial repression has led to a deterioration in expected growth (EG) under both arrangements with less negative effect under floating rates. As depicted, in terms of expected growth, the floating rates perform better than fixed rates even when there is no financial repression in the economy. However, in the presence of the financial repression its (expected) growth superiority in comparison with fixed rates is more obvious than in the absence of the financial repression. The reason behind this is very straightforward. Under floating rates, the share of traded assets is higher than that under the fixed rates. This can be easily realized by looking at the behaviour of the share of real money balances (Nm) under floating and fixed rates demonstrated in the graph (Nm). As we observe, the share of real money balances (Nm) is higher under the fixed rates than that under the floating rates even for zero degree of financial repression.

The expected growth pattern changes, though not dramatically, for the standard deviation (σ_G) of growth. That is, when there is no financial repression in the economy, there would not be any difference in the performance of the two arrangements with regard to the variance of growth. Nonetheless, the fixed rates stabilize the growth better than the floating rates in the presence of financial repression. Note that under both arrangements the higher degree of financial repression implies the lower level of variance of growth. Therefore, here our simulation results show a trade off between the two arrangements in terms of expected and variance of growth. According to the TGC graph (in that panel graphs), showing the total growth contribution to the welfare of the representative agent, in total, floating rates perform better in terms of its growth contribution to the welfare. However, this does not necessarily mean the welfare superiority of floating to fixed rates. On the contrary, the welfare performance (WF) of fixed rates reveals that it has been considerably better than that in the floating rates. This is true even when the economy is not subject to any financial repression. The fact that the real return on real money balances (i.e. $\sigma_p^2 - \pi$) is higher under fixed rates than that under the floating rates has resulted into a higher share of real money balances under fixed rates[10]. As it has been depicted in the graph of domestic inflation variance, this is true despite the fact that the variance of domestic inflation is significantly higher under floating rates[11]. Namely, the higher level of the expected inflation under floating rates has been the main cause of a reduction in the real return on real money balances. Evidently, the high level of expected inflation under floating rates is the result of the assumption of an opportunistic central banker (i.e. $\Lambda=1$). Hence, having taken into consideration this fact under floating rates, the (assumed) rational agent has hedged against the inflation through a switch away from nontraded assets (real money balances) towards traded assets. (i.e. the Tobin's effect) That is why the expected growth has been always higher under floating rates than that under fixed rates. However, this improvement in growth has been welfare distortionary through an increase in the agent's (shoe leather) inflation cost (i.e. a rise in deadweight (welfare) loss).

In sum, this simulated scenario indicates that there is no welfare and (expected) growth justification for financial repression under either of the fix and float arrangements. A result which might be viewed in accordance with the standard literature. This is so because under both regimes the financial repression has induced a reallocation in the agent's portfolio in favour of nontraded assets as well as a switch towards the less productive asset (i.e domestic capital here) within the traded assets. This portfolio adjustment, induced by the financial repression, has been so growth deteriorating that it has dominated the welfare gain through an increase in real money balances and initial wealth. By taking a public finance perspective one may understand the reason behind this matter relatively more straightforward. As shown graphically, even though financial repression has provided higher inflation tax revenue net of the government bonds interest burden (SSB), it, under both regimes, has led to a rise in the (expected) tax rate on the total wealth (TW) through mainly an increase in the government (expected) expenditure too (recall equation 3-20). Therefore, here, financial repression is a more distortionary source of public finance. This might be considered as a result of the more (welfare) distortionary role of inflation tax revenue. As we can observe in the sum of the seigniorage revenue and bond financing cost (SSB) graph, the SSB is higher under the floating rates than fixed rates even when there is no financial repression. The higher SSB corresponds to a lower tax rate on wealth which here is less (welfare) distortionary than inflation tax revenue. Hence, if the government resorts to the financial repression policy in order to raise its inflation tax revenue, it will just distort the welfare of the representative agent more. Notice that here the distortionary role of inflation tax revenue and tax on wealth changes dramatically in the context of the expected growth.

To be more specific, we see the exchange rate arrangement which implies higher tax on wealth (i.e. fixed rates) is more growth deteriorating than that involving higher inflation tax revenue (i.e. floating rates with an opportunistic central banker in office).

The above remark can be highlighted more clearly by examining the welfare and growth consequences of appointing a ultra conservative central banker under a floating arrangement (i.e. Λ=0). This scenario has been displayed in panel (1)-FL vs FI (12) graphs (figure 6.13, P. 317). It is evident that despite the similarity between the general patterns of the financial repression implications for the welfare and the (expected and variance of) growth, the previous ranking of superiority of the exchange rate arrangements has changed in the context of both welfare and (mean and variance of) growth. That is, now the floating rates imply higher level of welfare but lower level of mean and variance (the latter in the presence of the financial repression) of growth than fixed rates. The reasons for this result have already been explained above. In brief, when an ultra conservative central banker is in office the real return on real money balances is higher under floating rates (due to a higher variance of domestic inflation and lower expected domestic inflation) than that under fixed rates. Thus, the share of real money balances is higher under floating rates resulting to a lower level of traded assets. Note that since the inflation tax revenue under float is now (almost) zero the SSB is positive indicating the cost of interest burden on the government bonds. That is why the expected tax rate on wealth is higher under float than that under fix rates. In addition, in terms of welfare, the floating rates with an ultra conservative central banker is superior to the fixed rates and the floating rates with an opportunist central banker. Once more, as depicted in the TGC graph, in spite of the lower level of the variance of growth under float, the total mean-variance contribution (TGC) has been lower under float for all degrees of the financial repression.

Now let us turn our attention towards the episode involving higher marginal productivity cost of the financial repression through the Goldsmith channel. Panel (2)-FL vs FI (11) (figure 6.14, P. 318) displays the equilibrium behaviour of the variables of interest under the fixed and floating rates when the central banker is completely dependent (Λ=1) and the panel (2)-FL vs FI (12) (figure 6.15, P. 319) represents the situation where an ultra conservative central banker is in office.

We think the graphs are expressive enough. That is, now financial repression after a threshold has led to an improvement in the expected growth under both floating and fixed rates which is in sharp contrast to the previous episode! The interesting point is the different expected growth behaviour for specific range of the financial repression under different exchange rate arrangements. For instance, in panel (2)-FL vs FI (11), while under floating rates the financial repression has promoted the expected growth since a very low degree, it has been growth deteriorating for low degrees under the fixed rates and just started to improve the expected growth for high degrees range. Put differently, the expected growth benefits of financial repression under floating rates with a dependent central banker has always been higher than that under fixed rates. However, the reverse is true for the floating rates with a ultra conservative central banker (panel (2)-FL vs FI (12)). This improvement in the expected growth has occurred only through a favourable reallocation within the traded assets . Because the share of real money balances has increased following a rise in the financial repression under both arrangements (refer to the Nm graphs). This implies a reduction in the share of traded assets in the both arrangements which is expected growth deteriorating. However, since at the same time, financial repression has induced a switch away from the less productive asset (here domestic capital) within the traded assets (refer to the Nk graphs), it has fostered the expected growth after some critical level depending on the exchange rate arrangements and the type of central banker in office. Once again, as we clearly see, the ultra conservative central banker under floating rates implicates a lower expected growth than fixed rates and/or floating rates with a dependent central banker which it mimics our conclusion in the previous episode with regard to the Goldsmith effect. Also, the financial repression has the same implications as the pervious episode for the variance of growth under the fixed and the floating rates (refer to the σ_G graphs). As a result of these two growth characteristics of the financial repression, we observe the TGC has been an increasing function of the financial repression and has taken its highest level under floating rates with a dependent central banker. Note that despite the fact that the expected growth has been decreasing for the low degrees of the financial repression under fixed rates and floating rates with a ultra conservative central banker, the TGC has been always increasing in financial repression. This has occurred due to the role of the financial repression in lessening the variance of growth. However, as a consequence of the expected growth decreasing effect, the rate of increase in TGC under the fixed and floating rates has been decreasing at low degrees of the financial repression (refer to the TGC graphs).

In terms of welfare, the improvement in the mean and variance of growth as well as an increase in the share of real money balances and consequently the initial value of wealth all have resulted to a monotonic increase in the representative agent's welfare following a rise in the financial repression under the fixed and floating rates (refer to WF graphs). Like the previous episode regarding the Goldsmith effect, the floating rates with a ultra conservative central banker, in the context of welfare, is superior to either the fixed rates or floating rates with a dependent central banker. However, here, unlike the previous episode, there is a scope for financial repression not only in the context of the welfare but also in terms of the (expected) growth. From a public finance point of view, the rational behind these implications can be described as follows.

When the central banker is dependent, the hands of the government in reaping off the inflation tax revenue are not tied. This fact is perceived by the rational agent and, consequently, s/he will hold less real money balances in her/his portfolio than the other arrangements involving more disciplined monetary policy. That is why, in the absence of the financial repression the expected growth under floating rates with a dependent central banker is higher than the other arrangements. However, this will also restrict the government (ability in collecting) inflation tax revenue and , hence, make it to use the tax on wealth to balance its budget. Nevertheless, given the mean and variance of money growth, the government is able to apply the financial repression in order to raise its inflation tax revenue. That is, it may be willing to use financial repression as a complementary instrument. By resorting to financial repression, the government is able to reduce the tax rate on wealth, which here is more (expected) growth distortionary than the inflation tax revenue, through mainly an increase in its inflation tax revenue and a reduction in the level of its expenditure. Therefore, now financial repression is not growth distortionary.

Under the fixed rates arrangement, the government commitment on the exchange rate parity makes its hands tied in using the inflation tax revenue. Given this fact, in the absence of financial repression, the rational agent under fixed rates will hold higher real money balances in her/his (equilibrium) portfolio than that under floating rates with a dependent central banker. Note that in this case, in spite of the higher share of real money balances, since the equilibrium expected inflation is lower under fixed rates than that under floating rates with a dependent central banker, the inflation tax revenue is lower and thereby the tax rate on wealth is higher under fixed rates. Also, for the same reason as what explained above, the government can reduce its need to levy more growth distortionary taxes through using the financial repression policy. However, as the share of real money balances (traded assets) under fixed rates is higher (lower) for any given degree of financial repression than that under the floating rates, the expected growth is lower in the fixed rates (refer to Nm graph). Likewise, the lower expected growth performance of the fixed rates accords with its lower (higher) equilibrium inflation tax revenue (tax rate on wealth), which is here less (more) growth distortionary, for all degrees of the financial repression in comparison with that in the floating rates (refer to the SSB (TW) graph). For the same token, here the expected growth performance of the financial repression under floating rates with a ultra conservative central banker has never been higher than that under the fixed rates and floating rates with a dependent central banker (refer to TW and SSB graphs in panel (2)-FL vs FI (12)).

Since the above explanation is subject to a probable confusion, we should emphasize that our argument here must not be considered as an absolute (definite) one. It is not absolute (definite) in two respects. First, as we have already seen the inflation tax revenue through financial repression (financial repression tax revenue) under fixed rates and floating rates with a ultra conservative central banker is more growth distortionary than tax on wealth for (relatively) low degrees of the financial repression. Second, in comparative study among the arrangements, the comparison among the only (equilibrium) *level* of tax rate on wealth or inflation tax revenue through the financial repression is not crucial. What is important in this respect, is the implications of any alternative source of the public finance for the agent's equilibrium portfolio. To be more concrete, it is possible that the level of the tax rate on wealth under one type of exchange rate arrangement to be higher than that in the other one, while the higher tax-rate-on-wealth-arrangement implies higher growth rate in comparison with the arrangement involving lower level of tax on wealth. Below, we will make this case clearer with a simulated scenario. What we would like to emphasize here can be summarized in the following statement which might be viewed as one of the interesting findings of this study. *The (growth) distortionary role of any source of public finance should not be interpreted as an intrinsic characteristic of the instruments. Their distortionary role is something relative which is determined in an interactive fashion with the institutional and structural factors of any economy irrespective of the (productivity) role of the government expenditure.*

A reasonable question which might be raised in one's mind is if, here, the floating rates with a ultra conservative central banker performs worse in terms of (expected) growth, how it is superior to two other arrangements in the context of welfare. The answer is simply due to the welfare distortionary role of inflation tax revenue. That is, in our (expected) growth argument what has been ignored is the inflation (shoe leather) cost consideration which has been incorporated in our welfare criterion. More strictly speaking, albeit the fixed rates and floating rates (with a dependent central banker) arrangements are less (expected) growth distortionary, since the (shoe leather) cost of inflation is higher under those two arrangements, their welfare performance in equilibrium have been worse than that in floating rates with a ultra conservative central banker. Moreover, one must not take no notice to the fact that the variance of growth is also lower under floating rates with an ultra conservative central banker than any of the two other arrangements (refer to the σ_G graphs).

Another point which is worthy to pay attention to is the role of financial repression in decreasing the variance of domestic inflation in these scenarios like the previous episode regarding the Goldsmith effect. As shown in σ_p^2 graphs (P. 320), the equilibrium variance of domestic inflation has been a monotonic decreasing function of the financial repression under both types of the floating rates arrangements[12]. This feature may play a more crucial role for the implications of the financial repression when the cost of inflation variance is going to be taken into consideration.

A sceptic may raise this question that so far in our simulated scenarios there has been no case where the different degrees of the financial repression imply a change in the rank of a superior exchange rate arrangement for a given degree of central banker independence. More precisely, one may suggest in the presented scenarios if, for a specific type of central banker, an exchange rate arrangement is superior it is superior for all the feasible range of financial repression and financial repression cannot change the superiority rank. In the following we try to address this issue by raising just one extra case where we have assumed a conservative, rather than two extreme cases either a ultra conservative or an opportunist, central banker in office and high marginal productivity cost of financial repression through the Goldsmith channel. Also, for expositional convenience we have focused on the equilibrium trajectory of the difference of the variables of interest under floating rates with a conservative central banker (i.e. $0 \prec \Lambda \prec 1$) and fixed rates for different degrees of financial repression (when the marginal cost of financial repression is high). The panel (2)-FL vs FI (13) (figure 6.16, PP. 321-22) represents this scenario where the arrowed solid lines refer to the equilibrium trajectories and the shaded areas show all the disequilibrium (possible) points.

According to the DGE graph, when there is no financial repression or it exists only at low degree, the floating rates with a conservative central banker performs better than the fixed rates in the context of the expected growth. However, the reverse is true for (relatively) high degrees of financial repression. On the contrary, in terms of variance of growth, floating rates is superior to the fixed rates for all the degrees of financial repression (refer to the $D\sigma_G^2$graph). As a result of a higher expected growth and a lower variance of growth under floating rates the total growth contribution to the welfare (TGC) is higher under floating rates for the low degrees of financial repression. Despite the lower variance of growth under floating rates, this pattern has changed for high degrees of financial repression only due to the higher expected growth in fixed rates (refer to DTGC graph). Nonetheless, in the context of welfare, the fixed rates is superior to the floating rates for low degrees of the financial repression, while the floating rates performs better for the high degrees of financial repression (refer to the DWF graph). Therefore, now the financial repression has changed the rank of the superior arrangement.

The rational behind this behaviour is simple. As observed in the DNm graph, the share of real money balances is higher under fixed rates than that in floating rates for the low degrees of financial repression, whereas the reverse holds true for the higher degrees of financial repression. This has been mirrored in the reverse behaviour of the share of the traded assets (refer to the DST graph). Therefore, the better expected growth performance in the floating rates (fixed rates) for low (high) degrees of financial repression is due to the higher share of traded assets in comparison with that in the fixed rates (floating rates). Also, the (shoe leather) inflation cost has entailed the welfare superior arrangement to be associated with the arrangement involving higher share of real money balances, despite the fact that the arrangement has performed worse in terms of the expected growth.

The DSSB and DTW graphs represent the difference between the equilibrium inflation tax revenue net of the government bonds interest burden and the equilibrium tax rate on wealth under the floating and fixed rates respectively. As it is evident, for all the degrees of financial repression the inflation tax revenue under fixed rates has been higher than that under the floating rates with a conservative central banker. Somewhat, as a consequence of this fact, the tax rate on wealth under floating rates has been always higher than that in the fixed rates. This is true despite the fact that the equilibrium level of the government expenditure has been higher under the fixed rates for high degrees of the financial repression (refer to DGE graph). This lays stress on the point that we raised earlier. That is, in comparative assessment of the welfare (growth) performance of different arrangements, from a public finance point of view, the comparison among the level of the tax rates on wealth or the inflation tax revenue can be misleading. This is so because what determines the distortionary role of any instrument is its equilibrium effect on the agent's portfolio.

As a concluding remark to this section we would like to point out if one accepts that the first scenarios in the two episodes with regard to the Goldsmith effect are much closer to the real world experience in DCs, one may tend to conclude those economies which have followed the fixed rates had governments that were more concerned about the welfare whereas those which adopted the floating rates can be viewed as more growth maximization oriented. This remark can be the subject of a new empirical study to be tested by more formal empirical methods than the calibration method that we have applied in this study.

6.4.2 The Superior Exchange Rate Arrangement

In this section, our main objective is to introduce the managed rates arrangement (leaning with and against the wind) to the previous floating versus fixed rates scenarios. By doing that we want to see which arrangement among the three broad floating, managed and fixed rates arrangements is superior in terms of our welfare function. In addition, for our benchmark values we will work out the optimal level of the welfare and mean and variance of the growth when the economy is not subject to any financial repression. This will constitute our benchmark in order to study, given the optimal benchmark, whether there is any scope for financial repression[13].

Our simulation strategy in this section follows mainly the previous section. That is, we have simulated the model for the two episodes regarding the Goldsmith effect. Panel (1) corresponds to the low marginal productivity cost, while panel (2) represents the high marginal productivity cost. However, to have a tractable graphical presentation, we have been selective in the degrees of exchange rates flexibility. More strictly speaking, we have limited our choice to maximum seven and minium six values of ρ including the floating rates (ρ=0), fixed rates ($\rho \to \infty$) and two values for the managed rates with leaning against the wind (ρ=1, ρ=10) and two values for the managed rates with leaning with the wind (ρ=-1.1, ρ=-10). Also, to study the implications of different types of the central banker in office for the superior exchange rate arrangement in the presence of the financial repression, we have carried out the simulations for three scenarios regarding the central banker at office (i.e. ultra-conservative (Λ=0) (figures 6.17 and 6.20, P. 323 and P. 326), conservative ($0<\Lambda<1$) (figures 6.18 and 6.21, P. 324 and P. 327) and opportunist (Λ=1) (figures 6.19 and 6.22, P. 325 and P. 328)). Note that, the dashed lines in the EG, σ_G^2, TGC and WF graphs represent the optimal level of the corresponding variable when there is no financial repression in the economy. They have been computed on the basis of our benchmark values which implied a managed rate (leaning with the wind) arrangement as the optimal exchange rate arrangement for all types of the central bankers. More precisely, for an ultra conservative central banker , ρ=-0.7939, a conservative central banker, ρ=-0.9964, and a dependent central banker, ρ=-0.9895 were the optimal degrees of exchange rate flexibility.

According to the panel (1) graphs, for all types of the exchange rate arrangements there is neither (expected) growth nor welfare justification for the financial repression policy. This result holds true irrespective of the type of central banker at office. However, the financial repression has lessen the variance of growth for all types of the exchange rate arrangements. In this respect, though in the absence of financial repression, there is no difference among the exchange rate arrangements, the managed rates with a ultra conservative central banker seems to perform better than the other arrangements when the financial repression policy is followed. Furthermore, there exists a trade off between the mean and variance of growth performance of the arrangements. That is, the variance of growth of those arrangements which have performed better in terms of expected growth has been higher. Hence, in general, the financial repression implies, on the one hand, a deterioration in the expected growth and an improvement in the variance of growth, on the other hand. Nonetheless, the (monotonic) decreasing slope of the TGC graphs indicate that the reduction in the variance of growth has not been effective (large) enough to make any welfare case for financial repression policy.

An increase in the share of real money balances, though per se is welfare improving, plus an unfavourable reallocation within the agent's traded assets and an increase in the consumption, following an increase in degree of financial repression, have been so growth deteriorating that they have led to a welfare loss under all types of the exchange rate arrangements (refer to the Nm and Nk graphs). These adjustments accord with the increase the tax on wealth which is growth distortionary here (refer to the TW graphs). Put differently, in a stochastically endogenous growing economy under this episode, if the government, given the exchange rate arrangement and type of central banker, wants to increase its inflation tax revenue by resorting to the financial repression policy, it will end up to a higher use of tax on wealth due to an (endogenous) increase in the level of government expenditure. More technically speaking, an increase in the financial repression leads to a reduction in risk associated with domestic capital. Though the financial repression reduces the expected return on domestic capital too, here the decreasing effect of the financial repression on the risk dominates the marginal productivity effect so that it entails a reallocation towards the domestic capital (the upward slope of Nk graphs reflect this fact). This reallocation in the agent's portfolio induced by financial repression is distortionary for a couple of reasons. First, the financial repression has decreased the total share of traded assets which is growth deteriorating. Second, the domestic capital is less productive asset and , therefore, the economy as whole will lose due to this reallocation. Third, as the agent accumulates the domestic capital, the level of the government expenditure, which in our framework is a pure waste, will proportionally increase. As a result, since the financial repression (inflation) tax revenue is not enough to cover the increase in the government expenditure, it ultimately invokes a higher tax on wealth. That is to say, now under this episode the financial repression policy is more distortionary than the other sources of public finance. Hence, here, there is no incentive for a benevolent government to resort to the financial repression policy. The optimal policy is characterized by a managed rate (leaning with the wind) arrangement with a zero degree of financial repression irrespective of the type of central banker in office.

Notice, if one would like to drop the assumption of a benevolent government and/or to view the financial repression as a structural characteristic of an economy rather than the government induced one, the EG and WF graphs suggest that the financial repression has different growth and welfare implications depending on the exchange rate arrangement and the type of central banker at office. According to the graphs, in this occasion none of the fixed or floating rates is superior to the managed rates (leaning with the wind) in the context of the expected growth and the managed rates with a dependent central banker seems to perform better than the other scenarios. This has been the case for the total growth contribution to the welfare as well. Also, in the context of variance of growth the managed rates with a ultra conservative central banker seems to be superior to the other scenarios. Likewise, in terms of welfare, the managed rates (leaning with the wind) with a ultra conservative central banker has been superior to the other scenarios depicted in the graphs. Note that, for a dependent central banker scenario which can be viewed as a more common one in DCs, the superior arrangement among the studied cases has been the fixed rates. As the arrowed dash lines, corresponding to the equilibrium welfare for the optimal degree of exchange rate flexibility in the absence of the financial repression, indicate, in the presence of the financial repression, the optimal degree of exchange rate flexibility in the absence of the financial repression, has not been optimal in neither scenarios of a dependent and a conservative central banker anymore.

The marginal point worthy to pay attention here is, the fact that the optimal degree of exchange rate flexibility in the absence of financial repression has rendered the maximum level of welfare, does not ensure the maximum level of the expected growth. As it is evident, all the examined arrangements have performed better than it in the context of expected growth. This means the maximum level of our welfare criterion does not necessarily involve the maximum (expected) growth. This is essentially due to the real money balances effect.

Panel (2) graphs imply an improvement in the expected growth for high degrees of financial repression under all types of exchange rate arrangements and central banker examined here (refer to the EG graphs). As depicted, in this episode the expected growth is always higher than the optimal one when there is no any financial repression in the economy and the managed rates (leaning with the wind) has been superior to the fixed and floating rates for all the scenarios. Also, the highest expected growth has been achieved when a dependent central banker is at office. However, this uniform pattern of the expected growth effect of the high degrees financial repression is not seen for the low degrees of the financial repression. More precisely, though the low degrees of financial repression has been expected growth deteriorating under some exchange rate arrangements, it has been expected growth improving for the other arrangements. This different performance has been more distinctive when we take into account the type of central banker at office (compare the EG graphs in the panel (2)- The superior arrangement (21), (22) and (23) with one another).

Like the previous episode, the financial repression reduces the variance of growth for all types of the arrangements and central banker at office. Again, the managed rates (leaning with the wind) has performed better than the fixed and floating rates in this respect. Also the lowest variance has been associated with a ultra conservative central banker. As shown, though the fixed rates has stabilized the variance of growth better than the floating rates for a dependent central banker scenario, the floating rates has been superior to the fixed rates when either a ultra conservative or a conservative central banker is at office. Note that, albeit there is not any trade off between the expected growth and variance of growth performance of (high degrees of) financial repression, there exists a clear trade off between these two magnitudes for different exchange rate arrangements. That is, despite the fact that when there is no financial repression in the economy there has been no difference in the variance of growth performance of the arrangements, in the presence of (high degree of) financial repression those arrangements involved higher expected growth have been associated with a higher variance of growth as well. The differences in the mean and variance of growth performance for different degrees of financial repression under different arrangements and scenarios have been reflected in the equilibrium behaviour of the total growth contribution (TGC) of the financial repression graphs. That is, though as a result of the lessening effect of the financial repression on the variance of growth, the TGC graphs have been increasing in the financial repression, the rate of increase has been different for different range of the financial repression depending on the exchange rate arrangements and the type of central banker. Once more, in the presence of the financial repression the TGC for all the depicted arrangements has been higher than the optimal TGC in the absence of the financial repression and the highest TGC has been associated with the managed rates (leaning with the wind) with a dependent central banker.

Evidently, an increase in the TGC as well as a rise in the real money balances and the initial value of wealth following the application of the financial repression have led to an improvement in the agent's welfare under this episode (refer to the WF graphs). As clearly observed, for high degrees of the financial repression the welfare is higher for all the arrangements than the optimal level of welfare when there is no financial repression in the economy. This holds true irrespective of the type of the central banker. Again, the managed rates (leaning with the wind) is superior than the fixed and the floating rates. Therefore, now under this episode there is a scope for the financial repression policy in terms of the welfare, mean and variance of growth. The rational behind this can be described as follows.

For high degrees of the financial repression under all the arrangements, there has been a reallocation in the agent's portfolio towards nontraded assets (refer to the Nm graphs). This together with an increase in the (current) consumption have been (expected) growth deteriorating. However, the financial repression has induced a reallocation within the traded assets away from the less productive assets, namely, the domestic capital here (refer to the Nk graphs). This channel is growth promoting. For a high degree of financial repression the growth benefit from the latter channel has wiped out the negative effect of the former channels. From a public finance point of view, these adjustments have been associated with a decrease in the tax on wealth (refer to TW graphs). The reduction in tax on wealth has occurred mainly due to an increase in inflation tax revenue through the financial repression (refer to SSB graphs) and a lower level of the government expenditure. Therefor, now unlike the previous episode, the financial repression is less distortionary than the other sources of the public finance. This deserves more explanation. Here, though the financial repression might have reduced the risk associated to the domestic capital, since its decreasing effect on the marginal productivity of (domestic) capital has outweighed the risk lessening effect, it has led to a switch away from domestic capital. This portfolio adjustment, despite its negative effect on the total share of traded assets, has been less distortionary from two respects. First, the domestic capital is less productive asset and, hence, the economy as whole has benefited from a switch away from it. Second, as the agent deccumulates the domestic capital, the level of the government expenditure, which here is a pure drain of the resources, will proportionally decrease. This as well as an increase in the government financial repression (inflation) tax revenue will lead to a reduction in the tax on wealth which is more distortionary source of public finance here.

At the end of this section, there are two points which we would like to draw the reader's attention to them. First, if we examine the equilibrium behaviour of the welfare for the optimal exchange rate arrangement in the absence of the financial repression under different scenarios related to the type of central banker (depicted by arrowed dash lines), it is realized that the different types of the central banker have had different welfare implications in the presence of the financial repression. This is in contrast with the circumstance where there is no financial repression in the economy. That is to say, from a welfare point of view, in a financially repressed economy the type of the central banker at office might be more crucial than that in an economy which is not subject to the financial repression. This is so because they have different implications for the equilibrium nominal interest rate and thereby in a financially repressed economy they might imply different portfolio structure for the representative agent. A more formal analytical presentation of this remark can be found in chapter three.

Second, as shown in the σ_p^2 graphs (P.329), one of the interesting feature of financial repression under both episodes is its role in reducing the variance of the domestic inflation. This holds true for all the exchange rates arrangements, except fixed rates, and for all types of the central banker. This effect has been ignored in all the literature regarding financial repression. Considering the fact that the financial repression has lessen the variance of growth, one can realize that there is not necessarily any conflict in stabilizing the domestic inflation and the variance of growth through the financial repression. That is, a target which has been one of the most controversial issue in the stabilization policy literature. Therefore, in a stochastically endogenous growing economy there might be a scope to reconcile these two conflicting objectives. In the real world, it is very probable one comes across a government which cares more about these two objectives than (only) the welfare of the representative agent as we have considered throughout our analysis. That is, a government whose preferences do not match, at least completely, with the representative agent and which may weigh highly the variance of the growth and domestic inflation. This may rationally provide an incentive for the government to resort to the financial repression even when it might not involve a maximum level of welfare for the representative agent.

6.4 Conclusion

A striking distinctive feature of this chapter was its more realistic based arguments. It was so in two respects. First, we did not abstract in our arguments from neither the Goldsmith nor the MS effects which we had previously explored their different implications for the welfare (growth) consequences of the financial repression (refer to chapter 5). Second, the framework by which we studied the welfare implications of the financial repression policies was calibrated mainly on the basis of the real world economic magnitudes.

The calibration exercises indicated that our propositions regarding the welfare and mean and variance of the growth in the previous chapters were not completely idiosyncratic. That is, if we accept that the real world is basically characterized as a second best rather than a first best utopia, one quite plausibly can conceive situations in which a benevolent government may legitimately follow the financial repression policy.

Incidentally, we showed how, from a public finance point of view, the financial repression policy can be less distortionary source of tax revenue than the more regular (common) sources of public finance. More importantly, we saw how the (relative) distortionary role of a source of public finance is interactively determined by the institutional and structural factors in any economy. This finding is a genuine one, and at the same time in our opinion, worthy to be the agenda of future research in the context of other sources of public finance, because in our framework there was no productivity role for the government expenditures.

In addition, our simulation examples demonstrated that the superiority of any exchange rate arrangement in terms of the welfare and mean and variance of growth is closely affected by the degree of financial repression in the economy. The reverse turned out to be crucial too. That is, depending on the given exchange rate arrangement different degrees of financial repression might have different implications for the (expected) growth and thereby the welfare. Once more, this proves, now from a more empirically oriented point of view, the importance of financial repression for the optimal degree of exchange rate flexibility which was the main concern of this study.

Another interesting, but at the same time challenging, finding of our calibration exercise was the growth and inflation stabilizing characteristic of financial repression. More strictly, in general, depending on the values of the structural parameters, the relative sizes of the variances of the shocks hitting the economy and the type of exchange rate arrangement, the financial repression can be viewed as a policy instrument in order to mitigate or even to reconcile (between) these two competing objectives. As far as we know, there has been neither theoretical nor empirical literature to take into consideration the growth and inflation stabilizing characteristic of financial repression so far. This might have provided another incentive for the governments in DCs, which can be characterized as the most volatile block in the world in terms of both growth and inflation, to resort to financial repression policies.

Notes

1- On the basis of the IMF Annual Report (1982) and International Financial Statistics (1990) the percentage of developing countries that pegged to either a single currency or a currency composite has decreased from 86% in 1976 to 66.4% in 1989.

2- One of the characteristics of many DCs is scarcity of capital and saving that in many instances has led to their heavy reliance on agricultural and small size activities which are subject to higher level of risk.

3- This value implies 0.04 percent (nominal) interest rate differential for our simulations panel with 6.5 percent foreign real interest rate which accords with the minimum observed interest rate differential case in Giovannini & De Melo (1993) estimation. Moreover, excluding Brazil which performs as an outlier observation in their country sample, the benchmark value is close to the mean of the interest rate differential for all the countries, including those with negative interest rate differential such as Portugal and Mexico, in the sample.

4- This type of relationship can be found in the neoclassical models such as Romer (1986), Lucas (1988), King and Rebelo (1990) and in Easterly (1990) and, with some modifications, Barro (1990) too.

5- We took a bit more steps in order to analyze the observed relationship between the volatility and mean of the growth on the ground of continental effects and countries' speed of growth characterization via a very simple dummy variable approach. However, since we found this avenue far from the main concern of this study, we did not embark upon more detailed study in this respect. The following regression equation shows one of our findings after controlling for continent and countries' speed of growth effects in the previous regression equations.

Regression Equation (3)

Variable	Coefficient	Std.Error	t-value	t-prob
Constant	-3.1441	0.089878	-34.981	0.0000
M	-9.3786	3.8464	-2.438	0.0178
DUNREST	1.0547	0.19395	5.438	0.0000
DSAUDI	0.84943	0.37253	2.280	0.0263
DAF	0.34766	0.10360	3.356	0.0014

DM	0.25819	0.12397	2.083	0.0417
DVF	0.48766	0.21769	2.240	0.0289

$R^2 = 0.486041$ $F(6, 58) = 9.1416$ [0.0000] $\sigma = 0.361778$ DW = 2.21
RSS = 7.591215514 for 7 variables and 65 observations

Where: DAF stands for dummy variable for African countries,
DM is a dummy variable which takes value one when the country's mean rate of growth is within the range 1.5-3 percent,
DVF is a dummy variable which takes value one when the country's mean rate of growth is greater than 3 percent,
DSAUDI is a dummy variable to capture the country specific characteristic of Saudi Arabia country,
DUNREST and M are the same as the text regression equations.

The regression results are revealing enough. As we expected for countries subject to political instability the standard deviation of growth, irrespective of their continental location and speed of growth characteristics, is higher than the other countries in the sample. Also, given the specified characteristics in our regression equation, African countries on average have experienced higher volatility in their growth during the period 1972-1992 than the other countries located in the other continents. The coefficient of Saudi Arabia dummy variable shows the volatility of growth for this country , due to its economy dependence on the oil revenue and price which were highly volatile during the period, has been so high that it can be characterized as an outlier observation in the sample. The striking feature of the above regression equation is the significance of the negative relationship between the mean and standard deviation of growth after controlling for the specified factors in the regression equation. The estimated coefficients of DM and DVF variables indicate our country classifications in terms of their speed of growth characteristic is statistically significant. More specifically, this lays stress on this fact that having taken into account the continental and political unrest effects there is still negative correlation between mean and volatility of growth within any category of low, medium and fast growing economies.

6- Here we like to mention that, though less serious and systematic than Vector Autoregressive (panel data) econometrics analysis, we think , especially in light of lack of systematic data stream in DCs, the above simple single static equation approach can be considered as a parallel line with Barro's (1991) type empirical studies in order to investigate the government policies' implications for the *variance of growth* on the basis of the theoretical propositions such as those raised in the present study. We believe that with a little more elaboration this line of research will most likely end up to a couple of interesting and genuine findings.

7- The same results for the welfare and growth implications of the financial repression policy obtained for values less than 0.0005.

8- Though this study is not concern about the issue of capital flight in DCs, this general equilibrium frame work might provide a suitable vehicle in order to address the capital flight in DCs suffering from the financial repression.

9-The negative values for the welfare criterion must not be confusing. There are a couple of reasons to justify it. First, our welfare criterion here is based on a logarithmic utility function (recall that we are carrying out all the simulations for $\gamma=0$). Therefore, it has mainly a logarithmic specification for which negative values correspond to the positive decimal numbers (fractions). Second, it contains a constant term consisting of the initial level of capital stock and real foreign assets which we have put them equal to zero, in all the simulation examples. Hence, one can make positive values for the welfare criterion by simply assigning high positive values to these two arbitrary constants. Third, as it is obvious from our utility function specification, there is no reserved level assumed for the agent's utility function arguments. Accordingly, the ordering of the (utility) ranks and not absolute values of the (utility) ranks are important.

10.To give a more precise numerical impression, the equilibrium variance of the domestic inflation and the expected inflation under fixed rates in the absence of the financial repression are about 0.25×10^{-4} and 0.055 respectively while those are equal to about 0.0036 and 0.643 under floating rates.

11. As it is seen, another interesting aspect of the financial repression under floating rates is its role now as a decreasing factor for domestic inflation variance. Hence, here there is no conflict between the growth and the inflation stabilization role of the financial repression in the economy.

12. Under the fixed rates the variance of the domestic inflation is equal to the variance of the foreign inflation.

13.What we are not going to address here is working out the exact optimal degree of exchange rate flexibility in the presence of the financial repression. We have not done this due to two main reasons. First, the high degree of nonlinearity and consequently high level of computation cost involved in obtaining the optimal degree of flexibility for all the scenarios which we are concerned about through the application of an optimization algorithm, which was basically based on a (grid) direct search method, was the main barrier in this regard. Second, given the fact that we have already proved analytically the importance of the financial repression for the optimal degree of flexibility of exchange rates and considering the computational cost barrier, in this section we have taken a broader range of choice and have focused only on the three broad arrangements. Therefore, what exactly we want to study for any scenario here is if managed rates could be superior to either floating or fixed rates. That is, the superiority of the type of managed rates (leaning with or against the wind) has not taken up our main concern here. With this objective in mind, we think the approach followed here is efficient enough to address the issue of the superiority of the arrangement. Even if we had worked out the exact optimal degree of exchange rate flexibility, it would , after all, be ranked within one of the three main arrangements concerned here. That is, what we have done in the text. To be more conservative, the approach employed here might be considered as a less comprehensive and formal but more economized one (less costly too).

Figure 6.6-Panel (1): FS-11

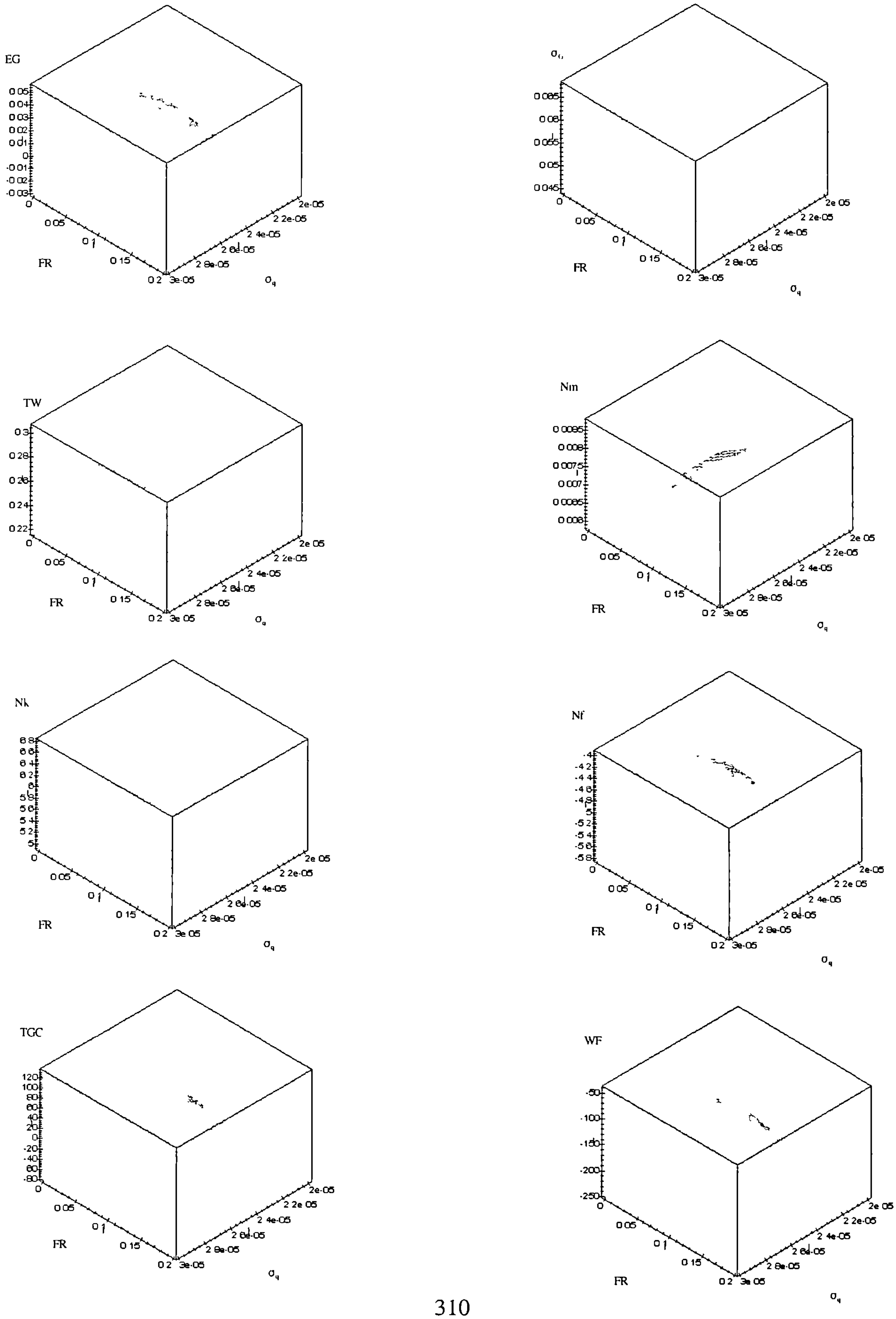


Figure 6.7-Panel (1): PS-11

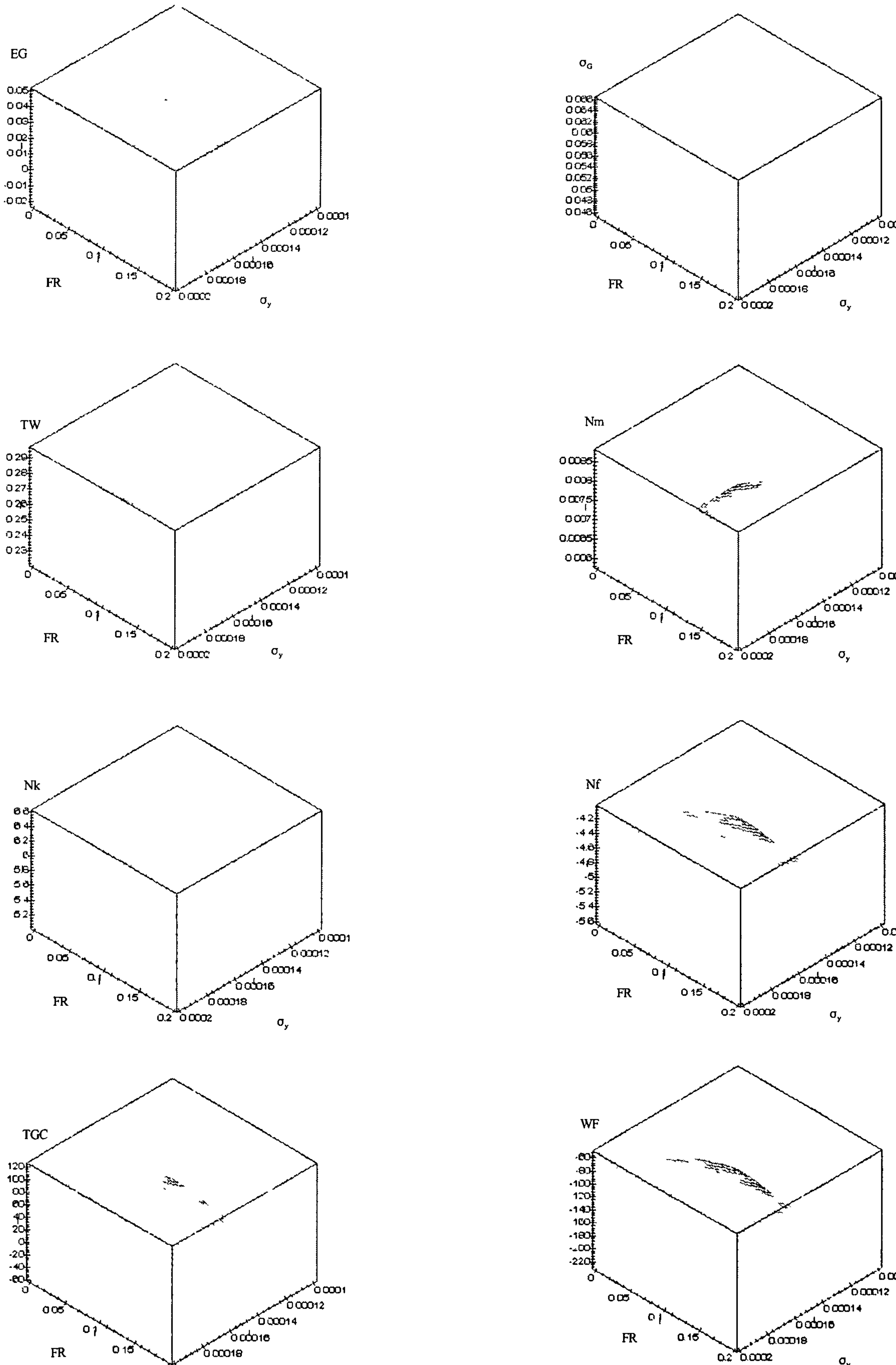


Figure 6.8-Panel (1): GS-11

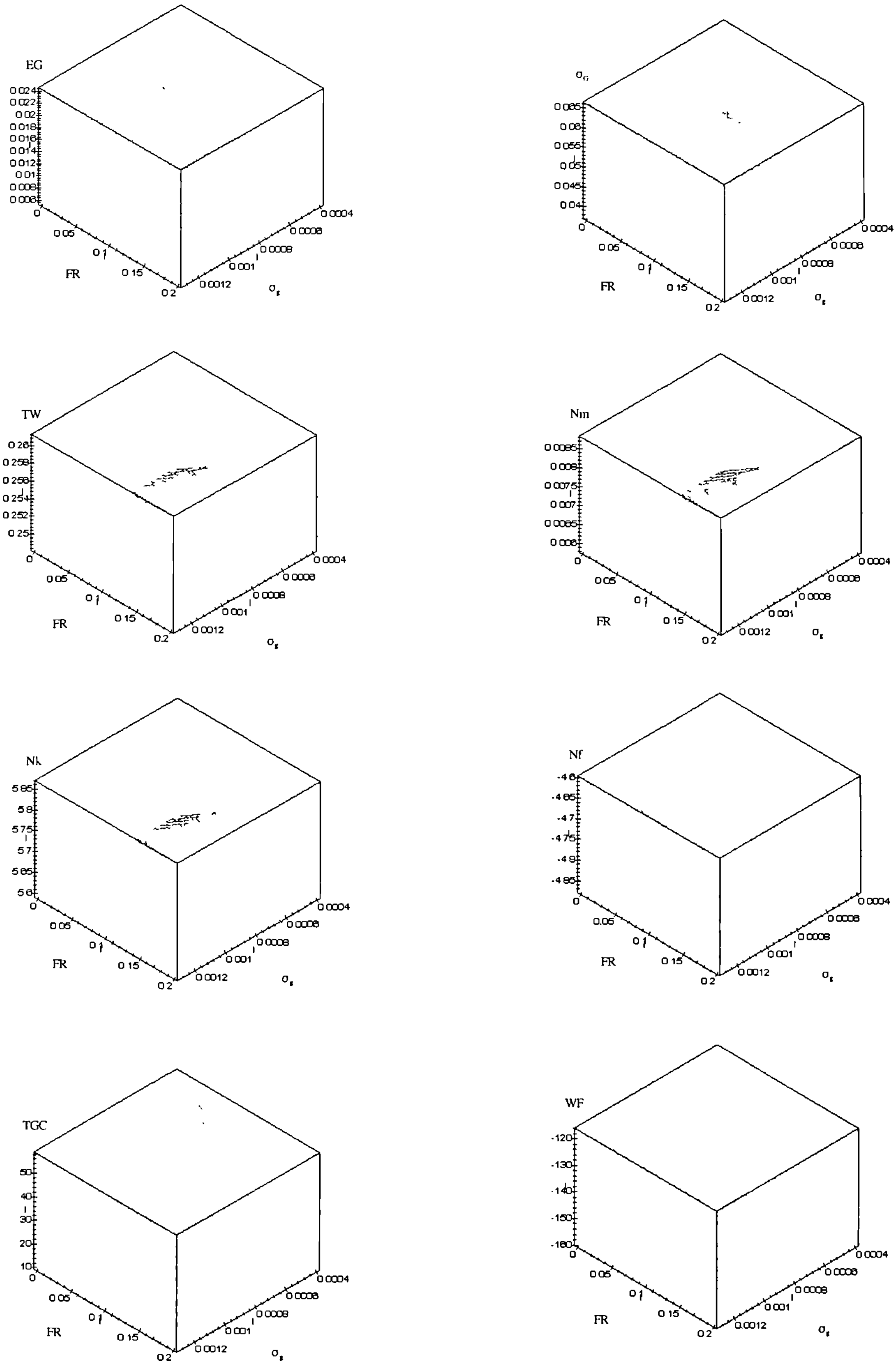


Figure 6.9-Panel (2): FS-12

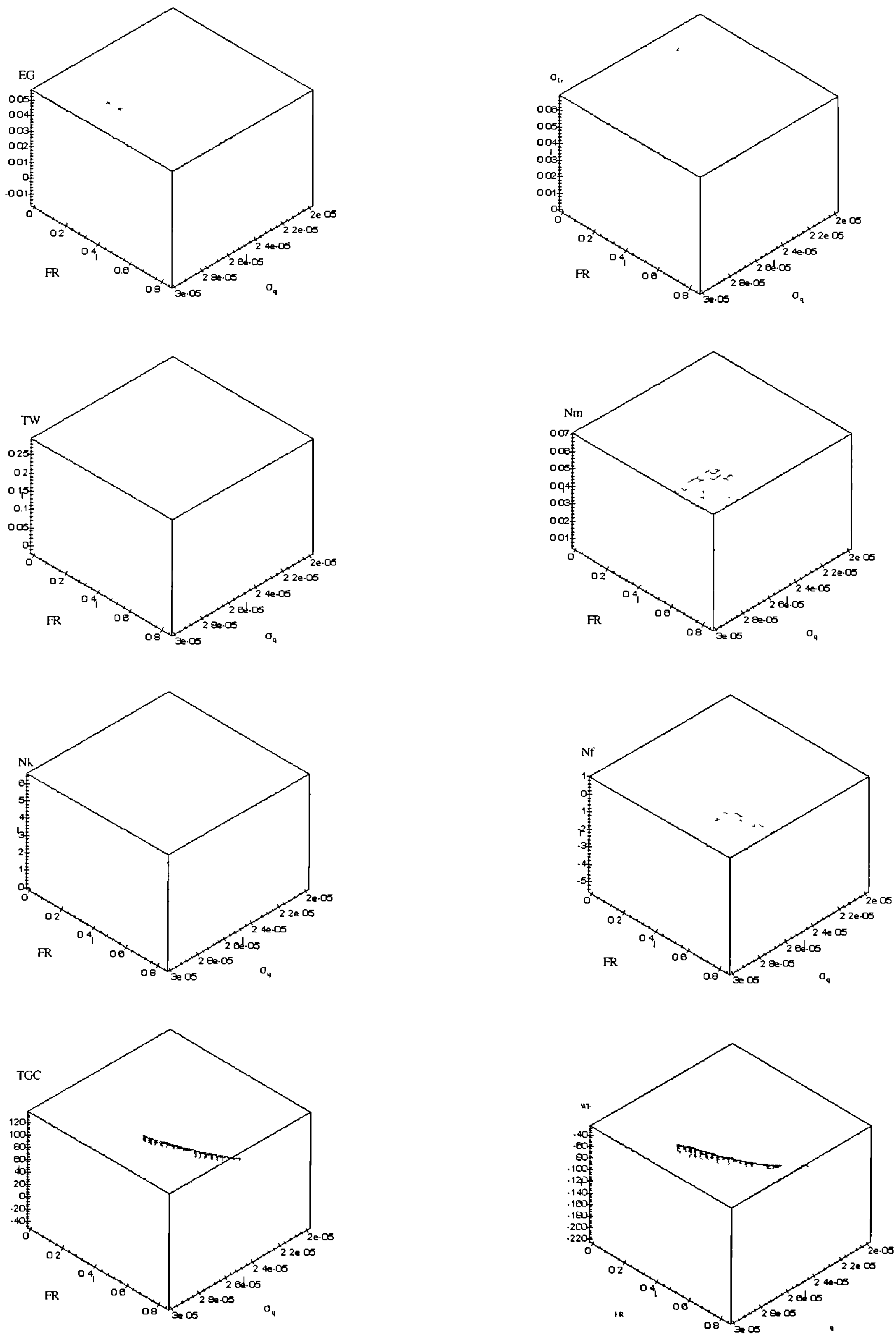


Figure 6.10-Panel (2): PS-12

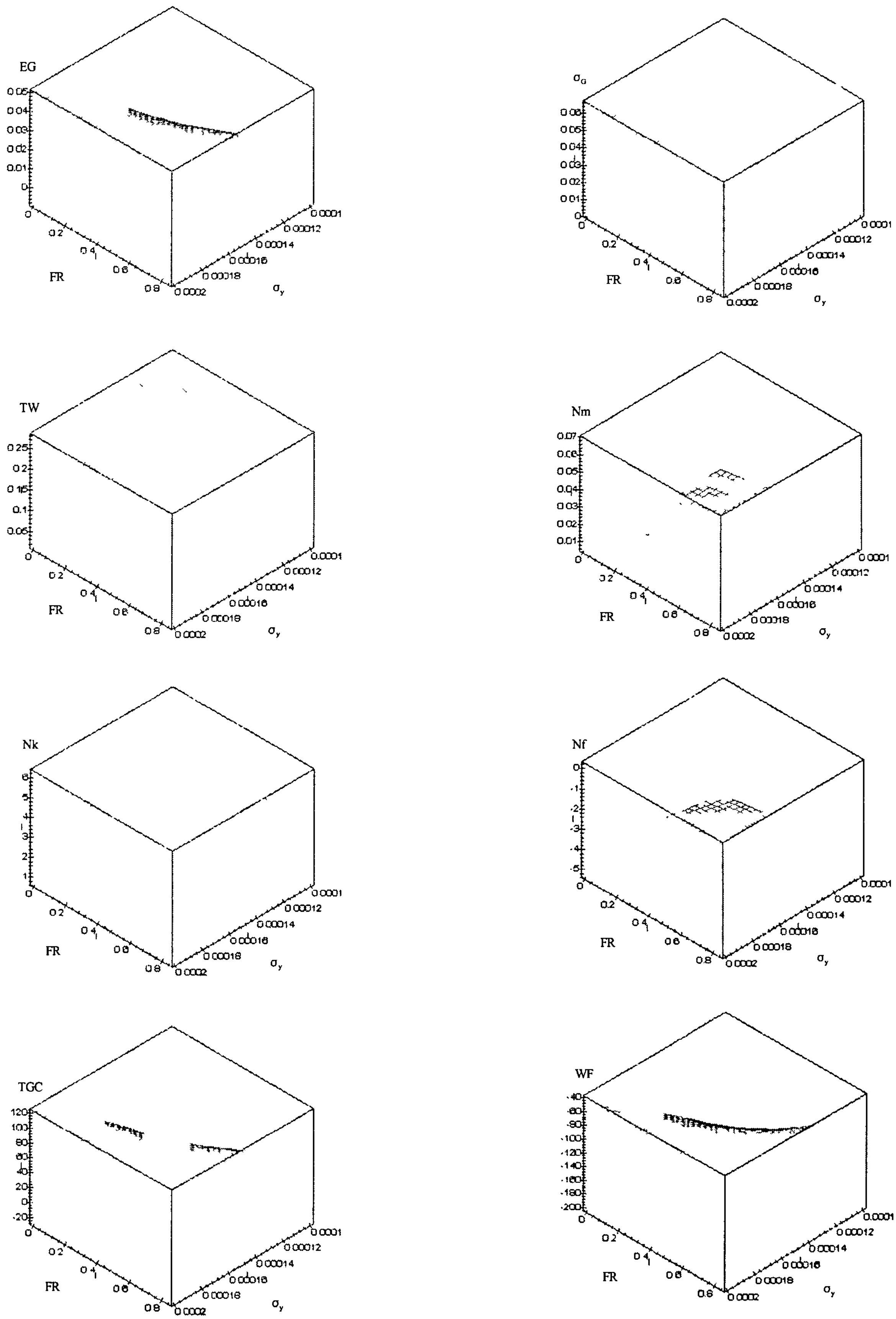


Figure 6.11-Panel (2): GS-12

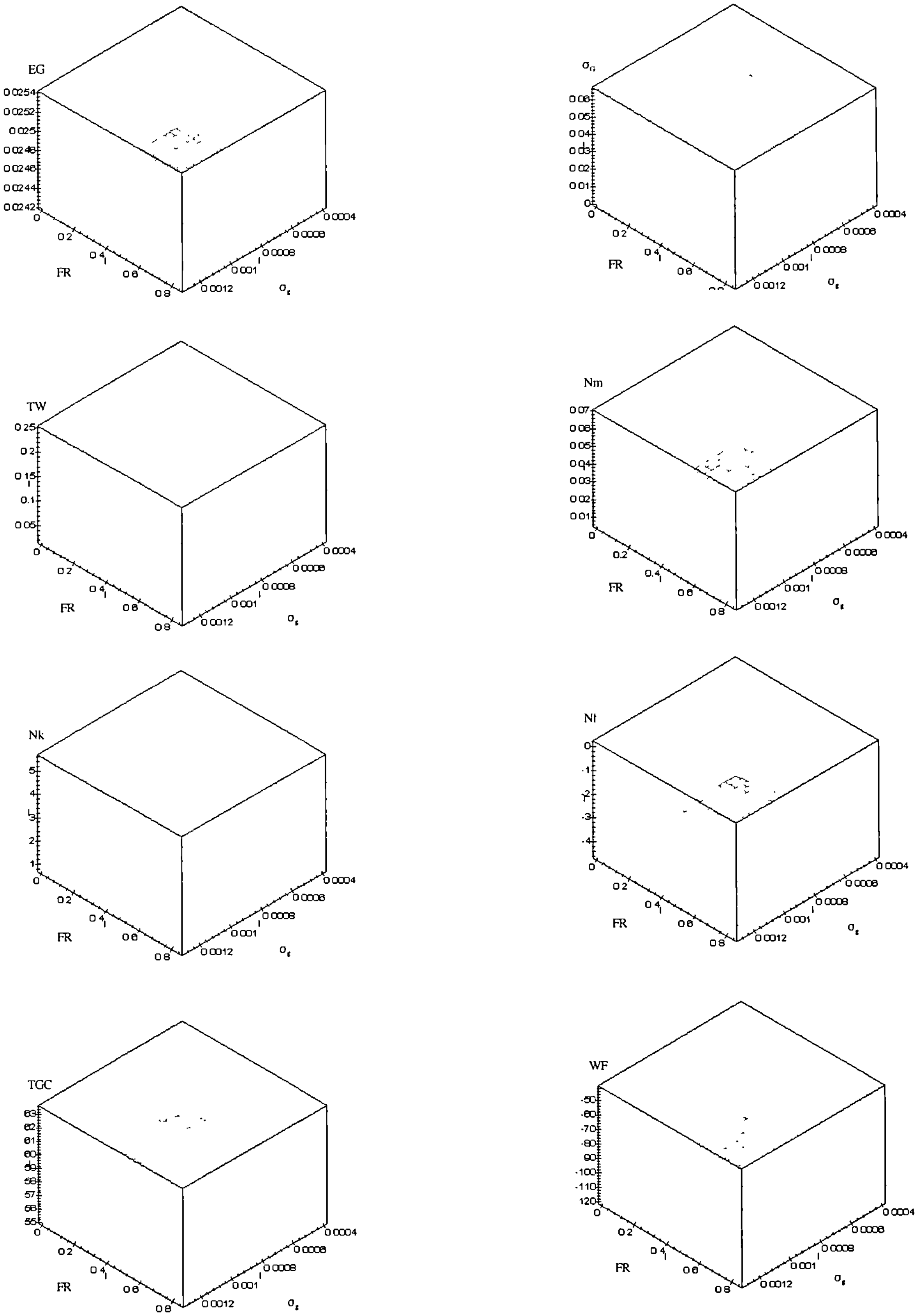


Figure 6.12-Panel (1):FL vs FI (11)

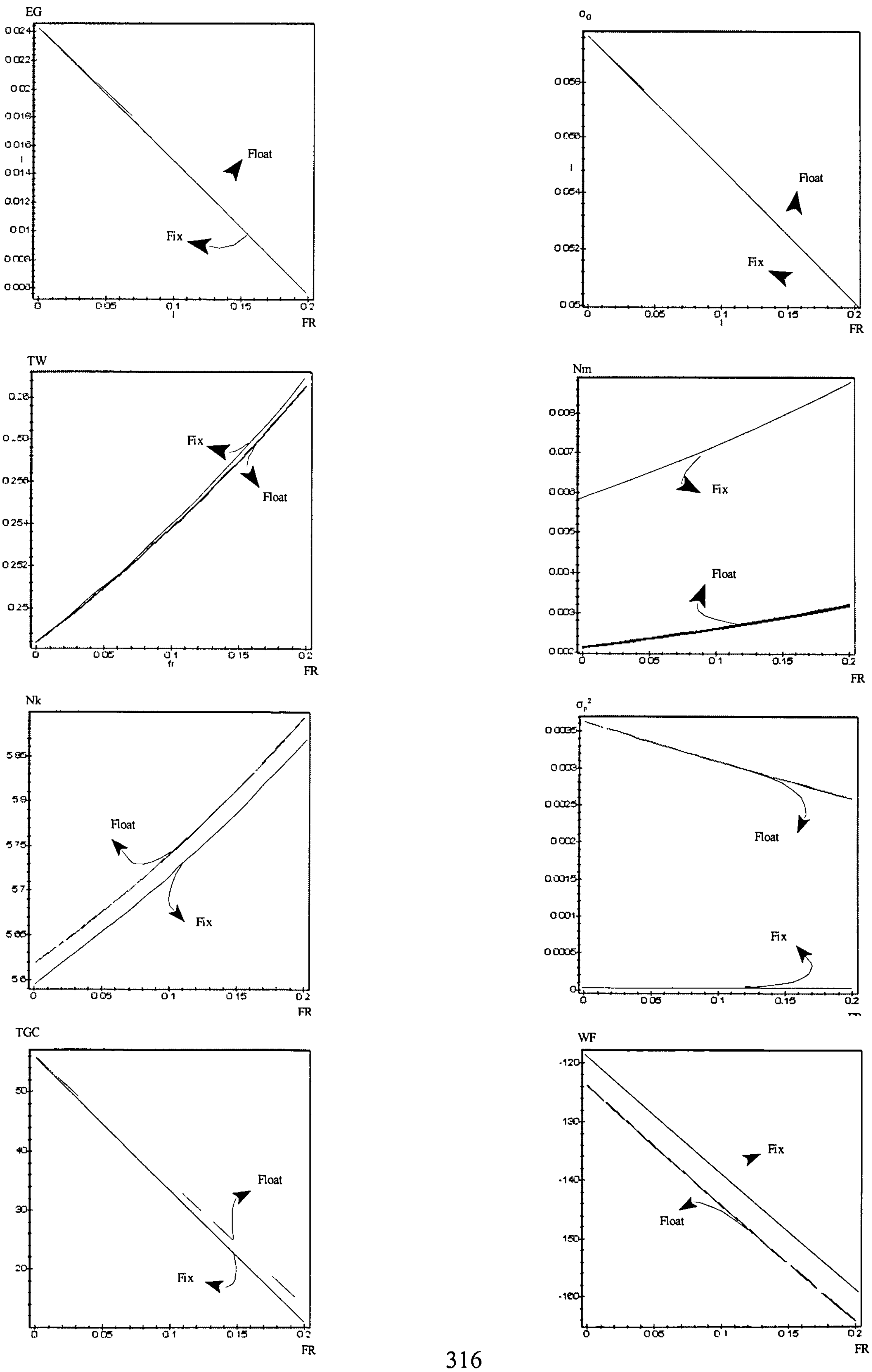


Figure 6.13-Panel (1):FL vs FI (12)

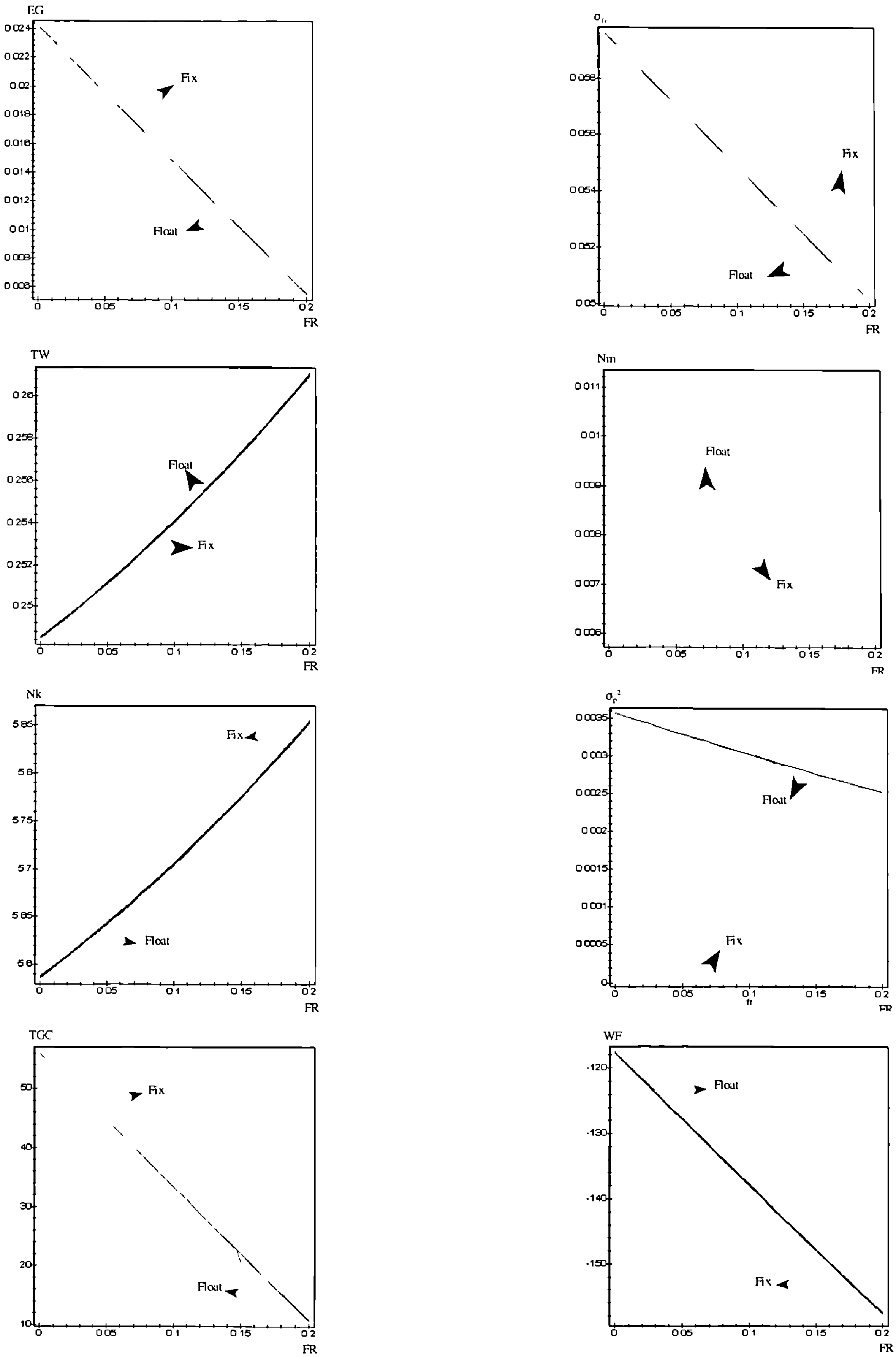


Figure 6.14-Panel (2): FL vs FI (11)

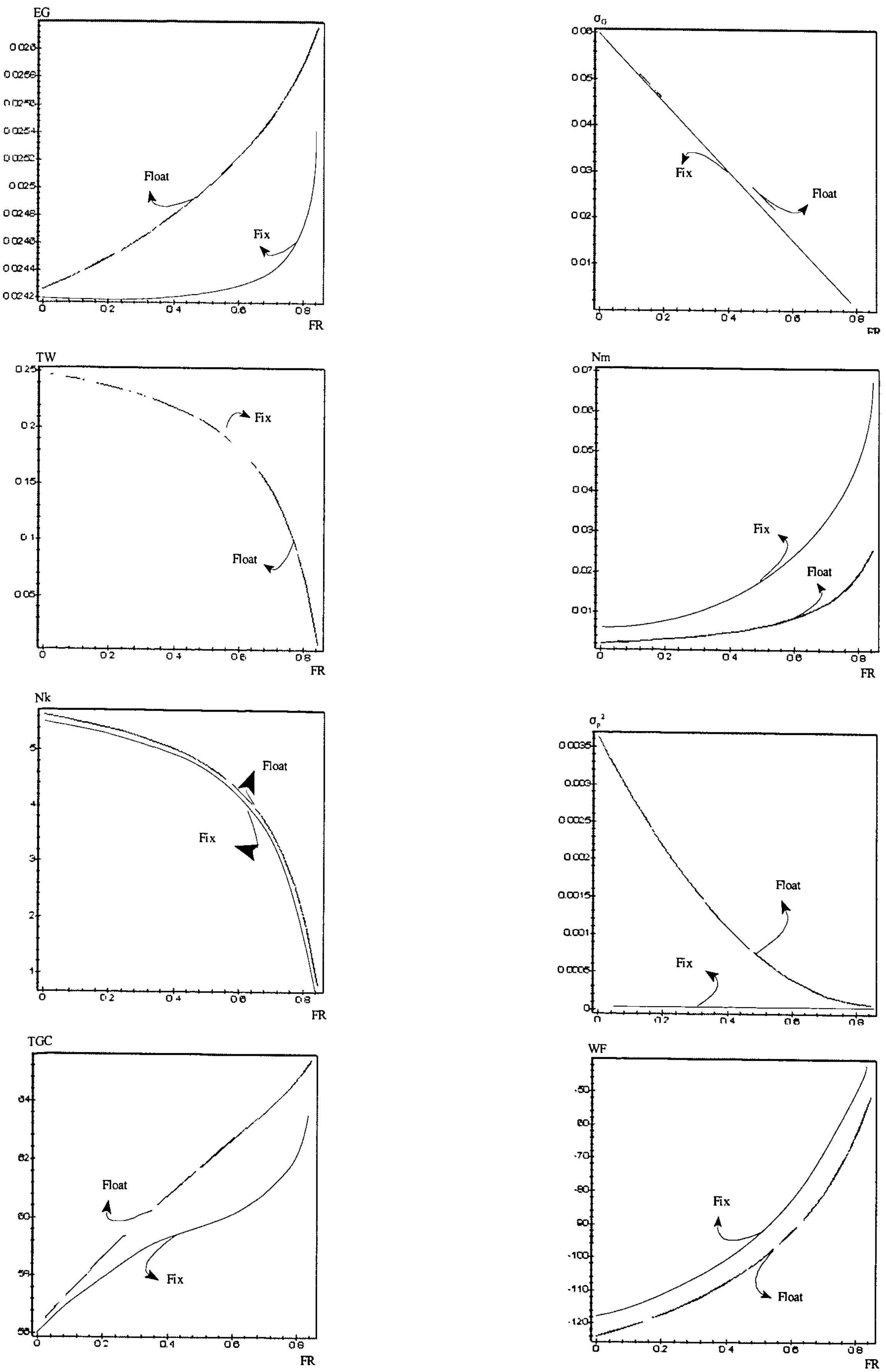
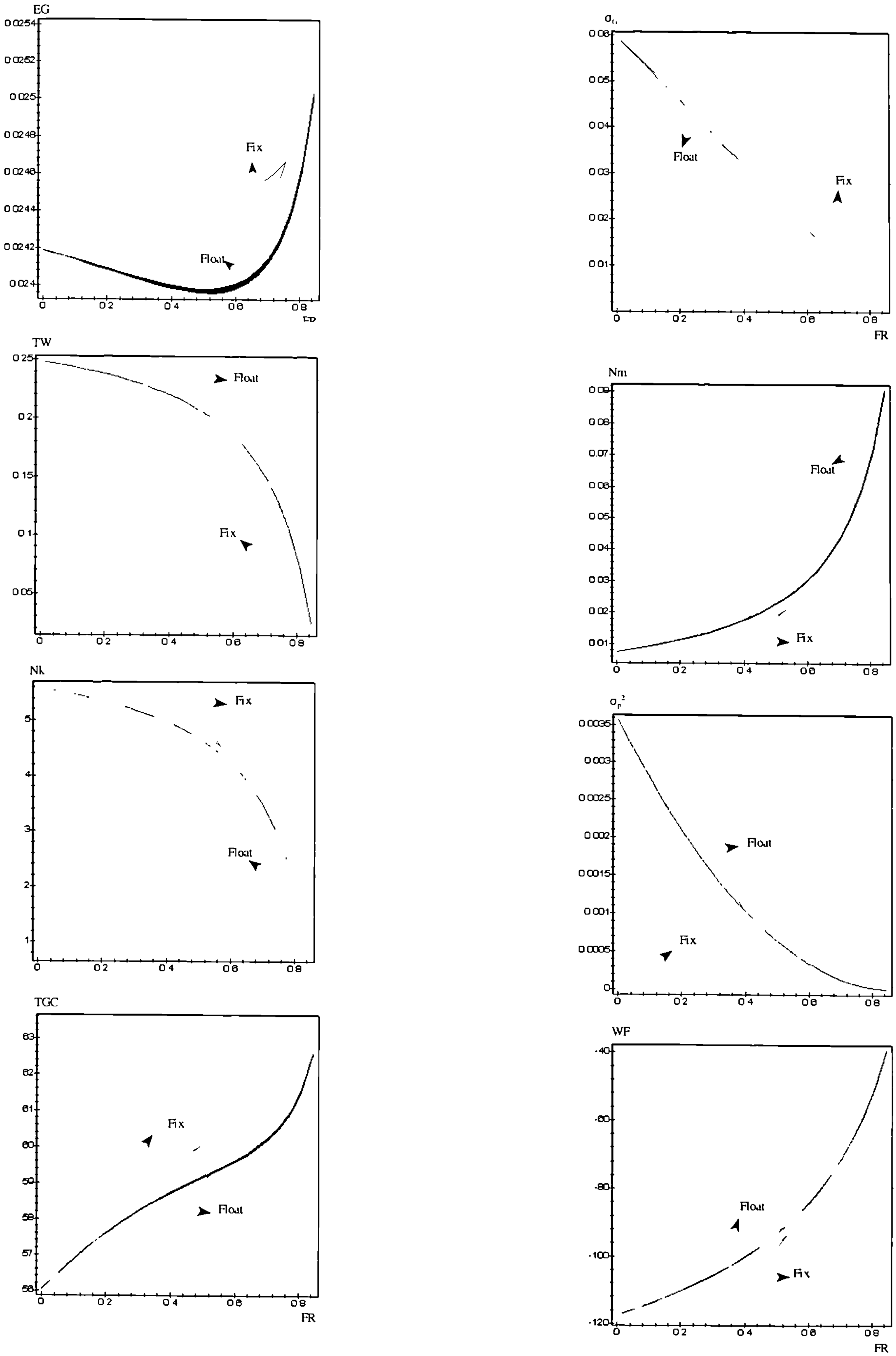


Figure 6.15-Panel (2): FL vs FI (12)



SSB Graphs

Figure 6.12-Panel (1): FL vs FI (11)

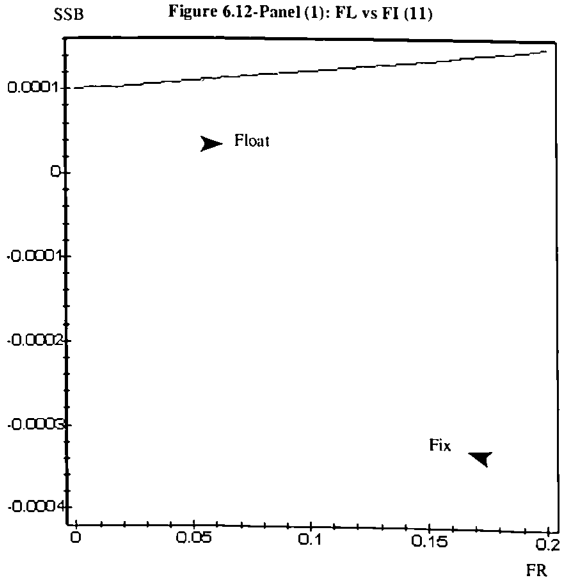


Figure 6.13-Panel (1): FL vs FI (12)

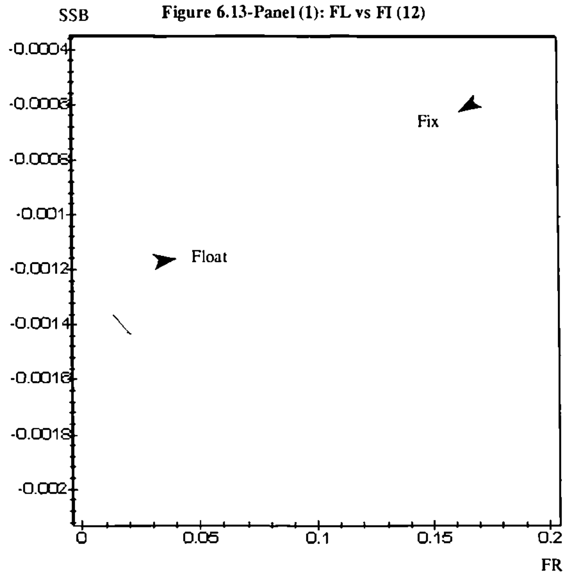


Figure 6.14-Panel (2): FL vs FI (11)

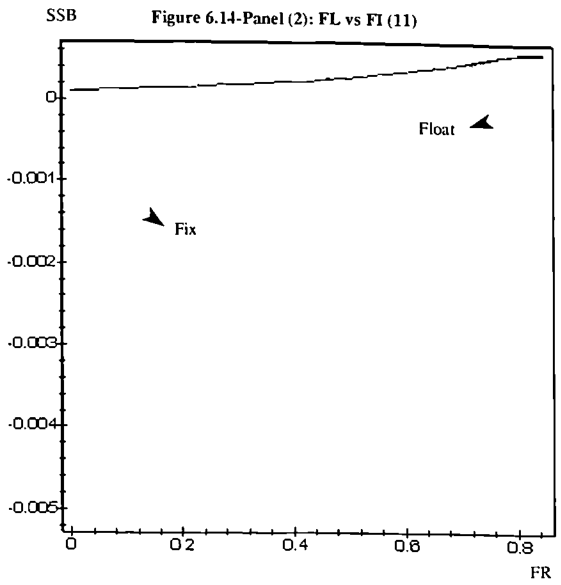


Figure 6.15-Panel (2): FL vs FI (12)

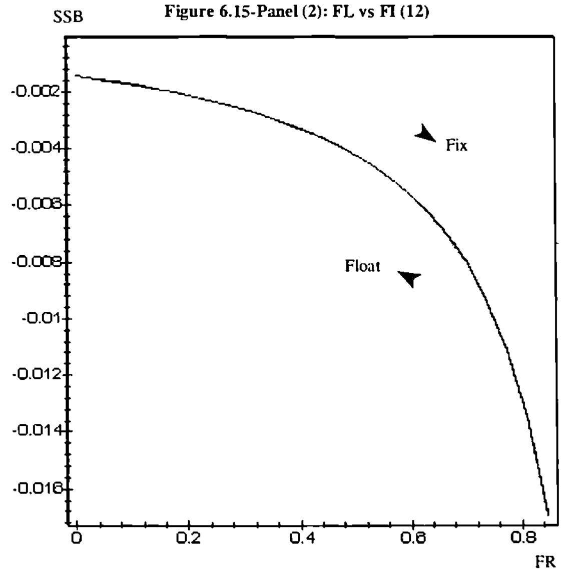


Figure 6.16-Panel (2): FL vs FI (13)

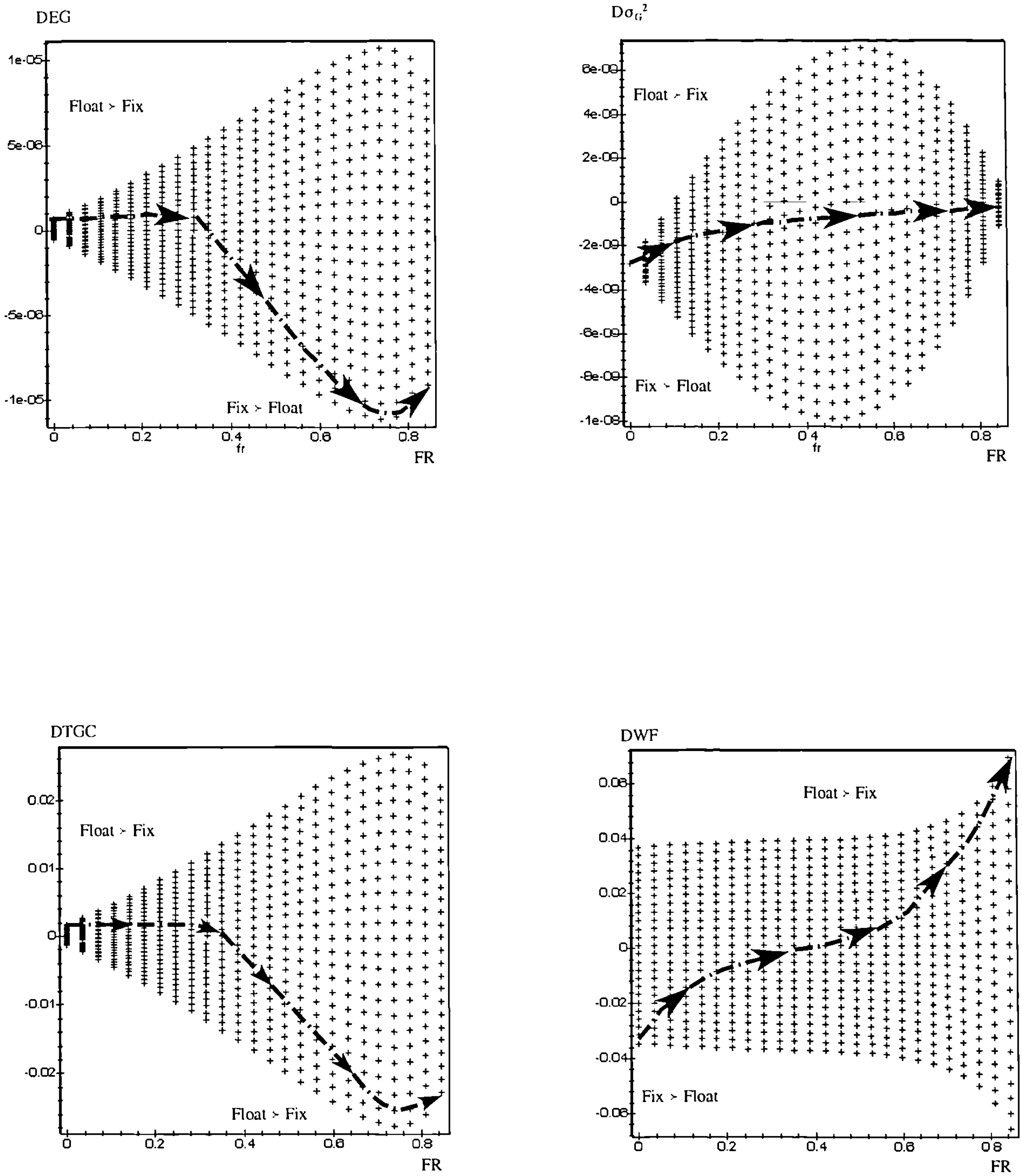


Figure 6.16-Panel (2)- FL vs FI (13)

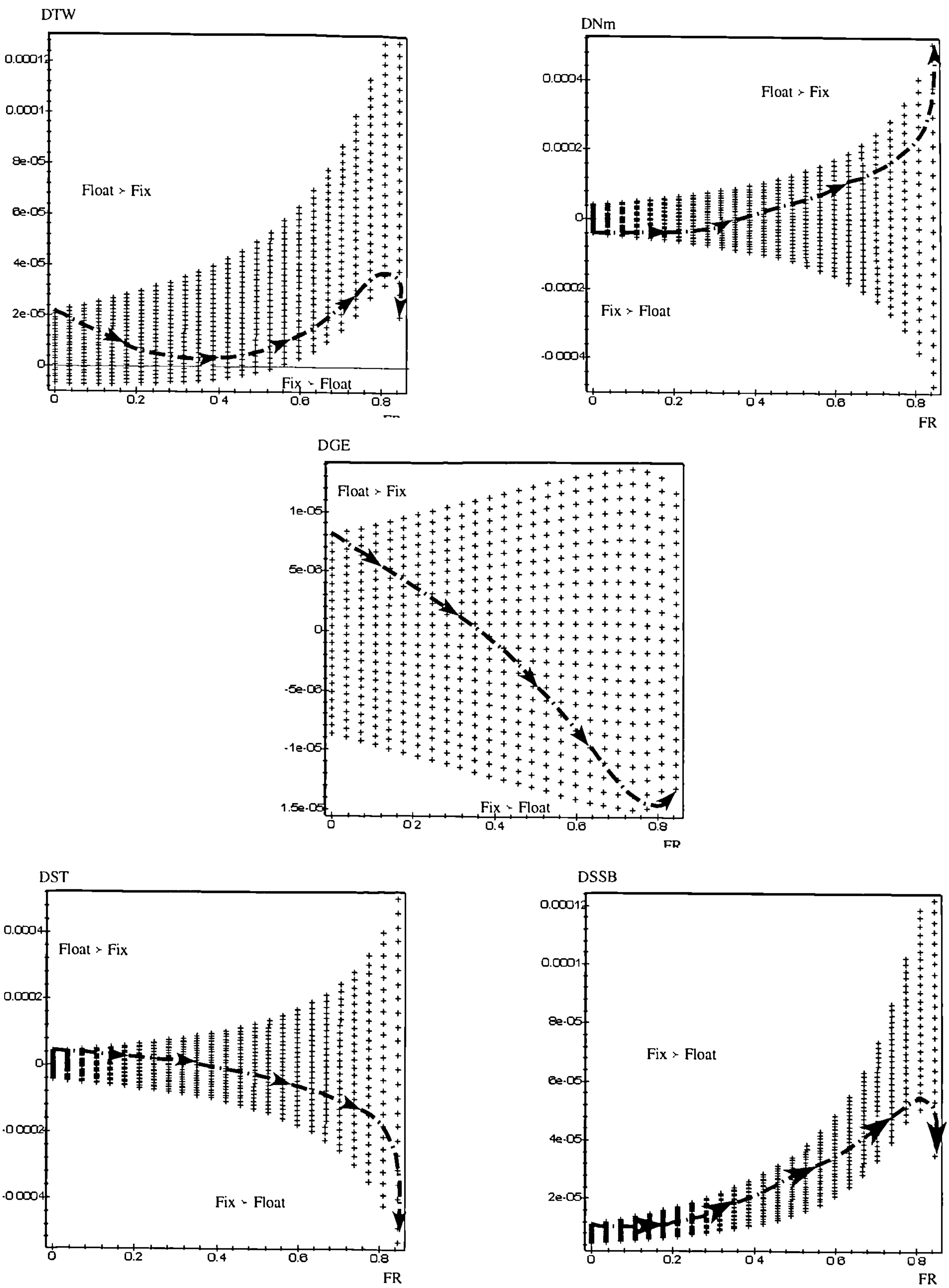


Figure 6.17-Panel (1):The Superior Arrangement (11)

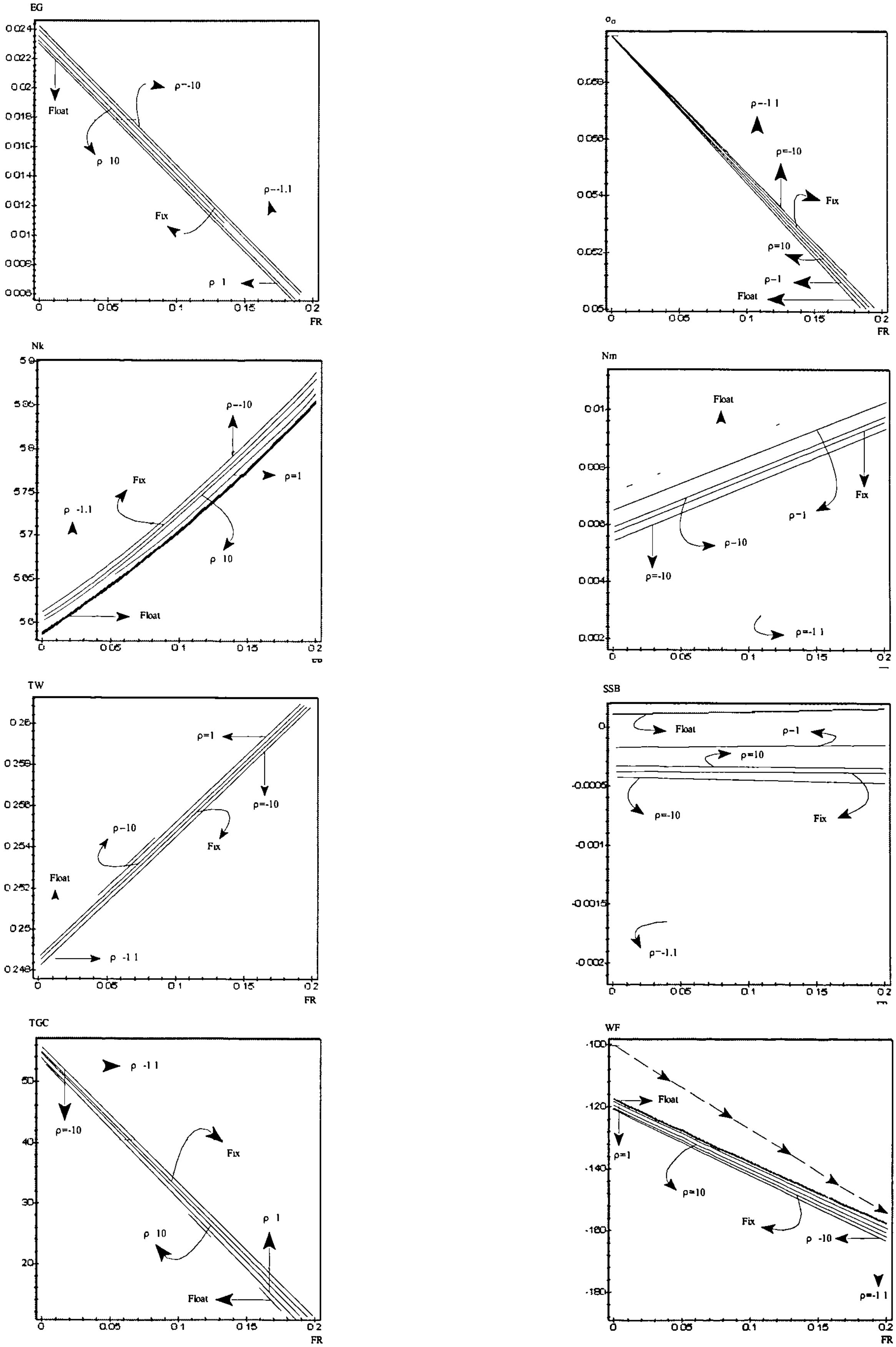


Figure 6.18-Panel (1):The Superior Arrangement (12)

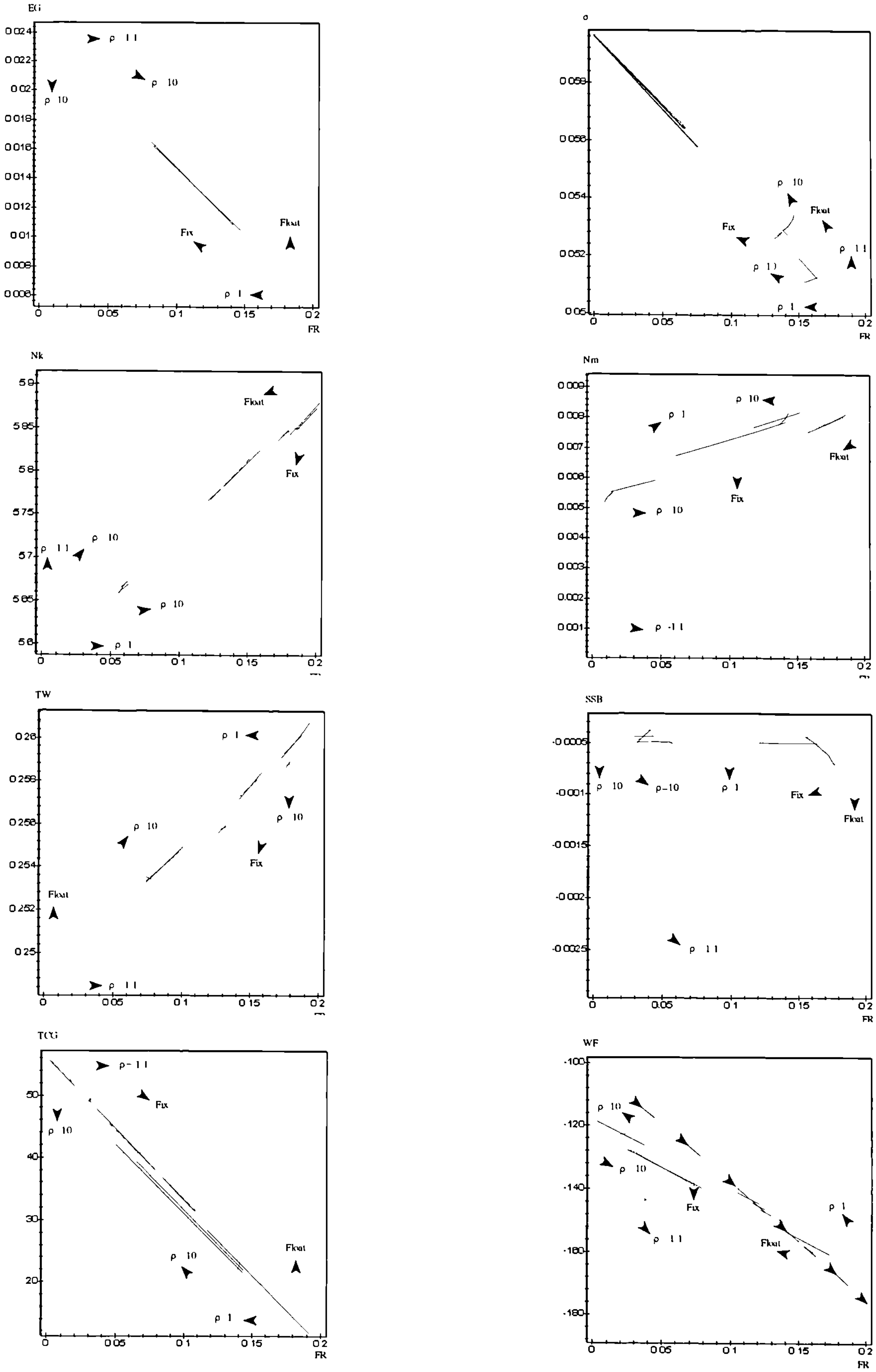


Figure 6.19-Panel (1):The Superior Arrangement (13)

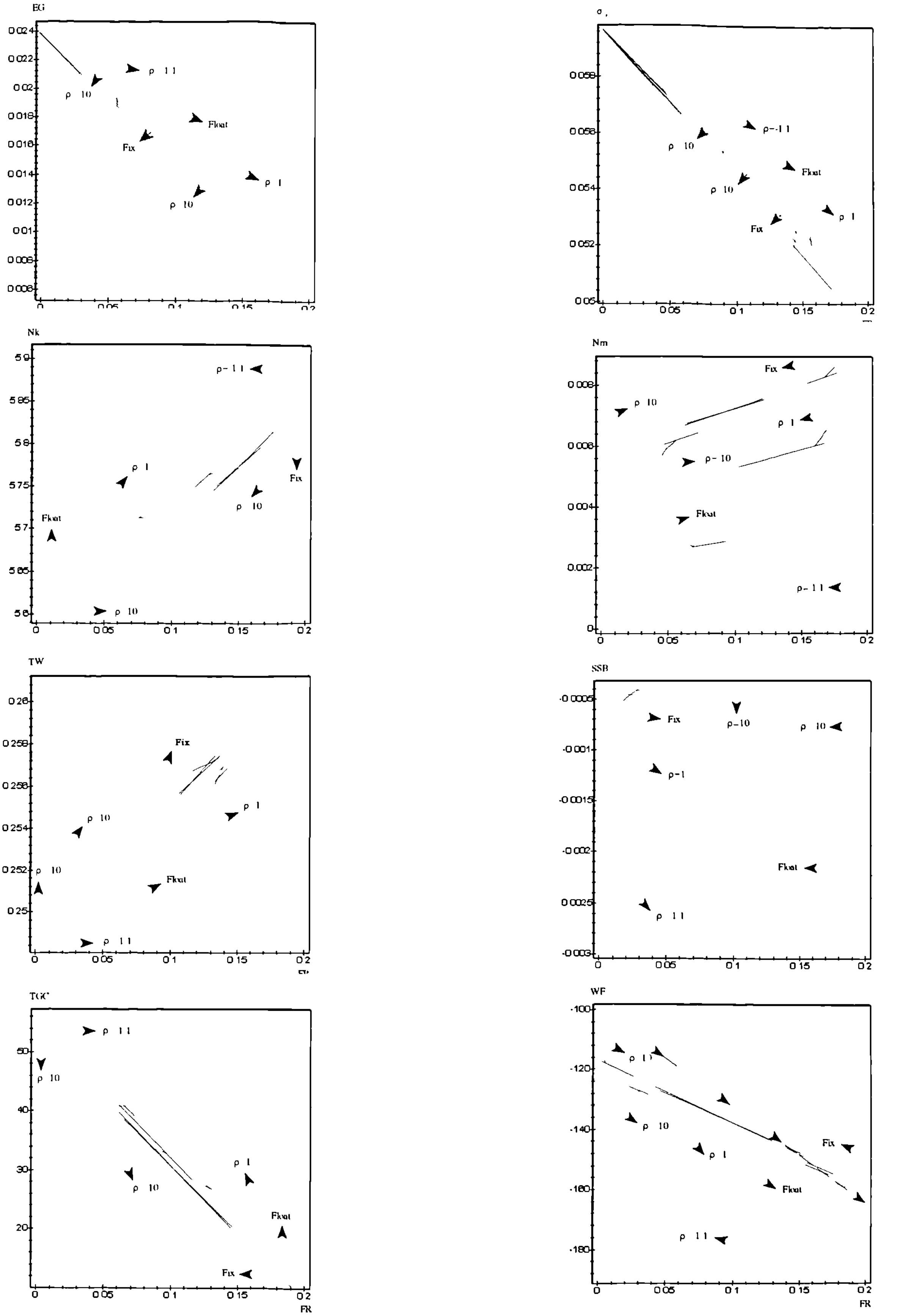


Figure 6.20-Panel (2):The Superior Arrangement (21)

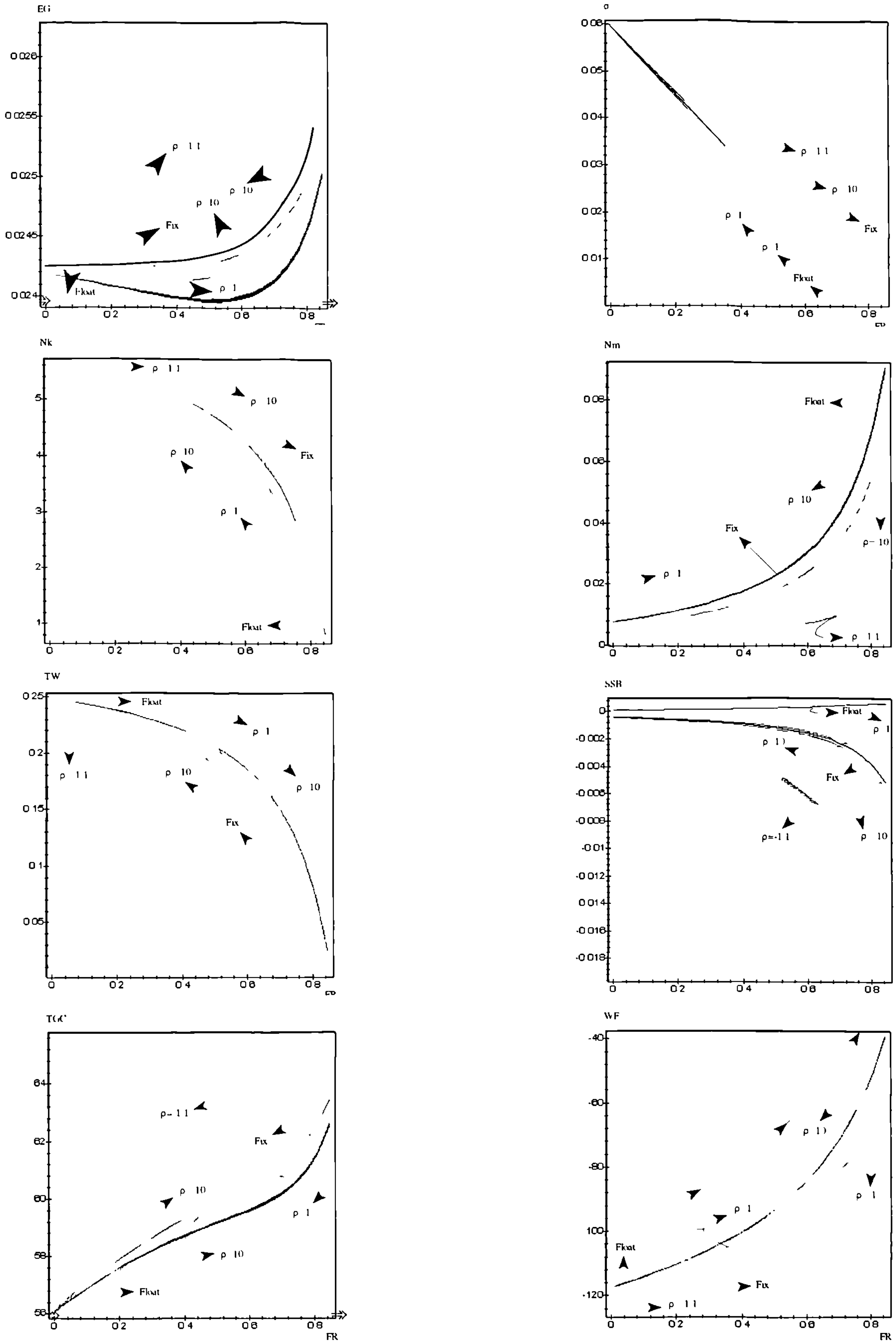


Figure 6.21-Panel (2):The Superior Arrangement (22)

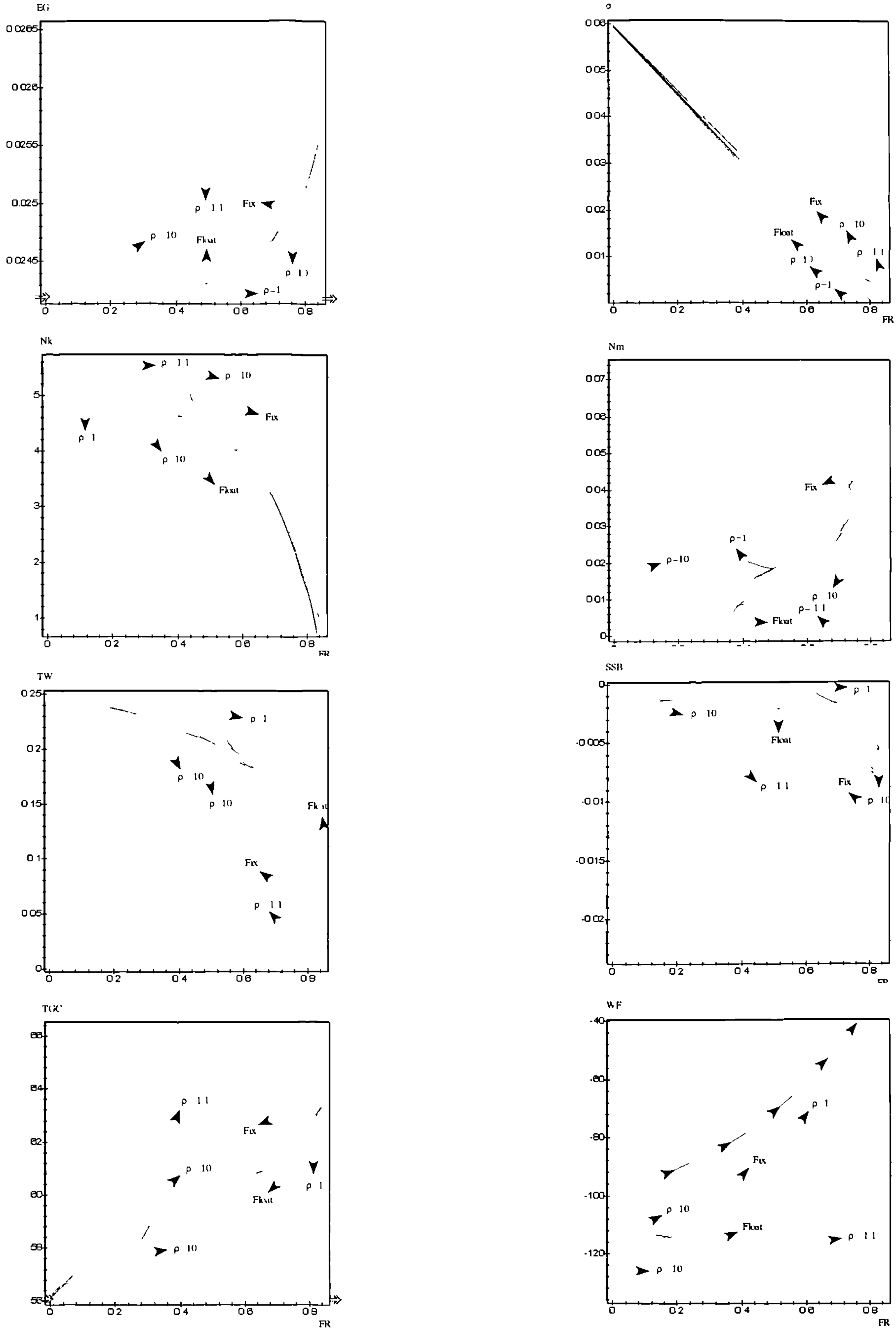
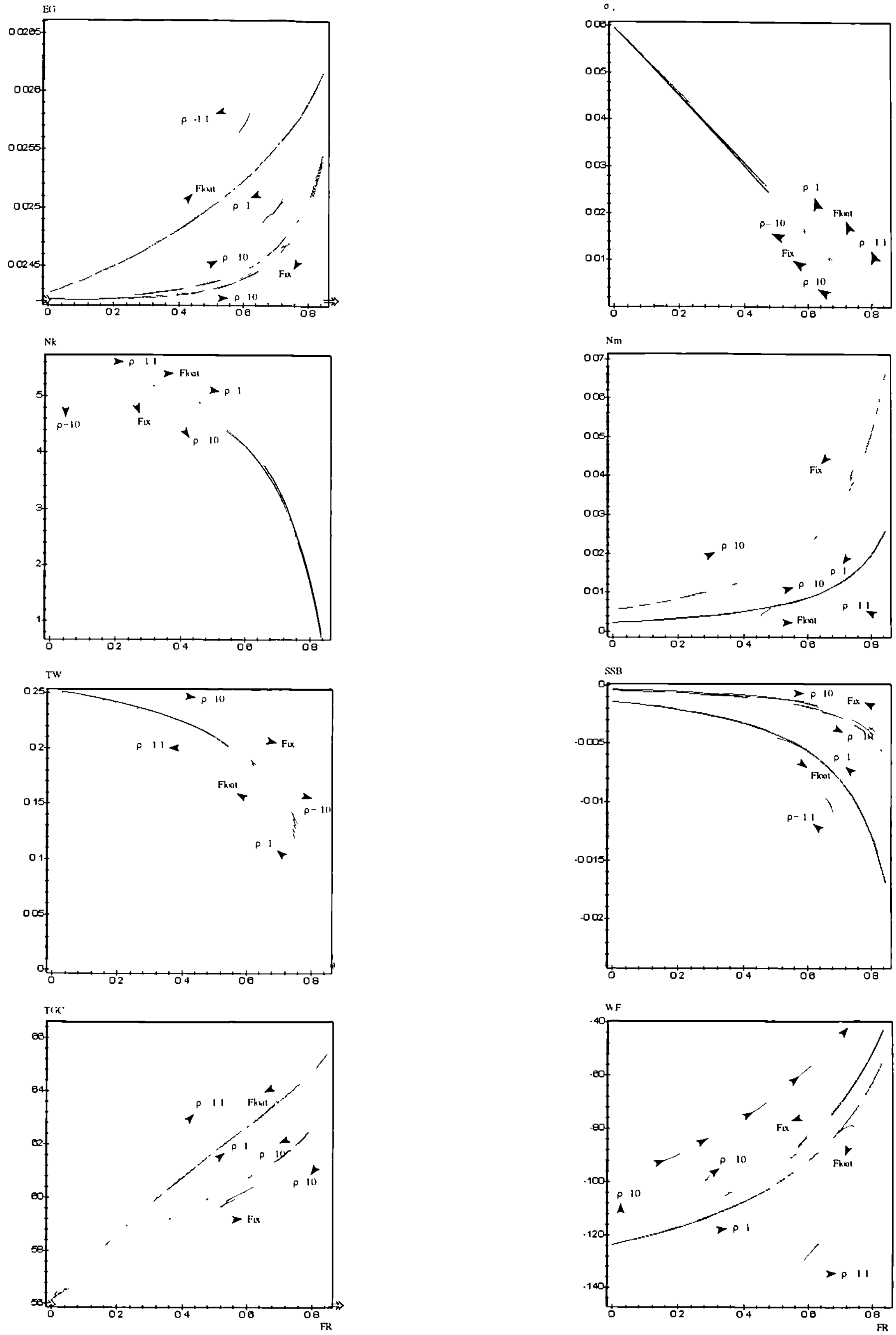
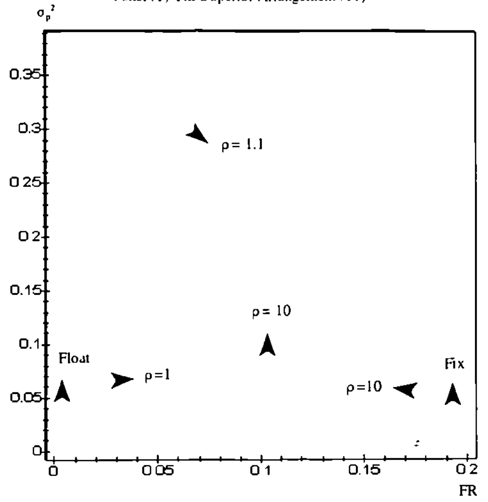


Figure 6.22-Panel (2):The Superior Arrangement (23)

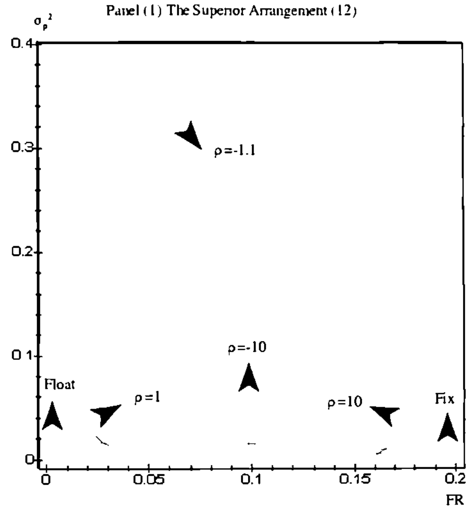


Variance of Domestic Price

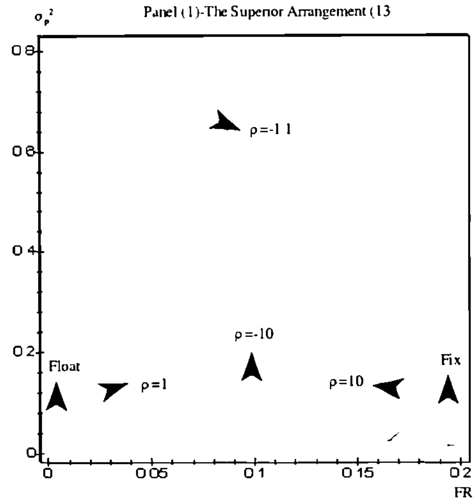
Panel (1) The Superior Arrangement (11)



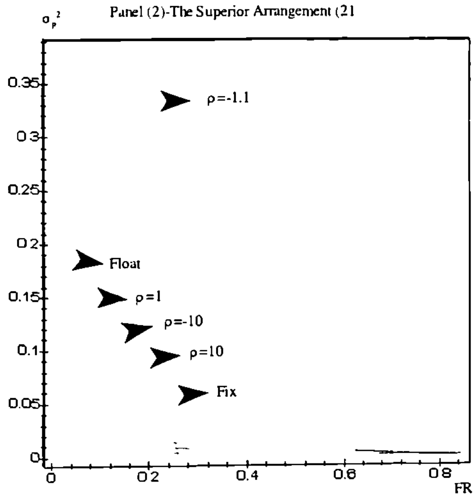
Panel (1) The Superior Arrangement (12)



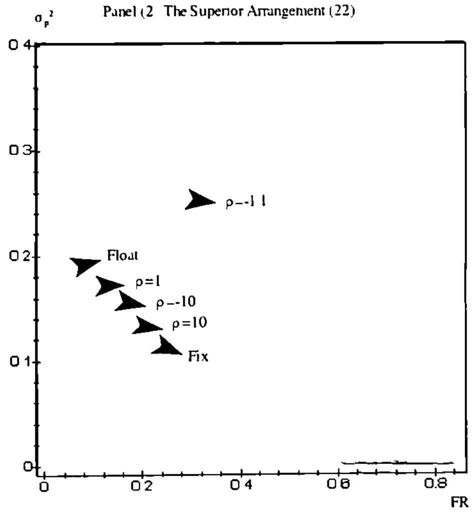
Panel (1)-The Superior Arrangement (13



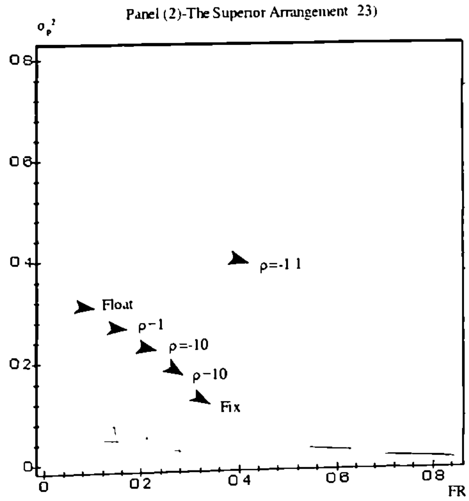
Panel (2)-The Superior Arrangement (21



Panel (2 The Superior Arrangement (22)



Panel (2)-The Superior Arrangement 23)



Conclusions

The main purpose of this study has been to explore the role of financial repression for optimal exchange rate regimes. We carried out our analysis within two distinct analytical frameworks. The first part of this study (chapters 1 and 2), focuses on a short run stabilization target. The analysis of this part of the thesis follows the strand of literature on optimal exchange rate intervention rules under uncertainty. Our innovation in the literature is the introduction of the supply side effect of imperfect domestic and foreign financial markets in line with the Neo-Structuralists who attribute a pivotal role to the informal credit markets. In chapter 1 the analysis has been restricted to the full insulating property of the two polar exchange rate regimes, namely the fixed rate and the floating rate regimes. The main findings of this part can be summarised as follows.

First, in general, as long as there are imperfections in the (domestic and foreign) financial and output markets neither the fixed exchange rate regime nor the floating exchange rate regime is able to render a full insulation for (domestic) prices against all types of shocks examined in this study.

Second, in general, there is not necessarily a conflict between the aggregate supply and (domestic) price stabilization objectives.

Third, the financial repression parameters play an important role for the full insulating property of the fixed and the floating rate regimes. They provide some plausible cases which do not exist in classical models.

Fourth, the necessary condition for the fixed exchange rate not to insulate fully the (domestic) prices against the foreign price shock, is the lack of any imperfection in the financial and real sectors of the economy.

Fifth, as long as there is either some degree of inertia in domestic prices or some degrees of imperfection in capital mobility, the sufficient condition for the fixed rate regime to render full insulation for (domestic) prices and aggregate supply against a foreign interest rate shock is either the output market to be real interest rate insensitive, or the money market to be nominal interest rate insensitive.

Sixth, as long as the output market is real interest rate sensitive, the capital mobility is not perfect and there is sluggishness in domestic prices, the fixed rate cannot insulate perfectly the (domestic) prices against a (domestic) money demand shock.

Seventh, as long as the output market is real interest rate sensitive, the perfect substitutability between domestic and foreign loans is a necessary condition and the lack of any inertia in domestic prices is a sufficient condition for the fixed rate to be able to isolate the (domestic) prices fully against a (domestic) money demand shock.

Eighth, the (domestic) price full insulation property of the fixed exchange rate regime is independent of the real exchange rate elasticity of the output market as long as the economy is subject to foreign interest rate, domestic monetary and real shocks.

Ninth, under the floating rate regime a full insulation of (domestic) prices against a money demand shock is possible. In case of a zero consumers' expenditure share of foreign good, the necessary and sufficient condition for floating rates to insulate fully the (domestic) prices from a money demand shock is the equality of the ratio of the real exchange rate to the real interest rate elasticities of output with the ratio of exchange rate to the nominal interest rate elasticities of the balance of payments.

Tenth, as long as capital mobility is not perfect, the sufficient condition for floating rates to isolate fully (domestic) prices against a supply shock is the equality of the ratio of the real interest rate to the real income elasticities of output with the ratio of the nominal interest rate to the real income elasticities of the money market and that of the balance of payments. This is true regardless of the degree of inertia in the domestic prices. Also, when domestic and foreign loans are perfectly substitutable and the consumers' expenditure share of foreign good is zero, the sufficient condition for the floating rates to insulate fully the (domestic) prices against a supply shock is the equality of the ratio of the difference between the real exchange rate and real interest rate elasticities to the real income elasticity of output with the ratio of the difference between the real exchange rate and nominal interest rate elasticities to the real income elasticity of money market. This would be a necessary condition when the domestic prices are perfectly flexible.

In chapter 2 our concern turns towards addressing numerically the issue of the role of financial repression for the optimal exchange rate regime. This task is carried out for a continuous time version of the model for the white noise and autoregressive disturbances. One of our main findings in this chapter is this: the lower the degree of substitutability between domestic and foreign loans, the more crucial is the role of financial repression parameters in the determination of the optimal exchange rate regime.

A number of directions can be suggested for future work related to the analysis in the first part. One direction is the consideration of credibility issues by introducing a more elaborated feedback rule. In this line one may want to address the issue of the role of financial repression, as a policy instrument at the government's disposal, for the episodes of currency crisis. Another direction can be the use of a different specification of the objective function. One suggestion may be the stabilization of the current account.

In the second part of the thesis (chapters 3, 4, 5 and 6), the issue is developed within a stochastic general equilibrium model and our evaluation of the role of financial repression for the optimal exchange rate regimes is based on a (micro based) welfare criterion. One striking feature of the analysis in this part is that having taken a longer-run perspective, financial repression and exchange rate regimes are viewed as two alternative sources of public finance. Within this framework the analysis runs with the assumption of a (benevolent) government whose main concern is the maximization of the welfare of a representative agent. Another feature of our analytical framework is the incorporation of uncertainty with a risk averse intertemporal optimizing agent which enables us to assess the degree of speculation in the part of the agent. Also, in the stochastic general equilibrium model, risks are determined endogenously. In addition, we examine the welfare consequences of appointing different types of central banker in conjunction with various degrees of financial repression and exchange rates flexibility. Our main findings in this part can be highlighted as follows.

First, whatever the type of shocks the economy is subject to, financial repression has a critical role in the determination of the optimal degree of exchange rates flexibility. The optimal degree of financial repression and the flexibility of the exchange rate are, in general, determined by the relative magnitudes of the second moments of the shocks hitting the economy, the structural parameters and the other policy variables.

Second, the financial repression can work as a shock absorber in the economy. This feature of financial repression policies may have motivated the use of financial repression policies by governments in the economies which are exposed to real and monetary shocks. This stabilization incentive might be growth enhancing if financial repression policies are managed wisely. Here is where in our theoretical framework the key role of good government comes into play.

Third, in the absence of the McKinnon-Shaw effect, if the economy is subject to domestic (real and monetary) shocks, the managed float with leaning with the wind is optimal in the stabilization of growth. If the economy is susceptible to a foreign inflation and domestic monetary shocks, either of the two polar cases performs best in stabilizing growth as long as the economy is a net debtor. In general, when the economy is exposed to all types of shocks, the relative sizes of the second moments of the shocks and the economy's indebtedness stance are key determinants in optimality of any exchange rate regime in this concern.

Fourth, under flexible exchange rate regimes one may be able to make a growth case for appointing an ultra conservative central banker in the presence of the McKinnon-Shaw effect. In other circumstances, though the appointment of an independent central banker might be growth deteriorating, it may be optimal in terms of welfare.

Fifth, the channel (either McKinnon-Shaw or Goldsmith) through which financial repression policies transmit to the economy have different implications for the expected and the variance of growth.

Sixth, in the context of real business cycles, our model implies that in the absence of any imperfection in the financial markets, if the economy is a net creditor or the domestic monetary and real shocks are the sources of the volatility in growth, we expect less volatility in growth under floating rates than under fixed rates. The opposite occurs if the economy is a net debtor and the main source of the volatility in growth is foreign inflation.

Seventh, our calibration exercises support the view that from a public finance point of view, the financial repression policy can be a less distortionary source of tax revenue than the more regular sources of public finance. We saw how the (relative) distortionary role of a source of public finance is interactively determined by the institutional and structural factors in any economy.

Eighth, our calibration exercises also emphasize the growth and inflation stabilizing characteristic of financial repression. More strictly, in general, depending on the values of the structural parameters, the relative sizes of the variances of the shocks hitting the economy and the type of exchange rate regime, financial repression can be viewed as a policy instrument in mitigating or even reconciling (between) these two competing objectives. This might have provided an incentive for the governments in DCS to resort to financial repression policies.

It is possible to suggest some theoretical and empirical extensions to our study in the second part. In the theoretical part, the analysis of the welfare consequences of financial repression and exchange rate regimes in an extended version of the framework incorporating human capital accumulation can be an interesting research proposal. Another extension can be the introduction of nontraded goods market as a step towards getting closer to the economic realities in DCs. Introduction of transitional dynamics into the framework will also help to address the issue of time inconsistency associated with the exchange rate and financial repression policies. This extension would be a major contribution towards making the analysis of the issue more realistic. In the empirical part, this study has raised some challenging propositions the relevance of which can be investigated for a wide range of economies which have experienced different degrees and types of financial repression policies through more formal and systematic empirical methods such as VAR analysis. Empirical work on such propositions even through a simple single equation econometrics models would seem to be a valuable line of future research.

Appendices

Appendix A

TABLE 2.3: SW111-OPTIMAL VALUES OF ρ

φ-1.0 $\beta 3=0.0$ $\gamma=1$ $\alpha 2=0.0$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	ML	---	T	* ML	T	* ML	T	* ML
0.5	T	---	T	T	T	T	T	* ML
0	T	---	T	T	T	* ML	T	T
	SUPPLY SHOCK							
0.9	ML	* T	T	* ML	T	* ML	T	* M
0.5	T	T	T	* X	T	* X	T	* X
0	T	T	T	* X	T	* X	T	* X
	MONETARY SHOCK							
0.9	X	---	X	T	X	T	X	T
0.5	X	---	X	T	X	T	X	T
0	X	---	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	ML	---	T	* ML	T	* ML	T	* ML
0.5	T	---	T	T	T	T	T	* ML
0	T	---	T	T	T	* ML	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.4: SW112-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.0 γ=1 α2=0.0 $-751.25 \le \rho \le 751.25$

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	SUPPLY SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T **	ML	T	T	T	T
0	T	T	T **	X	T **	MH	T **	MH
	MONETARY SHOCK							
0.9	M	---	M	T	M	T	M	T
0.5	M	---	M	T	M	T	M	T
0	M	---	M	T	M	T	M	T
	DOMESTIC PRICE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.5: SW113-OPTIMAL VALUES OF ρ

$\varphi=0.05$ $\beta3=0.0$ $\gamma=1$ $\alpha2=0.0$ $-751.25 \leq \rho \leq 751.25$

$\alpha1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	ML	---	T	T	T	T	T	T
0.5	X	---	MH **	MH	MH **	MH	MH *	MH
0	MH	---	MH	X	MH	X	MH *	MH
	SUPPLY SHOCK							
0.9	ML **	T	T	T	T	T	T	T
0.5	X **	T	X	X	MH	MH	MH **	MH
0	MH **	T	X	M	MH	MH	MH *	MH
	MONETARY SHOCK							
0.9	X	---	M	T	M	T	M	T
0.5	X	---	X	X	MH	MH	MH **	MH
0	MH	---	X	X	MH	MH	MH **	MH
	DOMESTIC PRICE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	MH	---	MH *	X	MH	MH	MH *	MH
0	X	---	MH	MH	X	X	MH	X
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.6: SW121-OPTIMAL VALUES OF ρ

φ-1.0 $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.0$ $-751.25 \le \rho \le 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	T *	X	T *	X	T *	MH
0.5	T	---	T *	ML	T *	ML	T *	ML
0	T	---	T *	ML	T *	ML	T *	ML
	SUPPLY SHOCK							
0.9	T	T	T *	X	T *	X	T *	X
0.5	T	T	T *	X	T *	X	T *	X
0	T	T	T *	X	T *	X	T *	X
	MONETARY SHOCK							
0.9	X	---	X	T	X	T	X	T
0.5	X	---	X	T	X	T	X	T
0	X	---	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	T	---	T *	X	T *	MH	T *	MH
0.5	T	---	T *	ML	T *	ML	T *	ML
0	T	---	T *	T	T *	ML	T *	ML
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.7: SW122-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.5 γ=1 α2=0.0 - 751.25 $\leq \rho \leq$ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	T *	ML	T *	ML	T *	ML
0.5	T	---	T *	T	T *	T	T	T
0	T	---	T	T	T	T	T	T
	SUPPLY SHOCK							
0.9	T	T	T *	ML	T *	ML	T *	ML
0.5	T	T	T *	M	T *	M	T *	ML
0	T	T	T *	X	T *	X	T *	X
	MONETARY SHOCK							
0.9	M	---	M	T	M	T	M	T
0.5	M	---	M	T	M	T	M	T
0	M	---	M	T	M	T	M	T
	DOMESTIC PRICE SHOCK							
0.9	T	---	T *	ML	T *	ML	T *	ML
0.5	T	---	T *	T	T *	T	T	T
0	T	---	T	T	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.8: SW211-OPTIMAL VALUES OF ρ

φ-1.0 $\beta 3=0.0$ $\gamma=1$ $\alpha 2=0.2$ $-751.25 \le \rho \le 751.25$

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	ML	ML	T **	ML	T **	ML	T **	ML
0.5	T	T	T **	ML	T **	ML	T	T
0	T	T	T **	ML	T	T	T	T
	SUPPLY SHOCK							
0.9	ML *	T	T **	ML	T **	MH	T **	X
0.5	T	T	T **	X	T **	X	T **	X
0	T	T	T **	X	T **	X	T **	X
	MONETARY SHOCK							
0.9	X	T	X	T	X	T	X	T
0.5	X	T	X	T	X	T	X	T
0	X	T	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	ML	ML	T *	ML	T	T	T *	ML
0.5	T	T	T *	ML	T *	ML	T *	ML
0	T	T	T *	ML	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.9: SW212-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.0 γ=1 α2=0.2 $-751.25 \leq \rho \leq 751.25$

α1	0.0			0.3			0.5			0.75		
π	PRIC		OUT	PRIC		OUT	PRIC		OUT	PRIC		OUT
	DEMAND SHOCK											
0.9	T	**	ML	T	**	ML	T		T	T		T
0.5	T	**	ML	T		T	T		T	T		T
0	T		T	T		T	T		T	T		T
	SUPPLY SHOCK											
0.9	T	**	ML	T	**	ML	T		T	T		T
0.5	T	**	ML	T	**	M	T	**	ML	T	**	ML
0	T		T	T	**	X	T	**	X	T	**	X
	MONETARY SHOCK											
0.9	M		T	M		T	M		T	M		T
0.5	M		T	M		T	M		T	M		T
0	M		T	M		T	M		T	M		T
	DOMESTIC PRICE SHOCK											
0.9	T	*	ML	T	*	ML	T		T	T		T
0.5	T	*	ML	T		T	T		T	T		T
0	T		T	T		T	T		T	T		T
	FOREIGN INTEREST RATE SHOCK											
0.9	T		T	T		T	T		T	T		T
0.5	T		T	T		T	T		T	T		T
0	T		T	T		T	T		T	T		T

TABLE 2.10: SW213-OPTIMAL VALUES OF ρ

φ=0.05 β3=0.0 γ=1 α2=0.2 - 751.25 ≤ ρ ≤ 751.25

α1	0.0			0.3			0.5			0.75		
π	PRIC		OUT	PRIC		OUT	PRIC		OUT	PRIC		OUT
	DEMAND SHOCK											
0.9	ML	*	ML	T		T	T		T	T		T
0.5	MH	*	MH	MH	**	MH	MH	**	MH	MH	*	MH
0	X		X	MH	**	X	X		X	MH	*	X
	SUPPLY SHOCK											
0.9	ML	**	ML	T		T	T		T	T		T
0.5	MH	**	M	MH	**	MH	MH		MH	MH	*	MH
0	X	**	MH	X	**	ML	X	*	MH	X	*	X
	MONETARY SHOCK											
0.9	ML	*	ML	ML		T	ML		T	ML		T
0.5	X	*	MH	X	**	MH	MH		MH	MH		MH
0	X		X	X		X	X	*	MH	X		X
	DOMESTIC PRICE SHOCK											
0.9	ML	*	ML	T		T	T		T	T		T
0.5	MH	*	MH	MH	*	X	MH	*	X	MH	*	MH
0	X	*	MH	MH	*	X	MH		MH	X		X
	FOREIGN INTEREST RATE SHOCK											
0.9	T		T	T		T	T		T	T		T
0.5	T		T	T		T	T		T	T		T
0	T		T	T		T	T		T	T		T

TABLE 2.11: SW221-OPTIMAL VALUES OF ρ

φ-1.0 β3=0.5 γ=1 α2=0.2 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	T	T *	MH	T *	X	T *	X
0.5	T	T	T	ML	T *	ML	T *	ML
0	T	T	T	T	T *	ML	T *	ML
	SUPPLY SHOCK							
0.9	T	T	T *	X	T *	X	T *	X
0.5	T	T	T *	X	T *	X	T *	X
0	T	T	T *	X	T *	X	T *	X
	MONETARY SHOCK							
0.9	X	T	X	T	X	T	X	T
0.5	X	T	X	T	X	T	X	T
0	X	T	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	T	T	T *	MH	T *	X	T *	X
0.5	T	T	T *	ML	T *	ML	T *	ML
0	T	T	T *	T	T *	ML	T *	ML
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.12: SW222-OPTIMAL VALUES OF ρ

$\varphi=0.5$ $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.2$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	T	T *	ML	T *	ML	T *	ML
0.5	T	T	T *	ML	T *	ML	T	T
0	T	T	T	T	T	T	T	T
	SUPPLY SHOCK							
0.9	T	T	T *	ML	T *	ML	T *	ML
0.5	T	T	T *	M	T *	M	T *	ML
0	T	T	T	X	T	X	T	X
	MONETARY SHOCK							
0.9	M	T	M	T	M	T	M	T
0.5	M	T	M	T	M	T	M	T
0	M	T	M	T	M	T	M	T
	DOMESTIC PRICE SHOCK							
0.9	T	T	T *	ML	T *	ML	T *	ML
0.5	T	T	T *	ML	T *	ML	T	T
0	T	T	T	T	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.13: LW111-OPTIMAL VALUES OF ρ

$\varphi \to 1.0$ $\beta 3=0.0$ $\gamma=1$ $\alpha 2=0.0$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	T *	ML	T *	ML	T *	ML
0.5	T	---	T	T	T	T	T *	T
0	T	---	T	T	T	T	T	T
	SUPPLY SHOCK							
0.9	T	T	T *	ML	T *	ML	T *	ML
0.5	T	T	T *	X	T *	X	T *	X
0	T	T	T *	X	T *	X	T *	X
	MONETARY SHOCK							
0.9	X	---	X	T	X	T	X	T
0.5	X	---	X	T	X	T	X	T
0	X	---	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.14: LW112-OPTIMAL VALUES OF ρ

φ=0.5 $\beta 3$=0.0 γ=1 $\alpha 2$=0.0 $-751.25 \le \rho \le 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	T	T	T	T	X *	MH
0.5	T	---	X **	MH	X	X	X	X
0	X	---	X	X	X	X	X	X
	SUPPLY SHOCK							
0.9	T	T	T	T	T	T	MH	MH
0.5	T	T	X **	MH	X	X	X	X
0	X	T	X **	MH	X **	MH	X	X
	MONETARY SHOCK							
0.9	M	---	M	T	M	T	MH *	MH
0.5	M	---	MH	MH	X	X	MH	MH
0	X	---	X	X	X	X	X	X
	DOMESTIC PRICE SHOCK							
0.9	T	---	T	T	T	T	MH	MH
0.5	T	---	X	X	X	X	X	X
0	X	---	X	X	X	X	X	X
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.15: LW113-OPTIMAL VALUES OF ρ

φ=0.05 β3=0.0 γ=1 α2=0.0 - 751.25 $\leq \rho \leq$ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	X	X	MH *	X	X *	MH
0.5	X	---	X	X	X	X	X	X
0	X	---	X	X	X	X	X	X
	SUPPLY SHOCK							
0.9	T	T	X	X	X	X	MH	MH
0.5	X *	T	X	X	X	X	X	X
0	X *	T	X	X	X	X	X	X
	MONETARY SHOCK							
0.9	ML	---	MH	MH	X *	MH	X	X
0.5	X	---	X	X	X	X	X	X
0	X	---	X	X	X	X	X	X
	DOMESTIC PRICE SHOCK							
0.9	T	---	X	X	X	X	X	X
0.5	X	---	X	X	X	X	X	X
0	X	---	X	X	X	X	X	X
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.16: LW121-OPTIMAL VALUES OF ρ

$\varphi \rightarrow 1.0$ $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.0$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	T *	ML	T	ML	T *	ML
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	SUPPLY SHOCK							
0.9	T	T	T *	ML	T *	ML	T *	ML
0.5	T	T	T *	X	T *	X	T *	X
0	T	T	T *	X	T *	X	T *	X
	MONETARY SHOCK							
0.9	X	---	X	T	X	T	X	T
0.5	X	---	X	T	X	T	X	T
0	X	---	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	T	---	T *	ML	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.17: LW122-OPTIMAL VALUES OF ρ

$\varphi=0.5$ $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.0$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	---	T	T	T	T	MH	* MH
0.5	T	---	X	X	X	X	X	X
0	X	---	X	X	X	X	X	X
	SUPPLY SHOCK							
0.9	T	T	T	T	T	T	MH	MH
0.5	T	T	X	X	X	X	X	X
0	X	* T	X	* MH	X	X	X	X
	MONETARY SHOCK							
0.9	M	---	M	T	M	T	MH	* MH
0.5	M	---	X	X	X	X	X	X
0	M	---	X	X	X	X	X	X
	DOMESTIC PRICE SHOCK							
0.9	T	---	T	T	T	T	MH	* X
0.5	T	---	X	X	X	X	X	X
0	X	---	X	X	X	X	X	X
	FOREIGN INTEREST RATE SHOCK							
0.9	T	---	T	T	T	T	MH	* MH
0.5	T	---	X	X	X	X	X	X
0	X	---	X	X	X	X	X	X

TABLE 2.18: LW211-OPTIMAL VALUES OF ρ

$\varphi \rightarrow 1.0$ $\beta 3 = 0.0$ $\gamma = 1$ $\alpha 2 = 0.2$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	T	T	* ML	T	* ML	T	* ML
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	* ML	T	T
	SUPPLY SHOCK							
0.9	T	T	T	* ML	T	* ML	T	* ML
0.5	T	T	T	* X	T	* X	T	* X
0	T	T	T	* X	T	* X	T	* X
	MONETARY SHOCK							
0.9	X	T	X	T	X	T	X	T
0.5	X	T	X	T	X	T	X	T
0	X	T	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	T	T	T	* ML	T	* ML	T	* ML
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.19: LW212-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.0 γ=1 α2=0.2 - 751.25 ≤ρ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T *	M	T	T	T	T	M	M
0.5	T	T	M *	X	X	X	MH *	X
0	X	X	X	X	X	X	X	X
	SUPPLY SHOCK							
0.9	T *	M	T	T	T	T	X *	MH
0.5	T	T	M **	M	X	X	X **	M
0	X *	MH	X *	M	X *	MH	X	X
	MONETARY SHOCK							
0.9	X *	M	X	T	X	T	X	T
0.5	X	T	X *	X	X	X	MH	MH
0	X	X	X	X	X	X	X *	MH
	DOMESTIC PRICE SHOCK							
0.9	T *	M	T	T	T	T	MH *	M
0.5	T	T	X	X	X	X	MH *	X
0	X	X	X	X	X	X	X	X
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.20: LW213-OPTIMAL VALUES OF ρ

φ=0.05 β3=0.0 γ=1 α2=0.2 - 751.25 $\leq \rho \leq$ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	* M	X	* MH	MH	* X	X	X
0.5	X	X	X	X	X	X	X	X
0	X	X	X	X	X	X	X	X
	SUPPLY SHOCK							
0.9	T	* M	M	M	X	X	M	** X
0.5	X	** M	X	X	X	X	X	X
0	X	X	X	* MH	X	X	X	* MH
	MONETARY SHOCK							
0.9	M	* M	X	* MH	X	X	MH	* MH
0.5	X	X	X	X	X	X	X	X
0	X	X	X	X	X	X	X	X
	DOMESTIC PRICE SHOCK							
0.9	T	* M	X	X	X	* MH	X	* MH
0.5	X	X	X	X	X	X	X	X
0	X	X	X	X	X	X	X	X
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.21: LW221-OPTIMAL VALUES OF ρ

$\varphi \to 1.0$ $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.2$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	T	T	* M	T	* ML	T	* ML
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	SUPPLY SHOCK							
0.9	T	T	T	* M	T	* ML	T	* ML
0.5	T	T	T	* X	T	* X	T	* X
0	T	T	T	* X	T	* X	T	* X
	MONETARY SHOCK							
0.9	X	T	X	T	X	T	X	T
0.5	X	T	X	T	X	T	X	T
0	X	T	X	T	X	T	X	T
	DOMESTIC PRICE SHOCK							
0.9	T	T	T	* M	T	* M	T	* ML
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.22: LW222-OPTIMAL VALUES OF ρ

$\varphi=0.5$ $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.2$ $-751.25 \leq \rho \leq 751.25$

$\alpha 1$	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	X	X	X	X	X	X
0	X	X	X	X	X	X	X	X
	SUPPLY SHOCK							
0.9	T	T	T	T	T	T	MH *	X
0.5	T	T	X	X	X	X	X	X
0	X *	MH	X *	M	X *	MH	X	X
	MONETARY SHOCK							
0.9	M	T	M	T	M	T	M	T
0.5	M	T	X	X	X	X	MH *	X
0	X	X	X	X	X	X	X	X
	DOMESTIC PRICE SHOCK							
0.9	T	T	T	T	T	T	MH *	MH
0.5	T	T	MH *	X	X	X	X	X
0	X	X	X	X	X	X	X	X
	FOREIGN INTEREST RATE SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	X	X	X	X	MH **	X
0	X	X	X	X	X	X	X	X

TABLE 2.23: SA111-OPTIMAL VALUES OF ρ

$\varphi \to 1.0$ $\beta 3=0.0$ $\gamma=1$ $\alpha 2=0.0$ $-751.25 \le \rho \le 751.25$

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	ML	---	T	T	T	ML	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	ML	T	ML	T	ML
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	MH	T	M	T	MH
0	T	---	T	M	T	MH	T	M
	SUPLLY(TEMPORARY) SHOCK							
0.9	ML	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	ML	ML	T	ML	T	MH	T	M
0.5	T	T	T	ML	T	ML	T	M
0	T	T	T	M	T	M	T	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	---	X	M	X	M	X	M
0.5	X	---	X	M	X	M	X	M
0	X	---	X	M	X	M	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	---	X	ML	X	M	X	ML
0.5	X	---	X	ML	X	ML	X	ML
0	X	---	X	ML	X	ML	X	ML

TABLE 2.23: SA111-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	---	T	ML	T	T	M	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	ML	T	ML	T	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	MH	T	M	T	M
0	T	---	T	M	T	M	T	M
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	T	---	MH	T	M	T	MH	ML
0.5	T	---	M	M	ML	T	MH	T
0	T	---	T	T	M	T	M	T
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	M	T	MH	T	X
0.5	T	---	T	ML	T	T	T	T
0	T	---	T	M	T	M	T	M
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	---	M	M	M	M	M	T
0.5	T	---	T	T	M	M	MH	M
0	T	---	M	T	M	T	M	M
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	ML	T	T	T	T
0	T	---	M	T	T	T	T	T

TABLE 2.24: SA112-OPTIMAL VALUES OF ρ

φ=0.5 $\beta 3$=0.0 γ=1 $\alpha 2$=0.0 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	M	---	T	M	T	M	T	M
0.5	T	---	T	X	T	X	T	X
0	T	---	T	X	T	X	T	X
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	T	M	T	M
0	T	---	T	M	T	M	T	T
	SUPLLY(TEMPORARY) SHOCK							
0.9	X	M	X	T	T	T	T	T
0.5	T	T	T	X	T	X	T	X
0	T	T	T	X	T	X	T	X
	SUPPLY(PERMANENT) SHOCK							
0.9	ML	ML	T	T	T	T	T	ML
0.5	T	T	T	M	T	M	T	M
0	T	T	T	M	T	M	T	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	---	M	T	M	T	M	T
0.5	X	---	X	T	M	T	M	T
0	X	---	MH	T	M	T	MH	T
	MONETARY (PERMANENT) SHOCK							
0.9	MH	---	MH	ML	M	ML	M	ML
0.5	X	---	M	ML	MH	ML	MH	ML
0	M	---	M	ML	M	ML	M	ML

TABLE 2.24: SA112-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	X	T	X	T	X
0	T	---	T	X	T	X	T	X
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	T	M	T	T
0	T	---	T	M	T	M	T	M
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	T	---	T	M	ML	M	M	M
0.5	T	---	T	X	ML	X	ML	X
0	ML	---	M	X	ML	X	ML	X
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	M	T	T	T	ML
0.5	T	---	T	M	T	ML	T	ML
0	T	---	T	M	T	M	T	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	---	M	M	M	M	M	T
0.5	T	---	T	T	M	M	MH	M
0	T	---	M	T	M	T	M	M
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	ML	T	T	T	T
0	T	---	M	T	T	T	T	T

TABLE 2-25: SA113-OPTIMAL VALUES OF ρ

φ=0.05 $\beta 3$=0.0 γ=1 $\alpha 2$=0.0 $-751.25 \leq \rho \leq 751.25$

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	M	---	T	X	T	MH	T	X
0.5	X	---	X	ML	X	ML	MH	ML
0	X	---	MH	ML	MH	ML	X	ML
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	M	---	M	ML	M	ML	M	ML
0	M	---	M	ML	M	ML	M	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	M	T	T	MH	T	M	T	M
0.5	X	T	M	ML	M	ML	M	ML
0	MH	T	M	ML	M	ML	M	ML
	SUPPLY(PERMANENT) SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	M	T	M	ML	M	ML	M	ML
0	M	T	M	ML	M	ML	M	ML
	MONETARY(TEMPORARY) SHOCK							
0.9	M	---	M	T	M	T	M	T
0.5	M	---	M	T	M	T	M	T
0	M	---	M	ML	M	ML	M	ML
	MONETARY (PERMANENT) SHOCK							
0.9	MH	---	M	ML	M	ML	M	ML
0.5	M	---	M	ML	M	ML	M	ML
0	MH	---	MH	ML	M	ML	M	ML

TABLE 2.25: SA113-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	M	---	T	X	T	MH	T	MH
0.5	MH	---	X	ML	X	ML	X	ML
0	MH	---	MH	ML	X	ML	X	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	T	T	M	T	M
0.5	M	---	M	ML	M	ML	M	ML
0	M	---	M	ML	M	ML	M	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	ML	---	M	X	M	M	M	M
0.5	M	---	ML	X	ML	X	ML	X
0	M	---	M	X	ML	X	ML	X
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	M	T	ML	T	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	M	---	MH	X	X	X	MH	MH
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T

TABLE 2.26: SA121-OPTIMAL VALUES OF ρ

φ→1.0 β3=0.5 γ=1 α2=0.0 - 751.25 ≤ρ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	T	M	T	M
0	T	---	T	MH	T	M	T	MH
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	T	T	T	M	T	M	T	M
0.5	T	T	T	M	T	M	T	M
0	T	T	T	M	T	T	T	T
	MONETARY(TEMPORARY) SHOCK							
0.9	X	---	X	T	X	M	X	M
0.5	X	---	X	M	X	T	X	M
0	X	---	X	M	X	T	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	---	X	M	X	M	X	M
0.5	X	---	X	M	X	M	X	M
0	X	---	X	M	X	M	X	M

TABLE 2.26: SA121-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	T	M	T	M
0	T	---	T	M	T	M	T	M
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	ML	---	T	M	T	M	M	M
0.5	T	---	X	M	MH	M	T	T
0	T	---	T	T	T	T	T	T
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	M	T	MH	T	M
0.5	T	---	T	ML	T	ML	T	T
0	T	---	T	M	T	M	T	T
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	---	T	T	M	M	M	M
0.5	T	---	T	T	T	T	ML	T
0	T	---	T	T	M	T	M	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	ML	---	M	M	T	M	T	M
0.5	T	---	T	ML	T	ML	M	ML
0	T	---	M	ML	T	ML	T	ML

TABLE 2.27: SA122-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.5 γ=1 α2=0.0 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	---	T	X	T	X	T	X
0.5	T	---	T	X	T	X	T	X
0	T	---	T	X	T	X	T	X
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	T	T	T	T	M
0	T	---	T	M	T	T	T	T
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	T	T	X	T	X	T	X
0.5	T	T	T	X	T	X	T	X
0	T	T	T	X	T	X	T	X
	SUPPLY(PERMANENT) SHOCK							
0.9	T	T	T	M	T	T	T	M
0.5	T	T	T	M	T	M	T	M
0	T	T	T	T	T	T	T	M
	MONETARY(TEMPORARY) SHOCK							
0.9	MH	---	MH	T	M	T	M	T
0.5	X	---	MH	T	M	T	M	T
0	X	---	X	T	M	T	M	T
	MONETARY (PERMANENT) SHOCK							
0.9	MH	---	MH	ML	MH	ML	M	ML
0.5	MH	---	MH	ML	MH	ML	M	ML
0	M	---	MH	ML	MH	ML	M	ML

TABLE 2.27: SA122-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	T	---	T	X	T	X	T	X
0.5	T	---	T	X	T	X	T	X
0	T	---	T	X	T	X	T	X
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	T
0.5	T	---	T	M	T	M	T	M
0	T	---	T	M	T	M	T	T
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	X	---	M	T	M	M	M	T
0.5	M	---	M	M	M	M	M	M
0	M	---	M	M	M	M	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	---	T	X	T	X	T	X
0.5	M	---	ML	X	ML	X	ML	X
0	M	---	M	X	ML	X	M	X
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	T	T	ML	T	ML

TABLE 2.28: SA211-OPTIMAL VALUES OF ρ

φ-1.0 β3=0.0 γ=1 α2=0.2 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	ML	ML	T	T	T	T	T	T
0.5	T	ML	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	ML	T	X	T	M	T	M
0	T	T	T	T	T	T	T	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	ML	ML	T	T	T	T	T	T
0.5	T	M	T	T	T	T	T	T
0	T	M	T	T	T	T	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	ML	ML	T	ML	T	ML	T	M
0.5	T	ML	T	T	T	ML	T	ML
0	T	ML	T	M	T	M	T	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	ML	X	M	X	M	X	M
0.5	X	T	X	M	X	M	X	M
0	X	T	X	M	X	M	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	MH	X	ML	X	ML	X	ML
0.5	X	MH	X	ML	X	ML	X	ML
0	X	M	X	ML	X	ML	X	ML

TABLE 2.28: SA211-OPTIMAL VALUES OF ρ

CONTINUE...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	ML	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	ML	T	T	T	M	T	T
0	T	T	T	T	T	T	T	T
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	ML	ML	M	M	MH	T	M	M
0.5	T	T	T	T	MH	M	MH	T
0	M	M	T	T	M	T	M	T
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	ML	ML	T	M	T	M	T	MH
0.5	T	ML	T	T	T	ML	T	T
0	T	T	T	M	T	M	T	T
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	X	X	MH	T	MH	T	M	T
0.5	T	T	M	M	MH	M	MH	M
0	M	M	M	T	M	T	M	M
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	ML	T	M	T	ML	T	M
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	M	T	T	T

TABLE 2.29: SA212-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.0 γ=1 α2=0.2 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	ML	T	X	T	X	T	X
0	T	T	T	X	T	X	T	X
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	T	ML	T	ML	T	ML
0.5	T	T	T	ML	T	T	T	M
0	T	T	T	ML	T	ML	T	M
	SUPLLY(TEMPORARY) SHOCK							
0.9	X	X	X	T	T	T	T	T
0.5	T	M	T	X	T	X	T	X
0	T	M	T	X	T	X	T	X
	SUPPLY(PERMANENT) SHOCK							
0.9	ML	ML	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	MONETARY(TEMPORARY) SHOCK							
0.9	X	X	M	ML	M	T	M	T
0.5	M	X	M	T	M	T	M	T
0	M	X	M	T	M	T	M	T
	MONETARY (PERMANENT) SHOCK							
0.9	MH	T	M	T	M	T	MH	T
0.5	MH	T	MH	T	MH	ML	MH	ML
0	MH	MH	MH	ML	MH	ML	M	ML

TABLE 2.29: SA212-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	ML	T	X	T	X	T	X
0	T	T	T	X	T	X	T	X
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	T	T	ML	T	ML	T	M
0.5	T	T	T	ML	T	ML	T	M
0	T	ML	T	ML	T	T	T	M
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	T	ML	T	M	ML	M	M	M
0.5	T	ML	ML	X	ML	X	ML	X
0	ML	ML	M	M	ML	X	ML	X
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	ML	T	T	T	ML	T	ML
0	T	ML	T	T	T	ML	T	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	X	X	T	M	ML	M	M	M
0.5	M	M	ML	X	ML	X	M	X
0	M	M	M	X	M	X	M	X
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	MH	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.30: SA213-OPTIMAL VALUES OF ρ

φ=0.05 β3=0 0 γ=1 α2=0.2 - 751.25 ≤ ρ ≤ 751.25

α1	0 0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND TEMPORARY)SHOCK							
0 9	ML	X	T	MH	T	MH	T	X
0 5	X	MH	X	ML	X	ML	MH	ML
0	X	MH	MH	ML	MH	ML	X	ML
	DEMAND PERMAMNENT) SHOCK							
0 9	T	ML	T	M	T	M	T	M
0 5	M	T	MH	ML	M	ML	M	ML
0	M	T	MH	ML	M	ML	M	ML
	SUPLLY TEMPORARY) SHOCK							
0 9	M	M	T	MH	T	M	T	M
0 5	X	T	M	ML	M	ML	M	ML
0	MH	T	M	ML	M	ML	M	ML
	SUPPLY PERMANENT) SHOCK							
0 9	T	T	T	T	T	T	T	T
0 5	M	T	M	ML	M	ML	M	ML
0	M	T	MH	ML	M	ML	M	ML
	MONETARY TEMPORARY) SHOCK							
0 9	M	M	M	T	M	T	M	T
0 5	X	ML	M	T	M	T	M	T
0	MH	M	M	ML	M	ML	M	ML
	MONETARY (PERMANENT) SHOCK							
0 9	M	ML	MH	T	M	ML	M	ML
0 5	M	T	M	ML	M	ML	M	ML
0	M	ML	MH	ML	M	ML	M	ML

TABLE 2.30: SA213-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	M	X	T	MH	T	X	T	X
0.5	X	MH	MH	ML	MH	ML	MH	ML
0	X	MH	X	ML	X	ML	MH	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	M	T	MH	ML	MH	ML	M	ML
0	MH	T	M	ML	M	ML	M	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	ML	M	M	MH	M	M	M	M
0.5	M	M	M	X	M	X	M	X
0	M	M	M	X	M	X	M	X
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	ML	T	ML	T	ML	T	ML
0.5	T	ML	T	ML	T	ML	T	ML
0	T	ML	T	ML	T	ML	T	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	ML	M	X	X	MH	X	X	X
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.31: SA221-OPTIMAL VALUES OF ρ

φ=1.0 β3=0.5 γ=1 α2=0.2 - 751.25 ≤ρ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	T	T	ML	T	ML	T	ML
0	T	T	T	ML	T	ML	T	ML
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	T	T	M	T	M	T	T
0.5	T	M	T	T	T	T	T	MH
0	T	T	T	T	T	ML	T	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	M	T	T	T	T	T	T
0.5	T	M	T	ML	T	T	T	T
0	T	M	T	ML	T	ML	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	T	M	T	T	T	T	T	M
0.5	T	T	T	M	T	M	T	M
0	T	ML	T	M	T	M	T	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	T	X	T	X	M	X	M
0.5	X	T	X	M	X	M	X	M
0	X	T	X	M	X	M	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	X	X	M	X	M	X	M
0.5	X	M	X	M	X	M	X	M
0	X	MH	X	M	X	M	X	M

TABLE 2.31: SA221-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	T	T	ML	T	ML	T	ML
0	T	T	T	ML	T	ML	T	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	ML	T	T	T	M	T	M
0.5	T	M	T	T	T	M	T	T
0	T	T	T	ML	T	T	T	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	ML	ML	T	M	M	M	M	M
0.5	T	X	X	M	T	T	T	T
0	X	X	T	T	T	T	T	T
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	ML	ML	T	M	T	ML	T	M
0.5	T	ML	T	T	T	ML	T	T
0	T	T	T	M	T	M	T	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	T	M	T	M	M	M	M
0.5	T	T	T	T	T	T	M	T
0	T	T	M	T	M	T	M	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	MH	M	M	T	M	T	M
0.5	T	ML	M	ML	T	ML	T	ML
0	T	ML	T	ML	T	ML	T	ML

TABLE 2.32: SA222-OPTIMAL VALUES OF ρ

$\varphi=0.5$ $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.2$ $-751.25 \leq \rho \leq 751.25$

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	ML	T	X	T	X	T	X
0.5	T	T	T	X	T	X	T	X
0	T	T	T	X	T	X	T	X
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	T	ML	T	M	T	M
0.5	T	T	T	ML	T	M	T	M
0	T	ML	T	ML	T	M	T	M
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	X	T	X	T	X	T	X
0.5	T	M	T	X	T	X	T	X
0	T	M	T	X	T	X	T	X
	SUPPLY(PERMANENT) SHOCK							
0.9	T	M	T	T	T	T	T	T
0.5	T	ML	T	T	T	T	T	T
0	T	ML	T	T	T	T	T	T
	MONETARY(TEMPORARY) SHOCK							
0.9	M	T	M	T	M	T	M	T
0.5	M	T	M	T	M	T	M	T
0	M	X	M	T	M	T	M	T
	MONETARY (PERMANENT) SHOCK							
0.9	MH	MH	M	ML	MH	ML	MH	ML
0.5	M	M	M	ML	M	ML	MH	ML
0	M	M	MH	ML	M	ML	MH	ML

TABLE 2.32: SA222-OPTIMAL VALUES OF ρ

CONTINUED...

α 1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	T	ML	T	X	T	X	T	X
0.5	T	T	T	X	T	X	T	X
0	T	T	T	X	T	X	T	X
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	T	T	T	T	M	T	M
0.5	T	T	T	T	T	M	T	M
0	T	ML	T	T	T	M	T	M
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	X	X	M	T	M	T	M	T
0.5	M	M	M	M	M	M	M	M
0	M	M	M	M	M	M	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	ML	T	T	T	ML	T	ML
0	T	ML	T	T	T	ML	T	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	T	T	X	T	X	ML	X
0.5	M	X	ML	X	ML	X	M	X
0	M	M	M	X	M	X	M	X
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	X	T	ML	T	ML	T	ML
0.5	T	M	T	ML	T	ML	T	ML
0	T	ML	T	T	T	ML	T	ML

TABLE 2.33: LA111-OPTIMAL VALUES OF ρ

φ→1.0 β3=0.0 γ=1 α2=0.0 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	---	T	T	ML	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	T	T	T	M	T	MH	T
0.5	T	T	X	M	T	T	X	M
0	T	T	T	T	T	T	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	M	T	M	M	M	M	M	M
0.5	MH	T	M	T	M	T	M	ML
0	MH	T	M	M	M	M	M	T
	MONETARY(TEMPORARY) SHOCK							
0.9	X	---	X	M	X	M	X	M
0.5	X	---	X	M	X	M	X	M
0	X	---	X	M	X	M	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	---	X	ML	X	M	X	M
0.5	X	---	X	ML	X	M	X	ML
0	X	---	X	ML	X	ML	X	ML

TABLE 2.33: LA111-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	---	T	T	T	T	T	T
0.5	T	---	T	T	T	T	T	T
0	T	---	T	T	T	T	T	T
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	T	---	M	T	M	T	MH	T
0.5	ML	---	MH	T	MH	T	MH	T
0	M	---	M	T	M	T	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	T	T	M	T	M
0.5	T	---	T	ML	T	ML	MH	ML
0	T	---	M	ML	M	ML	M	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	X	---	MH	M	M	T	MH	T
0.5	M	---	MH	M	X	T	X	M
0	M	---	M	T	M	T	M	M
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	ML	T	M	T	M
0.5	T	---	T	T	T	T	T	ML
0	T	---	T	T	T	T	T	T

TABLE 2.34: LA112-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.0 γ=1 α2=0.0 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	---	T	X	T	X	T	X
0.5	T	---	M	X	M	X	X	X
0	X	---	X	T	X	T	X	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	M	M	M	M
0	M	---	M	ML	M	ML	M	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	X	M	X	M	M	ML	M	ML
0.5	X	T	X	X	X	X	M	X
0	M	T	M	ML	X	ML	M	X
	SUPPLY(PERMANENT) SHOCK							
0.9	M	T	M	ML	M	T	M	ML
0.5	M	T	M	M	M	T	M	ML
0	M	T	M	ML	M	ML	M	ML
	MONETARY(TEMPORARY) SHOCK							
0.9	X	---	M	T	M	T	M	T
0.5	X	---	M	T	M	T	M	T
0	X	---	M	T	M	T	M	T
	MONETARY (PERMANENT) SHOCK							
0.9	M	---	M	ML	M	ML	MH	ML
0.5	MH	---	MH	ML	MH	ML	MH	ML
0	MH	---	X	ML	M	ML	MH	ML

TABLE 2.34: LA112-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	T	---	T	X	T	X	M	X
0.5	T	---	M	X	M	X	X	X
0	X	---	X	T	X	T	M	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	M	M	M	M
0	M	---	M	ML	M	M	M	M
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	T	---	M	M	M	M	M	M
0.5	M	---	M	X	M	X	M	X
0	M	---	M	X	M	X	M	X
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	M	T	M	M	ML
0	T	---	M	M	M	M	MH	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	X	---	M	M	M	M	M	M
0.5	ML	---	X	X	X	X	MH	X
0	T	---	T	T	T	T	T	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	T	T	T	T	T

TABLE 2.35: LA113-OPTIMAL VALUES OF ρ

φ=0.05 β3=0.0 γ=1 α2=0.0 - 751.25 ≤ρ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	X	---	X	X	X	X	X	X
0.5	X	---	X	ML	X	ML	X	ML
0	X	---	MH	ML	X	ML	M	ML
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	ML	M	ML	M	ML
0.5	MH	---	MH	ML	MH	ML	M	ML
0	M	---	MH	ML	M	ML	MH	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	ML	T	X	X	X	MH	MH	MH
0.5	X	T	M	ML	M	ML	X	ML
0	X	T	M	ML	M	ML	X	ML
	SUPPLY(PERMANENT) SHOCK							
0.9	M	T	M	ML	M	ML	T	ML
0.5	M	T	M	ML	M	M	M	M
0	T	T	T	ML	T	ML	T	M
	MONETARY(TEMPORARY) SHOCK							
0.9	M	---	M	T	M	T	X	T
0.5	X	---	M	ML	M	T	M	ML
0	X	---	M	ML	M	ML	M	ML
	MONETARY (PERMANENT) SHOCK							
0.9	M	---	MH	ML	M	ML	M	ML
0.5	M	---	M	ML	M	ML	MH	ML
0	MH	---	MH	ML	MH	ML	MH	ML

TABLE 2.35: LA113-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	MH	---	X	X	X	X	X	X
0.5	X	---	X	ML	X	ML	X	ML
0	X	---	MH	ML	X	ML	M	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	M	ML	M	ML	M	ML
0.5	X	---	M	ML	MH	ML	M	ML
0	MH	---	M	ML	MH	ML	M	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	M	---	M	X	X	M	X	M
0.5	MH	---	M	X	M	X	M	X
0	X	---	M	X	M	X	M	X
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	M	M	M	M	ML
0	T	---	M	M	M	M	MH	M
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	---	MH	MH	MH	MH	MH	MH
0.5	T	---	ML	T	ML	T	ML	T
0	T	---	ML	T	ML	T	ML	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	T	T	ML	T	ML
0	T	---	T	T	T	T	T	T

TABLE 2.36: 1A121-OPTIMAL VALUES OF ρ

φ-1.0 $\beta 3$=0.5 γ=1 $\alpha 2$=0.0 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	---	T	ML	T	ML	T	T
0.5	T	---	T	ML	T	ML	T	T
0	T	---	T	ML	T	ML	T	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	ML
0.5	T	---	T	M	T	M	T	ML
0	T	---	T	M	T	ML	T	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	M	T	M	M	M	M	M	M
0.5	M	T	MH	M	M	M	M	M
0	M	T	MH	M	MH	M	M	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	---	X	M	X	M	X	M
0.5	X	---	X	M	X	M	X	M
0	X	---	X	M	X	M	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	---	X	M	X	M	X	M
0.5	X	---	X	M	X	M	X	M
0	X	---	X	M	X	M	X	M

TABLE 2.36: IA121-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	---	T	ML	T	ML	T	ML
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	ML
0.5	T	---	T	M	T	M	T	ML
0	T	---	T	M	T	ML	T	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	X	---	MH	M	M	M	MH	M
0.5	X	---	X	T	X	M	MH	T
0	X	---	M	T	M	T	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	ML	---	T	ML	M	M	M	M
0.5	T	---	MH	ML	MH	ML	M	ML
0	M	---	M	ML	M	M	M	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	---	M	T	M	M	M	M
0.5	M	---	M	T	M	T	M	T
0	M	---	M	T	M	T	M	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML

TABLE 2.37: IA122-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.5 γ=1 α2=0.0 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	ML	---	T	X	T	X	M	X
0.5	T	---	M	X	M	X	MH	X
0	MH	---	X	T	X	T	M	ML
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	ML	M	M	T
0	M	---	M	ML	M	ML	M	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	T	T	X	X	X	M	X
0.5	X	T	X	X	X	X	M	X
0	M	T	M	M	MH	M	X	T
	SUPPLY(PERMANENT) SHOCK							
0.9	MH	T	M	MH	MH	M	M	M
0.5	MH	T	M	M	M	M	M	M
0	M	T	M	M	M	M	M	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	---	X	T	M	T	M	T
0.5	X	---	M	ML	M	ML	M	T
0	X	---	M	ML	M	ML	M	T
	MONETARY (PERMANENT) SHOCK							
0.9	MH	---	MH	M	MH	M	M	M
0.5	MH	---	MH	M	MH	M	MH	M
0	MH	---	MH	M	M	M	MH	M

TABLE 2.37: IA122-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	ML	---	T	X	T	X	M	X
0.5	T	---	M	X	M	X	T	X
0	X	---	X	T	X	T	X	T
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	M	ML	M	M	ML
0	M	---	M	ML	M	ML	M	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	X	---	M	T	M	T	M	T
0.5	M	---	M	M	M	M	M	M
0	M	---	M	M	M	M	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	M	---	M	ML	M	ML	M	ML
0.5	M	---	ML	M	M	ML	MH	ML
0	M	---	M	M	ML	M	MH	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	M	---	M	X	M	X	M	X
0.5	M	---	X	X	M	X	M	X
0	ML	---	T	T	T	T	T	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	---	T	M	T	M	T	M
0.5	T	---	T	ML	T	ML	T	ML
0	T	---	T	ML	T	ML	T	ML

TABLE 2.38: LA211-OPTIMAL VALUES OF ρ

φ-1.0 β3=0.0 γ=1 α2=0.2 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	T	T	T	T	T	T	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	T	T	T
0.5	T	T	T	ML	T	T	T	ML
0	T	T	T	T	T	ML	T	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	T	T	T	T	T	M	T
0.5	T	M	T	T	T	T	T	T
0	T	M	T	T	T	T	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	M	ML	M	T	M	T	M	T
0.5	MH	T	M	T	M	T	M	T
0	MH	T	M	M	M	ML	M	T
	MONETARY(TEMPORARY) SHOCK							
0.9	X	T	X	M	X	M	X	M
0.5	X	X	X	M	X	M	X	M
0	X	X	X	M	X	M	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	M	X	ML	X	ML	X	M
0.5	X	MH	X	ML	X	ML	X	ML
0	X	MH	X	ML	X	ML	X	ML

TABLE 2.38: LA211-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	T	T	T	T	T	M	T
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	T	T	M	T	MH	T	M
0.5	T	ML	T	ML	T	T	T	ML
0	T	T	T	ML	T	ML	T	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	T	T	MH	T	M	T	M	T
0.5	ML	ML	X	T	MH	T	MH	T
0	M	M	M	T	M	T	M	T
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	ML	T	M	T	T	T	M
0.5	T	ML	T	ML	T	ML	M	T
0	T	ML	M	T	MH	ML	MH	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	X	X	X	T	MH	M	M	T
0.5	M	T	X	M	X	M	MH	M
0	M	M	M	T	M	T	M	M
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	ML	T	ML	T	M	T	M
0.5	T	T	T	T	T	T	T	T
0	T	T	T	T	T	T	T	T

TABLE 2.39: LA212-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.0 γ=1 α2=0.2 - 751.25 ≤ρ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	ML	T	X	T	X	M	X
0.5	T	T	M	X	M	X	X	X
0	X	X	X	T	X	T	M	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	ML	T	M	T	M	M	M
0	M	M	M	ML	M	ML	M	T
	SUPLLY(TEMPORARY) SHOCK							
0.9	X	M	X	M	M	ML	M	ML
0.5	X	M	X	X	X	X	M	X
0	M	T	M	ML	X	ML	X	ML
	SUPPLY(PERMANENT) SHOCK							
0.9	M	ML	M	T	M	ML	M	ML
0.5	M	ML	M	T	MH	ML	M	ML
0	M	ML	M	ML	MH	ML	M	ML
	MONETARY(TEMPORARY) SHOCK							
0.9	X	T	M	T	M	T	M	T
0.5	X	X	M	T	M	T	M	T
0	X	X	M	T	M	T	M	T
	MONETARY (PERMANENT) SHOCK							
0.9	X	ML	M	ML	M	ML	MH	ML
0.5	MH	MH	MH	ML	MH	ML	M	ML
0	MH	M	MH	ML	MH	ML	MH	ML

TABLE 2.39: LA212-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	T	M	T	X	T	X	M	X
0.5	T	T	T	X	M	X	X	X
0	X	X	T	T	X	T	M	T
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	T	T	M
0.5	T	ML	T	MH	T	MH	M	M
0	M	M	M	ML	M	ML	M	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	T	M	M	M	M	M	M	M
0.5	M	M	M	X	M	X	M	X
0	M	M	M	X	M	X	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	ML	T	M	T	M	M	ML
0	T	ML	M	M	M	M	MH	M
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	X	X	M	M	M	M	M	M
0.5	ML	M	X	X	X	X	X	X
0	T	T	T	T	T	T	T	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	T	T	T	T	ML	T	ML
0	T	T	T	T	T	T	T	T

TABLE 2.40: LA213-OPTIMAL VALUES OF ρ

φ=0.05 β3=0.0 γ=1 α2=0.2 - 751.25 ≤ρ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	X	X	M	MH	MH	X	X	X
0.5	X	X	X	ML	X	ML	X	ML
0	X	X	X	ML	X	ML	X	ML
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	M	ML	M	ML	M	ML
0.5	M	ML	MH	ML	M	ML	M	ML
0	MH	ML	MH	ML	M	ML	M	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	MH	X	MH	X	X	X	X
0.5	X	T	M	ML	MH	ML	X	ML
0	X	T	M	ML	X	ML	X	ML
	SUPPLY(PERMANENT) SHOCK							
0.9	M	ML	MH	ML	M	ML	M	T
0.5	M	M	M	M	M	M	M	M
0	T	M	T	ML	T	T	T	M
	MONETARY(TEMPORARY) SHOCK							
0.9	M	T	M	T	X	T	X	T
0.5	X	X	M	ML	M	ML	M	ML
0	X	X	X	ML	M	ML	M	ML
	MONETARY (PERMANENT) SHOCK							
0.9	M	ML	MH	ML	MH	ML	MH	ML
0.5	X	ML	MH	ML	MH	ML	MH	ML
0	MH	ML	MH	ML	MH	ML	M	ML

TABLE 2.40: LA213-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	X	X	X	X	X	X	X	X
0.5	X	X	X	ML	X	ML	MH	ML
0	X	X	X	ML	X	ML	M	ML
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	ML	M	ML	M	ML	M	ML
0.5	M	ML	M	ML	M	ML	MH	ML
0	M	ML	MH	ML	M	ML	M	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	M	M	X	X	X	M	X	M
0.5	X	M	M	X	M	X	M	X
0	MH	M	M	X	M	X	M	X
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	ML	T	M	T	ML	M	ML
0	T	M	M	M	M	M	M	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	ML	X	X	X	X	MH	MH
0.5	T	T	ML	T	ML	T	ML	T
0	T	T	ML	T	ML	T	M	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	T	T	ML	T	ML	T	ML
0.5	T	T	T	ML	T	ML	T	ML
0	T	T	T	T	T	T	T	T

TABLE 2.41: LA221-OPTIMAL VALUES OF ρ

$\varphi \rightarrow 1.0$ $\beta 3=0.5$ $\gamma=1$ $\alpha 2=0.2$ $-751.25 \leq \rho \leq 751.25$

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	T	T	T	ML	T	ML	T	T
0.5	T	T	T	ML	T	ML	T	T
0	T	T	T	ML	T	ML	T	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	T	T	M	T	M	T	ML
0	T	T	T	M	T	ML	T	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	X	T	T	T	T	T	T
0.5	T	M	T	T	T	T	T	T
0	T	M	T	T	T	T	T	T
	SUPPLY(PERMANENT) SHOCK							
0.9	M	T	M	M	M	M	M	M
0.5	MH	T	X	M	M	M	M	M
0	M	T	M	M	M	M	MH	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	T	X	M	X	M	X	M
0.5	X	T	X	M	X	M	X	M
0	X	X	X	M	X	M	X	M
	MONETARY (PERMANENT) SHOCK							
0.9	X	X	X	M	X	M	X	M
0.5	X	X	X	M	X	M	X	M
0	X	X	X	M	X	M	X	M

TABLE 2.41: LA221-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMOPRARY)SHOCK							
0.9	T	T	T	ML	T	ML	T	T
0.5	T	T	T	ML	T	ML	T	T
0	T	T	T	ML	T	ML	T	T
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	M	T	M	T	M	T	T
0.5	T	T	T	M	T	M	T	ML
0	T	T	T	M	T	ML	T	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	X	X	MH	M	M	M	M	M
0.5	X	X	X	T	MH	T	MH	M
0	X	X	M	T	M	T	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	ML	ML	MH	MH	M	M	M	M
0.5	M	T	M	ML	M	ML	M	ML
0	M	M	M	M	MH	ML	M	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	T	T	M	T	M	M	M	M
0.5	M	ML	M	T	M	T	M	T
0	M	M	M	T	M	T	M	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	X	T	M	M	M	M	M
0.5	T	ML	T	ML	T	ML	T	ML
0	T	ML	T	ML	T	ML	T	ML

TABLE 2.42: LA222-OPTIMAL VALUES OF ρ

φ=0.5 β3=0.5 γ=1 α2=0.2 - 751.25 ≤ ρ ≤ 751.25

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DEMAND(TEMPORARY)SHOCK							
0.9	ML	ML	T	X	T	X	T	X
0.5	T	T	M	X	M	X	X	X
0	X	X	X	T	X	T	M	T
	DEMAND(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	T	T	M	T	M	M	M
0	M	M	M	ML	M	ML	M	ML
	SUPLLY(TEMPORARY) SHOCK							
0.9	T	X	T	X	X	X	M	X
0.5	X	M	X	X	X	X	M	X
0	M	T	M	M	X	M	X	X
	SUPPLY(PERMANENT) SHOCK							
0.9	MH	T	MH	M	MH	M	MH	M
0.5	M	ML	M	M	M	M	M	M
0	M	ML	M	M	M	M	M	M
	MONETARY(TEMPORARY) SHOCK							
0.9	X	T	M	T	M	T	M	T
0.5	X	X	M	ML	M	ML	M	ML
0	X	X	M	ML	M	ML	M	ML
	MONETARY (PERMANENT) SHOCK							
0.9	MH	MH	X	M	MH	M	MH	M
0.5	MH	MH	M	M	MH	M	MH	M
0	MH	MH	M	M	MH	M	M	M

TABLE 2.42: LA222-OPTIMAL VALUES OF ρ

CONTINUED...

α1	0.0		0.3		0.5		0.75	
π	PRIC	OUT	PRIC	OUT	PRIC	OUT	PRIC	OUT
	DOMESTIC PRICE(TEMPORARY)SHOCK							
0.9	ML	ML	T	X	T	X	T	X
0.5	T	T	M	X	M	X	X	X
0	X	X	X	T	X	T	M	T
	DOMESTIC PRICE(PERMAMNENT) SHOCK							
0.9	T	ML	T	M	T	M	T	M
0.5	T	T	T	M	T	M	ML	M
0	M	M	MH	ML	M	ML	M	ML
	FOREIGN INTEREST RATE(TEMPORARY) SHOCK							
0.9	X	X	M	T	M	T	M	T
0.5	M	M	M	M	M	M	M	M
0	M	M	M	M	M	M	M	M
	FOREIGN INTEREST RATE(PERMANENT) SHOCK							
0.9	MH	ML	MH	ML	MH	ML	MH	ML
0.5	M	ML	M	ML	MH	ML	MH	ML
0	MH	ML	MH	M	MH	M	M	ML
	FOREIGN PRICE(TEMPORARY) SHOCK							
0.9	M	T	M	X	M	X	M	X
0.5	M	M	X	X	MH	X	M	X
0	T	T	T	T	T	T	T	T
	FOREIGN PRICE (PERMANENT) SHOCK							
0.9	T	MH	T	M	T	M	T	M
0.5	T	ML	T	ML	T	ML	T	ML
0	T	ML	T	ML	T	ML	T	ML

Appendix B

Consider the following differential generator of the value function V(W,t):

$$\Sigma_W[V(W,t)]=\frac{\partial V}{\partial t}+(\Psi-\varphi(f)\frac{c}{W})W\frac{\partial V}{\partial W}+\frac{1}{2}\sigma_z^2 W^2\frac{\partial^2 V}{\partial W^2} \qquad \text{(B-1)}$$

Since the time is discounted exponentially, a time separable value function is assumed as follows: $V(W,t)=e^{\ \mu t}x(W)$

The following lagrangean expression is maximized with respect to c, n_M, n_B, n_k and n_{B*}:

$$\Upsilon=\frac{1}{\gamma}[c^{\theta}(n_M W)^{\zeta(f)}]^{\gamma}e^{-\mu t}+\Sigma_W[e^{-\mu t}x(W)]+e^{\ \mu t}\lambda[1-n_M-n_B-n_k-n_{B^*}] \qquad \text{(B-2)}$$

The first order conditions can be expressed as:

$$\theta c^{\theta\gamma\ 1}(n_M W)^{\gamma\zeta(f)}-\varphi(f)\frac{dx}{dW}=0 \qquad \text{(B-3-1)}$$

$$\begin{aligned}&[\zeta(f)c^{\theta\gamma}(n_M W)^{\gamma\zeta(f)\ 1}W-\lambda]dt+\varphi(f)r_M W\frac{dx}{dW}+\\ &\qquad [(n_M+n_B)\sigma_p^2-n_k\sigma_{pk}+n_{B^*}\sigma_{pq}+\sigma_{pv}]\varphi(f)^2W^2\frac{d^2x}{dw^2}=0\end{aligned} \qquad \text{(B-3-2)}$$

$$[\varphi(f)r_B W\frac{dx}{dW}-\lambda]dt+[(n_M+n_B)\sigma_p^2-n_k\sigma_{pk}+n_{B^*}\sigma_{pq}+\sigma_{pv}]\varphi(f)^2W^2\frac{d^2x}{dw^2}=0 \qquad \text{(B-3-3)}$$

$$[\varphi(f)r_k W\frac{dx}{dW}-\lambda]dt+[-(n_M+n_B)\sigma_{pk}+n_k\sigma_k^2-n_{B^*}\sigma_{qk}-\sigma_{vk}]\varphi(f)^2W^2\frac{d^2x}{dw^2}=0 \qquad \text{(B-3-4)}$$

$$[\varphi(f)r_{B^*}W\frac{dx}{dW}-\lambda]dt+[(n_M+n_B)\sigma_{pq}-n_k\sigma_{kq}+n_{B^*}\sigma_q^2+\sigma_{vq}]\varphi(f)^2W^2\frac{d^2x}{dw^2}=0 \qquad \text{(B-3-5)}$$

$$n_M + n_B + n_k + n_{B^*} = 1 \qquad \text{(B-3-6)}$$

The optimal values of c/W, n_M, n_B, n_k, n_B* and λ can be obtained from the above FOC equations as a function of dx/dW and d^2x/dW^2. Also, the stochastic Bellman equation must be satisfied. That is,

$$Max_{c,n_M,n_B,n_k,n_{B^*}} \{\frac{1}{\gamma}[c^{\theta}(n_M W)^{\zeta}(f)]\gamma e^{\ \mu t} + \Sigma_W[e^{\ \mu t}x(W)]\} = 0 \qquad \text{(B-4)}$$

This requires solving the following differential equation for x(W), resulted from substituting for the optimal values from (B-3):

$$\frac{1}{\gamma}[c^{*\theta}(n_M^* W)^{\zeta(f)}]^{\gamma} - \mu x(W) + (\Psi^* - \varphi(f)\frac{c^*}{W})W\frac{dx}{dW} + \frac{1}{2}\sigma_z^{*2} W^2 \frac{d^2x}{dW^2} = 0 \qquad \text{(B-5)}$$

To solve this differential equation, a solution of the form as follows is postulated:

$$x(W) = \Lambda^* W^{\gamma} \qquad \text{(B-6)}$$

where the Λ^* needs to be determined. From (B-6), we know:

$$\frac{dx}{dW} = \Lambda^*\gamma W^{\gamma-1} \quad , \quad \frac{d^2x}{dW^2} = \Lambda^*\gamma(\gamma-1)W^{\gamma\ 2} \qquad \text{(B-7)}$$

Having substituted for dx/dW and d^2 x/dW^2 in the (B-3) equations, we will have:

$$\theta c^{\theta\gamma\ 1}(n_M W)^{\gamma\zeta(f)} - \varphi(f)\Lambda^*\gamma W^{\gamma-1} = 0 \qquad \text{(B-8-1)}$$

$$[\zeta(f)c^{\theta\gamma}(n_M W)^{\gamma\zeta(f)\ 1}W - \lambda]dt + \varphi(f)r_M\Lambda^*\gamma W^{\gamma} + [(n_M + n_B)\sigma_p^2 - n_k\sigma_{pk} + n_{B^*}\sigma_{pq} + \sigma_{pv}]\varphi(f)^2\Lambda^*\gamma(\gamma-1)W^{\gamma} = 0 \qquad \text{(B-8-2)}$$

$$[\varphi(f)r_B\Lambda^*\gamma W^{\gamma} - \lambda]dt + [(n_M + n_B)\sigma_p^2 - n_k\sigma_{pk} + n_{B^*}\sigma_{pq} + \sigma_{pv}]\varphi(f)^2\Lambda^*\gamma(\gamma-1)W^{\gamma} = 0 \qquad \text{(B-8-3)}$$

$$[\varphi(f)r_k\Lambda^*\gamma W^\gamma-\lambda]dt+[-(n_M+n_B)\sigma_{pk}+n_k\sigma_k^2-n_B.\sigma_{qk}-\sigma_{vk}]\varphi(f)^2\Lambda^*\gamma(\gamma-1)W^\gamma=0 \quad \text{(B-8-4)}$$

$$[\varphi(f)r_B.\Lambda^*\gamma W^\gamma-\lambda]dt+[(n_M+n_B)\sigma_{pq}-n_k\sigma_{kq}+n_B.\sigma_q^2+\sigma_{vq}]\varphi(f)^2\Lambda^*\gamma(\gamma-1)W^\gamma=0 \quad \text{(B-8-5)}$$

Now, if we substitute from (B-8-1) for c^* into the Bellman equation and solve it for Λ^*, we obtain:

$$\Lambda^{*\frac{1}{\theta\gamma\ 1}}=\frac{\mu W^\gamma-\Psi^*\gamma W^\gamma-\frac{1}{2}\sigma_z^{*^2}}{[\frac{\varphi(f)\gamma w^{\gamma-1}}{\theta(n_M^*W)^{\gamma\zeta(f)}}]^{\frac{1}{\theta\gamma\ 1}}(\frac{1}{\theta\gamma}-1)\varphi(f)\gamma W^{\gamma-1}} \quad \text{(B-9)}$$

If we substitute from (B-9) for Λ^* into the (B-8-1), we end up to the expression (3-9-1) in the text for c/W. Also, the expressions (3-9-2), (3-9-3) and (3-9-4) in the text have yielded through dividing equations (B-8-2), (B-8-3) and (B-8-5) by ($\Lambda^*\ \gamma W^\gamma$) and doing some simple algebraic manipulation.

Appendix C

Combining the (3-6-2) of the text and the definition of wealth, we obtain:

$$\begin{aligned} d(B/P)+d(B^*/Q)+dk+\varphi(f)d(M/p)=\varphi(f)\{[(M/p)dR_M+(B/p)dR_B \\ +KdR_k+(B^*/Q)dR_B^*]-cdt-dT\} \end{aligned} \quad \text{(C-1)}$$

Using the (3-4-4) of the text and rearranging terms in (C-1), we end up with:

$$\begin{aligned} d(B/P)+\varphi(f)d(M/P)=\{-d(B^*/Q)-dk+\varphi(f)[dY-dC-dG+(B^*/Q)dR_{B^*} \\ +(B^*/Q)i^*t^*dt]\}+\varphi(f)[(M/P)dR_M+(B/P)dR_B+dG-dT-dT^*] \end{aligned} \quad \text{(C-2)}$$

From the product market equilibrium condition (3-14), the term in the curly brackets of the right hand side in (C-2) is zero. Hence, the expression (C-2) is equivalent to the government's flow budget constraint (3-10) of the text.

Appendix D

From equation (B-8-1) in appendix (B), we know:

$$\Lambda^* = \frac{\theta c^{\theta\gamma - 1}(n_M W)^{\gamma\zeta(f)}}{\varphi(f)\gamma W^{\gamma\ 1}} \tag{D-1}$$

By substituting from (D-1) for Λ^* in (B-6) of the appendix (B), we obtain:

$$x(W) = \frac{\theta(\frac{c}{W})^{\theta\gamma\ 1}(n_M)^{\gamma\zeta(f)} W^{\gamma(\theta+\zeta(f))}}{\varphi(f)\gamma} \tag{D-2}$$

From (D-2), we have equation (3-28) of the text.

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