Financial Instability in Indonesia: Theories and Practices

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Acknowledgements

Abstract

This thesis investigates the instability of a financial system by taking a specific country's example with the Indonesian financial system as a case study. To achieve its objectives, this research study aims to answer the following questions:

(1) Are there any factors that contribute to financial instability?

(2) How is the state of the financial system?

(3) Are the policies available effective at dealing with financial instability, in particular external instability?

To answer these questions, this study discusses the Financial Instability Hypothesis, employs different time series techniques, explores the relationships between relevant variables and investigates specific events within the observation period. First, this thesis examines the arguments of McKinnon (1973) and Shaw (1973) and applies them to the implementation of Indonesian financial reforms. By modifying IMF's financial liberalisation index and using it as one of the control variables, this thesis finds that financial liberalisation has a positive association with the volatility of the exchange rate.

Second, this thesis develops the measurement of financial instability and investigates the potential for it to become an instrument for the detection of the country's fragility condition. In developing these instruments, this study takes two different approaches into consideration, namely the 'static' and the 'dynamic' approaches. The former argues that the cause of financial instability is an exogenous process or a random shock. The construction of the instrument has the main purposes of predicting the occurrence of a financial crisis and measuring the instability of a financial system. Whereas, the latter assumes that financial instability is an endogenous process. In constructing the instrument, it has the objective of detecting the condition of a financial system. This study applies the financial instability measurements in Indonesian's case and compares their performances with respect to crisis prediction.

Third, this study investigates policies to handle the capital flows. It explores the implementation of policies to handle and manage the capital flows. Based on the empirical analysis, this study finds that the capital management policies fulfill its objectives in managing capital flows. Besides, this thesis examines the implementation of the compensation thesis and finds that this mechanism applies to Indonesia.

Abbreviations

ADF	Augmented Dickey-Fuller
AIC	Akaike Information Criteria
ARDL	Auto Regressive Distribution Lags
AREAER	Annual Report on Exchange Rate Arrangements and Exchange Restrictions
BIS	Bank for International Settlements
BOP	Balance of Payments
CB	Central Bank
CDF	Cumulative Distribution Function
CEIC	China Economic and Industry Data
DF-GLS	Dickey-Fuller Generalised Least Square
DOTS	Direction of Trade Statistics
ECM	Error Correction Model
ERM	Exchange Rate Mechanism
EU	European Union
EUR	Euro currency
EWI	Early Warning Indicators
FA	Foreign Assets
FDI	Foreign Direct Investment
FICI	Financial Instability Composite Index
FSI	Financial Stability Index
FLI	Financial Liberalisation Index
FTSE	Financial Times Stock Exchange
GBP	The Great Britain Pound sterling
GDP	Gross Domestic Product
HQIC	Hannah-Quin Information Criteria

IBRA	Indonesian Banking Restructuring Agency
ICRG	International Country Risk Guide
IDR	Indonesian Rupiah
IDX	Indonesian Stock Exchange Composite Index
IFS	International Financial Statistics
IMF	International Monetary Fund
INDRA	Indonesian Debt Restructuring Agency
IS	Investment-Saving
ISP	Index of Speculative Pressure
JIBOR	Jakarta Inter Bank Over-Night Rate
JPY	Japanese Yen
JSX	Jakarta Stock Exchange
KCFSI	Kansas City Financial Stability Index
LIBOR	London Inter Bank Over-Night Rate
LM	Liquidity preference – Money supply
N/S	Noise to signal ratio
OECD	Organization for Economic Co-operation and Development
PCA	Principal Component Analysis
RM	Reserves Money
SIC	Schwartz Information Criteria
SBI	Sertifikat Bank Indonesia
SSX	Surabaya Stock Exchange
US	United States
USD	United States Dollar
VIF	Vector Inflation Factor
WB	World Bank
WDI	World Development Indicators

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Chapter 1
Introduction

1.01   The research background and motivations

Financial fragility, financial instability, and financial crisis are three different concepts with differing levels of severity for the economy, but they all have one thing in common, which is that no country wants to experience them. It has been argued that the first two may cause the third. This means that a country, and in particular, its government and policy makers, must focus their attention on the first two concepts without ignoring the other. Financial crisis has a negative impact on the country, for example, the collapse of economic output, rising unemployment, increasing government debt, and drops in equity prices (Reinhart and Rogoff, 2009). However, one important thing is still missing. Most economists struggle to both define the concept and explain the mechanism of instability, and there is still little agreement on how to define and explain the aforementioned concepts (Schinasi, 2006; Creel *et al.*, 2015).

Economists have investigated the causes and mechanisms of financial crises in the search for understanding their occurrence. Financial crisis models have been developed to explain the mechanisms, factors that trigger the crises, and possible actions that can be taken to strengthen or restore the financial system to its original state. There are at least three types of models that provide an explanation for the occurrence of a financial crisis. The first-generation model assumes the existence of a fiscal deficit policy under the fixed exchange rate regime. This model (Krugman, 1979; Flood and Garber, 1984) emphasises the need to prioritize the implementation of prudential macroeconomic policies and to maintain a country's economic fundamentals, which are macroeconomic conditions that demonstrate the country's performance. The second-generation model explains the occurrence of a crisis as a consequence of government decisions to defend the value of its currency, and the impact that this has on the economic fundamentals of speculative behaviour (Eichengreen *et al.*, 1995; Obstfeld, 1994). The third-generation model (Krugman, 1999; Burnside *et al.* 2007) emphasises the role of the private sector in triggering the crisis. Within the third-generation model, there are various explanations of crisis offered. For example, the crisis is triggered by herding behaviour and asymmetric

information that creates an adverse selection[1] and moral hazard[2] (Mishkin, 1992 and 1999a). Krugman (1999) argued that balance sheets problems and the mismanagement of the private sectors' obligations are what triggers the crisis. Also, some economists (Kaminsky *et al.*, 1998; Calvo and Reinhart, 1999; among others) have underlined the contagion effect in triggering the financial crisis.

Hyman Minsky advanced the concept of the Financial Instability Hypothesis (FIH) and showed the ways by which a financial system becomes prone to experiencing an episode of financial crisis. Minsky (1986 and 1992) explained the mechanism of a modern financial system that has conceived a tendency towards fragility and instability, even under normal conditions, which is triggered by the needs for profit accumulation and expansion. The FIH has been used to explain the Southeast Asian crisis and the Global Financial Crisis (GFC). Within the FIH, there are two types of financial instability, namely internal and external instability. With reference to Vercelli (2001) and Tymoigne (2010), internal instability discusses the structural change of an economy to become unstable especially when the economic agents tend to use external funding to fulfil their previous debt obligations. External instability can be described as when the domestic financial system faces a large and volatile movement in the capital flows and exchange rate. This condition is possible as foreign investors have an increasing role in the domestic financial system (Kaltenbrunner and Painceira, 2015).

Some economists (Bordo *et al.*, 2002; Bordo, 2006; Tymoigne, 2010) argue that starting from the 1980s, crises occur more frequently; even though, the impact of the crises do not appear to have become more severe (Bordo *et al.*, 2002). Efforts have been made by Kaminsky and Reinhart (1999) to measure the country's level of fragility and subsequent likelihood of experiencing a crisis by developing early warning indicators (EWI). The authors expected that by constructing an instrument

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[1] Herding behaviour is the tendency of financial market investors in following other investors' decision without considering any significant new information (Banerjee, 1992). In a similar vein, Kaminsky and Schmukler (1999) explained that herding behaviour in a stock market occurs when investors rely on stock market indices as the only consideration in making a decision without considering other relevant indicators.

[2] Mishkin (1999b) defined asymmetric information as a condition when an entity that involves in a transaction has a better information than another one. According to Mishkin (1992 and 1999a) the problem of asymmetric information would create adverse selection and moral hazard. Mishkin explained that adverse selection is a problem when one party decides to make an agreement or business transaction with the ones who will unexpectedly produce an undesirable outcome. Whereas, moral hazard is a problem when a party that enters a transaction engages in an undesirable activity with the risk being borne by another party.

to predict the level and timing of a financial crisis (Tymoigne, 2010), it could enable the authorities to take the necessary actions to prevent the aforementioned crisis. Some studies (Borio and Lowe, 2002; Drehmann *et al.*, 2011; Drehmann and Juselius, 2014; Lang, 2013) have developed and refined the EWI as a method of signalling an upcoming financial crisis. Initiated by Bordo *et al.* (2002), there are economists (Illing and Liu, 2006; Cardarelli *et al.*, 2009; Hollo *et al.*, 2012; Louzis and Vouldis, 2013) who have also constructed a financial instability index that is meant to predict a crisis occurrence and measure the financial market's conditions. They developed this index based on several financial market indicators, and most of them use high-frequency data. There are various data that are used in developing this index such as the volatility of exchange rate, the volatility of stock index, the movement of daily bonds yield, and so on. Based on their arguments, high-frequency data is necessary for this analysis, especially to enhance the accuracy of the index in capturing the financial market's conditions. Hence, it is expected that the index will provide sufficient information on the financial market's conditions for the authorities[3]. The measurement should be able to capture the dynamic movements of the financial markets. To this end, most of the indices have been built on weekly or monthly data.

In understanding the conditions of a financial system, the FIH underlines the importance of exploring the private sector's balance sheets since they can explain the period of fragility, especially when the companies' balance sheets and their ratio of financial indicators have worsened (Lavoie, 2014, p. 253). The balance sheet shows that the operation is balanced, which suggests that a change on the asset side corresponds to a change on the liability side. From its structure, the balance sheet contains both assets and liabilities, which includes the company's net worth. The balance sheet may provide the necessary information about the evolution of the company's performance when it is compared with the previous ones. Additionally, it is also beneficial when one tries to trace the balance sheets' component and compares this component with those of other companies'. The result can present the interconnections that can be found amongst economic agents. One indicator that can be obtained from the balance sheets and that shows the state of instability is the debt-to-equity ratio. The movements of this ratio can provide a description on the

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[3] The authorities in this study refer to the Central Bank as the monetary authority and the government as the fiscal authority. In some countries, there is another unit to oversight and regulate the financial sector, a financial services authority.

behaviour of the economic agents in the domestic financial system. When the ratio increases, the financial system tends to incline towards instability.

In dealing with external instability, the Financial Instability Hypothesis starts the analysis by focusing on the country's degree of openness. The existence of capital movements among countries may facilitate foreign investors' decisions to maximize their profits through a carry-trade mechanism (Arestis and Glickman, 2002). This phenomenon occurs particularly when the domestic interest rate is higher than the foreign interest rate, which may attract foreign funds into the domestic financial system. The capital inflows, however, may create another problem such as when these flows take on the form of portfolio investments. Hence, there will be a need to construct a strategy to strengthen the financial system by mitigating against the perceived risks and lessening the impact of the financial crisis (Grabel, 2005, p.357-360).

This research has investigated financial instability in the case of a particular developing country, specifically Indonesia. Like many other developing countries, Indonesia faces challenges in dealing with financial instability. In 1997-1998, a financial crisis hit the country leading to a negative growth rate of 13% in 1998 (Kurniati and Yanfitri, 2010), the deepest currency depreciation when compared to other crisis-hit countries when it reached 231%, and the falling of the stock index by 80% (Martinez, 1998 cited in Arestis and Glickman, 2002). During the GFC, Indonesia also encountered a problem handling capital flows that threatened the domestic economy. Theoretically, there are some measures that could have been implemented in dealing with the financial instability as proposed by Grabel (2006, p. 364), such as the use of an early warning signal and crisis prevention instruments, the management of capital flows, and foreign exchange management.

1.02   The objective of study

This research has the main objective of investigating financial instability in the Indonesian financial system. The financial sector consists of the formal financial institutions that provide financial services, which consist of the banking sector, insurance companies, investment funds and so on. A few time series analytical tools have been used, with the 1990s up until 2015 as the observation period. To obtain a clear answer to the research questions, this study has specifically divided the main objective into several aspects, which consist of:

i. The investigation of the factors that contribute to financial instability. This objective includes the examination of the implementation of Indonesian financial reforms and how the reforms have impacted on the financial system and the economy.

ii. An assessment of Indonesia's financial instability and the ways to measure it; and

iii. An investigation of the policies for dealing with financial instability, and in this particular case, external instability.

Most of the discussion applies to two different frameworks, namely the mainstream views and the FIH. By presenting two competing frameworks, it is expected that this study may find the better framework for addressing financial fragility and instability in Indonesia.

The research questions that will be explored in this study are:

(1) Are there any factors that contribute to Indonesia's financial instability? How do financial reforms affect the stability of the financial system and economic performance?

(2) What is the state of the Indonesian financial system? Is there any instrument that can effectively predict the occurrence of a financial crisis? Is the domestic financial system in Indonesia becoming more unstable?

(3) Are the policies that have been implemented by the authorities effective in handling and managing financial instability, in particular, external instability?

1.03   Thesis contribution to the literature

First, this study contributes to the literature by critically assessing the current theoretical frameworks in explaining the financial crisis mechanism using FIH and empirically developing new ideas by employing the Indonesian financial system as a case study. Secondly, the empirical chapters in this study employ higher frequency and the most current data. The higher frequency data (daily and monthly data) has been used in some of the analyses to get detailed information. Thirdly, this study has extended particular methodologies that, to the best of my knowledge, are the first attempt to carry out certain observations especially in the case of Indonesia, for example, the monthly financial liberalisation index (FLI), the daily financial instability composite index, and the financial fragility seismogram.

1.04 The structure of thesis

Chapter 2 describes the phases of Indonesian financial liberalisation and details important events in relation to its financial reforms, including the occurrence of a financial crisis. This chapter presents three phases that stand out as significant periods in Indonesia's financial system development and covers the period from the 1960s to the presents. The first period is the 1960s-1970s, in which the government tried to stabilise its domestic economic system and developed the current financial architecture. The second period covered the period from the 1980s to the 1990s when the government adopted financial liberalisation. In this period, the financial crisis hit the country. The third period ranges from the early 2000s to the present; it covers the beginning of the country's recovery period from the crisis, but then starting from the late 2000s, the domestic financial system struggled with fragile global economic conditions. This chronicle of financial reforms from the 1960s to the 2000s, as discussed in Chapter 2, will enrich the analysis provided in Chapters 5 to 11.

Chapter 3 discusses the way in which each crisis generation model is developed and highlights the weakness of the models in explaining the crisis occurrence. The analysis highlights the features of the financial crisis under the mainstream perspective including the definition of financial crisis, the factors that triggered the financial crisis such as the weaknesses in the financial system and the liquidity problem in the banking sector, and the policies that should be taken on to handle the crisis.

Chapter 4 focuses on the framework developed by Hyman Minsky with his FIH. In this chapter, the discussion starts with Minsky's original framework, which is built using the closed-economy framework. This framework emphasized the argument for the disadvantages of a robust economic condition that goes on to become the source of fragility. Furthermore, this hypothesis also explored the importance of the economic agents' behaviour in seeking profits. Arestis and Glickman (2002) expanded on this analysis to include the open-economy framework by exploring the existence of capital mobility among countries.

Chapter 5 tries to address the first research question and examines the concept of financial liberalisation and its impact on the economy. To provide a detailed analysis, this chapter endeavours to construct a monthly FLI. This chapter undertakes an empirical analysis that examines the association between the control variables, such as the FLI, several macro-economic indicators and the response variables. This study

found that the implementation of financial liberalisation has a contribution towards increasing the volatility of the exchange rate and has a detrimental effect on economic performance.

Chapter 6 outlines the attempts to measure the level of instability by developing the so-called EWI as an instrument to predict crisis occurrences. The results will be looked at in the case of Indonesia. This study found some weaknesses in this method, for example, it cannot fully be utilized as an *ex-ante* financial instability measurement since the quality of the crisis episode prediction is low. Nevertheless, this method is useful for evaluating (*ex-post*) the patterns and behaviour of some of the economic variables which may trigger crisis occurrences.

Chapter 7 expands on the analysis that had been undertaken in Chapter 6, by exploring the methodology for constructing the financial instability index as another instrument to predict crisis occurrences. Based on the current development of the financial instability index, this study developed the index involving the financial system components and focused on two methods. These methods are the principal component analysis (PCA) and the cumulative distribution function (CDF). These two methods currently receive attention from many developed countries, especially in the European Union (EU) and North America. The construction of these indices is another contribution to the literature in the case of Indonesia, since it is considering to be developing a formal measurement method for domestic use.

Chapter 8 discusses financial fragility using a simple balance sheet framework by highlighting the interconnections of the six economic agents, namely the government, the Central Bank, commercial or private banks, the private sector, households and the foreign sector. This study found that increased outstanding debts, both at a country level and an individual level, potentially created a problem because it affects lenders' or investors' views and their assessment of the borrowers. The findings support Minsky's FIH, in that during the tranquil period, firms tend to increase their external financing, but when this optimism changes to pessimism, the financial system will suffer from a crisis episode. This chapter develops the financial fragility measurement based on the FIH and applies it to the Indonesian case in order to examine the structural changes and to assess the state of its financial system. The construction of the financial fragility seismogram is another contribution to the literature, especially in the case of Indonesia.

Chapter 9 explores the phenomenon of capital flight from the domestic financial market. This chapter employs two methods in computing capital flight, namely the

residual and adjusted-residual methods. There is one aspect in the adjusted-residual method to consider, which is the value of trade misinvoicing. Based on the results of trade misinvoicing, it suggests that there are motives on the end of either the exporters or importers to maximize their profits by becoming involving in the practise of misinvoicing. This study found that the capital flight over the period of the 1980s–1990s was positive. When the crisis erupted in 1997, the capital flight figure became negative. This negative value implies that there are more illicit inflows than illicit outflows during a crisis period.

Chapter 10 evaluates and explores the implementation of capital flows management in Indonesia. This chapter focuses on the policy options that are used by the authorities in dealing with capital flows. In the case of Indonesia, there are two such policies; the exchange rate management policy and the implementation of the minimum holding period. By examining the two dependent variables, consisting of the exchange rate volatility and the return on the stock market, this study found that the implementation of these policies, to some extent, was effective. There is a reason that may explain the weak impact of the implementation of the minimum holding period to curb the exchange rate volatility, which is caused by investors' decision to shift their investments to another risk-free financial asset.

In the Central Banks' daily operations, there is a mechanism named sterilization. Commonly, this term is understood as the Central Bank's policy to sell and buy securities to manage the money supply. In connection with the discussion on the Central Bank's balance sheets in Chapter 8, Chapter 11 examines the sterilization mechanism further. Under the mainstream view, Central Bank can affect the stock of base money. This view rests on the assumption of supply-led money creation in that the monetary authority has the power of setting the monetary base. The empirical results do not agree with the assumption since there is no positive relationship between foreign assets and the bank's reserve of money. This chapter has also provided another contribution to the literature, since no analysis has previously been undertaken on this issue involving the Indonesian Central Bank.

Chapter 12 presents the overall conclusions of the policy implications and has summarised the contributions to the literature of this study.

Chapter 2
Building a modern but fragile financial system

2.01   Introduction

The process of financial reforms in most of the developing countries began in the 1980s (World Bank, 2005, p.207), and it was undertaken with reference to the financial liberalisation framework. McKinnon (1973) emphasised the importance of financial liberalisation for its potential ability to boost savings, which will become the fuel for investment and economic growth. There are two types of liberalisation that are applied in the financial system: internal and external liberalisation (Ghosh, 2005). According to Ghosh (2005), domestic or internal liberalisation covers the policies of removing the government control over the interest rate, reforming the financial system to minimise government ownership in the development banks, and reducing government intervention in credit programmes. On the other hand, external liberalisation covers the policies for imposing trade liberalisation and liberalising the capital flows management. To implement financial liberalisation, a country should transform itself from financial repression[4] into a market-led economy through two major steps to ensure smooth economic reform and transformation. Johnston *et al*. (1997) and James and Stephenson (2002, pp.25-43) explained that the steps of financial reforms consist of stabilisation stage and structural adjustment programme. The first refers to a policy intended to stabilise the financial system and economic indicators. This can be done by controlling the level of inflation and managing the imbalances in foreign obligations by keeping government deficit low. The structural adjustment programme is a process involving deregulation policies to create a free market environment that consists of liberalisation policies in trade and flows of capital.

The need to apply these steps in sequence is based on the view that the stabilisation process is fundamental for the implementation of a long-term structural adjustment programme (Edwards, 1984, Johnston *et al*., 1997). One argument that supports this view hinges on the importance of stabilisation in assuring the implementation of a structural adjustment that involves a series of policies. According to Mathieson

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[4] Referring to Arestis and Caner (2004) and Ryan-Collins (2015), financial repression is policies to achieve a lower debt to GDP ratio and reduce the inflation rate by controlling the low level of interest rate, imposing high reserve requirements and implementing credit programmes to certain sectors.

(1980), a stabilisation policy helps a country to integrate monetary and fiscal policies so that these policies pursue consistent targets. Furthermore, Mathieson (1980) provided the following example to emphasise the need for stabilisation process. When a government adopts financial liberalisation, the implementation of policy to maintain an interest rate ceiling will be abolished, which may lead to the increasing of lending and deposit rate. In the short run, this decision may have a negative impact on non-bank corporations that borrow from commercial banks since their debt obligations will increase. In contrast, commercial banks may also face a problem to pay its depositors with the new deposit rate, especially when their long-term financial assets have returns that reflect the old interest rate. Thus, there is a high possibility of bankruptcy in the financial system that requires government's response.

Within the structural adjustment programme, there are important policies to put into practice to ensure liberalisation in financial sectors within a country by minimising the government's involvement; while, maximising the private sector's participation. To implement the structural adjustment programme, the government can implement trade liberalisation, which is crucial to strengthen the competitiveness of domestic products and to avoid the adverse effects of capital inflows in exchange rate appreciation (McKinnon, 1973, pp.160-161; James and Stephenson, 2002, pp.25-43). The reforms that were taken in Indonesia did not fully follow the previously-mentioned steps. However, in a deviation from the common practice, the implementation of capital account liberalisation in Indonesia take place in the late 1960s (Cole and Slade, 1996; Johnston, 1998), long before the implementation of trade liberalisation and structural adjustment policies.

By implementing financial liberalisation, a country is supposed to experience a better economic performance, including: increased economic growth, saving rate and financial deepening, as well as improved resource allocation. Nevertheless, the previously mentioned positive impacts may raise questions as some countries have different outcomes. One example of these adverse effects is the tendency of some countries that adopted financial liberalisation to experience financial crises (Williamson and Mahar, 1998, pp.37–52). In addition, Reinhart and Kaminsky (1999) argued that financial liberalisation has a negative effect on some countries, which causes them to be open to financial crisis as liberalisation allows the transmission of the adverse conditions across countries via capital mobility.

The rest of this chapter will discuss the sequence of Indonesian financial reforms. Thereby, this chapter describes the progress by distinguishing three periods of reform and discussing the policies and events in chronological order.

2.02   The phases of Indonesian financial liberalisation

In general, as provided in Figure 2.1, there are three phases that stand out as significant periods in Indonesia's financial system development that cover more than twenty years. The first phase covered the 1960s and 1970s, the period in which the government tried to stabilise and develop its domestic economic system and financial architecture. In this phase, there were policies in the implementation of external liberalisation with regards to the management of capital flows and exchange rate.

Figure 2.1 The sequence of Indonesian financial reforms
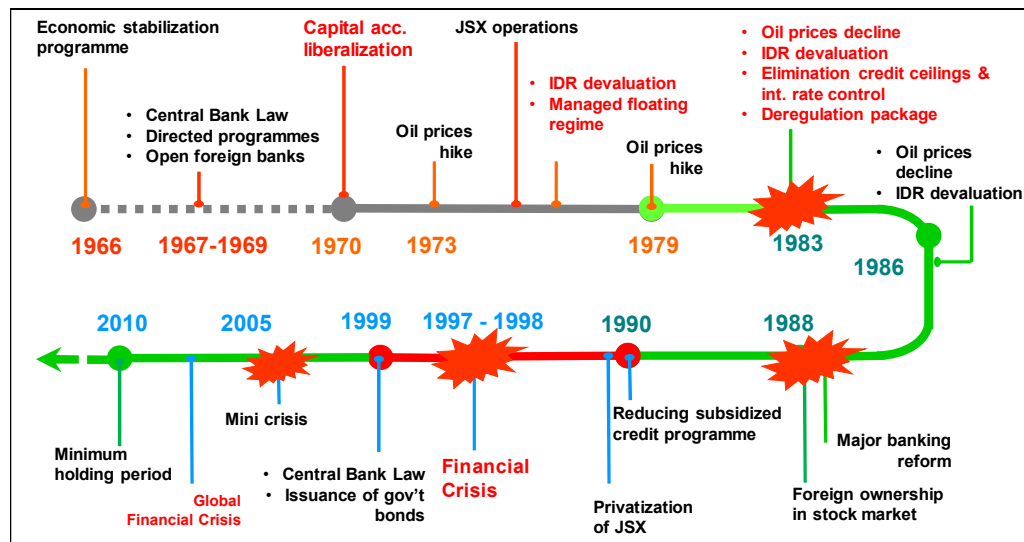
Source: Own construction based on Cole and Slade, 1996; Johnston, 1998; Bank Indonesia, 2014b; and Nasution, 2015.
Note: (i) JSX stands for Jakarta Stock Exchange. In 2007, JSX changed its name to become Indonesian Stock Exchange (IDX) after merging with Surabaya Stock Exchange (SSX). (ii) IDR is the Indonesian Rupiah; it is the official currency of the Republic of Indonesia.

The second phase covered the 1980s and 1990s when full financial liberalisation was adopted. In this period, most of the policies with regards to domestic or internal liberalisation were implemented. The domestic liberalisation covered some policies, such as the elimination of credit ceiling and interest rate control in 1983, and the deregulation of the banking sector and financial market in 1988. During this period, there was a regulation to abolish government controls on bank lending, followed by another phase of liberalisation when the government passed regulations in the area of banking and finance. Additionally, one example of external liberalisation policies

during this period was the elimination of the foreign ownership restrictions in the domestic financial market. The implementation of these policies in connection with financial liberalisation has brought far–reaching consequences, not only in the area of regulation but also in institutional arrangements. However, in this period, Indonesia experienced a financial crisis in 1997/1998. After the implementation of financial liberalisation, the role of the fiscal and monetary authorities was also transformed into two different recognised structures. Firstly, in the period before 1999, the government controlled the monetary authority. In this period, there was a monetary board led by Minister of Finance and the Central Bank's Governor was one of its members. This board would discuss the monetary policies that would be taken. Secondly, in the period of 1999 up until the present, the Central Bank as the monetary authority becomes independent.

The third phase ranged from the 2000s to the present when the recovery from the financial crisis began, but the domestic financial system continues to struggle with fragile global economic conditions. This long, painstaking process has encountered many challenges, for example, the unforgettable experience of coping with the financial crisis in 1997/1998; the impact of which was felt for more than five years afterwards. The IMF and the World Bank provided their assistance in the various stages of Indonesian reforms (the 1960s–1980s).

2.03   The period of the 1960s and 1970s

The transformation of Indonesia's financial system commenced in 1966 when hyperinflation surged through the country at about 600% per annum (Cole and Slade, 1996, p.16). This hyperinflation was an impact of the government's decision to force the Central Bank to print money during 1965–1966 for financing government expenditures since the fiscal and monetary policies were under the control of the President. The Central Bank, as the monetary authority, functioned merely as the government's cash machine to print money for funding government expenditures. This condition changed with the Central Bank law legislation in 1968 that assured the status of the Central Bank in dealing with monetary policy and banking regulations under the coordination of the so-called Monetary Board. This structure left the Central Bank with a new role that, far from being responsible for the main source of budget deficit financing, allowed the Central Bank to become more focused on conducting monetary policy. Within this framework, every substantial decision to be implemented

had to be discussed by the Monetary Board and reported to the President; this practice has been rendered obsolete by the Central Bank Law, passed in 1999.

With the assistance of the IMF and a group of donor countries, by the end of 1966, the government of Indonesia began to adopt stabilisation policy. The main objective of this policy was to improve the domestic economic condition. The efforts were packaged into a programme of drastic fiscal retrenchment to reduce the budget deficit, minimise the Central Bank credit to the government and quasi-government companies, and devalue the domestic currency (Cole and Slade, 1996, p.16). In the following years, the government maintained this programme and focused on inflation control. Taking into account the stable and improved economic performance, the government sought external funds by dismissing the capital control and so opened the country to financial flows from abroad (Cole and Slade, 1996, p. 17; Matsumoto, 2007, p.7).

In the late 1960s, with a strong intention to avoid a recurrence of high inflation, the government emphasised the need for some programme priorities to support civil society in the agricultural sector, foodstuffs price stabilisation, and investment5. The substantial programmes that were introduced from 1968 were a credit programme for the stabilization of foodstuffs through subsidizing credit for the government agency, the so-called National Logistic Agency, to finance its activities in procuring the rise crop, a staple food intensification programme to finance farmers in obtaining the inputs for production, and investment credit to finance small-scale industries (Cole and Slade, 1996, p.41). The distribution of the credit programme for the National Logistic Agency was run and administered by the Central Bank directly. This task was in line with one of the Central Bank's responsibilities of participating in the development as stipulated by the law governing the Central Bank. For the other credit programmes, the state-owned banks took the main role in distributing the funds to the beneficiaries as (Cole and Slade, 1996, pp.83–89).

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5 The credit programmes aimed to help sector priorities in having a better access for financing and encourage domestic economic activities. Three types of credit were prepared in pursuing these purposes, such as (Cole and Slade, 1996, pp.83–88): (i) the foodstuffs stabilization programme. The foodstuffs prices were very volatile, they were low during harvest and high in the cultivating season; (ii) The rice intensification programme, labelled Bimas – a kind of green revolution to boost the rice production. The credit was allocated to the farmers to purchase their basic production inputs, such as seeds, fertilizer, equipment, machinery, etc. (iii) Investment credit, called Kredit investasi, was addressed to domestic small and medium enterprises to facilitate access to the banking sector with a soft loan for enhancing production capacity by improving equipment and machinery

A policy that was imposed by the government with regard to the implementation of external liberalisation was the removal of control of capital flows and the unification of exchange rate. This policy package was enacted on April 1970 by eliminating the government control of capital flows and dual exchange markets[6]. This policy was in line with the IMF suggestion to apply the unified exchange rate management.

During the 1970s, Indonesia benefitted from relatively high international oil prices, and the oil revenues became a source of finance for the government budget. In this period, the revenue from oil and gas exports contributed more than 27% of the total government revenues (Ministry of Finance, 1991, p.28). With the plentiful funds from oil revenues, in the 1970s, the government introduced a balanced budget policy (Stern, 2003). This policy had several objectives. Firstly, it intended to minimise the amount of foreign borrowing; secondly, it was meant to show the fiscal authority's intention to support the monetary policy in maintaining a low inflation rate. In this context, the balanced-budget is a principle that was used to help the government keep its expenditure under control by allocating the funds to the priority expenses or projects (Stern, 2003). However, it appeared that the government faced a dilemma: on the one hand, it intended to have a balanced-budget; on the other hand, it needed to accelerate the development of high-profile projects. As a result, the objective of a balanced budget has never been achieved since the government invited the World Bank, Asian Development Bank and some bilateral supports to finance several high-profile projects. The disbursement of foreign financing from these international financial institutions and the bilateral cooperation was equal to the budget deficit (Kartasasmita, 2001).

In the period of 1970s, interest rates were maintained at relatively low levels, and this policy led to the negative real interest rates (Cole and Slide, 1996, p.45). In turn, this condition may have discouraged people from saving in the banking sector. Monetary policy was conducted in a so-called financial repression regime, with a combination of government directed interest rates on bank deposits, a ceiling on bank lending that was allocated as a percentage of total bank credit, and the implementation of a fixed exchange rate regime.

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[6] Previously there were dual foreign exchange rate markets that were called as '*Bonus Ekspor'* (BE) and *Devisa Pelengkap* (DP). The first one (BE) is the exchange rate that could be used to import goods that are included in the commodity import programme list. The second one (DP) is the rate for any transactions including import of goods that were on the BE list (Cole and Slade, 1996, pp. 42-43).

The existence of the capital market in Indonesia started back in 1912 when a small stock exchange was established during the Dutch colonial period, but its development could not be sustained as World Wars I and II intervened. The idea to rebuild the capital market began at the end of the 1960s in line with the government policy to open the capital account initiated through a series of high-level discussions involving the Ministry of Finance and the Central Bank. However, the operations of the Jakarta Stock Exchange (JSX) formally started in August 1977 with only one listed company. For at least three years there was no substantial progress in its scale of transactions; even though, the government, operating through the Ministry of Finance tried to offer incentives for every company that wanted to make a public offering.

In the 1970s and 1980s, the stock market remained undeveloped and found difficulties in expanding its market capitalization. The reasons behind this phenomenon can be listed as (i) there were no advantages to stock market quotation that benefitted the companies; (ii) the government was reluctant to let the state-owned enterprises be privatised; (iii) few companies issued bonds since the government bonds market had not developed yet making it difficult for bond issuers to determine the interest rate benchmark; (iv) high liquidity in the financial market, during the 1970s to the beginning of the 1980s, stimulated households and companies to choose financing sources from the banking sector rather than the stock exchange, and (v) non-residents were not allowed to participate directly in the equity market (Cole and Slide, 1996, pp. 157–159).

2.04   The period of the 1980s and the 1990s

The continuing increase in oil prices combined with a relatively stable nominal exchange rate created ample foreign exchange funds. Cole and Slade (1996, pp.16–19) argued that these conditions increased domestic spending, which then brought inflationary pressures. In response to this, the government took measures by, for example, devaluing the Indonesian Rupiah (IDR) against USD from IDR415 to IDR625 in November 1978. With this 50% devaluation, the government intended to encourage the domestic producers of tradable goods to enter the global market (Nitisastro, 2011, pp.196-197). In fact, this policy resulted in another dose of high inflation rates at the beginning of 1979.

An unexpected event occurred at the beginning of 1980 when global conditions changed drastically, and oil prices declined sharply (Cole and Slide, 1996, pp.21–

22). In 1982, an unpredicted predicament arose when the government of Indonesia faced a decrease in oil prices. With oil sector has been the main source of funds to finance its budget, this event encouraged the government to rethink its policy for sustaining the fiscal and macroeconomic performance. In 1983, the government took a major step in transforming the Indonesian financial system. It introduced policies that covered at least three areas: firstly, in the monetary area, it decided for the second time in five years to devalue the IDR against the USD. This devaluation had a similar intention to the previous devaluation that was taken place in 1978, chiefly to boost exports and discourage imports. Secondly, in the fiscal area, the policy went back to the retrenchment of budget and maintaining the balance budget policy through managing routine government expenditure and cutting back expenditure on big or high-profile investment projects. This policy was accompanied by tax reform in order to boost tax revenue in maintaining the budget sustainability and responding to the continuous decline in oil prices. Thirdly, there was a policy in the financial sector to abolish the private banks' credit ceiling and the state-owned banks' deposit rate ceiling. Together with these policies, the government also made some important decisions concerning the elimination of interest rate control and the reduction of directed credit on some predetermined government programmes. These policies were considered a substantial step in implementing financial liberalisation with strong support from the IMF.

With the decline of government revenue from the exports of oil and gas, the government introduced the policy to support non-oil export industries (Iqbal and James, 2002, p. 5). In so doing, the government undertook the measures to improve the domestic non-oil exporters' competitiveness and diversify the export products by facilitating new exporter companies exporting their products. The policy package that had been imposed by the government in October 1988 was the deregulation of the banking sector to provide domestic companies with access to credit. The purpose of this policy is to encourage the growth of the banking sector through the simplification of the procedure for opening new banks and their branches and changing in the control of bank borrowing and lending rates. Besides, this policy is to enable society to access financing sources and increase the rate of investments. By opening access to all parties, the level of investments will increase, which then have an impact on increasing economic growth. The government also allowed the private sector and the banking sector to borrow from abroad. Within this year, there was deregulation that permitted non-residents to purchase the shares of several joint ventures companies.

As a result of the October 1988 banking sector policy package, the number of banks grew rapidly from around 106 banks in 1989 to 240 banks at the beginning of 1995.

By the end of the 1980s, the reform also took place in the capital market, which covered the privatisation of the JSX and improvement in the Securities and Exchange Commission in supervising the stock exchange companies. In addition to this policy package, there was a policy to give a more opportunity for non-resident to purchase companies' shares up to 49%, but excluding banking sector shares (Cole and Slide, 1996, pp. 162 and 165). This policy was followed by another regulation that provided some incentives for the listed companies and all eligible companies to go public. The decision to stimulate the development of the stock market was considered urgent, and this became the government's response to the need to find alternative sources of financing. Soon after the enactment of this policy, the numbers of quoted companies and stock market activities increased dramatically. In March 1989, following the implementation of this deregulation, the government launched a policy, which was meant to abolish the constraints on financial institutions - banks and non-banks - obtaining foreign loans.

With the elimination of the prohibition on foreign ownership, the flow of funds from the global financial market into Indonesia, channelled through both direct lending and the stock market increased significantly. The adoption of financial liberalisation boosted the domestic financial market, which had not happened before its implementation (Grabel, 1995). The increase in capital inflows at the beginning of the 1990s became an important aspect for policy makers. On the one hand, it helped economic agents who looked for funds to finance their investments; on the other hand, it potentially created a problem, especially those that have a shorter maturity.

In connection with the management of capital inflows, in 1991 the government also passed a Presidential Decree to establish an inter-department team to control foreign commercial borrowing. Under this Decree, the team had responsibilities to assess and endorse every proposal that was made by the state-owned enterprises or private companies affiliated with government projects. This team consisted of several ministers and the Central Bank governor under the leadership of the Coordinating Minister for Economic Affairs. The establishment of this team was triggered by two factors: (i) there were growing concerns about external borrowing, which had increased at the beginning of the 1990s; and (ii) the government's intention to manage the foreign currency risk with regard to the repayment terms. This team set a ceiling on the amount of direct borrowing from foreign banks and banking sectors,

private companies and state-owned enterprises that had a project related to the government could engage in. While this team contributed to the control of state-owned enterprises' foreign borrowing, the Central Bank had a responsibility to control the banking sector's external loans by requiring every bank to report the amount of the loan and its timing. Under this scheme, every bank would have a quota for making foreign borrowing.

During the period 1992 to 1994, these regulations could handle the massive short-term capital inflows, but, only for the general government debt, which covered the Central Bank, the public sector and quasi-government corporations, and not the total debt. It seems that the regulations were ineffective at dealing with the short-term foreign debts since the outstanding debt was still escalating. The problem centred on the behaviour of private companies in expanding their businesses using foreign external financing, which subsequently created their obligations to foreign banks were mounting in this period. Based on the data from the Bank for International Settlements, the Indonesian non-bank private sector's obligations were USD12millions in 1990 and became USD28millions by 1995 and rising again to become USD36millions by 1996. The private sector was one area that was not covered by the two regulations mentioned above.

2.05   The period of 1996 to 2000

The major deregulation policies by the end of the 1980s and the beginning of the 1990s facilitated domestic firms in finding an alternative source of financing. The external borrowing became one additional source of funds. Up until 1996, with the increasing expansion of firms, the external debt was increasing sharply (McLeod, 1998, p. 33). Based on the annual data from World Development Indicator (WDI) from 1989 to 1996, the annual average of Indonesian external debt before 1989 was around USD 22,433million per year, but then it soared to become USD 93,382million per year.

One of the reasons that attracted domestic firms into taking foreign loans was the relatively low cost of borrowing (Goeltom, 1995, pp. 10-11; Nasution, 1998). With the intention to maintain the inflation rate, the Monetary Board set higher interest rate. Following the implementation of the high-interest rate in the 1990s, private sector went to the global financial market to obtain the foreign borrowing that offered lower cost of funds. As provided in Figure 2.2, the cost of a USD loan from foreign banks was lower than the average real domestic lending rate as offered by the domestic

banks. The spike in the effective cost of foreign borrowing in the third quarter of 1986 occurred as a result of the devaluation policy of the Indonesian government on the IDR against USD from IDR 1,134 to IDR 1,664. Overall, the discrepancy between the domestic and foreign cost of borrowing contributed to the increase of the external debt. The increasing of the external borrowing exposed the corporations to currency risk, which could deteriorate their balance sheets, especially when the domestic exchange rate experienced a sharp and prolonged depreciation.

Figure 2.2 Cost of foreign borrowing and domestic lending rate
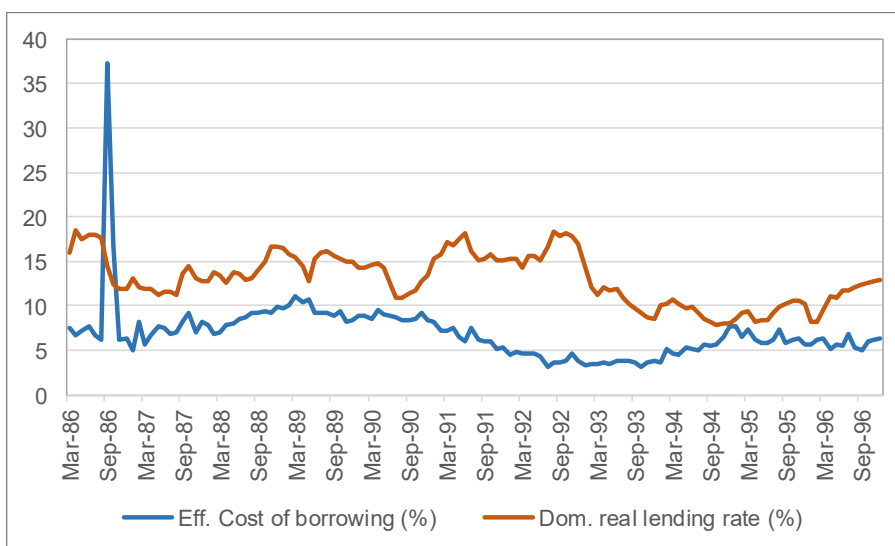
Source: Own calculations based on IFS–IMF

Note: The figure on foreign loan's effective cost of foreign borrowing is calculated from the LIBOR USD 6months rate minus the natural log of IDR to USD exchange rate. Following Goeltom (1995), this calculation employs the LIBOR rate, since this inter-bank rate is commonly used as a reference in most of the external loan's cost of borrowing. Due to the lack of data on the forward exchange rate within this period, data on the change of IDR/USD is employed to represent the forward rate.

The second reason that affected the increasing external borrowing was the implementation of pegged exchange rates within horizontal bands[7], by setting the

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[7] The classification of exchange rate in this study follows the IMF (2015, p.5) that differentiates the exchange rate regime into four categories:

- the first is hard pegs comprising (1) exchange arrangements with no separate legal tender and (2) currency board arrangements;

- the second is soft pegs that consist of (a) conventional pegged arrangements, (b) pegged exchange rates within horizontal bands, (c) crawling pegs, (d) stabilised arrangements, and (e) crawl-like arrangements;

- the third is floating regimes in which the market determines the rate. This third category has two type of exchange rate arrangements: (a) floating and (b) free floating;

upper and lower bands. The pegged exchange rates within horizontal bands led to a relatively low rate of volatility in the exchange rate, which enabled the private sector to make deals with their foreign lenders. During 1986 to 1995, with relatively stable IDR to USD exchange rates and a lower interest rate, foreign borrowing was advantageous for borrowers. Since for quite a long period the value of the exchange rate was relatively predictable and stable, most of the private sectors left their external borrowings unhedged (Nasution, 1998; McLeod, 1998, p.37). According to Nasution (1998), this phenomenon brought the deterioration of the private sector's balance sheets in the period of sharp depreciation of IDR against USD. The firms that faced a bad experience in the crisis period were those that had their revenues in local currency, but their debt obligations in foreign currency.

Following the government policies to create the opportunities for foreign investors to invest in the domestic financial market, the stock market index records a significant increase between 1994 and the middle of 1997. McLeod (1998, p.33) showed the JCI achieved its highest level of 637 by the end of 1996, which was then followed by a positive movement in July 1997 when the index reached the level of 720. Furthermore, McLeod (McLeod, 1998, p.33) noted that foreign investors dominated stock market activity during this period. In this case, the foreign investors' role has two different impacts: on the one hand, the stock market became more active, and there was a transfer of knowledge, which allowed the domestic investors to learn from the foreign investors. On the other hand, most foreign investors in a developing country's stock market represent a potential problem, especially if their investment preferences shift against the domestic market and they chose to sell their ownership of the domestic financial assets.

In 1997–1998, Indonesia experienced a financial crisis that devastated its economic, political and financial system. In the first week of July 1997, the Central Bank widened the intervention band to allow for greater flexibility in defending the value of IDR. Following the devaluation of Thai Baht in July 2nd, 1997, according to McLeod (1998, p. 37), the investors and the borrowers realised that the exchange rate risk was one important factor in dealing with external borrowing. This author underlined the role of the investors and borrowers in finding and buying foreign currency to protect themselves against the devaluation. With the decision to defend from a possible

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- the fourth is called as a residual category, which covers other managed exchange rate arrangements.

currency devaluation, however, the IDR exchange rate became under pressure, and the Central Bank shifted the exchange rate management from pegged exchange rates within horizontal bands to floating rate in the third quarter of 1997 (McLeod, 1998, p.34; Sarwono, 2005).

As a response to the economic turbulence in 1997, in the third quarter of 1997 the government reviewed its budget and postponed all expenditures (Muhammad, 2009, p.75; Abimanyu, 2009, p.124), except the ones that related to salaries. The postponement of government expenditure mainly focused on the high-profile projects that involved importing goods to lessen the pressure on the declining international reserves (Muhammad, 2009, p.75). However, this condition posed an additional problem for the companies that carried out government related projects. Even though the policy to review and postpone the government expenditures was revoked soon after it was realised that the problem was not in the government sector, a number of companies needed a longer period than was expected to recover from the impact of the budget postponement policy.

In November 1997, with reference to the IMF assistance package, 16 commercial banks were closed by the government. Following this closure, the currency depreciated severely, and the stock market index declined sharply. To restore financial market confidence, the government, and the Central Bank took necessary actions by restructuring and taking over some commercial banks through its Indonesian Banking Restructuring Agency (IBRA). The task of IBRA included managing the non-performing loans so that the illiquidity problem could be solved (Nasution, 2015). At the same time, the government also developed the Indonesian Debt Restructuring Agency (INDRA) to facilitate the private sector coping with their external borrowing. As a result of the IDR depreciation, most corporations that had foreign currencies debt faced problems as their debt in terms of IDR rose significantly. While the companies' income was mainly in IDR, the payment of their debt obligations was in foreign currency. With the help of INDRA, these corporations could negotiate to reschedule their debts with the lenders.

Following the closure of 16 commercial banks in the fourth quarter of 1997, in December 1997 and January 1998 the value of IDR against USD experienced a huge depreciation and reached 500%. At the same time, the stock market index also plunged by 40%, from around 697 in January 1997 to 394 in January 1998. In this period, there was another policy that was imposed by the Central Bank with regards to the increasing of policy interest rate, which then gave impact on deposit and

lending rates. As the lending rate increased, the corporations and households that had borrowed suffer since their debt obligations were increased significantly.

Table 2.1 Capital flows description (ratio of GDP)

	All	1981-1990	1991-1995	1996-2000	2001-2005	2006-2010	2010-2015
				Mean			
Gross inflows	0.032	0.004	0.019	-0.014	0.011	0.067	0.136
Direct invest. (liab.)	0.017	0.001	0.008	0.003	0.008	0.030	0.017
Portfolio invest. (liab.)	0.013	0.000	0.006	-0.002	0.008	0.029	0.047
Other invest. (liab.)	0.002	0.002	0.006	-0.014	-0.006	0.008	0.019
Gross outflows	-0.025	-0.001	-0.005	-0.007	-0.006	-0.081	-0.066
Direct invest. (assets)	-0.008	0.000	-0.001	-0.001	-0.018	-0.016	-0.031
Portfolio Invest. (assets)	-0.002	n.a	n.a	n.a	-0.008	-0.007	-0.004
Other invest. (assets)	-0.317	n.a	n.a	n.a	-0.008	-0.020	-0.019

Source: Own calculations based on IFS-IMF and Bank Indonesia

Table 2.1 provides a description of capital that goes in and out of Indonesia in the form of a ratio of GDP. In the period of 1996–2000 this country faced a crisis and experienced outflows. Two types of flows that contribute to the outflows were portfolio investments and other investments. However, based on Table 2.1 there is no data of gross outflows on portfolio and other investments during 1980s-2000. It is suspected that during this period the portfolio investments and private sector investments may have had an even bigger proportion of the gross outflows but there is insufficient data on this (Titiheruw and Atje, 2008; Usman, 2009, p.48). The former Minister of Finance was concerned with this condition and tried to collect all the information starting from the 1980s, especially on the external debt figures (Usman, 2009, p.48). Without sufficient information, authorities face difficulties in responding or anticipating a crisis, as already was evidenced in 1997/1998. For this reason, this study deems it necessary to investigate this phenomenon. The discussion of the proposed framework will be explored further in Chapter 9.

There are at least two milestones in the financial sector's development in Indonesia between 1997 and 2000, which shows a substantial reform in this sector. These key developments were, firstly, the enactment of the Central Bank's new law, which contained new structure and policy objectives for the monetary authority and the issuance of government securities in dealing with the banking crisis. By 1999, the Central Bank was awarded a mandate as an independent body, as stipulated in the new law. Its central position as the monetary authority was assured by this law as the law ensured the Bank supersede the function and existence of the Monetary Board.

Furthermore, there was now a guarantee that the monetary policy would be developed without government's intervention.

Secondly, following the crisis period, in 1999 the government policy for developing the bonds market commenced by establishing the securities commission with the first task of handling the banking crisis. This commission had its first task to issue government bond to recapitalise the banking sector as a result of the financial crisis and to finance the budget deficit. The issuance of the government bonds was part of the government strategy for handling the solvency and liquidity problems within the banking sector. The issuance that reached the amount of IDR670trillion had several objectives, firstly, a portion of the issuance was allocated to the banking sector restructuring programme under the coordination of IBRA, and secondly, it was also allocated to support the financing of the budget deficit. This amount was equal to half of Indonesian GDP in 1999, and nearly 30% was distributed to the state-owned banks (Nasution, 2015, pp.77-78 and 108).

2.06   The period of 2000 to the present

Starting from the year 2000, Indonesian economic and financial indicators depicted an improving economic performance. On average, according to the WDI, in the post-crisis period that covers the year 2000 up to 2015, the Indonesian growth rate reached 5.3% per annum, which represented a leap from minus 13% in 1998. Nevertheless, this post-crisis' achievement was still below the growth in the period of 1990 up to 1996 that reached around 8% per annum. Even though in the post-crisis period the Indonesian growth rate was positive, compared to the other neighbouring countries such as China and India, the rate was relatively low. These two countries during 2000–2005 reached 8% per year on average. The particular factors that impeded the acceleration of Indonesian economic growth were political instability, poor investment climate (Adiningsih, 2007), and natural disasters. Firstly, there were events that adversely affected the national security within this period, for example, a series of terrorist attacks, namely the JSX bombing, the first and second Bali bombings, and the Australian Embassy bombing. Secondly, toward the end of 2004, there was a tsunami that created a huge devastation in Aceh, a province in northern Sumatra. This natural disaster was then followed by the eruptions of some volcanoes in Indonesian two main islands, Sumatera and Java. Multinational cooperation from many countries helped Indonesia to recover by conducting the resettlement of residents and reconstruction of infrastructure. Thirdly, poor investment climate

became another problem. Lack of infrastructure, local governments' conflicting regulations, and complicated business licensing were factors that made the investors reluctant to invest.

There were mergers among the commercial banks to strengthen the domestic banking sector. Four state-owned banks merged to become one bank (Bank Mandiri) and sixteen private banks became three banks (Bank Permata, Bank Danamon and Bank Century). In its development, the possibility of foreign financial institutions to own the domestic commercial banks allowed the foreign penetration to the domestic banks (Nasution, 2015, p.114). There are several domestic banks that were sold to foreign institutions that hold the majority of equity. At least fifteen foreign financial institutions purchased and held the shares of sixteen domestic private banks. Up until today, there are discussions regarding foreign ownership in the domestic financial institutions whether foreign ownership facilitates modern banking practice and enables the local bankers to learn from them or not. Nasution (2015, p. 115) underlines the potential problem that may emerge if these banks would mainly depend on their source of financing from their parent companies. It is possible that these banks transmit adverse events, which may trigger instability in Indonesian banking sector, especially when the parent companies or their country of origin face problems.

The Central Bank's main task was to stabilise the exchange rate as stipulated in its law that enacted in 1999. The Central Bank states that the exchange rate regime adopts floating exchange rate arrangement, which should be distinguished from free-floating mechanism. This classification follows the IMF through its annual report on Exchange Rate Arrangements and Exchange Restrictions (AREAER) 2015. According to the IMF (2015), the classification of exchange rate arrangements has four categories, which range from hard pegs to floating regimes. Referring to this classification, floating exchange rate arrangement is the exchange rate mechanism by which the Central Bank may intervene the exchange rate frequently and is adopted to lessen the steep changes of this rate and avoid its extreme fluctuation (IMF, 2015, p.72). It can be inferred that in practical the floating exchange arrangement that is adopted by Indonesia is similar to the managed-floating definition. The rest of the study will use the term 'floating exchange rate' arrangement to describe Indonesian exchange rate regime. By adopting this exchange rate regime, the monetary authority has challenges to maintain the exchange rate stability. Thus, the Central Bank may undertake the management of the interest rate and, in certain cases, the Central

Bank may intervene in the exchange market, which requires sufficient foreign exchange reserves. By accumulating the reserves (Nasution, 2015, p. 37), the Central Bank can curb excessive exchange rate fluctuation. A less volatile exchange rate may facilitate reduced uncertainty for export-import activities.

In the early 2000s, the government issued government securities in order to finance its budget deficit, in addition to the funding that was come from international financial institutions. Before the 2000s, some projects obtained their financial support via external loans mainly from the World Bank, Asian Development Bank, Islamic Development Bank and bilateral cooperation with some developed countries. Starting from 2001 however, the government shifts its strategy on budget financing, from institutional financing to market financing. The development of the securities market took several stages in order to achieve the objectives to support budget funding and as a 'benchmark' for state-owned and private companies' issuance. Up until 2005, issuances were made in the domestic market, but it was considered necessary to tap from global financial market considering the needs to finance the expenditure in USD. This decision was a currency matching strategy. Besides, there were also a series of issuances in the form of JPY and EUR securities to achieve market diversification. By issuing government securities as a source of financing, the government facilitated the domestic private sector to have a benchmark for the issuance of corporate securities. Up until today, there is no restriction on non-residents purchasing and owning government securities. The foreign ownership of government securities tends to increase from time to time, and there are two different views on this matter. On the one hand, some institutions, such as rating agencies and international financial institutions, put their concerns on the government securities management. On the other hand, foreign ownership shows global or foreign investors' confidence in the Indonesian bonds market. Similar to foreign ownership in the equity market, the foreign ownership of government securities can make the financial market vulnerable. In this case, government securities are considered as the liquid financial assets. So, they can be sold, and the ownership can be moved easily. As the financial system, recovered from the crisis, non-residents and foreign banks privatised some commercial banks.

In the capital market development, the equity market has also developed markedly. The number of companies in the Indonesian stock market is increasing, and the daily trading typically begins with positive trends in its composite index. In 2007, there was a merger of two stock exchange companies to form the IDX.

In the second semester of 2005, the Indonesian financial market faced a mini-crisis. It started in the first quarter of 2005 when domestic investors felt discomfort at the increasing global oil price. They concerned by the sustainability of the government budget since a large portion of the budget was allocated for fuel subsidies (Abimanyu, 2009, p. 137; Ministry of Finance, 2016). If the domestic oil price was kept stable, the amount of fuel subsidy would be increasing and would lead to the widening of fiscal deficits. These investors predicted that the only way for the government to find the funds for its budget was via an additional issuance of government securities, though the additional issuance would add the outstanding debt and might make the government budget unsustainable. An additional issuance was believed by certain domestic investors to potentially create a crowding out effect for private corporations. Additionally, the continuing increase in global oil prices left the government with very few policy options, in this case, that of increasing the domestic oil price. There were two rounds of oil price increases, the first round in March 2005 by an average of 26%, and in August 2005 by an average of 126% (Abimanyu, 2009, pp. 136-137)[8]. As a result of this decision, there was an increase in general prices, which created an expectation of higher inflation and by the end of the year, the inflation rate in 2005 reached 17%, the highest rate in the post-crisis period. The monetary authority took action by increasing the policy rate. The positive movement of policy rate had an impact on the increasing time deposit rate, which offered a higher rate than the rate of returns in mutual funds[9]. Some investors, especially those who are new and do not have sufficient knowledge of financial instruments, shifted their investments from the mutual funds to the time deposits that was followed by the redemption for cash or taking a long position on the foreign financial instruments, leading to the increase in gross capital outflows.

The advent of GFC in August 2007 can be seen from the shock in the global financial market as BNP Paribas decided to freeze its funds that were exposed by the subprime mortgage. This decision triggered the increasing towards investors' sentiment and caused the risk aversion among global investors. One of the impacts is the evaporation of global liquidity (BBC, 2009). Moreover, the BBC (2009)

[8] The domestic oil price is determined by the government, which sets and announces the official price for LPG, premium gasoline, and diesel fuel.

[9] A mutual fund is a type of investment security that is used by a group of investors to gain returns under the management of an investment manager.

described that global financial market entered into a more serious situation as the cost of credit increased sharply. Some Central Banks, for example, the US Federal Reserve, the Bank of Canada, the Bank of Japan, and Bank of England tried to intervene. The US Federal Reserves injected liquidity and cut the Fed rate several times. However, these policies did not show any significant impact. This situation also gave impact on Indonesian financial system, especially the stock market and bonds market. The IDX plummeted to reach 1,355.4 in December 2008. This December 2008 figure was nearly half of its January 2008 figure, which recorded at 2,627. In the bonds market, the 10-years government bonds yield also experienced almost a similar situation. In January 2008, on average the yield was at 9.95%, but then it sharply increased to reached 16,1% in November 2008. However, this condition was not last long since in the following period the financial system was recovered from this shaky condition. Some factors that possibly affect this improvement are the policy to set the low-interest environment in the developed countries, the higher interest rate in the domestic market, and Indonesian good economic performance amid the GFC. These factors are then also attracted the foreign capital to flows into the domestic financial system.

To deal with the high capital inflows as a result of the GFC in the period of 2007-2010, the Central Bank passed some regulations. The first regulation, which was the one reinstated in 2011, concerned the ceiling for external borrowing by the banking sector. According to this regulation, all commercial banks should maintain the amount of their short-term debt at less than 30% of their capital. The second regulation is the minimum holding period in purchasing the CB certificates. This regulation has been amended several times, for example, in 2010 the minimum holding period was one month, and then it was revised in 2013 to six months. The Central Bank used the momentum of high flows of capital that came into the domestic financial market to implement these regulations and gain a positive response from the financial market investors. There was no adverse effect in Indonesian financial market such as that which occurred in Thailand when the implementation of government policies in dealing with foreign capital flows created a sharp drop in Thailand's stock index, and then Thai's government abandoned this kind of policy.

2.07   The fragile financial system

The government policy to implement financial reforms starting from the 1970s have the intention to ensure the availability of financing source and boost the economic

growth. The policy option that was taken by the government for pursuing this objective is by modernising the financial system through the adoption of financial liberalisation, which covers internal financial liberalisation and external financial liberalisation. From the point of view internal liberalisation, it is expected that the implementation of financial liberalisation will increase savings, which are argued to become a source of financing. With increasing funds availability in the financial market, economic agents have access to finance their investments or business expansions. Meanwhile, the external liberalisation facilitates the country obtaining foreign funds.

One principle of financial liberalisation is minimising government intervention in the financial market. Within this principle, modernising the financial system is done by shifting the government dominance into the market-oriented financial system, which is then translated into several dimensions (Cole and Slade, 1996, pp. 355-356) or policy implications (Arestis, 2006, p. 351). Firstly, the government lessens its role for facilitating targeted groups, for example, farmers and small merchants under a specific allocation of credit programme. Secondly, the government no longer sets the ceiling on lending and deposit interest rates; these rates are market determined. Thirdly, to ensure the easier access for economic agents to obtain funds, the government lifted its restriction for commercial banks to open its branches. Fourthly, the policy allowing the private sector to borrow from abroad was enacted in the 1980s, as well as the opening the capital market for foreign investors.

Following the implementation of financial liberalisation, some economists argued that these policies elevate Indonesian economy since they gave a better access for financing (Juoro, 1993; Harris *et al.*, 1994; Goeltom, 1995). However, at the same time, financial liberalisation may bring serious consequences. At least several indicators can show how financial liberalisation gives impact on the fragility of the domestic financial system such as the increasing volatility of non-FDI flows, increasing stock market volatility, and trend of increasing short-term external debt.

2.07.1 Increasing volatility of non-FDI flows

One dimension of financial liberalisation is the increasing flows of capital that come into Indonesian domestic financial market. This study defines capital flows as cross-border financial transactions (Bluedorn *et al.*, 2013) and considers the origin of the investors, whether they are residents or non-residents of a country in purchasing or selling the financial assets. According to Bluedorn *et al.* (2013), gross capital inflows are the country's external liabilities, which would be represented by a positive sign if

the country has more external liabilities than its assets, and a negative sign if the country's external liabilities are declining. Gross capital outflows are understood as the increasing of external financial assets held by residents, which means positive outflows and decreasing external financial assets when residents sell their foreign financial assets or negative outflows.

Figure 2.3 shows the movements of some categories that construct the flows, which consist of direct investments, portfolio investments, derivatives, international reserves, and other investments (IMF, 2009). This study excludes the monetary authorities and general government from 'other investments' to emphasise the role of the private sector and banks. It is argued that the omission of the official flows will help to capture the private and banking sector movements during the volatile period (Bluedorn *et al.*, 2013; Kaltenbrunner and Painceira, 2015).

Figure 2.3 Indonesian gross capital flows (Ratio of GDP)
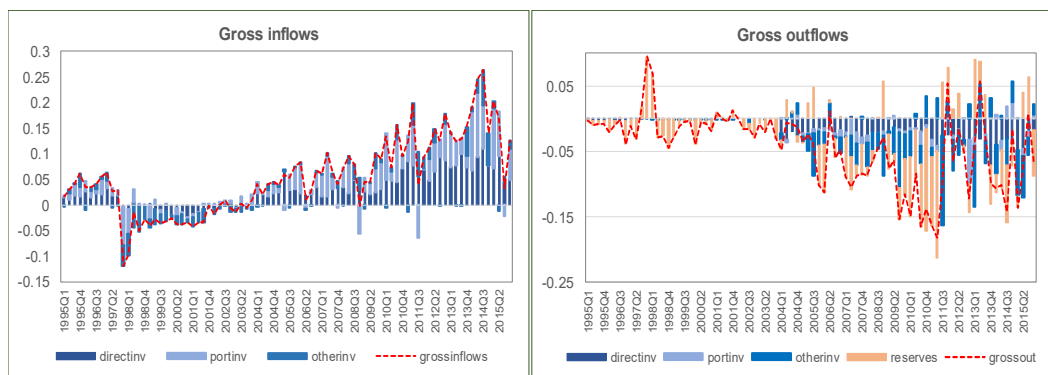
Source: Own calculations based on IFS-IMF and Bank Indonesia

From Figure 2.3 in the left column, by comparing the period before and after the financial crisis, there is a shift in the type of capital flows. Before the 1997/1998 financial crisis, the source of financing is in the form of direct borrowing with a small portion of portfolio investments and direct investments. Meanwhile, in the post-crisis period, the flows are mostly in the form of portfolio investments and direct investments. It can be inferred that in the post-crisis period the development of the financial system plays an important role in the availability of financial instruments for investors to place their funds into the equity market, rather than through direct borrowing or export credits mechanism. Through the gross inflows figure, the portfolio investments and other investments showed a tendency to become negative during the crisis period, meaning that foreign investors pulled out their funds by selling their financial assets and the country experienced declining external liabilities. These

events occurred in 1997/1998 during the Asian financial crisis, in 2008 during the subprime mortgage crisis, and in 2011 with the deepening Eurozone debt crisis. The right column of Figure 2.3 shows the gross outflows between 1995 and 2015. In certain cases, this figure reveals the domestic investors' activities in purchasing or selling foreign financial instruments. In the period of 2004 onwards, the net capital outflows mostly take on negative signs. With regards to portfolio investments, the negative signs mean that the domestic investors were reducing their ownerships of foreign financial assets. This phenomenon happened in the period of 2008-2011 when developed countries experience financial crises. Within this period, most of the domestic investors that invested their money in the global financial market sold their foreign financial assets and invested their funds in the domestic financial market.

As depicted in Figure 2.3 above, the flows of capital can take the form of direct investments, portfolio investments and other investments. Direct investment is considered the type of flow that is less volatile, while the portfolio investment is very volatile and easy to be moved by the funds' owners from one financial market to the others. Considering the characteristics each type of flow, the portfolio investment is argued as the most fragile type of flow and can cause fragility within the domestic financial market. With this reason, this study will explore the way that portfolio investment contributes to the crisis occurrence. Thus, it is necessary to exclude the flows of foreign direct investments from the analysis. By focusing on the portfolio investment, the figure on the short-term capital flows is expected to draw out the emergence of financial instability in the open-market system. Figure 2.3 tries to convey this message. As portrayed by Figure 2.4, when the government enacted the regulation to widen the possibilities for foreign investors to purchase private sector shares in the stock market by the end of the 1980s, some portfolio inflows show the tendency to be positive. During 1981–1989, the average capital inflows reached only USD 149million a year. The significant development was shown in the period of 1989 up until 1996, before the crisis period, when the average of inflows reached USD 1,284.6million. However, at the beginning of 1998, there were negative inflows experienced by the Indonesian financial system up until 2002. On average, the capital inflows to the country was negative USD 1.205million a year during 1998 up until 2002. By examining the movement of non-FDI inflows, this figure also confirms the way that financial instability is formed by the volatility of short-term capital inflows.

Figure 2.4 Non-FDI inflows (USD millions)
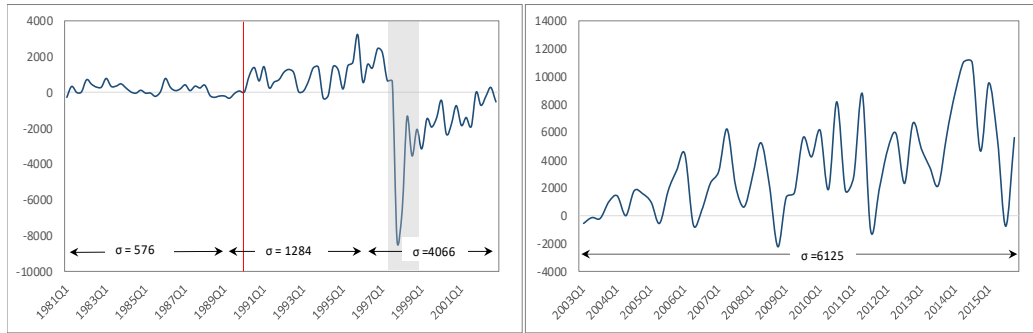
Note: For a better presentation, the figures on non-FDI inflows are divided into two periods. The left panel is the pre-crisis and crisis period, while, the right panel is the post-crisis period; the vertical line shows the financial liberalisation measures in the stock market; the dash area highlights the crisis period.

Even though in the post-crisis period the non-FDI inflows are mostly positive, by examining its movement, one may see that there is a perceived risk contained in this type of flows. A series of increase amounts of non-FDI inflows, which is followed by significant amounts of their reversals can create the volatility of the flows. In this section, the volatility of the inflows to the domestic financial market is calculated simply by its standard deviation. The post-crisis period has the highest standard deviation, suggesting growing instability in the financial system.

2.07.2 Increasing of role of foreign investors

In the period of 1984-1996, Indonesia experienced relatively stable net capital inflows. However, there was a shift in investors' expectation, which then changed the condition and the country faced a sudden reversal of capital inflows. This event was the onset of the financial crisis that severely hit the country's economy during 1997/1998. In this section, the discussion will focus on exploring and comparing the 1997/1998 financial crisis with the current condition.

The previous section shows that portfolio investments and private investments entered the Indonesian financial market starting from the 1980s, and based on the left panel of Figure 2.5, the net capital flows rose, especially in the late 1980s up until the beginning of the 1990s. This movement is in line with the movement of the sovereign rating that moves quite modestly from the late of the 1980s, implying the positive expectation toward the domestic financial system. As the government encourages foreign investors to invest their money, the domestic financial market receives a significant amount of inflows, which is being reflected in the increasing IDX composite index starting from 1989. However, there is a shift in investors'

expectations that reflected a sharp decline in the country rating. This event leads to the investors' decision to sell out their financial assets, which can be shown by the negative inflows. The portfolio investments dominate the inflows to this country. Hence, once there is an unfavourable condition in the domestic market, the foreign investors will respond it by selling the most liquid instruments, which are their financial assets (Kaltenbrunner and Painceira, 2015). In the domestic market, the unstable financial market is reflected by the sharp decline in the domestic composite index, and at the same time, the government policy response to the instability fails to have any impact. The widening interest rate spread cannot attract the capital back to the country and, even worse, it hits the real sector. The weakening of the domestic currency creates more burdens for the economic agents that have debt obligations in foreign currency.

Figure 2.5 Risk taking, assets prices and the financial crisis: 1995-2003
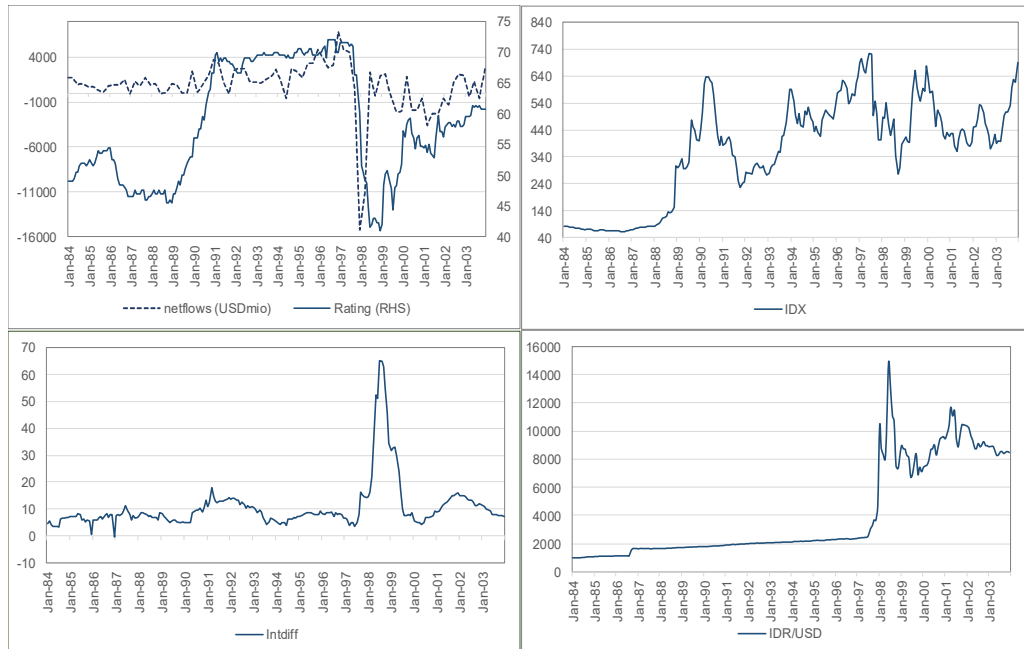
Source: Bank Indonesia, US-Federal Reserves, ICRG and CEIC
Note: The country rating is used to show the investors' risk preference. Some papers use the VIX index to represent this indicator; however, as the data available does not cover the period of the 1980s, this study employs the monthly country rating based on the survey of International Country Risk Guide (ICRG)

A similar pattern of financial fragility also happened between 2004 and 2015, especially in the wake of the GFC in 2008. The investors use the stable country rating during 2004–2007 to invest in the regions that offered higher interest rates, expecting higher returns. Capital flows into the domestic financial market, pushing up the composite index. Figure 2.6 displays the sharp increase in assets prices that is

represented by the IDX Composite Index from around 900 at the beginning of 2004, rising to become almost 2,700 at the end of 2007.

Figure 2.6 Risk taking, assets prices and the financial crisis: 2004-2015
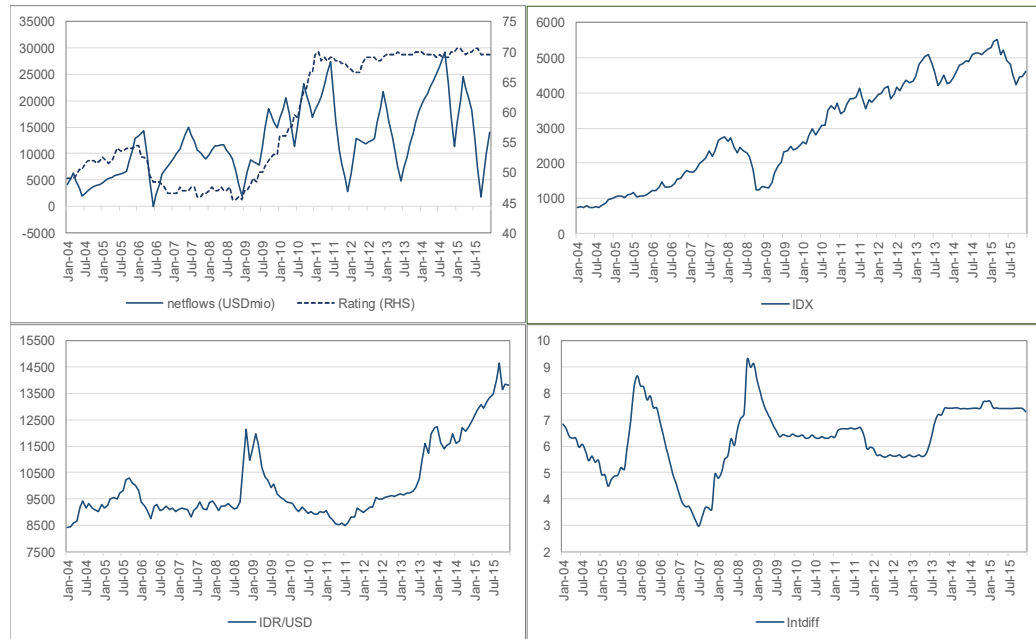
Source: Bank Indonesia, US-Federal Reserves, ICRG and CEIC

In the third quarter of 2008, there was a positive trend of the country rating, suggesting that the view towards domestic financial system was improving and the investors expected positive movements in the financial market. When there is a negative change of investors' expectation, it may lead to the sudden reversals of capital inflows that will be followed by the declining of the composite index. If this event happened, the monetary authority could adjust the policy rate, which results in the positive gap between foreign and domestic interest rate. Following the U.S subprime mortgage crisis, the Central Bank did not make any substantial change in the policy rate. However, at the same time, U.S. Federal Reserves adopted a lower interest rate policy that made the interest differential between Indonesia and U.S became wider than the previous period. Accordingly, the financial market investors responded this event by purchasing domestic financial assets, expecting for high returns. This phenomenon can explain the carry trade mechanism in the developing countries amidst the GFC. In addition to this, the IDX rebounded to reach its previous level of 2700, and it continued to reach the highest level of 5500 in April 2015. However, the increasing of assets prices had been followed by a declining trend or the boom became a bust, especially when this increasing price was constructed from

the fragile instruments that are volatile or easy to change, which is portfolio investment.

From this discussion, the decision to attract foreign investors to the domestic financial market brings the country to be exposed by the external vulnerability. The external vulnerability in the domestic financial market can be built up from negative events that occur in other countries and create instability. In this case, weak economic fundamentals do not cause the instability, but mostly it is triggered by the financial market investors' intention to find a favourable place for investing their money. However, when their view of the country's condition changes negatively, they will pull out and place their funds in other safer financial markets, creating reversals of capital inflows. The declining of capital inflows together with the depreciation of the domestic currency and, to a certain extent, the declining of foreign ownership in domestic financial assets are the examples of the external vulnerability that currently happens in most of the developing countries. This phenomenon also creates a challenge on the way to handle the external vulnerability, which is contributed by financial market investors with their portfolio investments.

2.07.3 Increasing trend of short-term external debt

The government enacted a policy to open access for the banking and private non-bank sectors to obtain external loans. This policy contributed to the increasing amount of external debt; especially the one belongs to the private sector. The need to obtain the source of financing drove these corporations to find additional debt from off-shore financial institutions. The problem could be recognised when there was a shift in the borrowers' preferences towards the shorter type of financing. The portion of the short-term debt to total debt accelerated and outperformed the longer-term debt commencing from the end of the 1980s up until the crisis period in 1997/1998. It is suspected that the domestic corporation was willing to borrow short-term debt since this type of debt offers a lower interest rate, which subsequently may push down its cost of borrowing. However, they forgot the risk exposure that is contained within this type of debt, namely the maturity risk, currency risk and interest rate risk.

By examining the level of short-term debt to the reserves ratio during the 1990s, one can identify the mismanagement of macro-prudential regulation. The historical data on the short-term debt shows that before the crisis period, the outstanding external and short-term debts are higher than the international reserves. At the macro-level, this condition might lead to increasing fragility, especially when there are massive claims on repayment of loan obligations. During this period, it was the private sector

that aggressively obtained an external source of financing from off-shore financial institutions. Unlike the public sector that should deal with its lenders to obtain external debt that is limited by a ceiling issued by the government, the private sector could make any debt agreements with their lenders without any oversight from the government.

Figure 2.7 Total and short-term external debt
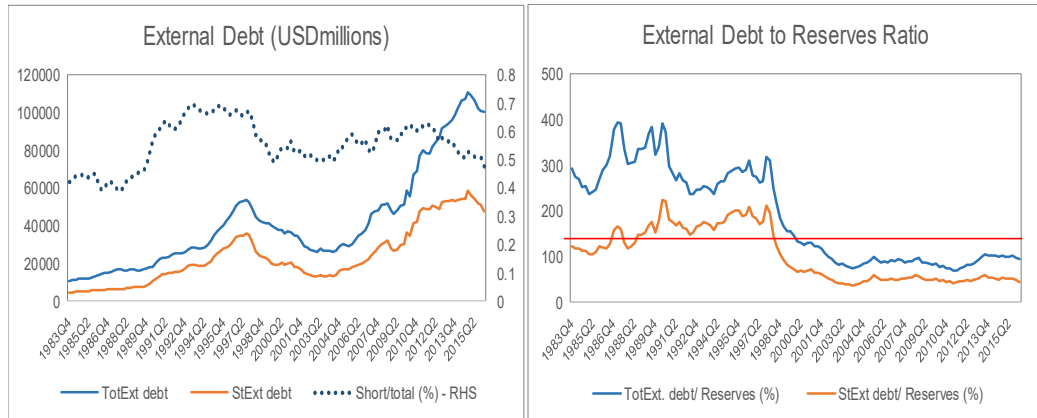
Source: Own calculations based on IFS- IMF and BIS
Note: the external debt is obtained from the international claims of BIS reporting banks

Figure 2.7 depicts the development of the external debt of Indonesia based on data from the Bank for International Settlements (BIS). This data is calculated from the consolidated banking statistics on the international claims of the reporting banks, which is based on its maturity. In a period of 30 years, the movement of total external debt outstanding shows a cycle of boom and bust, where the period of expansion will be followed by a period of a contraction. In 1995-1996 and 2013-2015, the left panel of figure 2.7 shows the period of increasing amounts of external debt. It can be inferred that during these years, the economic agents tried to expand the business, leading them to find the funding to finance their activities. It was during 1998-2003, as the financial crisis got under way in 1998, the debt outstanding presented a negative movement, which then reached its bottom in 2003. The period after 2003 had the opposite trend of positive external debt outstanding that started from 2004 to 2013, with a small shock in 2009. When the corporations succeed in doing their business within the tranquil period, they tend to ignore the adverse event or crisis period that had just been passed by. It is a phenomenon of a myopic hindsight, which describes the tendency of an economic agent to do the same things or repeat the same decision without considering the perceived risk (Lavoie, 2014, p.253).

2.07.4 Increasing volatility of stock index

From the aftermath of the 1998 crisis onwards, the government of Indonesia has faced great challenges in maintaining the open capital market as a consequence of financial liberalisation and growing concern for its fiscal sustainability. Besides, another challenge also emerges since the government needs to deal with domestic and global investors to maintain their confidence in investing their funds in the domestic financial market. These challenges are also coupled with the pressure coming from the increasing volatility, along with the development of an active and deep financial market since, for the policy makers, volatility tends to threaten the financial market and may transmit adverse effects to the economy. According to Grabel (1996), the increasing volatility leads the financial market investors to shift their investment preferences from long-term to short-term. The financial market investors make this investment decision to minimise loss or take the opportunity to obtain the capital gain.

Figure 2.8 The volatility of stock market return

	All sample	Pre_FL	Post_FL			
	1983-2015	1983-1988	1989 - 2015	1989-1996	1997-2003	2004-2015
Mean volatility	0.0154	0.0055	0.0170	0.0160	0.2200	0.0150
N	8121	1364	6757	2048	1744	2965
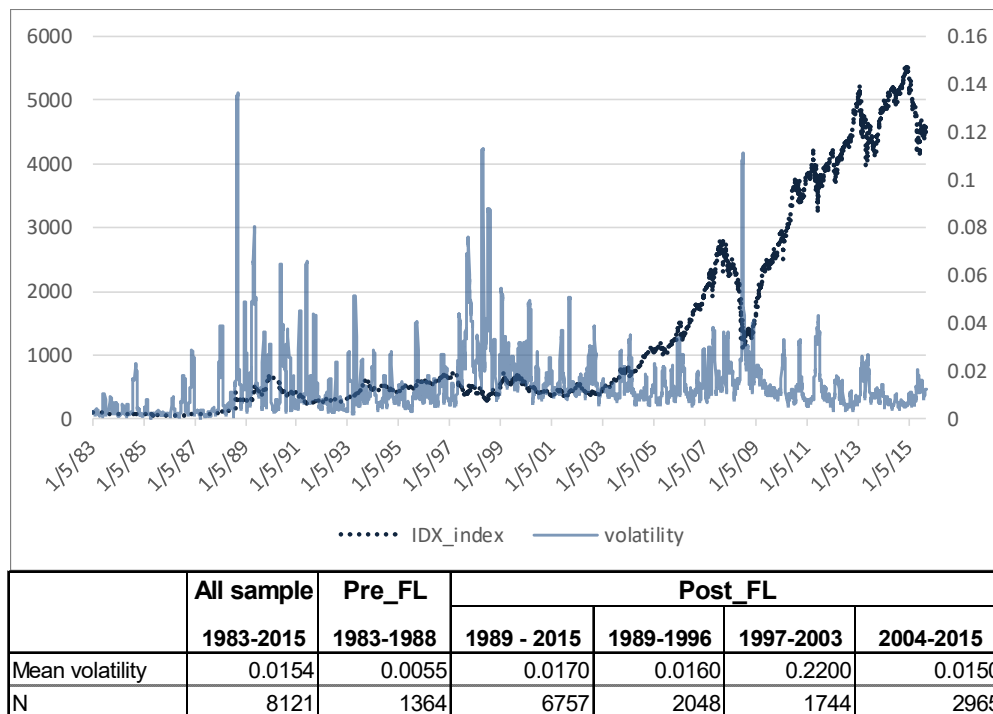
Source: Own calculations based on CEIC
Note: IDX_daily is the daily stock market composite index
*   FL stands for financial liberalisation*

As provided by Figure 2.8, the volatility of financial markets tends to increase during and following the implementation of financial liberalisation. This phenomenon can be

seen from the calculation of the daily return volatility[10] between the pre-liberalisation that took place in the period of before 1988 and the post-financial liberalisation that took place in 1989–2015. Comparing the historic volatility of the daily return of the IDX Composite Index in the period of 1983–2015, the mean volatility of pre-liberalisation is 0.0055, while post-liberalisation volatility is 0.017. The post-liberalisation period is divided into three sub-periods: pre-financial crisis (1989–1996), financial crisis (1997-2003), and post-financial crisis (2004–2015). The increasing volatility can be understood in the sense that the capital mobility from abroad to Indonesia and *vice versa* is easily executed. However, it should be noted that there are some extreme events that potentially became a source of problems for the domestic financial market in the post-crisis period, for example:

- The crisis occurrence in other countries including the tequila crisis, the Russian crisis to the U.S sub-prime crisis, and the European debt crisis. In other words, global financial markets have an impact on the Indonesian domestic stock market. When the subprime mortgage crisis hit the U.S. financial market in 2008, the Indonesian Stock Market trading was suspended for almost a week. This stock market suspension was taken considering the sharp decline in the composite index following the volatile movements of Indonesian macroeconomic indicators. However, a few months after this suspension, the market recovered and reached its peak as the U.S government decided to implement a low-interest policy.
- The volatility of global financial market because of policy made by developed countries, for example, the Federal Reserves' policy to raise its low-interest policy in 2013.
- The worsening of macroeconomic indicators in neighbouring countries also affected the IDX, for example, when China's economic growth was realised to be lower than financial market predictions.

The above explanation shows that the government's intention to build a modern financial system through the implementation of financial liberalisation may affect the instability of the domestic financial market. The movement of several financial market indicators – the non-FDI flows, stock market index, the role of foreign investors, and short-term external borrowing – tend to increase after the post-liberalisation policies were implemented. By comparing the period before and after the implementation of

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[10] The calculation of volatility has been done using the standard deviation of the first difference of the stock exchange daily return (Clark et al. 2004)

financial liberalisation, this study finds that the volatility of non-FDI flows and stock market return in the post-liberalisation period are higher than a pre-liberalisation period. Also, there is a tendency that in the post-liberalisation period, the external debt follows the business cycle – a pattern that shows a series of the period of expansion, crisis, and recovery. The tendency of increasing external debt should be treated carefully since it contains market risk and maturity risk, which may deteriorate the borrowers' balance sheets.

2.08   Conclusion

There were drastic changes that transformed Indonesia from a country that received a huge amount of funding to one that lacked resources, as an impact of the continued decline in oil prices between the 1970s and 1980s. As a response, the government of Indonesia shifted its policy to allow the movement of capital as a means to finance its investments. Several packages of financial reform had already been prepared and then launched in a two-step implementation. The first step took place at the beginning of the 1980s, which led to the policy of reducing the allocation for subsidised credit programmes, removing the interest ceiling, as well as deregulation. The other step was taken in 1988 with the liberalisation of the banking sector and the stock market.

In the following period, Indonesian economy performed better than any other Asian countries. However, by the end of the 1990s, Indonesia experienced a financial crisis, causing a negative growth. The financial crisis became a milestone for reforming Indonesia's financial system that was manifested, by introducing new responsibilities for the Central Bank and the issuances of government securities. In the post-crisis period, it appeared that the financial market of Indonesia experienced a vulnerable condition as a result of the domestic mini-crisis and a series of financial crises that occurred in several developed countries.

In this context, the government is capable of achieving its intention for building a modern domestic financial system. However, the authorities had to face a broad range of issues that needed to be resolved, such as the difficulties in maintaining the open capital market, allocating limited resources amid a growing concern for the fiscal sustainability, and coping with domestic and global investors' confidence.

Chapter 3
An analysis of the models and features of financial crises frameworks

3.01 Introduction

In response to more frequent crisis occurrence during the past 30 years, policy-makers and economists have sought to identify the causes of financial crises and accordingly establish methods of management. There are some financial crisis models, which are dubbed as first-, second- and third-generation models, aiming at explaining the mechanisms of financial crisis. The objective for constructing these models hinges on the idea that the authorities will be eased in locating the cause, prescribing the policy response, and, if possible, predicting the occurrence of a financial crisis. With such crisis models, however, it is held by some—as this chapter argues—that the foundation in constructing the models is based on specific events in a particular country or region, which may not be applicable to other financial systems. Therefore, if there is an occurrence of a new financial crisis, there will be an advent of another crisis-generation model. This chapter seeks to gain a perspective onto the mechanisms of financial crises under the mainstream views, factors that cause crisis episodes, and the way to respond a crisis.

Many economists have attempted to determine the mechanisms of financial crisis, which leads to the argument that financial instability could create a financial crisis (Mishkin, 1999b). Based on this view, Mishkin (1999b) described the process of financial instability in leading to financial crisis. Laeven and Valencia (2013) presented a database on the banking crisis, discussed the policy responses that have been taken by the authorities and proposed a methodology to record the dates of the crises. They highlighted three main types of financial crisis, namely banking, currency, and sovereign debt crises. In line with such types of crisis, the authors emphasised the definition of each crisis by outlining criteria for each crisis condition. Based on these two terminologies describing the state of a financial system, namely financial instability and financial crisis, it is admitted that the need for financial stability is fundamental for every country so as to facilitate the avoidance of such events. Schinasi (2006, p. 11) underlined that the stability of a country's financial conditions is necessary for ensuring the presence of stable macroeconomic conditions.

Efforts are being made in policy-making circles and elsewhere in mind of developing techniques that assess factors suspected of causing financial crisis. These efforts

have several aims: for example, firstly, equipping the authority to construct a policy response and other economic agents to anticipate the adverse financial market situation; secondly, gaining better understanding of how an instrument can be developed to enable authorities to monitor, evaluate and assess the financial condition; and thirdly, finding ways of increasing the country's resiliency to cope with an adverse situation. Furthermore, according to Schinasi (2006, p. 3) the need to maintain the stability of the financial system is one solution for managing the increasing trend of financial vulnerability as an impact of the liberalisation and globalisation of the financial system.

This chapter explores the models of financial crises, the type of financial crises, and various features of mainstream views for defining, finding the cause, and responding to the financial crisis.

3.02   Financial crisis models

The explanations of financial instability are associated with the attempts of various economists to develop an understanding of the mechanisms recognised as triggering financial crises. There are some models that seek to formalise the mechanisms of a crisis and the way in which a financial system becomes vulnerable. Such models expose the causes and thereby link some variables that are suspected of triggering crises. Since these models have occurred in sequence, most economists label each generation as the first-, second- and third-generation models. The first-generation was developed by Krugman (1979) and Flood and Garber (1984), all of whom emphasised the needs to prioritise the implementation of prudential macroeconomic policies to maintain economic fundamentals. Focusing on investors' behaviour, Obstfeld (1994) and Eichengreen *et al*. (1995) developed the second-generation model. This model explains the occurrence of a crisis because of government decisions to defend the value of its currency, and the impact of such on the fundamentals. The third-generation model was proposed following the Southeast Asian crisis and links the role of the country's economic units, its balance sheets, and the exchange rate pressure (Krugman, 1999). Such models will be explored briefly in the following sub-sections.

3.02.1 First-generation models

Krugman (1979), extended by Flood and Garber (1984), developed this model, arguing that the consistency of fiscal and monetary policies supports the

implementation of the fixed exchange rate arrangement. A financial crisis under the first-generation model is caused by the inconsistency of government policy on the implementation of the budget deficit and the adoption of fixed exchange rate regime. Moreover, Krugman's argument involves speculative attacks, as an exogenous factor, which occurred in a period of distress, where such an attack triggers the financial crisis (Iancu, 2011).

The mechanism of crises can be described with the government intention to raise the debt to finance the budget deficit, causing the increasing amount of debt outstanding. The condition was seen to worsen when the government financed the deficit by printing money. This caused the money supply to increase and, with a stable demand for money, this condition may cause the rate of interest to decrease, which then triggers capital outflows (Pilbeam, 2013, p. 455). At the same time, the country adopts the fixed exchange rate. Hence, in an effort to maintain the value of domestic currency, the Central Bank uses its foreign exchange reserves, which leads to a decline in the foreign reserves. Thus, with the authority upholding its fixed exchange rate regime, a speculative attack can occur. Should speculators understand the condition of domestic economy, an attack may be carried out through taking a short position on the domestic currency. Such speculation will continue until the foreign reserves fall to reach a certain level.

There are various issues with this model. The first is linked to the assumption on the government's decision to keep the exchange rate fixed, where such a decision may cause the country to experience a financial crisis. This assumption cannot be easily accepted since it does not exactly describe the real condition. The first-generation model applies to the Latin American crisis of the 1960s and 1970s (Kaminsky, 2003). However, when the European Exchange Rate Market (ERM) crisis occurred at the beginning of the 1990s, the model could not explain clearly the mechanism of the crisis. The second-generation model was developed in an attempt to explain how this crisis erupted.

3.02.2 Second-generation models

Obstfeld (1994) proposed the second-generation model following the ERM crisis of the early 1990s. This model argued that the government policy to devalue or not devalue its currency is based on the trade-off between the cost and benefit of the choice of adopting the fixed or floating exchange rate regime (Allen *et al*., 2002). Through his model, Obstfeld (1994) sought to answer the question on the weakness

of the first-generation model by adding government policy choices to remain with or find an alternative to the fixed exchange regime. Within this model, the government will be more active, and takes necessary action to avoid its exchange rate being attack by speculators. In other words, this model explains how the financial market investors' expectations may affect the formulation of macroeconomic policy (Iancu, 2011).

The following explanation aims at simplifying the mechanism of the second-generation model. Suppose that the authority adopts two policies that may create a trade-off: for instance, the government wants to maintain the fixed exchange rate policy; however, at the same time, the efforts to defend the currency from speculative attack involve the costs corresponding to the devaluation, such as increased inflation (Burnside *et al.*, 2007; Pilbeam, 2013, p. 460). In this model, when investors have a low expectation that the government will devalue its currency, the cost of maintaining the currency is also low. Hence, the government will be unlikely to devalue its currency. In a case when the currency is overvalued but the government does not take the decision to devalue it, this condition may create a tendency of low expected inflation[11]. Thus, this condition will lead national output to become lower than expected. In line with this decision, the government's policy to maintain the fixed exchange rate regime creates a loss of output (Burnside *et al.*, 2007). Furthermore, Pilbeam (2013, pp. 460-461) and Iancu (2011) explained that the government can devalue its currency so as to minimise the loss because of the expectations of financial market players[12]. In other words, market players' expectations will have an important contribution to the government decision since they will determine the cost that will be borne by the government. In this regard, the market perception also plays a critical role since it can change the country's condition, regardless of economic fundamentals.

Nevertheless, this financial crisis model faced a challenge when used to explain the Asian financial crisis of 1997/1998. The occurrence of the Asian financial crisis was different to previous crises since the Asian crisis countries demonstrated good economic performance, consistent macro-policy involving fiscal and monetary

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[11] The currency overvaluation will lead to the condition that domestic goods are more expensive than foreign ones, which may push the import of goods to increase.

[12] Financial market players in this study refer to those who actively involved in the financial market transactions, for example, debt issuers, investors, dealers, etc.

policies, and relatively stable political conditions. Accordingly, the Asian financial crisis led to the advent of the third-generation model.

3.02.3 Third-generation models

During and following the period of the Southeast Asian Crisis, as the first- and second-generation models failed to explain the 1997/1998 financial crisis, the third-generation model was developed. The third-generation model analyses that the cause of a crisis is not a result of government failure, but rather as a result of the private sector role. There are factors that act as the trigger for events of crises, such as the increasing of the private sector's proportion of short-term debt and the increasing of non-performing loans in the banking sector, for example. Such issues were complicated, with an imprudent financing utilisation, such that the economic agents borrowed short-term debts to finance long-term projects.

Some authors (Krugman, 1999; Mishkin, 1999b; Burnside *et al*., 2007) explained the mechanisms and occurrence of the financial crisis in various ways. Firstly, from the point of view of moral hazards, which occur as the borrower has an opportunity to take a riskier transaction or project since the lender covers the risks. Moral hazard problems emerge when economic agents notice a blanket guarantee, which is provided by the authorities to ensure all depositors or trouble institutions are protected (Mishkin, 1997 and 1999b). The blanket guarantee then leads to excessive borrowing by the private sector. Secondly, according to Krugman (1999) and Burnside *et al*. (2007), one key problem causing countries to be vulnerable is the deterioration of the private sector balance sheets as a result of the mismanagement of their debt obligations. Two examples of this mismanagement are currency and maturity mismatches. Thirdly, the financial crisis was triggered by a combination of investors' panic and inaccurate government measures in responding to such. These factors led to massive sudden reversals of capital inflow and increasing capital outflow, subsequently causing the domestic financial market to experience financial market turbulence (Radelet and Sachs, 1998).

Within the third-generation model, some authors (Kaminsky *et al*., 1998; Calvo and Reinhart, 1999; Fratzscher, 2003) explored the role of the contagion effect in triggering the outbreak of a financial crisis. As emphasised by Pilbeam (2013, p. 463), the contagion is possible when interdependence, for example, in the financial sector or trade amongst countries is seen to exist. This statement is in line with the argument of Kaminsky *et al*. (1998), where the policy to devalue the currency of one country

could lead its trading partners to take similar action in an effort to maintain their competitiveness (Tularam and Subramanian, 2013).

All of these models claim to have the ability to explain and provide the mechanisms of financial instability that may trigger financial crises. According to these models, it is expected that a country will eradicate and overcome a financial crisis when it solves the problems lying within domestic economy, such as weak domestic institutions, and when there are strong economic fundamentals in the absence of government interventions (Kaltenbrunner and Painciera, 2015). However, these models were developed based on a situation that occurred in a specific country or region. The construction of each model was adapted from a specific mechanism in a crisis country (Tularam and Subramanian, 2013) and then formalised as it may be applied to other countries. Thus, the models may only apply to a certain condition of a country in a certain time and cannot be used to explain a financial crisis that may be erupted in another country or region in the near future. Based on the above discussion, the first-generation that was built as a response to the Latin American crisis could not clearly explain the following crisis that occurred in the European region and Mexico. This fact led to the advent of the second-generation model. Nevertheless, when the Southeast Asian crisis occurred, the first- and second-generation models were unable to justify the mechanism of this crisis, which then led to the development of the third-generation model. When the GFC occurred, it seems that the first-, second-, and third-generation models also faced difficulties in predicting and explaining this crisis event. Therefore, should another crisis occur and be seen to spread, there would be the possibility that another generation model would need to be devised.

3.03   The definition of financial crisis

Based on historical events, Laeven and Valencia (2013) categorised the types of financial crisis into three distinct groups, namely banking, currency and sovereign debt crises. According to these authors, when seeking to define each crisis that occurs in a country, the following criteria should be considered. Firstly, a banking crisis occurs if there are bank runs, an increase in non-performing loans, and the decline of the banking sector's assets. The World Bank (2016) defines a banking crisis as a situation when there are depositors' runs on commercial banks, where the majority of private and financial sectors face defaults and fail to fulfil their debt obligations on time, which, in turn, accelerate the increase of non-performing loans. During recent decades, there have been a series of banking crises, based on these

criteria, which have been witnessed in several countries, such as Iceland in 2008, Ireland in 2008 and Nigeria in 2009. Secondly, a country experiences a currency crisis when there is a depreciation in the country's exchange rate of more than 30% (Laeven and Valencia, 2008). From this criterion, the currency crisis can be defined as a crisis that occurs in a country that experiences a steep decline in the value of its currency. The countries seen to have suffered from this type of crisis include some East Asian countries during the financial crisis of 1997/1998, Argentina in 2001, and Turkey in 2001. The third type is the sovereign debt crisis, which occurs when a country has a huge amount of public debt, where fears spread pertaining to the financial market about the country's ability to pay its debt obligations, which subsequently results in a state of default. With no ability to pay its debt obligations, the country needs to renegotiate with its creditors (Pescatori & Sy, 2004). Examples of the debt crisis were witnessed in Mexico in 1994, Brazil in 1999 and Argentina in 2002; these countries were then categorised as debt crisis countries.

Up until the occurrence of the Southeast Asian crisis, the definition of the term 'financial crisis' had not explicitly explained the process of the fragility of a financial system. Under the framework of the third-generation model, economists have sought to explore the connection between the fragility of a financial system and subsequent financial crisis by emphasising the role of external borrowing in affecting the deterioration of the private sector's balance sheets (Tularam and Subramanian, 2013). Furthermore, Borio and Drehmann (2009) have argued that it is necessary to distinguish the phases of a banking crisis based on its severity. There are at least three periods that are introduced, namely the existence of a tranquil period, an instability period, and the financial crisis. Based on these stages, the authors define financial instability as the situation before financial crisis, in which a disturbance creates significant damage to the financial system and ultimately leads to financial crisis.

Within the mainstream views, however, the terms 'fragility' and 'instability' are used interchangeably, which suggests that there is no precise differentiation between them. Some factors that create additional problems in defining financial instability include the lack of consensus in terms of its analytical framework, the sophistication of the structure of the financial system, and, to a certain extent, the clarity of its institutional arrangements (Schinasi, 2004; Gadanecz and Jayaram, 2009; Creel *et al.*, 2015).

Schinasi (2004) emphasised various basic principles in defining financial stability. Such principles consist of the following: the concept of financial system development that covers the instruments, institutions and markets; the wide role of finance in the economy; the resiliency of an economy that should be developed based on the dynamic characteristic of the financial market; and the financial crisis's impacts, which should be measured in terms of the real economy's level of severity. Based on these principles, Schinasi (2004) proposed a definition of financial stability as follows:

'…a financial system is in a range of stability whenever it is capable of facilitating the performance of an economy, and of dissipating financial imbalances that arise endogenously or as a result of significant adverse and unanticipated events…' (Schinasi, 2004).

This definition captures two basic concepts of instability, namely (i) that one should be aware of the real disturbance and its real impact on economic fundamentals, and (ii) the ability of such an economy to become resilient from adverse effects or to recover from the crisis. Schinasi (2004) emphasised several fundamental points in this definition. The first point is the range of stability that explains the state or position of financial system stability in a tolerable boundary, which can be measured by the ability of finance in promoting the economic performance. The second point is the ability of the financial system to facilitate the performance of an economy, which intends to explain the role of finance to help the financial market to efficiently allocate resources, accelerate the rate of growth and maintain the performance of the economy. Moreover, the above definition seeks to combine two sources of instability by emphasising the endogenous factor and the exogenous factor. According to Schinasi (2004), the endogenous factor is the process of the accumulation of instability as the financial system—in this case, the banking system—is prone to a liquidity crisis. This problem may occur in connection with the banking sector's role in gathering the funds from savers and investors and distributing these funds in the form of a loan to the borrowers. Meanwhile, the exogenous factor is the existence of shock or various adverse events that occur to affect the financial system.

3.04   The causes of and responses to deal with financial crisis

The causes of financial crises under mainstream views can be summarised into two factors. The first mechanism is related to weaknesses in the financial system, which covers the government and market failure; the second channel is the liquidity problem in the banking sector. In some cases, the occurrence of a crisis is the combination of

both of these factors and the presence of adverse shock attacking the financial system (Mishkin, 1997, 2001; Krugman, 1999; Corsetti *et al*., 1998).

From the crisis-generation models, the first- and second-generation models explained the mechanisms of the occurrence of a financial crisis, and have discussed their causes, emphasising the role of government policy and speculative attack. The first-generation model has underlined the inconsistency of government policies as the cause of financial crisis. One of the common policy responses that should be taken by authorities under this model is the avoidance of the occurrence of a financial crisis by preventing the conflict between fiscal and monetary policies. The second-generation model emphasises the shift of financial market expectations towards the government's decision to maintain its fixed exchange rate. Since market expectations can affect government decisions, the second-generation model prescribes the policy in terms of how the government should take the decision in the period of currency crisis, such as minimising costs by devaluing its currency (Flood & Merion, 1996). Under the third-generation model, the explanation of the causes and policy responses to the financial crisis are different to the previous two models.

Mishkin (1997, 2001) framed his analysis in line with the assumption of financial market imperfection. According to Mishkin (2001), the financial market cannot efficiently perform its function to channel the funds to the economic agents since they do not have perfectly similar or identical information on such transactions or financial instruments. Mishkin (1997) explained four factors as being the causes of financial instability, comprising increasing interest rates, balance sheets deterioration, the deterioration of non-bank balance sheets, and increasing uncertainty, which are considered as adverse shocks. The financial system becomes unstable when these factors are transmitted to the financial system and are seen to hinder the flow of information, which creates an ill-functioning and inefficient financial market. As a result, Mishkin argued that the government should be more active in undertaking prudential supervision, promoting market-based discipline, strengthening domestic institutions, and improving risk management.

The analyses of financial instability under mainstream views commonly focus on the relationship between financial instability and the structure of financial system, especially in the banking sector. Banking sector distress is argued as being the central problem that creates disruption into other sectors in the country, leads to the deterioration of macroeconomic indicators, and is expected to cause increasing

financial crisis costs (Borio & Lowe, 2002). Moreover, in the case of developing countries, private sector reliance on the banking sector is much greater than those of some developed countries. If there is a vulnerability within the banking sector, negative effects on the economy may be witnessed. In most cases, when a crisis occurs, domestic financial institutions face liquidity problems as they experience a shortage in liquid assets.

Commercial banks are exposed to liquidity risk, which may create vulnerability across the banking sector. According to Knittel *et al*. (2006, pp. 258–260), in its daily operations, commercial banks have a task as intermediaries to channel funds from depositors to borrowers. Within this operation, there are two dimensions of the utilisation of money that affect the commercial banks, namely short-term and long-term. In lending funds to borrowers, commercial banks engage in long-term transactions since loan repayment from borrowers depends on the schedule provided in the loan agreement. On the other hand, the customers may claim their money at any time. In the normal period, commercial banks can manage its liquidity by obtaining credit from the banking system, encouraging their customers to make deposits, selling financial assets on the capital market, and using the Central Bank's lending facility (Knittel *et al*., 2006, p. 259). However, during the crisis, it is difficult to meet customers' demand for cash since the process of converting assets to cash or finding a lending facility cannot be performed simultaneously. Accordingly, a liquidity crisis or liquidity problem will be experienced by commercial banks as their liquid assets—which are their stock of liquid reserves—are seen to be less than or cannot cover their liabilities—more specifically, their deposits. In an effort to deal with this problem, the Central Bank can step in by providing liquidity support to the illiquid banks. As an example, during the period of the 1997/1998 financial crisis, the Indonesian Central Bank used liquidity assistance and operated as the lender of last resort to save the condition of the banking sector, accompanied by a higher interest policy. This practice can also be found during the current European debt crisis, when Greece supplied liquidity to its banks (Deutsche Bundesbank, 2012). The effort to help the banking sector out of its liquidity problem is one of the mainstream view's policy prescriptions; in many cases, however, the implementation of tight monetary policy causes the corporation to experience burdens. Tight monetary policy in the crisis circumstance is argued as worsening economic conditions and weakening private sector balance sheets. With a high-interest rate policy, the debt-to-equity ratio in the private sector will change drastically as a result of the escalation of its numerator, which is the outstanding debt. In other words, besides the problem of

liquidity, there is another problem of solvency; this is seen to have a crucial impact and endures in the longer period.

3.05   The approach to measuring financial instability

Tymoigne (2010) described two different approaches to financial instability, the evolutionary or dynamic approach, and the static approach. The first approach is the evolutionary or dynamic approach, which considers financial instability as a process within the financial system that changes the structure of the economy to become fragile and where this change may occur even in a tranquil period. The examples of dynamic approach will be discussed further in Chapter 4.

The second approach is a static one that assumes financial fragility as a state and treats the exogenous shock as the cause of the financial system becoming unstable, and may lead the country into the stage of crisis (Schroeder, 2009; Tymoigne, 2010). This approach uses different variables to develop an index that is expected to give a signal that policy-makers can take as an indication of the occurrence and severity of a financial crisis. Some economists (Kaminsky *et al*., 1998; Kaminsky and Reinhart, 1999; Goldstein *et al*., 2000) developed the instrument with this approach, which intends to send a signal before the crisis outbreak and has named it the EWI. In developing the instrument, the method involves existing variables capturing financial system movements, such as macroeconomic indicators including real, household and corporate sectors, financial liberalisation indicators, the external sector and the financial market indicators. Furthermore, there are efforts focused on building the instrument in mind of assessing the condition of a financial system by developing such index. This effort arises in response to the growing need amongst policy-makers to anticipate and implement the necessary policy for handling financial fragility.

3.05.1 Early Warning Indicators

Kaminsky and Reinhart (1999) proposed the so-called EWI to gauge the vulnerability of economic conditions. Borio and Lowe (2002), Borio and Drehmann (2009) and Drehmann *et al*. (2011) expanded this method by focusing on banking crises. The main purpose of such studies was to determine effective indicators that could prevent a country from crisis occurrence. The analysis is conducted by identifying the gap between the long-term trend and the current level of each concerned variable. This step is followed by setting up the threshold to capture the extreme movements and assessing the accuracy of each variable by comparing it with the crisis episode.

Some indicators that are commonly used include the ratio of private credit to GDP, economic growth, exchange rate movement, stock prices movement, monetary aggregates, and the Central Bank policy rate.

3.05.2 The Financial Instability Composite Index

Bordo *et al*. (2002) developed the US financial instability index by aggregating four sub-indices that consist of the rate of business failures, banking system conditions, real interest rate, and interest rate spreads. Through this analysis, the annual sub-index is computed from the annual values minus its median, which is divided by each sub index's standard deviation. These sub-indices are summed to obtain the composite index, which is meant to be a forward indicator of a financial crisis. Bordo *et al*. (2002) set the threshold based on the value of the standard deviation of the composite index to determine the crisis period, and further classifies the crisis period when the index exceeds 1.5 standard deviations. With this threshold, it seems that, when the index reaches 1.5 standard deviations, the financial system has already entered the crisis period. In other words, the index cannot fulfil the intention as a forward indicator.

Following the attempt to develop and measure the financial instability index, Illing and Liu (2006) maintained that the structure of a financial system is fragile to experiencing a shock. When there is an economic shock, the shock will be transmitted to each economic unit within the financial system and will accordingly affect the economic unit's financial condition. As a result, the economic units will experience cash flow and balance sheet problems. The authors argued that one should emphasise the banking sector, foreign exchange market, debt market and equity market. With these four sub-systems, it is possible to develop an index that measures financial conditions and predicts the state of instability. Following this work, there are methods focused on developing the crisis index, as presented in the works of Hakkio and Keeton (2009), Hollo *et al*. (2012), and Louzis and Vouldis (2013).

These methods are extended and improved by involving the current techniques on econometrics, adding other financial market variables, or using high-frequency data. There are several steps to developing the index: for example, one should calculate the sub-index of each market segment based on the relevant variables. This step can

be done by standardising[13] or manipulating market segment data using common techniques, such as principal component analysis, cumulative distribution function, or weighted-average, so as to produce an index. These methods are argued as showing the ability to capture financial instability that may lead to the financial crisis. Once each sub index of the market segment is obtained, all sub-indices can be aggregated to achieve the composite index. However, Borio (2009) emphasised two aspects of financial instability measurement: the first deals with the assessment of a financial instability measurement that was done and taken by the authorities, or an *ex-post* financial instability measurement; the second factor is the *ex-ante* financial instability measurement, which focuses on the measurement of the level of current instability, and whether or not it pressures the financial system. By understanding the level, authorities will be well positioned to identify the strategy or response needed to tackle the problems. The author asserts that the instrument for measuring the instability of a financial system is needed by the government and agencies concerned, such as the Central Bank and Financial Service Authority, in helping them to evaluate their performance in decision-making and supporting them in assessing the current economic or financial condition. According to Borio (2009), most of the instruments offered have sufficient sensitivity and ability to measure past and current conditions, but are weak in forecasting future situations. In other words, the *ex-ante* measurements lack the capability to capture the financial conditions and transmit the useful information that permits authorities to respond with a more precise strategy.

The following chapters, namely Chapter 6 and Chapter 7, will discuss the methods commonly used in dealing and measuring financial instability, based on the frameworks previously discussed. The intention is to explore the applicability of these frameworks using empirical data, which then needs to be examined in line with the facts or historical events, either in the case of domestic or global events.

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[13] Two types of data rescaling are standardisation and normalisation. The first term refers to the process of data transformation to have mean of 0 and standard deviations of 1. Bordo *et al* (2002) used standardisation process in calculating the index. The latter refers to the process for finding a same range of value in order to minimise biases. The normalisation scales all data to have value in the range of 0 to 1.

3.06   Conclusion

The objective of this chapter is to gain a more in-depth understanding of financial crises mechanisms under the mainstream views by exploring three financial crisis-generation models. The chapter discusses the way in which each generation model was developed and further highlights the weaknesses of each model in explaining crisis occurrence. From the discussion, this chapter finds that the crisis-generation models are formulated and developed based on a specific crisis event in a country or region and formalised into a model. When the analyses are based on a specific crisis event in a certain period, it is possible that the model will be difficult to predict or explain the occurrence of a financial crisis that may be erupted in a country in the near future.

The analysis also highlights several features of financial crisis under the mainstream views. First, it seeks to clarify the definition of a financial crisis. There are three types of crisis, namely banking, currency and debt, as identified in the literature. Each of these crises has its own definition, which is based on a criterion. In mainstream views, one may find that there is a distinction between financial instability and financial crisis; however, the terms 'financial fragility' and 'financial instability' are used interchangeably.

Second, this chapter succinctly provides an explanation of the factors seen to trigger financial crises, such as weaknesses in the financial system and liquidity problems in the banking sector. By identifying the cause of the crisis, the policy that should be implemented so as to handle the problem focuses on prudential supervision, improvement of market-based discipline and risk management. Within the mainstream views, the crisis that occurred in Southeast Asian countries, as well as the GFC, is argued as representing the issue of liquidity crisis. The policy option that can be adopted by the government in an effort to solve this crisis should focus on providing liquidity support to the illiquid financial institutions.

Chapter 4
Financial Instability Hypothesis: closed and open economy frameworks

4.01 Introduction

In the late 1970s, the U.S. began to liberalise its financial system by introducing the deregulation of financial market that was followed by the decision of the U.S. authorities not to supervise its financial sector (Orhangazi, 2014; Arestis, 2016, p.23). The process of liberalisation came to its peak when the government revoked the Glass-Stegal Act in 1999. Glass-Steagal Act is the law that regulates the separation of commercial bank and investment bank. Furthermore, there is a new law pertaining to Commodity and Futures Modernization Act that was enacted in 2000, which makes transactions in the form of credit default swap and asset-backed securities unregulated (Orhangazi, 2014). Starting from 1999, securitization occurred extensively since there is no regulation to separate the commercial and investment bank. The mechanism of securitization has commonly been used by financial institutions to get rid of their loan portfolio. At the same time, house prices were very high and it opened the opportunity for households to obtain new loans. When the housing prices started to decline, it led to the increasing mortgage loan rate, which gave burden for the borrowers. In addition, the condition was worsened as a result of the borrowers' inability to repay their mortgages. Following this condition, the asset-backed securities that used the mortgages as the underlying transaction lost their value, which then adversely affected the capital market.

To deal with the crisis that occurred in 2007/2008, the U.S. authorities responded through the implementation of conventional and unconventional accommodative monetary policies, as well as the fiscal stimulus and bank bailouts, to maintain the level of domestic economic performance. In particular, with regards to monetary policy, the U.S. monetary authority sets low-interest rate, which was assumed to increase domestic economic activity and encourage growth. However, when the level of interest rate is low or near zero, the U.S. monetary authority may not be willing to push down the interest rate further. One alternative policy is by imposing the Quantitative Easing. This is the unconventional policy as the Central Bank prints money to purchase the government bonds from the secondary market. This mechanism has the ultimate objective to boost the private sector's expenditures (Joyce *et.al*, 2011).

With the high degree of openness among countries and capital mobility among the financial markets, the policy of the U.S. monetary authority cutting their interest rate triggered the funds' owners to find the most profitable place and instruments. The motive of funds' owners is clear: maximizing their profit; hence, a possible way to attain a high profit is avoiding the low-interest environment and seeking a place or instrument elsewhere that offers high rate of returns, even though this decision may involve a higher risk. The developed countries' monetary policy that set lower interest rates may lead to large capital inflows into the developing countries, which adopt higher interest rate. However, this may create a problem for the developing countries especially when the inflows are in the form of portfolio investments (Grabel, 1996). The portfolio investment is a type of flow that is easy to move to other financial markets. If the U.S. authority then increases the interest rate, there is a tendency that the investors will pull out their money from the developing financial markets, which then create negative inflows, or, in the worst cases, the sudden reversal of capital inflows. One reason for the global financial market investors is still investing their funds in the U.S. financial market deals with the investors' view that the U.S. is the safe haven.

There are studies that have explored the cause of the crisis, which are inspired by the work that is developed by Hyman Minsky (1986). Minsky's Financial Instability Hypothesis (FIH) originally starts the analysis on the firm's behaviour to respond tranquil economic conditions. The favourable economic conditions motivate this firm to expand the business capacity by finding external funds. This decision leads to the positive movement of debt to equity ratio. When the firm tends to obtain external funds to finance its investment, this condition may change the firm's financial structure to become more speculative. As more firms in the country have the same decision, the country will experience a transformation to become more fragile financial structure (Lavoie and Seccareccia, 2001, p. 86).

Minsky's explanation of financial instability is quite different to the common understanding of financial instability that focuses their attention on the exogenous factors, for example, relaxed government regulation and the occurrence of external shocks. Minsky's work conveys the idea that instability lies inside the financial system, and that a stable financial system becomes fragile, and stability breeds instability (Arestis and Glickman, 2002; Kregel, 2007). The FIH introduces the view that a crisis happens when the structure of financial system has become unstable.

This chapter will focus the discussion on the financial instability and financial crisis from the perspective of this specific features of FIH.

Minsky's argument is framed in a closed-economy analysis and is explained by identifying important elements that have the potential to create instability. Arestis and Glickman (2002) listed five elements in explaining Minsky's framework under the closed-economy analysis. First, the motive to innovate financial instruments is to gain high profits. As one of the economic units that plays a central role, the commercial banks try to attract their customers by creating a new financial instrument. This activity includes the process to innovate financial product in addition to their daily activities as lenders (Minsky, 1986, p. 237). Second, the behaviour of each economic unit in financing their debt obligations will determine the type of financing units, whether it is a hedge, speculative or Ponzi finance. In the closed-economy analysis, with these type of financing units, it is possible to explain the transformation of a robust economy to become fragile as the structure or composition of the units changes. Third, the carry trade mechanism allows the economic units to take the opportunity to borrow from the financial institutions with a lower interest and invest the funds in the higher interest financial instruments to obtain a higher return. Fourth, the phenomenon of 'success breeds success' motivates the economic agents to gain profits regardless of the risks that may be embedded on the transactions. Fifth, the triggers of a crisis lie within the financial system.

Arestis and Glickman (2002) extended Minsky's closed-economy analysis to an open economy. The discussion emphasised the existence of capital movements between countries resulting from the foreign investors' decision to maximize their profit through the carry trade mechanism. This phenomenon occurs, particularly when the domestic interest rate is higher than the foreign interest rate and the exchange rate is relatively stable, which has the power to attract foreign funds. The capital inflows to the domestic financial system, however, may create another problem, for example, when these flows are followed by the increased government debt to absorb the funds available, or it takes the form of short-term financing (Kaltenbrunner and Painceira, 2015). In most cases, capital inflows to a country occur when there is an entity that looks for a foreign borrowing from abroad; creating a build-up of liabilities of borrower regarding foreign currency and, for the Central Bank, accumulating the foreign reserves. If the debt to reserves ratio is low, the country is categorized as a hedge financing unit. Conversely, when the debt to reserves ratio increases, it suggests that there is a growing amount of domestic institutions' liabilities, which could make the

country a more speculative or a Ponzi financing unit. The increasing debt to reserves ratio may provide a negative signal for investors or speculators, who then intend to sell their financial assets. When this event occurs, the price of domestic assets will drop, which then has a negative impact on the assets and liabilities of the lenders and borrowers.

This chapter will also cover the discussion on the concept of FIH that is developed by Hyman Minsky. The following section will present the framework that commonly used to discuss the FIH, in the closed and open economy, including the famous types of financing unit. The last section is an exploration of the implications of the FIH.

4.02   General concept

Minsky (1986, pp. 68-69 and pp.183-184) framed the discussion of the FIH within a capitalist economy. The term capitalist economy could be described as a system

'using complex, elaborate and expensive capital equipment and as a sophisticated, complex, convoluted, and evolving financial system that makes the indirect ownership of wealth possible' (Minsky, 1986, p. 68).

The capitalist economy involves the activity of economic agents, i.e. public and private sectors, households, and their interrelationships in a financial system that comprises financial institutions, markets, and instruments. The factor that plays an important role in Minsky's analysis is the relationship between non-bank institutions and the banking sector, particularly in financing processes. When a firm intends to expand the business, there are various sources of financing, for example, cash financing, equity shares, and debt. Cash financing is the internal source of financing, which can be used to undertake corporate actions. Since the firms still need to finance its daily activities, however, sometimes there are constraints on utilizing cash financing to meet all the investment needs. If there is a limited amount of cash available or none at all, the firm may obtain the funds by issuing its shares in the stock market. Issuing shares have the consequence of declaring the buyers of the stocks as new owners of the firm and hence, the firm is obliged to generate profits and pay dividends to these owners (Minsky, 1986, p. 69). The third alternative is financing from debt, either in the form of direct borrowing or debt securities. These debt instruments have the consequences of the debtor needing to fulfil their obligations to those it borrowed from. The potential fragility of an economic system will be explored by using this framework.

Further, Minsky (1992) emphasised the banking sector, including the activities of commercial banks, as a particularly important entity in his analysis. The reason to include the banking sector in the FIH is based on the common characteristic of commercial banks. In its daily routine, commercial banks are the credit creators (Lavoie, 2014, p.188). Banks can expand their balance sheets by creating new lending to its customers. As the borrowers draw on the loan commitment, they will spend the funds to finance activities and transfer the money to their counterparts, which would be deposited in a bank account. Hence, this is the mechanism of how loans create deposits. In addition to the money creation function, bankers can also obtain profits by charging the borrowers an interest margin or mark-up in addition to the Central Bank interest rate. Other than the interest rate, bankers maintain their relationship with the customers, and some banks also offer their expertise in financial arrangements to the customers. The effort to maximize profits is natural since bankers need to be compensated for the risks that are embedded in every transaction they are involved in. In so doing, besides undertaking its activity through lending and borrowing mechanism, the banking sector also innovates, creating new financial instruments (Minsky, 1986, p.72; 1992).

4.03   The closed economic system

Minsky's argument is developed within a closed economy analysis (Arestis and Glickman, 2002; Matsumoto, 2007) and explained via an example of the relationship between commercial banks and firms. The central argument of the FIH rests on the relationship between non-bank institutions and the banking sector, especially in dealing with the external sources of financing. External funds can be obtained through direct borrowing from financial institutions. In other words, there are two parties involved based on their role in an economy, namely non-financial institutions – consist of corporations, households, government - and financial institutions. In the lending-borrowing framework, the first conducts itself as the entity who will obtain the funds to finance its investments or activities or as the borrower; while, the latter have an important role in providing or lending their funds to the borrower.

The investment decision proceeds in stages: a corporate action that is being made in the current period will provide an amount of return in the next period. While the returns received today are the result of investment decisions that were made in the past. In the context of investment financed by external funds, the process of obtaining debt to finance investment is brought forward to emphasise the importance of

borrowers' expectation of securing loans and lenders' expectation of lending assessment. As a consequence of the lending and borrowing activities, there will be a schedule of cash flows and liabilities. How firm deals with its income and expenses or payment obligations will determine the firm's types of financing, whether it is a hedge, speculative or Ponzi financing unit. The firm's type of financing is one of the central topics of the FIH. The types of financing will be discussed further in the next subsection, which then will be followed by a discussion of the potential problem created when the structure of these types of financing changes.

4.03.1 Type of financing units

In investment decisions, a corporation will be expected to generate cash flows on income, portfolio, and the balance sheet (Minsky, 1986, p.201). The income cash flows are defined as flows that are generated from the production process, for example, wages, salaries, the production expenses, and earnings after taxes. An economic unit that has income cash flows that meet with the repayment schedule is relatively immune to experiencing a financial crisis. The portfolio cash flows are flows generated from the operation of the purchasing and selling of the corporation's assets or the acknowledgment of new liabilities. The third cash flow is balance sheet cash flows that are generated from the existing liabilities. At the aggregate level, these three cash flows can influence the financial system vulnerability.

There are three types of financing units that can be identified by combining the cash flows of the economic agents with their debt or liabilities. These types of financing units consist of: hedge, speculative and Ponzi finance (Dymski and Pollin, 1992). Minsky (1986, p. 206-208) described the definition of these three types of financing units, which were distinguished by the level of the expected income and payment of obligations or commitments. Hedge financing units are entities whose income cash flows exceed the current and future obligations. Even though a hedge financing unit has debt, but the amount of its debt is low. In other words, the hedge financing unit's cash flows are sufficient enough to fulfil its liabilities commitments (Tymoigne and Wray, 2014, p.22). Speculative financing means that corporations can partially repay their debt obligations (interest payment), but roll over their amortization of principal. This refinancing practice takes place because of insufficient income to fulfil its debt obligations. The speculative financing unit borrows the short-term financing to make a cash payment and maintain its solvency. The last entities are called Ponzi financing or interest-capitalization financing (Tymoigne and Wray, 2014, p.22) that capitalizes its interest and principal payments. Ponzi financing uses new borrowing to refinance

all its debt obligations. Similar to speculative units, Ponzi financing units have greater expenses than income. With this practice, Ponzi financing generates an accumulation of outstanding debt. Among these three units, Ponzi financing should obtain at higher risk premium from the commercial banks than the others when they propose to obtain the debt.

4.03.2 Definitions of financial fragility and instability

One factor that may affect the financial fragility is the economic units' expectation or risk preference with regards to economic performance. The adjustment of the risk preference depends on the financial market situation which affects the financial institutions in assessing their risk tolerance or 'margin of safety'. When the financial market is 'bullish', and the economic units' confidence is high, the borrowers will shift their source of financing from an internal source to an external source to increase their investment (Weise and Barbera, 2010, pp. 215-216). Minsky (1995) maintained that the attitudes of the borrowers and lenders towards risk will change because of the improvement in the financial market condition. In the early stage of economic recovery, the borrowers and lenders are risks averse. This attitude affects their investment behaviour by setting large margins of safety and prioritizing the internal source of financing. In the case where they use the external sources; they keep maintaining their position as Hedge financing units. As economic conditions are improving, this attitude may change to become risk neutral, and there will be increasing corporate actions via external financed investments. At this stage, we may consider this behaviour that of speculative financing units. Finally, as the economic recovery continues, and the economic units being comfortable to expand their business, the attitude will change to become risk acceptance, and the economic units will tend to use Ponzi borrowing schemes to finance investments.

The change of liability structures (Schroeder, 2002) and the transformation of the proportion of financing units will determine the state of the economy (Minsky, 1995). The firm's liability structure is determined by the decision to obtain external financing, which in turn will increase its indebtedness. However, if this decision does not increase the firm's profit and improve the ability of the firm to repay its debt obligations, the firm may be categorized as a speculative or Ponzi financing unit. The increasing ratio of firm's liabilities to its profits will increase the fragility of the firm, and when most of the firms in the economy face this same situation, this condition can yield a financially unstable economy (Schroeder, 2002).

In a capitalist economy, the financial system may frequently change from robustness or resilience to fragile (Dymski and Pollin, 1992, p. 40). To emphasise the difference between these terms, Minsky (1986, p. 204; 1995) explained that robustness is the economic state where it can easily absorb and handle shocks that emerge, and resilience means that the economy can recover quickly after experiencing a shock. Whereas, financial fragility is a condition when the economy is unable to respond to a shock. In other words, financial fragility is negative relative to robustness and resilience. This proposition implies that the state of robustness and resilience contains a high proportion of Hedge financing units, whilst fragility suggests a high proportion of Ponzi financing units.

According to Tymoigne (2010) and Tymoigne and Wray (2014, p. 40), financial fragility as characterized by a high proportion of Ponzi financing can trigger increasing levels of financial instability. By having a high proportion of Ponzi financing units, the economy will be sensitive to a change in variables, namely the interest rates and exchange rates that are associated with the balance sheets and income statements. For example, when there is a sudden increase in the interest rate, the balance sheet of Ponzi financing units will quickly deteriorate. In addition, a deep currency depreciation affects the ability of firms that have external debts. Based on this argument, the definition of financial fragility is a condition when the financial system is sensitive to the movement of the interest and exchange rates and changes in these variables will have an impact on the financial system to become unstable. Therefore, when financial fragility emerges and grows in the economy, it will result in more severe financial instability (Tymoigne, 2010).

From this point of view, there is a distinction between financial fragility and financial instability. It can be inferred that financial fragility is the trigger for financial instability. Hence, financial instability can be defined as a condition that can create an adverse impact on the economy, especially the ability of financial instability to affect the price instability that may cause the debt deflation (Tymoigne, 2010; Lavoie, 2014, p. 286; Tymoigne and Wray, 2014, p. 41).

4.03.3 The cause of financial instability

Minsky (1986) started his analysis with the premise that financial fragility and instability are endogenous. Minsky argued that instability is embedded in the capitalist economy, and the fragility may create financial instability (Kregel, 2007). This argument means that crises happen because of internal factors already located within the financial system that causes the economy to become unstable with regards

to the behaviour of economic agents during the tranquil period (Papadimitriou and Wray, 2008). There are, at least, three mechanisms that may explain the endogeneity of financial fragility and instability.

First, when the circumstances support doing business, profits are positive, and firms try to increase their capacity with new investment. The increasing confidence together with positive profit expectations will be accompanied by the availability of credit. At the same time, the stock market also experiences similar conditions with a rising trend of stock market indices, representing the rising of assets prices, which build strong expectations among the financial market investors of obtaining capital gains (DeAntoni, 2010, p.198). The promising conditions for doing business, together with the availability of funding in the credit market will encourage businesspeople to expand their business and find an external source of financing. When they obtain the debt commitment, on the liability side, the expenses to serve the debt obligations will also increase. DeAntoni (2010) argued that debt commitments could increase faster than a firm's profit, and at a certain level, exceeded it. This condition may bring the consequence that a firm's revenue cannot fully serve the debt obligations, which then may lead the transformation of the structure of the economic units. With this condition, there will be a high possibility of increasing speculative and Ponzi financing units, a condition that forms the fragility of a financial system.

Second, the intention to get a lower cost of borrowing drives economic agents to find short-term financing. There are two main reasons why the amount of shorter maturity debt with flexible interest rates are increasing in a prolonged period of economic growth (Tymoigne, 2010). The first reason is a shorter maturity debt has a cheaper cost of borrowing compared to longer ones. This comparison can be seen from the pattern of a normal yield curve that has an upward slope with horizontal line showing the maturity of financial instruments and the rate of yield in the vertical line. From the structure of its yield, the shorter maturity financial instrument has lower cost since it contains less risk exposure. The second reason is the possibility to roll over the debt principal. The refinancing practice allows the borrower to have options to manage their risks, in particular, the refinancing risk. Because of these reasons, however, the borrowers become more vulnerable and will be exposed to changes in economic conditions.

Third, the transformation from robustness to fragility is possible in an environment of profit-maximizing entities. The commercial banks will guide and accommodate their customers' need (Arestis and Glickman, 2002) to find the way in obtaining more

profits through investing in a certain financial instrument. To attract customers, commercial banks will seek to create new financial products. Minsky (1986, p. 72, 198 and 229-230) noted that a successful financial innovation would generate more profits and spread to the other entities. The success of financial products will be followed by the innovation of instruments, a new type of financial contract and new customers. The disadvantage of new innovative instruments is that they may contain high risks and have a structure that potentially creates financial lost in the adverse economic events. One example of how financial innovation can trigger financial instability and crisis is the U.S. subprime crisis episode. The crisis occurs as a result of the subprime lending that is bundled or packaged in the form of mortgage-backed securities. This type of lending is characterized by low quality of borrowers, with low credit rating or high risk. By repackaging it into a new financial instrument with higher rate of returns, the financial market investors will be attracted and intend to buy it.

To deal with this endogeneity problem, the proposal is to strengthen the financial system by involving a stringent government regulation. This proposal is quite similar to the mainstream views', but the substance and object of the regulation are different. Lavoie (2014, pp.272-274; 2015) explained several points on this proposal. Starting from the lender side, the regulations should have the aim of restricting the entrepreneurial attitude of bankers to lessen the pace of financial innovations. Second, regulation can promote the borrower's circumspection and prevent the borrower from low-quality lending. One proposal that can be considered is the implementation of strict regulations on the advance payment required in lending-borrowing mechanisms. Following the magnitude of capital movements among countries under the open economy framework, one policy that could be implemented is capital controls or the management of capital flows (Arestis and Glickman, 2002; Epstein, 2005; Grabel, 2016). It is typically capital controls that have lately been abandoned by most of the countries as a result of free market principles ruling the global financial system.

The prolongation of an economic boom will eventually experience a turning point and crisis. As pointed out by DeAntoni (2010, p.198), the persistence of the economic expansion may generate the pressure on the inflation rate. When the inflation rate hikes, the monetary authority will impose a tight monetary policy. This policy will subsequently result in a higher rate of interest. In other words, monetary policy affects the solvency of a firm. The mechanism by which the policy of the monetary authority

affects a firm's condition will be explored in the next subsection by discussing the association between the policy rate and the solvency of firms.

4.03.4 Financial instability and firms' solvency in a closed economy

The concept of solvency is important in dealing with the ability of a firm to be able to handle and cover its liabilities by having sufficient assets. It is quite different from the concept of liquidity, which refers to the ability to pay the *short-term* obligations using current assets and it links to the cash flows problem. The issue of solvency deals with *long-term* financial obligations, and within this concept, if an entity is insolvent, it has a problem with its capacity to pay the debts over the long-term. These two concepts should have received an equal attention from the monetary authority as they may have a serious impact on the economy.

A corporation that tends to obtain the external source of financing via obtaining debt may face solvency problem. When a corporation faces a solvency problem, it does not have sufficient assets to cover its total debt. As more and more companies in a country have assets less than their liabilities, the country is possible to enter into an insolvency condition. With the increasing insolvency of corporations in a financial system, the occurrence of an adverse event may trigger debt deflation. According to Tymoigne and Wray (2014, p.41) debt deflation occurs when the borrowers, which may have a problem in their cash flows want to pay their debts by selling their assets. As a result, there is a massive declining in the asset prices. This declining of prices will affect the net worth of other economic units that previously do not face any difficulties. The authorities need a longer time to deal with solvency crisis compared to liquidity crisis since this issue touches the borrowers' and lenders' financial structure. However, according to Tymoigne and Wray (2014, p. 335), the economic agent that requires the help from the authorities is the borrowers. This policy can be implemented by helping the borrowers in restructuring the debts to increase borrows' ability to pay the debt service. It is expected that this policy can have an impact on the lenders as they will gain their long-run profitability. However, in handling the financial crisis, most of the government focuses their attention to save the financial institutions. Hence, instead of focusing mainly on the illiquidity of financial institutions, it is necessary that the authorities pay attention to these two problems, namely liquidity crisis by actively conducting as lender of last resort and solvency crisis (Brancaccio and Fontana, 2013; Tymoigne and Wray, 2014, p. 335).

As mentioned, the solvency of borrowers may be affected by the way the monetary authority determined the level of the domestic policy rate. Wolfson (2002)

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emphasised the stance of a Central Bank in setting up the policy rate and this may be relevant to borrowers. Brancaccio and Fontana (2013) developed a model that could explain the mechanism by which a Central Bank's policy influences the economic agents' ability to deal with its long-term obligations. There are two explanations with regards to the solvency of an economy that involve the firms and workers. However, to get an idea of the mechanism as pertains to firms, this chapter focuses only on the solvency rule model constructed for firms.

The solvency rule involves three equations consisting of the equilibrium of macroeconomic condition, the solvency conditions for firms, and the interest rate model. The first equation describes the relationship between the rate of profit (r) and its deviation (γ) on left side with some main indicators, such as, the rate of inflation (π), the growth rate (g), the ratio of expenditure to income (z), the firms and workers' savings (s_f and s_w), and the quantity of product per unit of worker ($f(k)$) in the right-hand side.

$$(1 + \gamma r) = \frac{(1+\pi)}{s_f} * \left[(1 + g) + z\frac{f(k)}{k} - \frac{\frac{s_w W}{P}}{k} \right] \ldots\ldots\ldots\ldots\ldots\ldots\text{(1)}$$

With this equation, the left-hand side shows the function of firms' income and the right-hand side depicts the expenditure of the firms. The firms will enter solvency if their expenditures, on the right-hand side, are lower than or at least similar to their incomes. When the incomes are lower than the expenditures, the firms are insolvent. Departing from this assumption and including the variable of external financing into the model, the second equation describes the solvency condition of firms, as follows:

$$(1 + i)(1 - \lambda) \leq s_f(1 + \gamma r) \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\text{(2)}$$

According to Brancaccio and Fontana (2013), the variable λ explains how borrowers refinance their debt obligations, which may show the level of financial instability. On this basis, the hedge financings unit will repay their debt principals and interests when these debt obligations fall due with the value of $\lambda = 0$. The speculative financing units need to roll over their debt principals and the value of $\lambda = \frac{1}{(1+i)}$. Since the Ponzi financing units rely on and use new borrowing to refinance all the debt obligations, their value of λ is $\frac{1}{(1+i)} \leq \lambda \leq 1$.

It is possible to draw the equation for the interest rate (i) that is matched with the firms' solvency by combining these two formulas.

$$i = \frac{1}{(1-\lambda)} * \left[1 + s_w(1 + r) + \left(1 + (z - s_w)\frac{f(k)}{k}\right)\pi + g\right] - 1 \quad \text{......................(3)}$$

The right-hand side represents the level of firms' profits and shows that when the value of λ is low or around 0, the level of profit is high. Conversely, when the value of λ is high or around 1, the firms' profit is very low. It can be inferred that with low profit, the firms face a solvency problem and highly possibility of experiencing bankruptcy.

To maintain the solvency of the borrowers, the rate of interest needs to be set to ensure equilibrium in these equations. If the Central Bank set the interest rate above the value of the equation, there is a high possibility that firms will experience insolvency. With a higher interest rate, the borrowers need to put an additional portion of their budget to serve their debt obligations, leading to declining amount of profits. The condition will become worse for the firms that pay their debt obligations by refinancing it, i.e. issuing new debt to pay the interests and rolling over the debt principals. These firms have limited option for dealing with this problem since the effort to obtain a new debt will be difficult as a result of the sharp decline of future confidence. The borrowers may lessen the debt obligations by selling the assets and pre-paying the debt, but this option is also not easy to do since it is the illiquid asset.

4.04   Financial instability in an open economy

In developing his argument concerning the open economy, Minsky (1990) explained financial instability with the same framework as the closed-economy that the economic units' balance sheets and income statements affected the robustness, resiliency, and instability of a financial structure in the economy. In an open economy, a similar relationship occurs in the way that economic units tend to deal with sources of funding. The intention to obtain more funding for expanding their businesses becomes one reason that foreign funds flow into the country. Some economists (Kregel, 1998; Dymski, 1999; and Arestis and Glickman, 2002) underlined the role of capital mobility among countries. As an example, where there are low-interest rates in the developed world, the developing countries that have a higher interest rate will have an advantage with respect to capital inflows. The capital inflows may occur when there is a decision of foreign investors to make a placement in developing countries. These investors' purpose to invest in developing countries is to acquire a higher potential positive rate of return. Referring to the firms' behaviour in lending and borrowing framework, the FIH under open economic system also can be applied

to emerging market economies or developing countries that depend on foreign funds from international financial market to finance their development (Kregel, 2004, p.4).

4.04.1   The relevant factors in foreign borrowing

The consequences of using foreign funds to finance the investments depend on two variables: the movement of exchange rate and the interest rate changes. For entities that borrow from abroad, they should repay the debt obligations and, in most cases, they will expose themselves to currency risk since the movement of the exchange rate will affect the debt obligations' payments. This mechanism also applies to a country that borrows from abroad. When indebtedness increases and at the same time there is a currency risk embedded in the foreign debt transactions, a country will become fragile and crisis-prone. In the case of Asian crisis 1997-1998, Arestis and Glickman (2002) explored one possibility of the transmission of financial crisis, which could be transmitted from an external financial system to a domestic financial market. The accumulation of foreign indebtedness leads to an increasing debt to reserves ratio and suggests a growing amount of domestic institutions' liabilities, which could bring the country to resemble a more speculative or a Ponzi financing unit. This condition may serve as a negative signal for the financial market players, including investors and speculators, who then intend to sell their financial assets. There are at least two mechanisms that can affect a country's condition adversely. Firstly, when the financial market players decide to liquidate their domestic financial assets, the price of domestic assets will drop, which then leads to the deterioration of the assets and liabilities of lenders and borrowers. Secondly, when the country finally devalues the domestic currency, the entities that have foreign currency liabilities while their revenues are in the domestic currency, will face a problem of currency mismatch (DeAntony, 2010, p.166).

If there is a depreciation of the domestic currency, the amount of money in terms of domestic currency to serve the principal and interest payments will increase proportionately. In other words, the sudden appreciation in foreign currency may affect the cash flow of speculative financing units. This appreciation of foreign currency may cause the occurrence of currency mismatch since the firms' outcomes of the investments only generate domestic currency. Paula and Alves (2000) made a simulation that described the combination of firms' revenue and expenditures. These authors showed how the change of foreign currency has an impact on the firms' incomes and expenditures.

From this simple simulation, Table 4.1 describes the impact of foreign currency appreciation on various types of companies. Two types of companies that are relatively free from the impact of currency appreciation or depreciation are company 1 and 4, whose incomes and expenditures are in the same form of currency. If there will be a depreciation or appreciation of the foreign currency, these companies are free from additional expenses since they do not have exposure to the currency risk. Company 2 will enjoy the windfall profit in the case that the foreign exchange depreciation occurs. As one may see from Table 4.1, this company's revenues are denominated in USD. Conversely, Company 3 suffers from loss or declining profits if the domestic currency is weakened against the USD.

Table 4.1 A simulation of revenue & expenditures based on type of currency

	Company 1	Company 2	Company 3	Company 4
Revenue	USD	USD	IDR	IDR
Expenditures	USD	IDR	USD	IDR
Impact from USD appreciation	neutral	+	-	neutral

Source: Own calculations based on Paula and Alves (2000)

The second variable that affects the use of foreign capital relates to the interest rates. There are two mechanisms that are labelled as carry trade and interest rate changes. The carry trade mechanism can be defined as the decision of the economic units to obtain a return by borrowing in a low-interest rate and investing the money in a financial asset that offers a higher return (Lavoie, 2014, p.471). In a global context, this mechanism allows the flow of funds to go to the place that offers a higher profit, for example, when a financial institution borrows at a low short-term interest rate in one country and lends the funds to another entity at the higher long-term interest rate (Wolfson, 2002). Arestis and Glickman (2002) emphasised that the decision to use the external financing rather than internal financing as a source of finance would not be necessary make them as a speculative unit. Nevertheless, the decision of economic units to use a carry trade mechanism will have an impact on the fragility of financial structure. Since the speculative financing units borrow money in the short-term and lend it in the long-term, maturity mismatch potentially occurs as these financing units are not able to refinance their obligations, or they cannot find the source of financing because the borrowing cost is too high. This condition can make the country vulnerable to experiencing a financial crisis. Also, increasing interest rates may also threaten domestic firms when the funds that are obtained use a

floating interest rate since the interest expense will increase. The increasing interest rate expense will create a burden for the speculative financing units, which in a certain stage will pass on the cost to the Hedge financing units. The increasing portion of Hedge financing units that are transformed to become speculative financing units may lead the country into vulnerability.

4.04.2 The solvency rules in the open economy

Wolfson (2002) maintained that in the global context, two factors were relevant for borrowers that borrowed from abroad, domestic monetary policy and the rate of interest in the lender's country. One example that it is worth noting is the U.S. Federal Reserve policy of increasing the rate of interest in the 1980s, which affected the Mexican government and firms asking their lenders to reschedule their commercial loans (Whitt, 1996; Rabobank, 2013). The interconnections among open-economic countries will create the complexity in an attempt to draw the mechanism of the domestic monetary policy, the interest rate, and the movement of the exchange rate. To solve this problem, Brancaccio and Fontana (2015) offered an explanation of the solvency rule in two countries with the framework of a monetary union. The authors used the monetary union as a case study to simplify the complex mechanisms that exist in the financial system. However, this model can portray the association between the monetary policy and the relevant variables, as well as its impact on the movement of capital between the countries.

Following the work of Brancaccio and Fontana (2015), the construction of the model in the open economy framework is much more complicated than the closed economy. The model involves two countries within a monetary union, which means there will be a Central Bank issuing the currency. Within this model, there are three equations that are involved in explaining the mechanism of the policy of monetary authority for each country. These three equations can be extended to examine other variables, such as the sustainability of fiscal policy and the policy to devalue the currency.

The first equation shows the profit of firms (γr) as a function of their expenditures, where π represents the rate of inflation, g represents the capital accumulation of the countries, and m denotes parameters with regards to export and import. The prime variables show the other country's conditions, which are represented by the rate of inflation (π'), the capital accumulation (g'), and imports elasticity (m_1'). There are two variables in connection with parameters m, those are m_0 that represents the share of profits to purchase the goods from abroad and m_1 is the imports elasticity of the country. Assuming that $m_1 = m_0'$, the first equation will be as follows:

$$(1 + \gamma r) = \frac{(1 + m_0)(1 + \pi)(1 + g) + (m_0)(1 + \pi')(1 + g') + (m'_1 - m_1)(\pi - \pi')}{(1 + 2m_0)}$$

Based on this equation, the variables that may affect the value of profit are the inflation rate and capital accumulation, whether they come from the domestic financial system or abroad.

The solvency rule in an open economy tells a similar story to the close economy that the firms in the domestic economy will stay solvent if the sum of the profits and the external financing is at least equal to the total expenditures in the production process. This expenditure covers the expense of purchasing raw materials or goods from abroad, repayments of debt obligations, and the acquisition of foreign assets. Departing from this proposition, the next step is to derive the solvency rule and involve some new variables, such as the Central Bank's policy rate (i), interest margin or mark-up (s) that is set by commercial banks in domestic financial market, the net acquisition of financial assets (NFA). According to Brancaccio and Fontana (2015), the NFA that is incorporated into this model shows the position of a country; when the sign is positive, it means that the country becomes the net creditor and when negative it means that the country becomes the net debtor, and the change of net financial assets (δ). Besides this variable, there is another variable to represent the trading activity of financial assets (ΔK^A) between the countries. The sign of this variable will show the result of this activity; it is positive if the domestic firms purchase the financial assets and negative, if they sell the assets to its foreign counterparts. Considering both sides of the equation, when the firms' profits are higher than their expenditures, the solvency of the firms is maintained.

$$(1 + \gamma r) \geq \frac{1}{1 - m_0} \left[(1 - \lambda)(1 + si) + m_1(\pi - \pi') + (1 + \pi^*)\frac{\Delta K^A}{K} + (\delta - si)\frac{NFA_t}{P_{t-1}K} \right]$$

The financial instability indicator is represented by λ by which the firms have a tendency to repay their debts, whether they use the internal finance (hedge financing), roll over the principal (speculative financing), or refinance all the debt obligations (Ponzi financing). Combining two equations in the framework of an open economy, one will get the solvency condition by obtaining the value of net sales or acquisition of the financial assets (g_c), which can be called the rate of centralisation. This variable is different to the previous variable g or g', which describe the level of accumulation of capital. The positive sign of variable g_c indicates that the domestic firms purchase the physical capital of another country and vice versa.

$$g_c \leq \frac{(1 - m_0)^2(1 + \pi)(1 + g) + (m_0 - m_0^2)(1 + \pi')(1 + g')}{(1 + \pi^*)(1 + 2m_0)}$$

$$+ \left[\frac{(1 - m_0)(m'_1 - m_1)}{(1 + 2m_0)} - m_1 \right] \frac{(\pi - \pi')}{(1 + \pi^*)} - \frac{(1 - \lambda') - \delta nfa}{(1 + \pi^*)} - \frac{(1 - \lambda) - nfa}{(1 + \pi^*)} \, si$$

Brancaccio and Fontana (2015) argued that there will be a connection between the Central Bank policy rate and the rate of centralization, which is shown by this equation. Using this relationship, one may conclude that the monetary policy has an important role in setting the interest rate since it also determines the allocation of ownership of physical capital. The negative relationship between these two variables suggests that the higher the interest rate, the lower the rate of centralization will be. On the other hand, the level of the centralization rate has a positive relationship with the financial instability (λ). It can be inferred that the acquisition of foreign assets, shown by positive sign of g_c, indicates increasing financial instability in the form of speculative transactions.

4.05   The implications of the Financial Instability Hypothesis

One factor that can trigger the turning point in a period of expansion to become the period of crash or downturn is a sharp increase in the policy interest. There are two different implications. Firstly, within the framework of the closed-economy, the increasing of the domestic interest rate will affect the domestic debt market since it will increase the cost of debt. This policy also has a negative impact on the ability of the borrowers to service their debt obligations. Secondly, within the framework of the open-economy, the increase in the domestic interest rate will affect the flows of capital. Assuming the international interest rate is stable, the increasing domestic rate will widen the interest rate differential, a factor that may attract inflows of capital.

In a closed-economy framework, when the interest rate increases, automatically the interest payment will rise. The firms with debt commitments need to manage their budget and expenditures carefully due to the increasing portion of interest payment obligations. As a consequence of the increasing cost of borrowing, these firms will experience lower profits than expected. In addition to this, the borrowers who refinance their interest payment by issuing the new debt will also experience an even worse financial condition. As mentioned earlier, they have a limited option for repaying their debt obligations, in which can be done by selling their assets with a potentially low price. By observing the debt to equity ratio, one will notice the firms'

financial level of difficulty in dealing with their finance in the case of increasing interest rate.

Figure 4.1 depicts the impact of changing monetary policy and the interest rate on the economic condition. This figure describes the U.S. experience during the 2000–2009 period, which has been explained by Weise and Barbera (2010, pp. 222–225). At the initial stage, with good economic conditions, the financial market players and businesspeople feel optimistic to expand their business; this condition leads to an increase in investment expenditure. The increasing consumption and investment shift the TS (Term Structure) schedule from TS_1 to TS_2 in the left panel of Figure 4.1, leaving the declining interest rate to reach r_1 with the policy rate is set at f^* and a positive gap of the national output at y_1. This process shows the expansion of the economy within the low interest rate environment. As the expansion is going on, there is a growing concern toward the economic condition due to the higher rate of inflation, which could bring the implementation of tight monetary policy and lead the Federal funds rate higher than the previous period. If the firms anticipate this condition and find a way to deal with the increasing interest rate, they will reduce their leverage or have re-negotiations with their lenders on how to get rid from the increasing cost of borrowing. In the case that the firms are not aware, they will face a financial problem and need additional financing to run the business. The right panel of figure 4.1 depicts that the TS schedule shifts up and the interest rate rises. The increasing of interest rate (r) is possible since lenders re-assess the borrowers condition and offer a more expensive cost of borrowing. This condition causes the decline in investment and leads the output gap to become negative.

Figure 4.1 The business cycle and monetary policy
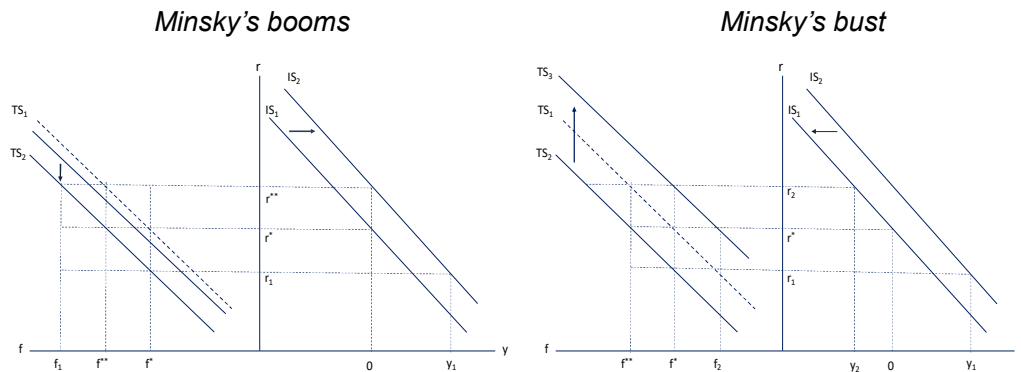
Source: modified from Weise and Barbera (2010, p. 224)
Note: TS schedule shows the real long-term interest rate and represents the expectations of the term structure of interest rate (Weise and Barbera, 2010, pp. 220)

In an open-economy framework, the increasing domestic interest rate triggers foreign investors to invest their money in the domestic financial market, which creates the inflows of capital. This event happens especially when the interest differential widens, and the foreign investors take the opportunity to make the carry of a financial asset. Arestis and Glickman (2002) emphasised that the domestic banks will receive the increasing amount of deposits as well as an open opportunity for foreign borrowing. In this framework, the episode of instability is slightly different from the closed-economy as mentioned above. The boom phase will end when there is a threat to economic performance as the inflation rate increases, which leads the monetary authority to adopt a tight monetary policy by increasing the interest rate. In fact, the policy to increase the domestic rate will not have a strong influence on managing the inflationary pressure (Arestis and Glickman, 2002), especially in the floating currency regime, since the higher interest rate has the ability to attract the capital inflows (Paula and Alves, 2000). With a high-interest rate and sufficient amount of capital inflows, the monetary authority will take action to compensate for the flows of foreign capital that can lead to increasing government debt. As a result, there is a tendency that the public sector will transform into speculative or Ponzi financing units as the government debt outstanding is increasing in the same direction as the interest rate payments.

Concerning the government debt, Brancaccio and Fontana (2015) provided an explanation on the sustainability of government debt in relation to monetary policy. Within a framework that describes the relationship of two countries within a monetary union, the model incorporates the government expenditure (z), the tax rate (ϑ), government debt (d), and the tax revenue (x). The identity of the outstanding government debt follows the concept of $D_t = D_{t-1} + siD_{t-1} + Z_t - X_t$ with $d_t = D_t/(P_{t-1}K)$. This identity includes the accumulation of the principal and interest payments commitment plus the budget deficit. The condition that maintains the sustainability of the government debt is set at $d_t \leq d_{t-1}$, which suggests that the amount of current government debt is less than previous period, or the accumulation of capital is higher than the previous period. In addition to this, the government expenditures that keep the debt stable follows the function of $z_s \leq [(g + \pi) - si]d + x$; hence, it follows:

$$z_s = \frac{(1+\vartheta)[(1+2m(1-\vartheta)]}{(1+\vartheta) - m(1-\vartheta) + 2m(1-\vartheta)^2 - 1} *$$

$$\left\{ [(g+\pi) - si]d \right.$$

$$\left. + \frac{[1+m(1-\vartheta)](1+\pi)(1+g) + m(1-\vartheta)[(1+\pi')(1+g') + z'] + (m_1' - m_1)(\pi - \pi')}{(1-\vartheta)^2(1+2m)} \right\}$$

From this equation, one may see the negative connection between the monetary policy and the stabilisation condition of public spending; it suggests that the increasing interest rate may push the public expenditure and the outstanding government debts upward. Increasing public expenditure can be understood as a result of the increasing of firms' insolvency. To maintain the level of firms' profit and avoid the acquisition of foreign ownership of domestic physical capital, the government needs to increase its spending to bolster the economic activity. Given the constant level of tax revenue, however, this decision will have an impact on the increasing of the external financing needs by raising debt. In other words, within the increasing rate of interest, the decision of the government to maintain the sustainability of its debt may affect the increasing insolvency of the private corporations (Brancaccio and Fontana, 2015).

4.06   The effort to detect financial instability

There are two approaches in measuring the state of instability, there are static and dynamic approaches (Tymoigne, 2010). The static approach has been discussed in Chapter 3.05 as an approach that treats the exogenous shock as the cause of the financial system becoming unstable. On the other hand, the evolutionary or dynamic approach is an approach that treats financial instability as an endogenous process that changes the structure of the economy to become fragile and where this change may occur even in a tranquil period. The efforts to measure how the financial fragility develops into instability and then crisis are based on this approach, for instance, the balance sheets approach, structural transformation analysis and financial fragility index.

4.06.1 Balance sheets approach

Minsky (1990) maintained that in analysing instability one could use the firms' financing position. With this argument, it is worthwhile using firms' financing positions through their balance sheets and income statements. Considering the balance sheets' structure, the balance sheets contain assets and liabilities, which include the

commitment to pay the debt obligations. Whereas, the income statements cover the revenues and expenditures of each unit and usually take the form of cash flows. The relationship between the balance sheet and income statement is located on the structure of repayment on commitments, income as a source of fund to fulfil the obligations, and refinancing mechanism (Minsky, 1990), which specifically can be viewed from the internal structure of a corporation. Minsky's argument also can be explained by the basic principle of the relationship between lenders and borrowers, especially the position of commercial banks as lenders and non-bank economic agents as borrowers that have the intention to finance their investments. In the case of an adverse situation experienced by the borrowers, this will affect the lenders' position since each borrowers' debt will be reckoned as lenders' assets (Kregel, 2004, p.4).

In line with this argument, Cozzi and Toporowski (2006) made an empirical study of three Asian countries using the balance sheets of selected financial and non-financial companies. They employed the development of some financial ratios, for example, the gearing ratio, debt ratio, current ratio, as well as the development of assets and liabilities during the observation period. The authors found that analysing the assets-liabilities movement proves very useful tools for understanding the behaviour of economic agents. In the countries under observation, there was a trend that the increasing liabilities cause the increasing assets, but not as a result of increasing income.

4.06.2 Structural transformation analysis

Schroeder (2002, 2009) examined countries' financial fragility, namely Thailand and New Zealand, using the FIH. Following Schroeder's approach, Blancas (2007) used the same method and applied it to the case of Mexico. The authors (Schroeder, 2002 and 2009; Blancas, 2007) employed several variables and compared their movements to capture the evolution of the financial system. Three variables that were used, such as the interest rate, rate of profit, and growth. By comparing these variables, one may gauge and understand the state of the financial system, whether hedge, speculative or Ponzi financing units. It is expected that this method may help the authorities in monitoring the economic condition of a country and detecting the financial fragility stage that may bring the country to financial instability and crisis.

Mulligan *et al.* (2010) showed the development of financial structure by analysing the impact of changes in interest rate, movement of the exchange rate, and the level of leverage in the companies' performance. The authors emphasised the impact of

interest rate on companies' level of investments. In the tranquil situation, lower interest rates encourage firms to borrow more as they expect higher profits in the next period. This condition transforms Hedge financing units into speculative financing units and speculative financing units to Ponzi financing units. Mulligan *et al.* (2010) maintained that the movement of exchange rates also has an impact on the structural transformation of the financing units since currency depreciation can create an additional burden for firms that engage in foreign borrowing.

4.06.3 Financial fragility index

Tymoigne (2011, 2012) offered a method for developing an index to detect financial fragility by focusing on the financial system under Ponzi financing behaviour. This index measured the financial condition by focusing on the households, non-financial corporation, and business sectors. In generating this index, the author differentiated the variables of interest for households and companies. For households, the author employed the total liabilities, debt service ratio, cash-out refinancing loans, and the proportions of consumers' debts. While, for the companies, the author used data consisting of total liabilities, the net worth of the companies, the debt-service ratio, the monetary instrument to outstanding liabilities ratio, and the ratio of short-term debt to total debt. According to Tymoigne (2011, 2012), these variables are used to provide information on the refinancing and liquidation risks. The former shows the inability of a borrower to refinance its debt. The latter explains the risk that emerges when the entity is unable to sell the illiquid assets to pay its debt obligations.

After looking at the summary of these methods, the approaches under the FIH are argued to have their advantages especially in describing the transmission mechanism of each component within the financial system. Besides, the FIH contains a comprehensive explanation to understand the core problem that occurs in a financial system. It can be inferred that under this framework, the economic units' behaviour in pursuing profits and the inherent fragility of the financial system become the factors that cause financial fragility. There are several factors that show the current condition of financial system or behaviour of the economic agents, which become a central discussion in this framework. Firstly, the hedging instruments that previously were meant to protect the parties involved in a financial transaction are now changed, becoming a structured product or derivative to pursue capital gain. This financial product transformation becomes the source of financial problem.

Taking as an example is the Credit Default Swap[14] (CDS), at first, it was meant to cover the risks against default borrowers. However, when speculators that do not necessarily own CDS use it for increasing their returns, this instrument can bring a negative impact on the financial system. Secondly, the commercial banks in their daily operations are exposed to liquidity risk. At the same time, they must meet the capital adequacy ratio[15]. To deal with the liquidity risk and maximise the profit, the banks see the opportunity to issue Collateralized-Debt Obligations (CDO), which allows them to sell securities that are linked with their income from the payment obligations of loans. This instrument contains higher risk when the borrowers fail to pay their debt obligations, which will affect the cash flows stream of CDO. However, this instrument and its structured product created a problem as the U.S. faced a turbulence in its financial market in 2008. Thirdly, companies will expand their business when the expectation of future profit is high, which implies that all the obligations will be repaid on time. However, the companies or borrowers' over-optimism can be replaced by lenders' over-pessimism that leads to the revision of loan term and conditions. The increasing debt obligations create additional burdens for these companies, which may cause a decline in firms' profit. Fourthly, as the financial system developed, the economy becomes more open to the international financial transactions. To attract the flows of capital from abroad to domestic financial market, the monetary authority set a higher interest rate. For domestic firms that need financing from external sources to finance their investments, higher domestic lending interest rate encourages them to obtain external debts. In the end, this investment decision can lead the domestic financial market to become fragile. At a certain point, there is a tendency that international investors begin to doubt to the performance of the country and its ability to serve its debt obligations or to defend its currency. The financial instability can transform to a financial crisis when the exchange rate is sharply depreciated, and the interest rate is increasing; this condition may change the structure of economic units to become increasingly dominated by Ponzi financing units.

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[14] CDS is one of financial instruments that was created to provide insurance for financial market investors that purchase securities or to hedge the default risk (Noeth and Sengupta, 2012).

[15] The liquidity risk is embedded in commercial banks' operation especially when they pool the depositors' money and lend the money to the borrowers. For some reasons, the capital adequacy requirement is an additional cost for commercial banks since the funds are idle or do not generate income but the banks should pay the interest for their depositors (Barnett-Hart, 2009).

4.07 Comparing the main features of two financial instability frameworks

The discussions on financial instability hypothesis help to find a better approach to understanding the concept of financial instability. Table 4.2 describes the summary of the discussion on the main features of financial instability, namely the definitions, the causes, the type of crisis, the policy response and the objective of measuring the financial instability.

Table 4.2 Competing frameworks of financial instability

Main features	Mainstream views	Financial Instability Hypothesis
The definition of financial instability	The incapability of a financial system to accelerate and maintain the economic performance and solve the problem of financial imbalances	A condition that can create an adverse impact on the economy, especially the ability of financial instability to affect the price instability and cause the debt deflation
The cause(s) of financial instability	The weaknesses in the domestic financial system and the presence of adverse shock make the financial system unstable.	The endogenous problem that lies within the financial system as the economic agents become more speculative in finding the source of financing during the tranquil periods.
The type of crisis	Liquidity crisis	Solvency crisis
The policy prescription	The authorities should impose prudential supervisions, promoting market based discipline, and strengthening the domestic institutions. The Central Bank needs to provide the liquidity assistance for the financial sector and combine it with a tight monetary policy.	The proposal on stricter regulations that rule over all agents, particularly lenders and borrowers. The authority needs to pay attention to the borrowers' ability to pay the debt service, e.g. by restructuring the debt. When there is a liquidity problem, the authorities must conduct as the lender of last resort.
The approach of measuring financial instability	Most of the analyses intent to measure and predict the state of financial system by using the static approach	The analyses try to detect the state of financial system by using the dynamic approach

Source: Own construction.

In mainstream views, financial instability is defined as the situation before the financial crisis in which an external shock creates a significant damage to the financial system (Borio and Drehmann, 2009). According to Schinasi (2004), financial instability can be defined as the incapability of a financial system to accelerate and maintain the economic performance and to solve the problem of financial imbalances. These definitions cover the terminologies of financial instability and financial crisis but have not emphasised the different between financial fragility and financial

instability. Under FIH, financial fragility is characterised by a high proportion of Ponzi financing that can trigger the increasing of financial instability because the economy will be sensitive to interest rates and exchange rates movements. For example, the sharp currency depreciation will affect the ability of firms that have external debts. Tymoigne and Wray (2014, p. 40) defined financial instability as a condition that creates a negative impact on the economy. In FIH there is a clear difference between financial fragility and financial instability, which is rarely found in the mainstream literature.

Mainstream views emphasise the weaknesses in the domestic financial system and the presence of adverse shock that makes the financial system unstable. Therefore, in dealing with financial instability and financial crisis, the prudential supervision and market-based discipline should be undertaken by the authorities. Meanwhile, FIH focuses on endogenous problems that lie within the financial system, which is related to the behaviour of economic agents that become more speculative in a period of positive growth.

The problem in the banking sector is argued will affect the financial system negatively. This perspective is based on the thought that private sector reliance on the banking sector in obtaining the funding may give an adverse impact, especially when the banking sector experiences liquidity problems as they experience the shortage of liquid assets. This condition is called a liquidity crisis. The effort to help the banking sector out of its liquidity problem is one of the mainstream views' policies prescriptions together with the implementation of the tight monetary policy. The FIH underlines the significant impact of solvency crisis on the economic agents. This framework suggests that the government should facilitate the borrowers by aiding them to improve their financial condition so that they can fulfil their debt obligations. In this case, FIH offers a solution that answers the need for handling the financial crisis events, especially for the Southeast Asian crisis and the GFC.

There are two approaches to measuring the fragility of a financial system, static and evolutionary approaches. The first is commonly used by the mainstream views to develop the instruments to measure the state of instability and predict the occurrence of a financial crisis. The latter, which is also called the dynamic approach mostly is used by the proponents of FIH and focuses the measurement in detecting the state of financial fragility of the economy.

4.08   Conclusion

The Southeast Asian financial crisis, followed by series of crises in developing and advanced economies led economists to seek an alternative explanation for the crisis. The existing crisis models cannot fully explain the Southeast Asian crisis and the U.S. sub-prime mortgage financial crisis as has been done by the FIH. In the original framework, Minsky builds the argument from a closed-economy approach and claims that the robust economic condition may become the source of instability.

This chapter lists several factors that may cause financial instability. Firstly, the intention of economic agents to get higher profits increases the use of external sources of financing. Secondly, to get a lower cost of borrowing, the economic agents choose short-term financing, which is argued to have a cheaper borrowing cost and easier debt principal rolling over. Third, to obtain and maintain the level of profitability, most of the financial institutions use financial innovations. The innovations involve existing instruments that may contain a risky financial product (Tymoigne, 2014, p. 55).

The analysis of the open-economy framework has been developed by presenting the existence of capital mobility among countries. In this mechanism, the investors will try to find the most favourable place to invest their money, which subsequently increases the capital flows that go to the countries that have a high-interest rate differential. For the recipient or borrower countries, however, there are risks embedded in this mechanism since the sudden reversals phenomenon may lead the country to experience a financial crisis.

Several basic features of financial instability have been explored by making a comparison between two competing frameworks; those are mainstream views and FIH. By juxtaposing these features, one may get the understanding of the way to explain the mechanism of crisis. Since in its analysis the FIH has a comprehensive explanation such as an understanding of the core problem in the financial system, considering various aspects and complexity of crisis events, and involving various methods in its discussions, it offers the solution that can answer the problem in a country's financial system.

Chapter 5
Financial liberalisation and financial instability: Indonesian case

5.01   Introduction

The development of financial systems has been widely promoted to enhance economic growth and development starting from the early 1970s. There are two basic frameworks that are widely known, namely financial development and financial liberalisation[16]. The emerging controversy over the impact of the development of financial systems via its financial reforms creates a new area of discussion that it is worth exploring. Thus far, the discussion has involved debates focused on whether or not financial liberalisation has reached its objectives. Furthermore, the increased occurrence of financial crises, both in developed and developing countries, leads to an argument as to the detrimental effects of financial liberalisation on the financial system.

The dominant mainstream views argue that financial liberalisation accelerates and improves economic performance. Based on their findings, it is argued that financial liberalisation supports economic performance by lowering the costs of capital (Bekaert and Harvey, 2000), raising economic growth (Quinn and Toyoda, 2008) and helping the country to lessen the occurrence of crisis (Beck *et al.*, 2006). However, there are economists who remain sceptical on the implementation of these frameworks. They argue that financial liberalisation as a part of financial system development tends to make countries' financial system more fragile (Arestis and Demetriades, 1996, 1997; Demirgüç-Kunt and Detragiache, 1998; Kaminsky and Reinhart, 1999; Weller, 2010). Moreover, Schinasi (2006, p. 3) highlighted the tendency of financial systems to become unstable and prone to experiencing adverse events as the countries adopted expansion, liberalisation and globalisation policies.

Indonesia adopted financial liberalisation and financial development in a series of policies packages that impacted on its financial sector. Beginning from the early

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[16] Financial development can be depicted as an evolution of a financial system that allows the increasing access to financial source (Fry, 1995, p.299). The World Bank defines financial development as well-functioning institutions, instruments, markets, and legal framework that allow the lowering transaction cost in a financial system. While, financial liberalization refers to the elimination of government regulations, involvements, or restrictions, for example, in its banking sector.

1970s up until the beginning of the 1990s, the process of financial reforms took place with the support of international financial institutions. At least until the middle of the 1990s, this process was going on track and resulting in good economic performance. Nevertheless, the financial crisis hit the country in 1997/1998, raising doubt as to the soundness of financial reforms in supporting Indonesian development.

This chapter's objective is to engage in this discussion by focusing on the concept of financial liberalisation and the way it impacts the country's financial system and, whether or not it provides a positive impact, as expected. In so doing, this chapter discusses the financial liberalisation thesis and reviews various empirical studies centred on the impacts of financial liberalisation on economic performance and financial stability. This section will be followed by the empirical analysis on Indonesian financial reforms and how it affects to the volatility of its exchange rate. In addition to this exploration, it is considered important to examine the contribution of financial reforms to economic growth. In order to perform this empirical analysis, instead of using the panel data model, as has already been done by economists, this study will use a time series method.

The discussion of this chapter involves two elements of financial reform, namely the domestic financial liberalisation and capital account liberalisation in which their development will be represented by constructing the Financial Liberalisation Index (FLI). This is the first attempt at constructing an FLI on a monthly basis. The aim to generate the monthly index is focused on gathering understanding into the detailed progress of financial liberalisation in Indonesia. With this monthly index, the empirical analysis using higher frequency macroeconomic and financial indicators will be possible to undertake. Furthermore, the empirical analysis involving the volatility of the exchange rate to represent financial fragility and financial liberalisation indicators is also carried out. These two empirical analyses are expected to act as the contributions of this study to the literature.

This chapter consists of seven sections. Following the introduction, the subsequent sections will summarise the theoretical framework of financial liberalisation. The fifth section explains the construction of the FLI based on the stages of the process of liberalisation in the Indonesian financial system. The next section seeks to explore and describe several variables in connection with the implementation of financial liberalisation, which is then followed by the empirical analysis.

5.02 Financial liberalisation, economic growth and financial instability

The concept of financial liberalisation was pioneered by McKinnon (1973) and Shaw (1973) through their arguments to expedite economic growth. In developing his argument, McKinnon (1973, pp. 5–8) maintained that government policies tend to intervene at almost all levels of economic activity, which contributes to the creation of inequality of income and fragmentation amongst economic agents. McKinnon (1973, pp. 5–7) provided some examples of these policies, such as government subsidies, government protections on certain industries, regulations on imports, and tax concessions. These policies are conducted when the government feels or assumes that the regulation of banks and financial markets is required. This proposition hinges on the thought that there is no assurance that every economic agent can get similar access to the efficient prices of factor production and technology. Therefore, McKinnon (1973, p. 8) argued that the government should cease to intervene in the capital market.

Together with Shaw (1973), McKinnon (1973) maintained that the level of growth can be accelerated by encouraging the level and quality of investments. According to the authors, the country should actively raise its savings in an effort to achieve the targeted level of investment. Moreover, it is noted that the accumulation of capital through saving enables financial institutions to serve the demand of private sector loans. It is assumed that, under the framework of McKinnon and Shaw, the level of investments is equal to the level of loans; that is, an investment is funded by banks. Hence, once savings can serve investment demand, the country's economic activities will improve. Within financial repression, the low deposit interest rate hampers the effort to encourage savings. The works of McKinnon and Shaw argued that a higher deposit interest rate would encourage willingness to save, and increased savings lead to the increased availability of loanable funds. With support from financial institutions acting as intermediaries, the increasing availability of funds will enable borrowers to get easier access to different sources of financing. Other than this, the high reserve requirements obliged by the Central Bank to be fulfilled by commercial banks is another factor impeding commercial banks in allocating banks' lending. In a condition where financing is abundant, investments will flourish, meaning this condition may stimulate economic growth.

In order to achieve the optimum level of capital accumulation through savings, McKinnon (1973) and Shaw (1973) suggested that the government should get rid of financial repression and accordingly shift the policy to financial liberalisation by

removing the control on interest rate and credit programmes, as well as reducing reserve requirements. Following the analyses of McKinnon and that of Shaw, Fry (1995, p. 26) set out, in detail, the drawbacks of financial repression. First, by placing a ceiling on the level of interest rates, the authorities create a lending rate of interest at which the demand for loans exceeds the supply of loans. Consequently, this condition may give a bad signal for financial market participants, especially depositors, borrowers, and lenders. The depositors that are households will have lower savings as their expectations of receiving higher returns do not meet the offered rate of return. The commercial banks as the intermediaries could participate in low yielding projects. Finally, the non-bank private sectors acting as borrowers will be stimulated to shift their preference to financing relatively capital-intensive investments. Second, banks as lenders will be obliged to set aside a certain portion of their assets to provide loans for the credit programmes. The credit programmes potentially lead to inefficiency in the loan distribution since the implementation of these programmes is not directed towards productive investment; therefore, it potentially increases the non-performing loans. Third, high reserve requirements will lessen the flexibility of the banking sector in allocating their assets to productive investment.

The same mechanism also applies to external liberalisation by opening the domestic economy to the global market. As explained previously in Chapter 2, the government policies to deregulate capital control or capital account liberalisation and impose trade liberalisation are to be included in external liberalisation. The elements of external liberalisation consist of capital account liberalisation, trade liberalisation, and stock market liberalisation. However, one may find that there is no strict rule when discussing these elements; in other words, whilst economists emphasise the trade liberalisation and capital account liberalisation (Johnston, 1998), others focus on the domestic financial sector, capital account, and stock market liberalisation (Kaminsky and Schmukler, 1999).

In line with financial liberalisation, trade liberalisation refers to the policy to open the country for the exchange of goods and services. This condition can be achieved when the country removes barriers to allowing free trades of goods and services, such as by removing tariff and non-tariff barriers. Capital account liberalisation is the element of external liberalisation that focuses on the efforts to remove the barriers on capital movements to and from a financial system. Capital account liberalisation covers several policy areas, including the removal of capital control, allowing foreign

investors involvement in the domestic capital market, and permitting domestic investors to own foreign financial assets (Ghosh, 2005). One of the objectives underpinning capital account liberalisation is the facilitation of the mobility of capital between countries.

When increasing capital mobility to and from the domestic financial market, a country will garner benefits, especially in receiving foreign funds. Eichengreen and Musa (1998) emphasised two main advantages of capital flow, namely portfolio diversification and risk-sharing. The former is associated with the argument that foreign funds have a positive impact on the domestic financial market since residents have an opportunity to protect themselves and find an alternative source of financing should adverse events occur in the home country. The latter is related to investors' decisions to find a place to invest their funds in order to obtain higher rates of return. With a higher return, these authors argue, savings and investments will increase. However, in a recent paper, Eichengreen (2001) underlined the ambiguity of the relationship between capital account liberalisation and economic growth. The author gathered and explored empirical studies on the relationship of capital account and growth, and found that there are three strands of argument. The first argument emphasised that capital account restrictions have a detrimental effect on development. The second argument maintained that capital account liberalisation does not give a clear impact on economic performance. Whereas, the third argument claimed that capital account liberalisation has an association with the financial crisis.

Considering the elements of external liberalisation, the IMF and World Bank (2005, p. 318) suggested a step-by-step implementation of these liberalisations. The IMF and World Bank (2005) argued that the correct sequencing of these elements would help the country to facilitate the stability of its financial system and would allow the country to avoid a severe financial crisis. Additionally, sequencing is important in regards the performance of the domestic banking sector (Bayraktar and Wang, 2004). By prioritising the development of the domestic financial system in the first stage, it is expected that the domestic financial market can strengthen itself to use the funds efficiently (Johnston, 1998), build its resilience and mitigate the risks (IMF and the World Bank, 2005, pp. 318–320).

Bayraktar and Wang (2004) provided the various steps of domestic financial reform with reference to McKinnon's argument. The authors explained that the first step was a country decision to prioritise the balancing of government finance, which was then followed by the opening of the domestic capital market and, as the final step, the

liberalisation of the country's foreign exchange. However, one may find that there is no assurance for the country that follows this sequence that it will be problem-free. The series of financial crises, which occurred frequently starting from the 1990s reveal that sequencing is not the most important factor.

There are various models that have intended to clarify whether or not financial liberalisation provides positive effects on the financial system. Hau (2002) offered a model that was based on the argument that a higher level of external liberalisation facilitated the country with a more stable exchange rate. The author explained this argument by describing the effect of increasing imported goods and services on the flexibility of domestic price level, stating that such flexibility would reduce any effect of money supply shock on the economic agents' balances, which then lessened the volatility of the exchange rate. Hau (2002) proposed the model with the following equation:

$$VE = \alpha_0 + \alpha_1 COP + \alpha_2 Z_i + u_i$$

The volatility of the exchange rate (VE) is calculated as the standard deviation of the exchange rate changes over the window of three years. Variable country openness (COP) shows the degree of trade openness in a country, which is measured by the ratio of import to GDP. The third variable is Z_i, which represents some different control variables such as economic growth, political stability, oil-exporter country, and dummy variable for exchange rate arrangement.

In a similar vein, Kose *et al.* (2003) argued that there was a non-positive relationship between macroeconomic volatility and financial liberalisation. They framed the discussion by assuming that the higher level of external liberalisation would lessen the volatility of macro-indicators, which consists of the volatility of growth, consumption or income. In their research, the authors utilised two external liberalisation policies, namely trade liberalisation and capital account openness as the main indicators. Their model can be written as follows:

$$vol = f(EL, IL)$$

where vol represents the volatility of macroeconomic indicators as the dependent variable, which is computed as the standard deviation of the relevant variable, such as exchange rate or growth volatilities. EL refers to external liberalisation, which is represented by numerous variables, such as terms of trade and capital account openness, for example. Moreover, IL represents the internal liberalisation that is

represented by the M2 to GDP ratio. In addition to these two main variables, the authors considered additional macro variables, such as inflation rate and fiscal deficit.

Following the authors, other studies (Stancik, 2006; Eozenou, 2008; Tayebi and Torki, 2010) used these models to examine the impact of financial liberalisation on the volatility of macroeconomic indicators. Eozenou (2008) modified Kose's model and applied it in the following equation:

$$vol = \alpha_0 + \alpha_1 CAOP + \alpha_2 KAOP + \alpha_3 Z_i + u_i$$

where $CAOP$ refers to current account openness and $KAOP$ is capital account openness, whilst Z_i pertains to some independent variables that consist of different macro-economic variables. Using 90 countries over the period spanning 1960–2000, Eozenou (2006) examined the relationship between financial liberalisation and the volatility of three macro-indicators. Based on the findings, external liberalisation was seen to have a positive association with a higher volatility of consumption growth.

Tayebi and Torki (2010) replicated the above models and applied them to the Southeast Asian countries that experienced financial crisis. They modified the model and used it to test the effect of financial liberalisation in line with growth, exchange rate and investment volatilities. Based on their empirical analysis, the results showed that the effect of financial liberalisation was positive to the volatility of the independent variables.

5.03   Financial liberalisation and growth: some empirical studies

It is the advocacy of McKinnon and Shaw in regards financial liberalisation that claims that financial liberalisation and deepening will boost growth. Balassa (1989) and Laeven (2003) argued that this framework would promote the overall functioning of intermediaries so that the financial market became more efficient. King and Levine (1993) provided an empirical study involving 57 countries over the period spanning 1960–1989. The authors found that financial development had a positive relationship with economic growth, and the level of financial development was a good predictor of long-term economic growth and had a strong association with future improvements in capital efficiency. According to Levine (2004), the financial liberalisation ensures the availability of information on investments, and a better implementation of corporate governance facilitates risk management and mobilises savings.

In addition, there has been extensive studies that assess the interrelation between financial liberalisation and growth. Based on the findings, it can be concluded that the nexus between these two variables at least can be divided into two groups. The first group has findings that support the positive relationship between financial liberalisation and growth. There are studies that seek to prove this relationship, such as the methodology developed to explain the increasing role of foreign investors who are able to have a positive impact on domestic stock markets and could potentially lower the cost of capital (Bekaert and Harvey, 2000; Henry, 2000). Quinn and Toyoda (2008) examined the relationship of capital account liberalisation and growth using capital account openness index and found a positive relationship between these variables. Another scholar focused on the relationship using cross-sectional data and found that financial liberalisation had a positive effect on economic growth (Levine, 2001).

For the case of Indonesia, Juoro (1993) emphasised the important role of financial liberalisation in alleviating Indonesian economic growth. By examining financial liberalisation indicators in the period of 1978–1990, this author argued that Indonesian financial reforms succeeded in integrating the money market, promoting banking sector competition, improving the overall efficiency of the banking sector, and increasing economic activities. However, Juoro (1993) described potential problems as a result of financial liberalisation, where, for example, higher interest rate can bring about a detrimental effect in terms of increasing public distrust for the domestic financial market and accordingly resulting in higher risk-taking, which intensifies the problem of moral hazard. Furthermore, Goeltom (1995) studied the implementation of financial liberalisation in Indonesia over the period 1981–1988. The author found that the implementation of financial liberalisation increased lending rates, but helped small-scale enterprises to have access to credit and further improved the allocation of funds to efficient firms, which then had an effect on the overall efficiency of investments.

On the other hand, some economists have come to recognise that the relationship between financial liberalisation and growth cannot be explained clearly. Arestis and Demetriades (1996, 1997) provided an analysis of financial liberalisation and growth with focused on the role of the banking sector and stock market. In their 1996 paper, Arestis and Demetriades studied the causal association between financial liberalisation and growth. These authors argued that one should consider the institutional structure of financial systems and financial sector policies in each

observed country. A lack of consideration towards such factors could lead to incorrect conclusions. Furthermore, Arestis and Demetriades (1996) examined the causality between finance and growth using 12 countries data. The authors found that the structure of financial institution and policies in each country determined the causal link between finance and economic growth. In line with their previous paper, Arestis and Demetriades (1997) underlined the relationship between financial development and growth, which would be determined by institutional factors. In this study, the authors also showed that the causality of finance leading to higher growth was somewhat inconclusive.

Recently, there has been a growing number of researchers questioning the relationship of financial liberalisation and growth (Beck *et al.*, 2013; Cecchetti and Kharroubi, 2015). Beck *et al.* (2013) carried out a study on the association between the growth of financial industries as a result of financial liberalisation and economic development. In so doing, the authors focused on examining the size of a financial system and the degree of intermediation using a sample of 77 countries in the period 1980–2007. They found that there was a positive association in the long-run between financial sector size and economic growth. However, based on their estimation, this association was becoming weaker over time and, for the specific case of developed countries, the size of the financial system would affect the increase of growth volatility (Beck *et al.*, 2013). Cecchetti and Kharroubi (2015) studied the effect of growth on the financial sector and the growth of real total factor productivity. Data from 15 developed countries was used; it was found that the growth of the financial sector has a negative effect on the growth of total factor productivity. They explained that this phenomenon occurred as a result of the growth of financial sector reducing the growth of total factor productivity. In other words, the development of financial sector does not support but rather competes with the other sectors in the country in absorbing the available resources.

5.04 Financial liberalisation and financial instability: some empirical studies

Beck *et al*. (2006) undertook a study centred on the relationship between bank concentration, bank competition and banking system fragility. The authors argued that bank concentration facilitates the financial system in becoming less fragile. Using data from 69 countries over the period of 1980–1997, the study concluded that the implementation of financial reforms through banking sector liberalisation, such as

allowing bank entry and ensuring wider bank activities, had increased banking system resiliency and accordingly, reduced its fragility. The authors found that countries with a competitive banking sector would experience a lower probability of banking crisis.

Focusing on the policy to liberalise the capital flows, Glick *et al*. (2006) argued that a country that implements capital account liberalisation has a lower likelihood of experiencing currency crises. The authors employed a matching method that was used to minimise sample bias and examined the role of capital account policy, which focused on the implementation of capital control in lessening the probability of crises. The implementation of a restricted capital account—for example, the control on capital outflows—opened the possibility of crises since investors in the financial market would be reluctant to invest in the country. This would affect the country to become less attractive to international investors and to suffer from a lack of sources of funding. Also, Kose *et al*. (2009) explained that there were many empirical studies that showed the positive impact of financial liberalisation—in particular the policy of external liberalisation—in boosting the domestic financial market and helping the country to alleviate its economic growth. The authors synthesised the findings of some empirical studies on the effects of external liberalisation. They found that capital account liberalisation has a minor contribution in terms of the volatility of the financial system.

Based on the research that was conducted by Demirgüç-Kunt & Detragiache (1998), financial liberalisation, as one part of a financial system's development, tends to make countries' financial systems more fragile. Using the panel data method of 53 countries for the period 1980–1995, they investigated the nexus between the implementation of financial liberalisation and financial fragility. Based on their analysis, they found that the banking crisis occurrence tends to increase in a country that implements financial liberalisation. This finding was based on the mechanism of increasing the role of financial institutions, especially the banking sector, as an intermediary that could lead to the moral hazard problem. As a result, the financial systems become prone to experiencing a financial crisis.

In term of external liberalisation, there is growing concern as to the flow of capital, especially the funds that have shorter maturity. The financial crisis seen to have occurred in Southeast Asian countries is a perfect example of the impact of external liberalisation on the financial system (Arestis, 2016). The adoption of free capital

mobility between countries suggests that the government lifts its control on capital flows. This mechanism allows foreign investors to place their funds in the domestic financial market in an effort to gain higher returns or pull their money from the domestic market when other financial markets offer favourable returns. The increasing portion of foreign ownership in the equity market or the form of portfolio investments gives a signal of increasing vulnerability of domestic financial market. When the view of financial market investors is shifted against the domestic market, there will be the sudden reversal of capital inflow. This condition places further pressure on exchange rate management since most countries, during this period, have applied a fixed exchange rate arrangement.

Kaminsky and Reinhart (1999) analysed 20 countries for the period 1975–1995, arguing that the financial crises in many countries occur after the implementation of financial liberalisation. They examined the causes of banking and currency crises by assessing the movements of different macroeconomic indicators both before and after the outbreak of crises. Their findings suggested that there is the tendency of an increased asset bubble in the period of post-liberalisation. The authors described the implementation of domestic and external liberalisation in failing to ensure the financial system was in a stable condition. Following the implementation of financial liberalisation, the countries have experienced good economic performance with stable inflation, increased economic growth and, in certain cases, fiscal surpluses. However, owing to the weak banking supervision and inadequate financial market regulations, the problem in the banking sector has been intensified, causing the ability of the authorities to be affected in terms of supporting its exchange rate (Kaminsky and Reinhart, 1999). In line with the previous study, Weller (2010) claimed that financial liberalisation in emerging economies leads to currency and banking crises. In completing this research, 27 developing countries were examined over the period 1973–1998, with a comparison drawn between the period of pre-liberalisation and post-liberalisation. According to Weller (2010), countries with financial liberalisation policy tend to receive greater funding, which can then be used to finance productive or unproductive investments. The author found that there is a tendency for increased unproductive investments, with the funding being directed towards speculative expansions. As a result, this investment decision increases the higher probability of default, which may stimulate capital outflows or sudden reversals of inflows.

Before engaging in the empirical analysis of financial liberalisation, the next section will provide the Indonesian financial liberalisation stages, which are transformed so as to produce an index that will be used as a variable of interest in the analysis.

5.05 Measuring the stages of financial liberalisation

In discussing financial liberalisation and the way in which it is implemented, researchers (Bandiera *et al.*, 2000; Laeven, 2003) have used several elements of financial liberalisation, such as the interest rate liberalisation policy, credit programmes, and the level of reserve requirements. Bandiera *et al.* (2000) and Laeven (2003) used a dummy variable to show the progress of the financial liberalisation that reflects the date when these elements of financial liberalisation have been adopted; these take the value of 1 when the liberalisation measures are applied and 0 otherwise. As an example, Bandiera *et al.* (2000) proposed an index that is developed from six indicators, namely the implementation of interest rate liberalisation, the policy on the lowering of entry barriers to foster the level of competition, the policy to reduce the reserve requirements, the elimination of the credit programme, the process of privatisation, and the implementation of prudential regulations. However, this method has the disadvantage of being inflexible since it provides only two options or choices for every financial liberalisation indicator, regardless of whether or not it has been adopted. In other words, this method is unable to capture another stage or type of government measure that could be found in between these two choices.

Abiad *et al.* (2008) wrote a paper and offered a similar approach to examining the implementation of financial market liberalisation policies. This paper explored seven policy dimensions of financial market liberalisation, consisting of credit programmes and reserve requirements, deposit and lending rate liberalisation, banking sector entry barriers, privatisation policy, capital account openness, the securities market, and banking supervision. In order to get the score for each indicator, the paper provided a list of questions concerning the government policy on or the condition of the domestic financial system. One can transform the results into a score ranging from 0 (financially repressed) to 3 (fully liberalised).

The FLI proposed by Abiad *et al.* (2008) has the advantage that it features a reversal principle. This principle suggests that there is the possibility of a country experiencing an increasing score when the policies are considered to be more liberalised or

decreasing score when there is a shift in the policy that is considered less-liberalised. Taking into consideration this advantage, this study uses this method to construct the Indonesian FLI. Based on the assessment of each policy dimension, the FLI can be obtained by adding all the scores; this final result will be divided by the number of policy dimensions.

The first step in developing the index is to identify and record the government policies in each financial liberalisation indicator, as provided above. This study investigates each relevant policy based on their sequences in order to get the detailed description of each policy that has a relation with financial liberalisation.

Table 5.1 Indonesian financial liberalisation policies

Dimension/ Policy areas	Sub-dimension	Date	Remarks
Credit control	Credit programme	1968	In 1968, the government introduced BIMAS, a rice intensification programme, which then was followed by another credit programme called investment credit.
	Ceiling on Reserve Requirement	...- Oct. 1988 Nov. 1988 Feb. 1996 Apr. 1997 Jun. 2004 Oct. 2010	Required reserve : 15% required reserve: 2% required reserve : 3% required reserve : 5% required reserve : 5% for IDR and 3% for foreign currencies required reserve : 8% for IDR and 1% for foreign currencies
	Subsidized sector	-	Up until present, Government of Indonesia provides interest subsidy (subsidized rate) especially for small scale industries
Credit ceiling		Jun. 1983	Government policy to eliminate credit ceiling
Interest rate Liberalization	Deposit	Jun. 1983	Government policy to eliminate interest rate control
	Lending	Jun. 1983	
Banking sector entry	Foreign bank branch	1968	The government allowed the foreign banks to open their branches
	Banned of new domestic banks	1968	The government regulation pertaining to the restriction of the opening of the new domestic banks, but this regulation had been revoked in third quarter of 1988.
	Branching restriction	Oct. 1988	Branching restriction has been eased
	Banking sector activities	Dec. 1968	Banking sector covers wide ranging task: banking activities, insurance, investment.
Capital account transaction	Exc. Rate	Apr. 1970	Exchange rates fully convertible and unified
	Restric. KI	Apr. 1970 Sep. 1991 Jun. 2005	- No tight restriction on capital inflows exist. - Presidential Decree pertaining to the ceiling on foreign borrowing. However, starting from 1994/1995, it was no longer effective. - In June 2005, the Central Bank enacted a regulation on the maximum of banking sector foreign borrowing, which then was revoked in 2008. This regulation has been reinstated in 2011.
	Restric. KO	Apr. 1970 Jul. 2010	- No tight restrictions exist - The implementation of the Central Bank regulation pertaining to the minimum holding period
Privatization		Nov. 1996	BBNI was the first state-owned bank doing IPO in Nov. 1996. The other state-owned banks followed this step in the 2000s.
Securities market	Development measures	Jun. 1999 Dec. 2004 Oct. 2005	The establishment of security commision under the Ministry of Finance. The introduction of primary dealer system The attempt to broaden the investor base.
	Foreign ownership	Sep. 1989	The equity market is open for foreign ownership
Banking sector supervision	CAR	Dec. 1993	The implementation of Basel I: capital adequacy ratio 7%
	CB independent	May 1999	Based upon the Central Bank Law that enacted in 1999
	Supervisory	Dec. 1968	Based on the Central Bank Law that regulates the on-off site supervisory
	Supervisory coverage	Dec. 1968	Supevisory covers all banks

Source: Own construction based on Cole and Slade (1996) and Bank Indonesia (2014)
Note: the information on the enactment of banking sector entry and the implementation of credit programme policies are available only in the year of its implementation, which is 1968.

The second step is classifying each policy into the related policy areas or dimensions. These policies and their dates are then classified and categorised based on the indicators of financial liberalisation measures (Abiad *et al.*, 2008). Referring to

Chapter 2, Table 5.1 provides the detail on the financial liberalisation policies and the dates they have been enacted or implemented. Instead of focusing only on seven financial liberalisation indicators, Table 5.1 incorporates one additional indicator, namely credit ceiling, to be included in the calculation. The inclusion of credit ceiling as one indicator is based on the basic framework of financial liberalisation, which underlines the important of the government decision to eliminate the credit ceiling. Moreover, the government policy to abolish the credit ceiling in June 1983 became a milestone in the implementation of the Indonesian financial reforms. Hence, there will be eight indicators that will be involved in the construction of this index.

Figure 5.1 Monthly FLI 1970–2015
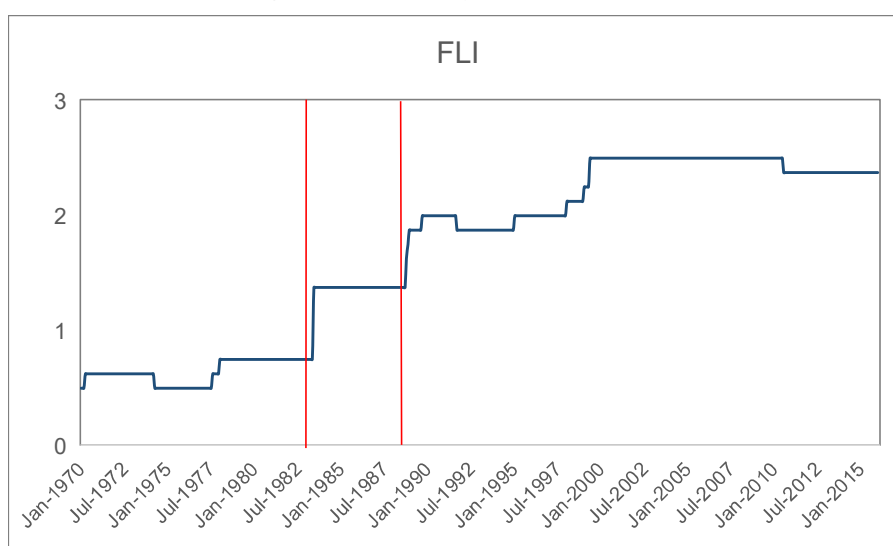
Source: Own calculations based on Abiad et al. (2008)
Note: The vertical lines show two critical steps of financial liberalisation measures in 1983 and 1988

The third step is providing the score for each financial liberalisation dimension, which is constructed from the score of several sub-dimensions. According to Abiad *et al.* (2008), there are two dimensions that do not have sub-dimensions, namely the credit ceiling and privatisation. The rule in scoring these dimensions or sub-dimensions is provided in Appendix A. Following the reversals principle, as explained above, when there is any new policy that affects a specific dimension, the score of this sub-dimension or dimension should be adjusted; therefore, when the policy leads to the more liberalised situation, the score is increasing, and if it makes the financial system less liberalised, the score is then seen to be decreasing. For each dimension with its own sub-dimensions, the score is calculated from the total 'raw-score' of each sub-dimension's score. The monthly FLI is obtained from the summation of monthly

financial liberalisation score divided by the number of financial liberalisation policy dimensions. In the case of Indonesia, however, the FLI calculated using seven policy areas, as suggested by Abiad *et al*. (2008), has a value that is almost similar to the index calculated using eight policy areas, which has been done in this study. Figure 5.1 shows the monthly FLI spanning 1970–2015.

The monthly FLI provided in Figure 5.1 demonstrates that the process completed in order to obtain a higher frequency of FLI on the development of financial liberalisation is possible. There are several advantages associated with constructing a higher frequency financial liberalisation: for instance, (i) this index allows the researcher to use it with other higher frequency indicators in the empirical analysis; and (ii) a higher frequency index can portray the detailed development and accordingly describe the phase or process of financial liberalisation policies. Thus far, this is the study of financial liberalisation that implements the first effort in constructing the FLI by examining the change of government policies on a monthly basis.

5.06   Empirical analysis

5.06.1 Autoregressive Distributed Lag technique

Most of the empirical analyses in economics examine a long-run relationship between independent variable(s) and the dependent variable. The assumption that needs to be fulfilled by the data series is that they are stationary. Brooks (2008, pp. 207–208) underlined the importance of stationary data in time series analysis for its ability to give a better estimate in the long-run. On the other hand, the non-stationary series are argued to give an unreliable estimate since they can produce a false statistical evidence[17]. However, in an effort to make a variable stationary, researchers need to employ the first-differencing or de-trending technique. Meanwhile, utilising this technique may imply a loss of important long-run information of the relationship between the variables interest (Nkoro and Uko, 2016).

Recent developments in the econometrics technique offer a way out in terms of dealing with the above challenge. Cointegration is one of the econometrics methods that may be used as a tool in examining the long-run relationship between variables interest. There are several techniques in testing the cointegration: for example, a two-

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[17] In line with Brooks (2008), Gujarati and Porter (2009, p. 741) explained that it would be difficult to study a long-term behaviour of such series if the data were non-stationary data for they only provided information for a specific period. As a result, the forecasting could produce less-precise outcome.

step procedure that is formalised by Engle and Granger, the Stock-Watson common trends test, and the Johansen cointegration test. Such tests offer the solution of long-run relationship, although these tests require all variables involved to be non-stationary and have the same level of integration order, which is I(1).

One technique that is widely used is the Autoregressive Distributed Lag (ARDL) model, as developed by Pesaran *et al*. (1999, 2001). This technique has various advantages compared to others in the way that: (i) it considers the problems of serial correlation and endogeneity by involving lagged values in the estimation process, both for dependent and independent variables; and (ii) it can estimate short- and long-run parameters simultaneously, irrespective of order of cointegration of each variable is, whether I(0) or I(1).

In general, the ARDL model can be formulated based on the following basic equation:

$$\Delta y_t = \alpha_0 + \sum \beta_i \Delta y_{t-1} + \sum \gamma_j \Delta x_{1t-j} + \sum \gamma_j \Delta x_{2t-k} + \delta_0 y_{t-1} + \delta_1 x_{1t-1} + \delta_2 x_{2t-1} + \varepsilon_t$$

In this equation, α_0 denotes the intercept, y_t is the dependent variable, x_t denotes the independent variables and ε_t is the error term. There is specific characteristic of an ARDL equation, which contains an Error Correction term (EC). In the above equation it is represented by δ_0. The EC describes the adjustment speed of the model to its equilibrium when there is a shock. EC has to meet the stability condition and takes the value between $-1 < \delta_0 < 0$. This negative value shows that the process of adjustment is convergence, which means that if the value of error correction term = –0.5, it can be inferred that, after the shock, 50% of the speed of adjustment takes place in each period or quarter or year. The above equation is similar to the traditional error correction model (ECM). However, the usual error-correction term is replaced by y_{t-1}, x_{1t-1}, and x_{2t-1} or the lagged level of the dependent and independent variables.

In the case of the ARDL technique, Pesaran *et al*. (1999, 2001) use bounds-testing to assess the cointegration of the variables interest. The null hypothesis that will be examined centres on there being no long-run association between variable interests. Within this process, the Wald test, which is derived based on the model constructed, allows the researcher to examine the existence of co-integration (Ononugbo, 2012, p. 202). The null hypothesis and the alternative hypothesis of the Wald test can be presented as follows:

H_0: $\delta_0 = \delta_1 = \delta_2 = 0$ (there is no long-run relationship)

H_A: $\delta_0 \neq \delta_1 \neq \delta_2 \neq 0$ (there is a long-run relationship)

To examine the computed *F*-statistics, Pesaran *et al.* (1999, 2001) provide the *F*-statistics critical values that consist of lower and upper bound critical values. The first critical value assumes that the variables involved in the model are integrated of order zero, I(0), which means there is no cointegration between the variables interest. The latter assumes that all variables involved are integrated of order one, I(1), which means that the cointegration between variables exists.

These lower and upper bounds critical values will be used to assess the computed *F*-statistics (Pesaran *et al.*,1999, 2001; Nkoro and Uko, 2016). When the value of the computed *F*-statistics reaches a point beyond the critical bounds, the lower and upper bounds, one can then draw a conclusion as to whether or not there is a long-run relationship between variables involved. The decision that the long-run relationship exists can be made if the computed *F*-statistics is greater than the upper bound; on the other hand, there is no long-run relationship if the value of computed *F*-statistics is below the lower bound critical value. However, if the computed value falls in between of these bounds or lies within the lower and upper bounds, the result is then inconclusive, which requires that the researcher take another test of unit root and order of integrations of the variables interests.

Following the conclusion of the long-run relationship, one can proceed the estimation using ARDL. This next step is the process of estimating the long-run relationship coefficients and error correction term. However, when undertaking this process, the selection of lagged length for each variable involved is required so as to ensure that the model has Gaussian error terms (Nkoro and Uko, 2016). In other words, this model can provide a reliable output when the values of the maximum lags are appropriately selected. In order to generate a parsimonious model, one usually faces a trade-off between the choice of lowering the sum squared residual or losing the degree of freedom. The decision to add the lagged length may reduce the residual of sum square; however, this decision has an association with decreasing the degree of freedom. The selection of the lags values can be done using the ordinary selection criteria: for example, Akaike Information Criteria (AIC) and Schwarz Information Criteria (SIC). These selection criteria enable researchers to examine whether or not the model fits the data. According to Brooks (2008, pp. 232–233), these information criteria contain two important features: a term to measure model fit, which is a function of the sum squares residual; and a penalty when there are additional parameters that will reduce the degree of freedom.

After reviewing the technique to be used in the analysis, the following subsections will discuss the empirical analyses on the impact of financial liberalisation on exchange rate volatility and economic performance.

5.06.2 Exchange rate volatility and financial liberalisation

Financial liberalisation is argued as helping a country in terms of providing the source of funds and accordingly reducing the volatility of its exchange rate. Following this argument, the hypothesis of this chapter is that financial liberalisation has a negative impact on exchange rate volatility. Referring to this hypothesis, an analysis will be undertaken to examine the impact of financial liberalisation on Indonesian financial stability. At the first stage, this chapter will explore the association of financial liberalisation with the volatility of exchange rate. It is supposed that there is a negative association between these indicators, which leads to the conclusion that the process of liberalisation in the financial market supports the Indonesian economy by lessening its exchange rate volatility. In so doing, this study extends the model proposed by Hau (2002) and Kose (2003), as discussed in Section 5.02, as follows:

$$VE = f(EL, IL, Z)$$

In this study, the macro-indicator that intends to be examined is the exchange rate volatility. In order to represent financial liberalisation, this chapter will employ several macroeconomic indicators, for example, domestic liberalisation (IL) covers the development of stock exchange, which will be represented by the return of stock index and the development of banking sector credit to the private sector. In terms of the external liberalisation (EL), the movement of the domestic interest rate may attract the flow of capital and trade openness represented by the term of trade. FLI will be involved so as to represent all processes of liberalisation in the financial system. In addition to these, there are several macro-economic indicators that will function as independent variables.

The choice of exchange rate volatility is inspired by the fact that, in the last Asian financial crisis of 1997/1998, Indonesia suffered a sharp decline and high volatility in its currency. Even though a currency crisis does not always follow high exchange rate volatility, this indicator may reveal a problem for the country. Some researchers define currency crisis based on how deeply the currency has depreciated and in consideration to the overall volatility of the currency. As an example, Laeven and Valencia (2008) argued that the currency crisis occurs when there is a nominal

depreciation of a currency of at least 30%[18]. Frankel and Rose (1996) define the currency crisis as the movement of the exchange rate that reaches two or three standard deviations in a particular period.

Danielsson *et al.* (2016) maintained that the high volatility of a financial market would contribute to the economic agent's view of the future, especially when financial market volatility diverges from economic agents' expectations. The volatility of a financial market indicator that is increasing may lower investors' or economic agents' confidence. This argument is in line with Kohler (2010) who emphasised the increasing probability of a financial crisis with increasing exchange rate volatility.

Table 5.2 List of variables interest

Variable	Description	Data source
$excrate$	Exchange rate volatility is calculated using 12-month rolling standard deviation	International Financial Statistics (IFS– IMF) 1991–2015
gdp	The quarterly data of real economic growth	OECD statistics 1991–2015
$realintrate$	The first difference of Central Bank policy interest rate deflated by inflation rate	IFS– IMF 1991–2015
$privcre$	The change of credit to the private sector in the form of natural logarithm	BIS 1991–2015
$idxreturn$	The return of stock index that is calculated from the natural logarithm of stock market index	CEIC 1991–2015
$inflation$	The natural log of the consumer price index	IFS 1991–2015
fli	The FLI based on the method developed by Abiad *et al.* (2008). The monthly data is converted to become quarterly data.	Own calculations

Source: Own construction

This sub-section endeavours to investigate the association of the volatility of the exchange rate ($excrate$) with several other independent variables. The volatility of an

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[18] The authors of the paper did not explain further how they determined the 30% as the limit of the volatility. However, it can be inferred that the percentage is calculated based on the average exchange rate volatility of countries that are experienced a financial crisis.

exchange rate in this study follows Clark *et al.* (2004) that defined exchange rate volatility as the standard deviation of the first difference of the exchange rate natural logarithm. In this analysis, the exchange rate volatility is calculated using 12-quarter rolling standard deviation. The independent variables to be included in this study consist of the inflation rate, the real interest rate, the stock market index and the FLI. The inflation rate ($inflation$) is argued as having a positive impact on the overall volatility of the exchange rate. One variable that can influence the decision of foreign investors in investing their funds into the domestic market is inflation. The higher the inflation rate, the more reluctant investors are to invest their funds. Another variable that may affect investors' decision is the domestic interest rate ($realintrate$). Most developing countries have a higher rate of interest compared to developed countries. The change of interest rate from its previous period may affect the volatility of the exchange rate. A country's financial reforms can be portrayed by the development of its stock market. A higher return of stock market index ($idxreturn$) may attract domestic and foreign investors to make the domestic equity market more active and liquid. It is expected that the change of stock index will cause impacts on the exchange rate volatility. Moreover, when investigating the impacts of financial liberalisation on the dependent variable, this study adds variables with regards the implementation of financial liberalisation, such as the credit to the private sector and the financial liberalisation index (fli), for example. These data are expected to represent the macroeconomic condition and the implementation of financial liberalisation in the country. There is another variable that was intended for use in this analysis—the terms of trade—but, considering the presence of multicollinearity, this variable was excluded from the estimation. The observation period for this analysis ranges 1990–2015, using quarterly data. A list of the variables can be seen in Table 5.2.

The problem with structural breaks is a common problem in a model that involves macroeconomics variables. The existence of a structural break can result in the misleading interpretation or unreliability of a model. In the process of the date of break identification, most researchers may locate the structural break phenomenon, such as by the eye-balling process, for example. However, this process sometimes does not precisely determine the break date. To deal with this problem, this study applies

the methodology of Bai and Perron in examining structural breaks[19]. There are several advantages to using the Bai-Perron method, such as that one can identify multiple break dates and estimate the structural change at an unknown date (Troncoso-Valverde, 2004). By examining the exchange rate volatility, this study finds that the structural break occurs starting from the third quarter of 1997 up to the second quarter of 2002, which displays a significant shift and evolves over several quarters. One may suspect that this period covers the period of financial crisis seen to have occurred in Indonesia, which then shifts the series of the variable concerned. It then can be inferred that, during the period of crisis, the volatility of the exchange rate moves beyond the normal period. In response to this structural break, the dummy variable of break is constructed, which contains binomial numbers and has the value of one for all observations over this period, and zero otherwise.

Table 5.3 Unit root tests

Variables	ADF			Phillips-Perron		
	Level	1st different	Decision	Level	1st different	Decision
excrate	-2.897 **	-2.773 *	I(0)	-1.814	-5.004 ***	I(1)
gdp	-7.141 ***	-15.081 ***	I(0)	-7.141 ***	-40.18 ***	I(0)
privcre	-3.288 ***	-8.164 ***	I(0)	-3.821 **	-7.306 ***	I(0)
idxreturn	-10.34 ***	-11.606 ***	I(0)	-10.348 ***	-57.17 ***	I(0)
inflation	-6.606 ***	-5.718 ***	I(0)	-3.487 **	-4.171 ***	I(0)
realintrate	-3.451 ***	-8.29 ***	I(0)	-3.236 **	-8.308 ***	I(0)
fli	-1.225	-7.882 **	I(1)	-1.261	-7.828 ***	I(1)

Source: Own calculations
Note: The unit root tests are conducted using the ADF and Phillips-Peron methods, which are based on the MacKinnon critical values that correspond to -3.497, -2.890, and -2.582 of 1%, 5% and 10% significance level, respectively.

As provided in Section 5.06.1, the first step in using this method is the examination of the order of integration of each variable involved in the model, either I(0) or I(1). This step is considered critical since it will determine whether or not the estimation can use ARDL. If the orders of integration across all variables involved are similar, the method that will be used is the error correction model (ECM). If there is a mixture of the order of integration amongst the variables, one can employ ARDL. Table 5.3 displays the results of the unit root test using the Augmented Dicky-Fuller (ADF) and the Phillips-Peron methods. It can be inferred that all of these variables have a mixed

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[19] To apply the Bai-Perron method in identifying the break date, this study uses the statistical software Eviews 9. The objective of this method is to estimate the unknown coefficient regressions and the period or date of the structural change occurs under a certain number of observations (Troncoso-Valverde, 2004).

order of integration. Since the orders of integration are mixed, the analysis may proceed with ARDL.

Table 5.4 Bounds test results

k	F-statistic	Critical values					
		at 1% level of significant		at 5% level of significant		at 10% level of significant	
		I(1)	I(0)	I(1)	I(0)	I(1)	I(0)
6	8.6549	4.43	3.15	3.61	2.45	3.23	2.12

Source: Own calculations

Based on the results of having the order of integration, the next step is to calculate the bound testing and compare the computed F-statistic with the critical value. Before undertaking this step, the maximum number of lags needs to be set. In so doing, this study uses Akaike Information Criteria (AIC) to determine the lagged values of the model, which provides the result of four as the maximum lags. With four as the maximum lags, one may proceed to the bounds test to check the existence of the long-run relationship amongst the variables interests. Table 5.4 provides the number independent variables (*k*), the value of computed F-statistics, and two critical values, namely the upper (I(1)) and lower (I(0)) bounds. Based on this table, the output of the bounds test is above the upper bound at 1% significance level. According to Pesaran *et al.* (1999, 2001), the critical value of the upper bound assumes that all variable interests have the order of integration one, I(1), which suggests that co-integration does exist. This explanation leads to the decision of the rejection of H_0 that no long-run relationship exists. In other words, this result demonstrates the existence of a long-run relationship between variables interest since the F-statistic is above the critical value.

The long-run relationship between the variables in the model with ARDL (3, 4, 0, 3, 4, 0, 0) for the exchange rate volatility is as follows:

$$excrate_t = -0.027 - 0.036gdp_t - 0.009inflation_t - 0.07privcre_t + 0.00003realintrate_t$$
$$\quad\quad\quad\quad [-3.094] \quad\quad\quad [-0.077] \quad\quad\quad [-1.58] \quad\quad\quad [0.022]$$

$$- 0.04idxreturn_t + 0.052fli_t + 0.027break + \varepsilon_t$$
$$\quad\quad [-1.18] \quad\quad\quad [2.19] \quad\quad [5.03]$$

R-squared = 0.816   Adj.R-squared = 0.782   S.E.of regression = 0.007   No. obs=100
Note: The numbers in brackets are the t-statistics

The sign of each coefficient estimate may reveal the long-run association between the dependent and independent variables. In this observation, the variables that are

seen to positively affect the volatility of the exchange rate ($excrate$) are the real interest rate ($realintrate$) and the FLI (fli). However, from these two variables, it is only the FLI that is statistically significant at the 5% level. On the other hand, there are some independent variables that have a negative association with the dependent variable. Those variables are growth (gdp), which is statistically significant at the 1% level, private credit ($privcre$), and the inflation rate ($inflation$), as well as the stock market return ($idxreturn$). These two last independent variables are not significant.

From this output, one can see that the increasing economic growth may have a positive impact in terms of reducing exchange rate volatility. On the other hand, the increasing FLI, all other things being equal, will increase the exchange rate volatility. To sum up, not all the indicators representing the implementation of financial liberalisation have similar movements to the currency volatility. However, the development of financial liberalisation as the focus of this study and represented by the FLI shows a positive relationship. It can be inferred that the implementation of financial liberalisation in Indonesia has a positive association with the volatility of the exchange rate. In addition to the long-run relationship, this model has a negative and statistically significant error correction term at the 1% level (error correction value is –0.242 with t-statistic –7.723). This result indicates the speed of adjustment of the model in the long-run. In other words, the system has a recovery speed at 0.242 to return to the long-run equilibrium if there is a shock. The detail error correction of the estimation of ARDL is provided in the Appendix B.III.

This study also carries out diagnostic tests, such as the serial correlation and heteroscedasticity tests, for example. The diagnostic test of serial correlation LM test shows that the probability of $F(4,71)$ is 0.5932, which is above the p-value of 0.05. The value of the Lagrange Multiplier (Obs*R-squared=3.65) is lower than the critical value (χ^2 =9.487), with a probability of Chi-square equals to 0.4551. This output shows that these tests do not reject the null hypothesis of no serial correlation. The output of the White test for detecting heteroscedasticity, which is the value of Lagrange Multiplier (Obs*R-squared=20.77) is below the critical Chi-squared ($\square^2$ =22.36). It can be inferred that the test cannot reject the null hypothesis of homoscedasticity.

5.06.3 Economic growth and financial liberalisation

In addition to the analysis of the impact of financial liberalisation on the volatility of the exchange rate, as above, this study deems it necessary to examine the impact of

financial liberalisation on growth. So far, the association between finance and growth nexus is under intense discussion. As discussed in Section 5.02, Fry (1995) underlined the extensive studies that showed a positive relationship between these two variables and emphasises the causal link that finance supports growth. His argument was based on the thought that the availability of funds in the financial market will facilitate economic agents to expand their business capacity. The availability of funds will increase as the government stimulates saving by liberalising the interest rate. The increasing availability of funds allows the financial sector to play a significant role in channelling the funds to the private sector. With this argument, the mainstream views describe the model of finance-growth nexus as follows (Elsayed, 2013):

$$lnGDP = f(Bankingsector, Stockmarket)$$

where $lnGDP$ is the economic growth obtained from country's income in the form of its natural logarithm. The $Bankingsector$ and $Stockmarket$ refer to the indicators that represents the role of banking sector and stock market in domestic financial system. King and Levine (1993) applied this model by focusing on the role of the domestic banking sector and tried to establish this relationship with the following equation:

$$lnGDP_t = \alpha_0 + \alpha_1 lnGDP_1 + \alpha_2 bank_t + \alpha_3 privatecredit_t + \alpha_4 privateGDP_t + u_t$$

Following Arestis and Demetriades (1997), in an effort to test the association between the financial liberalisation and economic growth, this chapter will use several variables, such as economic growth (gdp), the ratio of M2 to GDP ($m2gdp$), the ratio of credit to GDP ($credgdp$), the stock market volatility ($idxvolp$), and the stock market capitalisation ($idxcap$). It is common that the analyses of financial liberalisation emphasise the role of the banking system in the financial sector, which, in most studies, is represented by the ratio of M2 to GDP and the ratio of private credit to GDP. The indicator of M2 over GDP is argued as an indicator that shows the level of the financial-deepening of a country. This variable corresponds to the ability of the financial sector to provide sufficient liquidity for transactions (DeGregorio and Guidotti, 1995). The credit to GDP ratio is commonly used to represent the role of the banking system in channelling money to the private sector. The ratio of credit to GDP may capture the intermediation process of the banking sector so as to provide the private sector's needs to source of funds. The availability of funds in the domestic financial market will provide access for the private sector to achieve its objectives in terms of expanding their business. This will lead to increased economic activity in a country. In addition to the banking sector, this study also involves the role of the stock

market in providing economic units, especially the private sector, with sources of financing. The second aspect of financial liberalisation is the increasing role of the stock market in the financial system. Levine and Zervos (1998) emphasised the important role of the stock market and banking sector in terms of spurring on economic growth. In this context, several indicators measure the importance of the stock market, such as liquidity, size and volatility. One indicator commonly used to examine the size of a stock market is stock market capitalisation. This indicator, according to Levine and Zervos (1998), is measured by the value of the listed domestic shares as a ratio to the GDP. This variable relates to the ability of a financial system to mobilise the funds available and diversify risks (Arestis and Demetriades, 1997). However, in the case of Indonesia, this data is available starting from 1993 onwards; hence, its number of observations are inconsistent with the other variables. For this reason, market capitalisation is excluded from the estimation. The second indicator is stock market volatility. The volatility of stock market returns, in certain cases, may not have had a positive contribution on economic growth. Nonetheless, Levine (1996) noted that stock market volatility and liquidity can demonstrate future economic growth. It is expected that the results of the model will show the positive relationship between the independent variables in association with its dependent variable. This study also attempts to include an additional variable, which is the FLI that is constructed based on the method developed by Abiad *et al*. (2008).

The data set for this analysis covers the period 1991–2015. The sources of data are the IFS–IMF, the CEIC, OECD statistics, and BIS. Table 5.5 provides the list of indicators involved in the analysis.

Table 5.5 List of variables

Variable	Description	Data source
gdp	The quarterly data of economic growth	OECD statistics 1991–2015
$m2gdp$	The ratio of broad money to GDP	IFS– IMF 1991–2015
$credgdp$	The credit to the private sector as a ratio of GDP	IFS– IMF and BIS 1991–2015
$idxvol$	The volatility of stock index obtained from the 12-month rolling standard deviation of the first different of natural logarithm of stock market index	CEIC 1991–2015
fli	The FLI based on the method developed by Abiad *et al.* (2008). The monthly data is converted to become quarterly data.	Own calculations

Source: Own construction

Similar to the previous subsection, the first stage involves examining the presence of unit root. The unit root test is undertaken using the ADF test and is further validated by the Phillip-Peron (PP) test. In this step, the variables' integration order can also be defined, which are expected as I(0) or I(1). Based on the unit root tests carried out, Table 5.6 displays the results of unit root test and further concludes that the *t*-statistics for these variables are mixed between I(0) and I(1). Since the results are inconclusive, the analysis may proceed and use the ARDL and bounds testing that are apt to the results, which show a mixed order of integration.

Table 5.6 Unit root tests

Variables	ADF			Phillips-Perron		
	Level	1st different	Decision	Level	1st different	Decision
gdp	-7.141 ***	-15.081 ***	I(0)	-7.141 ***	-40.180 ***	I(0)
credgdp	-1.476	-5.371 ***	I(1)	-1.642	-10.458 ***	I(1)
m2gdp	-1.540	-15.819 ***	I(1)	-2.282	-15.246 ***	I(1)
idxvol	-2.004	-10.088 ***	I(1)	-2.004	-10.090 ***	I(1)
fli	-1.225	-7.882 ***	I(1)	-1.261	-7.828 ***	I(1)

Source: Own calculations
Note: The unit root tests are conducted using the ADF and Phillips-Peron methods, which are based on the MacKinnon critical values that correspond to -3.497, -2.890, and -2.582 of 1%, 5% and 10% significance level, respectively.

After defining the order of integration, the next step is to set the maximum number of lags. This study uses AIC to determine the lagged values of the model, which is down to four as the maximum number of lags. Subsequently, the next step is the bounds test to check the existence of the long-run relationship amongst the variables interests. Table 5.7 provides the detail of the bounds tests result. From this table, the lag-length can be identified, which is down to 4 lagged. The value of computed *F*-statistics for this case is 16.12, which is higher than the critical value of upper bound, which has a value of 5.06 at the 1% level of significance. The result of the bounds test demonstrates the existence of a long-run relationship and accordingly rejects the null hypothesis of no long-run relationship between variables interest.

Table 5.7 Bounds test result

k	F-statistic	Critical values					
		at 1% level of significant		at 5% level of significant		at 10% level of significant	
		I(1)	I(0)	I(1)	I(0)	I(1)	I(0)
4	16.12	5.06	3.74	4.01	2.86	3.52	2.45

Source: Own calculations

The following equation provides the long-run relationship between the variables in the model of ARDL (1,0,3,0,0) and the economic growth as the dependent variable:

$$gdp_t = 23.2 - 0.12m2gdp_t - 4.24credgdp_t - 0.1idxvol_t - 8.32fli_t + \varepsilon_t$$
$$\quad\quad\quad [-0.1] \quad\quad\quad [-3.84] \quad\quad\quad [-1.44] \quad\quad [-4.3]$$

Note: R-squared= 0.579   Adj.R-squared= 0.560 S.E.of regression:1.32 No. obs. = 100
the numbers in brackets are the t-statistics

Based on the above equation, from four independent variables, two variables are statistically significant. The variables of the ratio credit to GDP ($credgdp$) and FLI (fli) are statistically significant at the 1% level. The interpretation from this equation is that, in the long-run, an in the credit to GDP ratio, all other things being equal, may reduce the economic growth. In line with Weller's (2010) argument, the credit from the banking sector may go to the unproductive investment activities. As a result, the funds distributed to the private sector do not generate a direct impact on economic activities. This also applies to the FLI, which may also slow down the growth rate if the index increases; in other words, based on this observation, two indicators representing financial liberalisation and financial development, namely the ratio of credit to GDP and FLI, can be seen to have a detrimental effect on economic growth. It can be concluded that the implementation of financial liberalisation in Indonesia has had a different effect to what is commonly believed.

In addition, this model has a negative and statistically significant error correction, which has a value of –0.884 at the 1% level of significance. The error correction term shows the speed of adjustment to the long-run equilibrium of 0.884. This value shows the recovery speed of the system following a shock. The error correction of the estimation of ARDL is provided in the Appendix B.III.

This study also performs diagnostic tests. The serial correlation LM test shows that the probability of F(4,84) is 0.995, which is above the *p*-value of 0.05. The value of Lagrange Multiplier (Obs*R-squared=0.229), with a probability of Chi-square, equals 0.993 and has the value above the *p*-value of 0.05. It can be inferred that there is no evidence of serial correlation. However, one problem detected is the heteroscedasticity. The output of the White test for detecting heteroscedasticity, which is the value of Lagrange Multiplier (Obs*R-squared=29.1) exceeds the critical Chi-squared (χ^2=15.50) shows the presence of heteroscedasticity. This test suggests that the estimation uses the robust standard error.

5.07 Conclusion

The financial system development is argued to help the country in terms of accelerating and improving its economic performance. One aspect of financial system development is that it is argued as having the ability to support economic performance by lowering the costs of capital (Bekaert and Harvey, 2000), raising economic growth (Quinn and Toyoda, 2008), and lessening crisis occurrence (Beck *et al*., 2006). However, some economists claim that financial liberalisation has a negative effect on the financial system.

This chapter's objective is to engage in this discussion by focusing on the concept of financial liberalisation and the way in which it impacts the country's financial system, whether by providing a positive impact, as expected, or not. In so doing, this chapter has discussed the financial liberalisation thesis and reviewed various empirical studies focused on the impacts of financial liberalisation on financial stability and economic performance. The discussion of this chapter involved the concepts of domestic financial liberalisation and capital account liberalisation.

This chapter contributes to the literature by observing the implementation of financial reforms in the Indonesian context and assessing its association with the instability of Indonesia financial system using the most recent data available. Besides, this chapter provides the first effort to constructing FLI on a monthly basis in an attempt to garner understanding into the detailed progress of financial liberalisation in Indonesia. With this monthly index, the empirical analysis using higher frequency macroeconomic and financial indicators has been possible to undertake.

This chapter has provided several findings in association with the implementation of financial reforms in Indonesia. First, financial reforms are argued as having an impact on supporting a country in achieving a better economic performance; inside this framework, however, a number of damaging effects can be seen. The empirical results show that Indonesia entered into an unstable financial condition after adopting financial liberalisation. Second, this study finds that the process centred on obtaining a more detailed description of the development of financial liberalisation by constructing a monthly FLI is possible. By having higher frequency data, the analysis can capture the heterogeneity and characteristics of the observations much better than low-frequency ones. Third, the implementation of financial liberalisation creates financial system vulnerability. By employing the ARDL method, this study rejects the hypothesis that financial liberalisation reduces exchange rate volatility. Furthermore,

when investigating the association between financial liberalisation and economic growth, the study finds that the output displays a negative long-run relationship.

Chapter 6
Assessing the measurement of financial instability

6.01 Introduction

Almost all countries experience the negative impacts that come from financial crisis when it occurs, such as negative growth, a substantial increase in unemployment, and a decline in asset prices. As a result, crisis countries need a period to recover. In the case of Indonesian, since the Southeast Asian financial crisis in 1997/1998 hit the country severely, it needed more than five years to get back to pre-crisis conditions. Because of these impacts, no single country expects to experience a crisis. This condition encourages economists and the authorities to search for the correct methods to prevent their country from experiencing financial crisis by improving the country's stability overall.

The need for financial stability in the global economic condition overall has not been accompanied by the construction of an effective policy framework. The first question to be raised is in connection with the performance of the policy framework in preventing, maintaining and dealing with a crisis. In order to answer this question, there are criteria that have been used to ensure that quality and effectiveness has been maintained in the construction of the framework. Besides, the framework needs to reach a consensus on the definition of financial stability, its coverage, and the way to measure it.

Recent developments in the prevention of financial crisis have reached the stage of developing a tool to measure and predict crisis episodes. There are efforts to construct an instrument for measuring and predicting crisis occurrence. However, there are challenges concerning the accuracy and precision of the instrument. Besides, the sophistication of modern financial systems puts pressure on this effort. One method that has been initiated and is meant to give a signal of a crisis occurrence is an EWI. This method became the foundation for the next generation of financial crisis measurement tools. Despite its weaknesses, especially its poor capability for crisis prediction, this method facilitates its users to explain and evaluate the crisis episodes.

This chapter provides a contribution to the literature by developing the instrument of EWI using the most current available dataset. In this chapter, this study endeavours to investigate the applicability of the EWI by applying it to the Indonesian case. This

study focuses on the assessment of the macroeconomic variables that are commonly used as crisis indicators referring to previous studies and extending to include one additional variable, namely short-term debt; this will be to investigate its performance when it comes to being a leading indicator of crisis. In so doing, the analysis will explore the monthly data on the Indonesian economy over the period from 1990 to 2015. It has been argued that using higher frequency data can capture the diversity and specific characteristics of the observation much better than low-frequency ones. The higher frequency data is also expected to capture a more sensitive signal, which is required in building the EWI.

Following the introduction, the next section is a short exploration of some studies that have constructed methods to measure the financial instability. The third section will explore the method of construction for the EWI, and its application to the Indonesian case. The last section will discuss the results, which is then followed by the conclusion.

6.02   Theoretical review

6.02.1 The methods to find the leading indicators

Since the 1990s, economists have developed tools for preventing the financial system from crisis. They have offered forward extensive methodologies to build a reliable instrument to predict financial crisis. Frankel and Saravelos (2010) categorised three methods for developing this instrument. The first method is the behaviour analysis that is considered to be the earliest technique to select crisis leading indicators. This method examines the behaviour of several variables in the run-up to a crisis by differentiating the countries under observation in to two groups: crisis and non-crisis countries. Then this method compares the movement of the variables of interest that belong to each group. The second method is the signal approach that selects some of the macroeconomic indicators to be crisis leading indicators, and sets the threshold for each indicator by which the border between crisis and non-crisis period is determined. The third method is a linear regression or a binary regression approach, which uses linear regression to test the statistical significance of some of the variables under observation. Furthermore, there are more recent techniques that have been developed for identifying the variables of interest.

Kamin (1988) conducted a study on the movements of macroeconomic indicators before, during and after the countries under observation went through a period of currency devaluation. The intention of this observation was to understand the inter-

relationship between the movements of the variables involved and whether or not there were any difference in the movements between the crisis and non-crisis countries. This method used three steps to observe the variables of interest. The first step was examining the value of all macro-indicators before, during and after the period of devaluation within a seven-year window. The second step was to calculate the average value of each indicator for all of the countries under observation. Finally, the third step was comparing the movement of each indicator that belonged to the devaluing countries from the entire sample during the same period (Kamin, 1988, pp.7-8). By comparing the movements of the variables between the crisis and non-crisis countries, the author claimed that it is possible to differentiate the behaviour of the variables of interests.

Under the second method, Kaminsky and Reinhart (1999) observed some macroeconomic variables that were suspected to have relationship with the balance of payment and banking crises. In their paper, these variables were examined to go on to become the best crises predictors, and to became known as EWI. The first objective of this research was to observe the economic and financial variables that have unusual movements in the outbreak of such crises. By examining and comparing the movements of each variable in both normal and crisis periods, economists may get an impression of how the financial system can become unstable and, if possible, the variables can also show the date or timing of a pending crisis with some degree of accuracy. The second objective was to explore these crises, and whether or not they have any relationship to one another. The examination of the behaviour of the relevant variables is meant to obtain an insight into the cause of the crises, especially if there are any variables that have similar movements which may explain the outbreak. The most important step in this analysis is the way that is used to determine the crisis outbreak, for it will affect the rest of the analysis.

The third method intends to find the crisis leading indicators by using regression techniques, namely linear regression and binary regression. Various variables which may indicate a country's vulnerability are chosen. Economists will undertake a probability test; in this case, a crisis occurrence serves as the dependent variable that is determined by a set of explanatory variables. The dependent variable is determined based on the criteria that are applied to the crisis occurrence, whether it is currency crisis (Eichengreen et al. 1995; Frankel and Rose, 1996) or banking crisis (Demirgüç-Kunt and Detragiache, 1998). Similar to the second method, the identification of the crisis also becomes one critical step in this analysis.

One of the challenges in constructing the EWI was how to translate the definition of crises in relation to determining the onset of the crisis. There are definitions of crises that are relevant to this discussion, as provided in Chapter 3 - Section 03. In short, one can refer to the World Bank's definition of a banking crisis as a situation when there are bank runs, and all sectors in the country face a difficult financial situation and fail to pay their contract obligations on time (World Bank, 2016). Demirgüç-Kunt and Detragiache (1998) set four conditions that describe the banking crisis. Those are the ratio of non-performing assets to total assets in the banking system being more than 10%, the bail-out cost to support the banking sector reaches at least 2% of the GDP, the banking sector problem leads into the nationalisation of banks, or there is the occurrence of massive bank runs. If one or more of the conditions above hold, then a country is then categorised as a banking crisis country.

The second type of crisis is a currency crisis, which occurs when there is a deep depreciation of the country's exchange rate. Frankel and Rose (1996) proposed the cut-off point of deep depreciation as reaching more than 25 % to translate the definition of a currency crisis that enables a researcher in categorising a crisis country. Laeven and Valencia (2008) set the limit of the currency depreciation when it reaches not less than 30%. According to Frankel and Rose (1996), however, this criterion of a minimum level of depreciation is constructed arbitrarily. Most of the studies refer to these approaches and will set the date of the beginning of the crisis as when the limit is breached (Frankel and Saravelos, 2010).

6.02.2   The financial crisis measurements

As mentioned in the previous subsection, Kaminsky and Reinhart (1999) proposed an instrument to anticipate the occurrence of a crisis by developing EWI. According to Kaminsky and Reinhart (1999) and Borio and Lowe (2002), the important stages of developing this instrument was choosing the variables, classifying the crisis event, and setting the precise date of the crisis itself. The criteria to determine whether a chosen indicator performs well consists of two factors; firstly, it must have the ability to predict the episode of a financial crisis. Secondly, it should not give a false signal, which is the forecast of a crisis that does not materialise, too often. The other critical part involved is setting the threshold precisely because it affects the performance of the indicator overall. The threshold is the boundary between the crisis area and non-crisis area. When the threshold is set randomly, an inaccurate indicator may turn into a good one, or *vice versa*.

Kaminsky and Reinhart (1999) focused on indicators that consisted of several elements, such as the financial sector, the external sector, the real sector, and the fiscal sector. The financial sector was measured by examining some of the variables that are expected to describe the banking sector's condition. These are the M2 multiplier, domestic credit to GDP ratio, real interest rate, lending to deposit rate ratio, M2 to reserves ratio, bank deposits and the excess of M1 balances. They argued that in the domestic financial sector, a problem within the domestic banking sector has an important role in triggering the occurrence of a crisis. The external sector aims to capture the external vulnerabilities of a country by examining several variables such as exports, imports, real exchange rate, the level of international reserves, and the interest rate differential. Instead of using the real exchange rate as suggested by Kaminsky and Reinhart (1999), this study has employed real effective exchange rate data from the BIS. Lang (2013) argued that the real effective exchange rate can be used to analyse the onset of a crisis since it considers the price level and the basket of any main trading partners. The third element is the real sector, which is employed by examining the movement of the national output and stock prices. The fiscal sector uses the ratio of deficit to GDP, and observes the source of funding for the government budget, whether it comes from the Central Bank or other sources of financing.

After defining the variables involved in the observation, the next step is assessing the movement and the ability of each variable to provide a signal of instability. Kaminsky and Reinhart (1999), who were followed by Borio and Lowe (2002) and Drehmann *et al*. (2011), proposed a mechanism for measuring the variables that are defined as the deviations of the current level from some notion of what a 'normal period' is. Borio and Lowe (2002) used the long-term trend of a variable to represent the normal period. This long-term trend is measured using the Hodrick-Prescott filter with smoothing parameter λ taking the value of 14,400 since the data is monthly. It is supposed that each variable depicts the correct signal; hence, one should be concerned in the case of a wider gap, as it may indicate a more vulnerable financial system.

There are three important steps in applying the EWI method; those are the determination of the crisis outbreak, the crisis period and the normal period. With regards to the determination of the outbreak, some studies (Kaminsky and Reinhart, 1999; Laeven and Valencia, 2008; Laeven and Valencia, 2013) provide the information on the definition, date and type of crises. These authors analysed a series

of crises based on the experiences of the crisis countries. From this date, one can generate and distinguish between the period of crisis and the normal period. Kaminsky and Reinhart (1999) suggested that the window in which a crisis period is observed may range from twenty-four months to thirty-six months, or forty-eight months. They also defined the normal period as being a period when the country does not experience the crisis. Hence in order to obtain the value of the normal period, one must find the average value of each concerned variable in the remaining period outside of the crisis period.

To ascertain whether or not a variable can capture the possibility of a crisis, there needs to be an evaluation on each variable's ability to have a low noise to signal (N/S) ratio. This ratio explains the ability of a variable to provide a more precise signal. There is a crucial step that needs to be carried out to get this ratio, namely, the setting of the threshold. This threshold is the limit that sets the upper boundary of an indicator. When the value of such an indicator goes beyond this limit, this indicator is considered as issuing a signal of a crisis (Guru, 2016). The challenge in performing this stage comes since there is a trade-off in setting the threshold. For example, when the threshold value is too high, the indicator may not capture the crisis signal, and when it is set too low, the variable may send too many false signals. Economists use several techniques in defining this threshold. Kaminsky and Reinhart (1999) used a fine-grid approach and Lang (2013) set 1.5 standard deviations as the threshold; so, when the value of a variable breached this threshold, it will be counted as the crisis period.

Guru (2016) applied the extreme value for setting the threshold. The crisis is categorised as a rare and extreme event, which has a small probability compared to the existence of a tranquil period. According to the author, if one decides to specify that a crisis event will have a probability at level p, which at this level is considered very small, then a value of the concerned variable that goes beyond $100(1-p)^{\text{th}}$ percentile will portray the crisis period (Guru, 2016). In other words, $100(1-p)^{\text{th}}$ is the threshold value to distinguish the border between the stress event or crisis and non-crisis. For example, the stress probability is set at 5%, it means that the 95th percentile will be included as the stress-threshold (Guru, 2016).

Kaminsky and Reinhart (1999) selected the value of the threshold by carrying out an examination on each variable and deciding the value of the stress probability or the critical region of a maximum 30%. Considering the number and characteristics of the observation, these authors set a different level of stress probability for each different

variable. In so doing, the result will commonly give two types of error (Kaminsky and Reinhart, 1999; Borio and Lowe, 2002; Drehmann *et al*., 2011): firstly, that no signal is sent but a crisis occurs (Type I error), and secondly, that there is a signal that can be recognised but no crisis occurs (Type II error). To obtain the appropriate variable for the EWI, a variable should have a low N/S ratio.

6.03　The application of the early warning signal

This study employs a monthly data set of twelve variables ranging from January 1990 to December 2015 to generate the EWI. This data was mostly retrieved from the IFS-IMF, Indonesian Central Bank, and OECD statistics. Following Kaminsky and Reinhart (1999), this study has examined the movement of each variable by looking at the series of deviations between the actual rate relative to the normal period. It is expected that the deviation of each variable within the crisis period can provide the signal of fragility. This study will observe most of the variables that have a connection to the three sectors, namely the financial sector, the external sector, and the real sector. In this study, the indicators that have a link with financial sector are represented by M2 to reserves ratio, lending to deposit ratio, bank deposits, total credit, and real interest rate. The foreign sector will be represented by several indicators such as the interest rate differential, reserves, exchange rate, exports, and imports. The indicators linked to the real sector are economic growth, which is represented by the index of industrial production and stock market index. There are a few pieces of data that cannot be obtained in a higher frequency or are only available in a shorter period, for example, the budget deficit, government expenditures and government debt. Hence, this study does not involve the examination of the indicators within the fiscal sector. In analysing the series of each indicator, the long-term trend is measured by the average of the normal period. Except for the interest rate and stock market index, all of the variables will be calculated from their 12-month changes.

The choice of the above indicators is based on theoretical considerations, especially the way that the indicators explain the economic condition and have the ability to show the signal of a crisis (Kaminsky and Reinhart, 1999). Referring to Kaminsky and Reinhart (1999), the following paragraphs will summarise the reason for picking the above indicators. Within the financial sector indicators, the M2 to reserves ratio is used to show that a low and continually declining value of this variable indicates a problem in the financial sector. This indicator describes the ability to meet the

economic agents' demands for foreign currency. In the crisis period, economic agents may rush to convert their domestic currency into foreign currencies. If there are insufficient reserves, the financial system will have a serious problem (Kim et al., 2007). The second indicator is the loan to deposits ratio that is expected to portray the quality of the lending-borrowing process. Usually, this indicator will increase since the banking sector is aware of the increasing of borrowers' credit risk before or during the crisis period. The bank deposit will represent the banking sector indicator, especially for portraying the possibility of bank runs. In the crisis period, the indicator of the bank deposit will decline below the normal period, which can be captured by the negative movements of bank deposits. The fourth indicator is the credit to GDP ratio which is expected to portray the banking sector's credit expansion. The increasing credit to GDP ratio usually occurs before the onset of a financial crisis. The fifth indicator is the real interest rate. In a crisis period, the real interest rate will be higher than in the normal period. This indicator can capture the banking sector's intention to maintain its deposit and prevent massive withdrawals.

Under the foreign sector, there are five indicators that represent the conditions of the capital and current accounts of the country that is under observation. Firstly, a higher interest rate differential can show the decision of a country to attract foreign capital and prevent the deterioration of the exchange rate of the domestic currency. Secondly, the negative movements of international reserves describe the loss of the Central Bank's foreign exchange reserves. Before and during the crisis period, the international reserves will be depleted, and this condition usually recovers when the country devalues the currency or shifts its policy to a floating rate arrangement. The third indicator is the exchange rate movement, which is expected to show deep depreciation in a crisis period. Prior to the crisis period, a sharp decline in domestic currency against foreign currency shows the possibility of a currency overvaluation. The behaviour of exports and imports may also indicate a problem with the country. A negative growth of exports can portray the weak performance of the domestic industry. Besides, the declining nature of exports also shows that the country is facing a slowing down in its economic activities. However, the behaviour of its imports can be ambiguous. On the one hand, declining imports can be interpreted as a growing sign of a country's own products, which also shows the potential of trade to balance improvements. On the other hand, since in the crisis period the countries mostly experience a decline in their economic activities, the growth of imports will also decline. To deal with this, Kaminsky and Reinhart (1999) emphasised that a decline

of imports is also a sign of crisis since a crisis country may experience a sharp decline in the import of both goods and services.

The real sector is represented by economic growth and the stock market index. In a time of crisis, the economic growth of a country is highly likely to become negative. While, when the stock market index continues to decline at the same time, this condition may show the deterioration of the real sector. Capital market investors usually will sell their stocks during an unstable condition that will affect the sharp decline of the stock market's composite index. In the onset of a crisis, most of the crisis countries face this condition that makes them suspend daily trading to prevent the index from further declining. Appendix C shows the summary of the variables, the range, median, and their various sources.

According to Kaminsky and Reinhart (1999), the crisis period lies within a twelve, eighteen, or twenty-four-month window, prior to and after the occurrence of a crisis. The crisis definition in this study follows that given by Reinhart et al. (2000), who defined a currency crisis as the sharp depreciation of the value of domestic currency. Laeven and Valencia (2008) argued that the level of a sharp depreciation must reach at least 30%. Based on this criterion, Indonesia experienced a currency crisis in January 1998, when the average daily value of IDR experienced deep depreciation against USD from IDR2450 in June 1997 to become IDR10,375 in January 1998. This finding is in line with Lang's argument (2013) that provides the monthly period of the Indonesian crisis ranging from November 1997 up until January 1998. With eighteen months prior and post-crisis period, the crisis period spans from July 1996 to June 1999.

Figure 6.1 depicts the results of the movement of the deviation of each variable of interest within the crisis window. The first column provides information on the development of the domestic financial market in the period before and after the outbreak of the crisis. The first variable is the M2 to reserves ratio, starting eighteen months before the crisis occurred. The gaps of this ratio were below its normal period and continued to decline, reaching its lowest level at the onset of the crisis. The negative value of the gaps occurred before the outbreak of the crisis due to the declining of M2 as the numerator that happened to start from the second quarter of 1997. It should be noted that the calculation of this ratio involving the conversion of the M2 into USD using the nominal exchange rate. As there was a series of depreciations of IDR against USD from January 1997, thus, other things being equal, the amount of M2 in term of USD would have also declined. The movement of the

gaps reversed in the sixth month after the crisis date and had a positive value relative to the normal period in the fifteenth month after the crisis.

Figure 6.1 The variables and the gaps
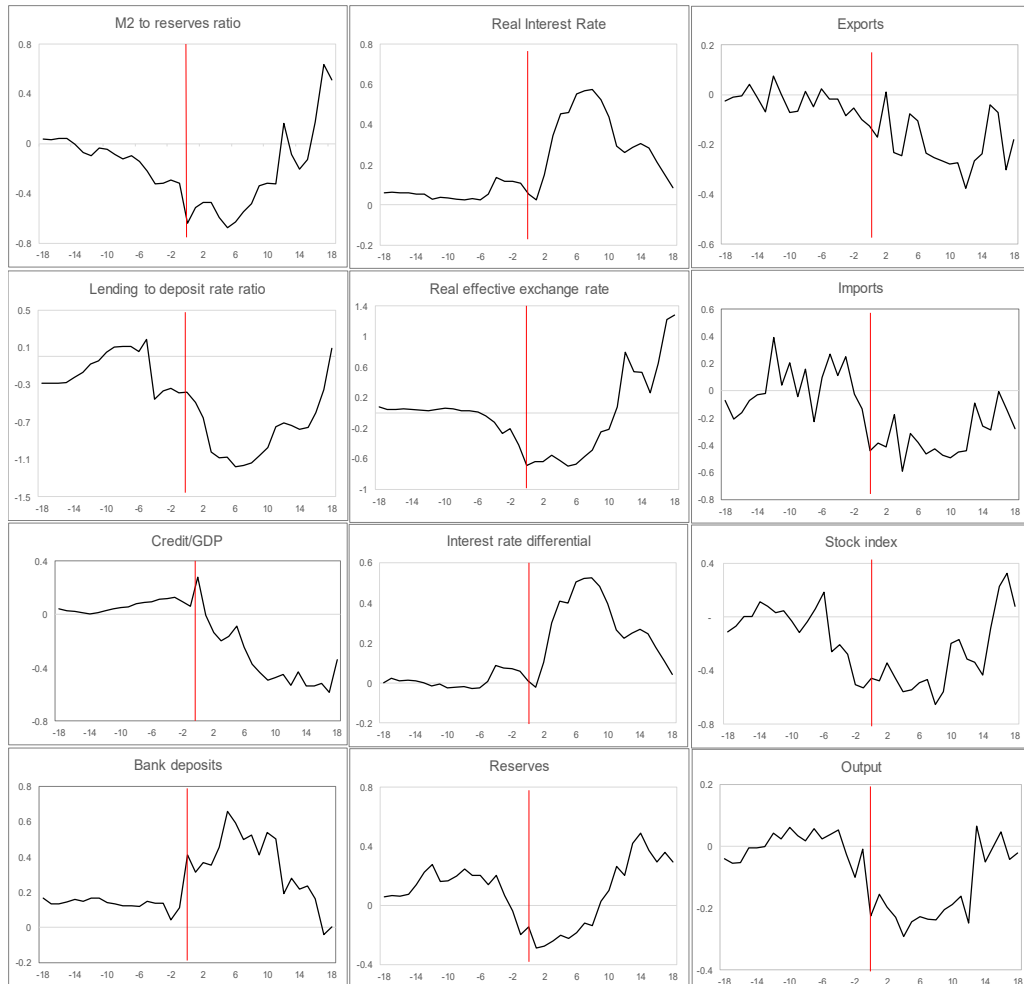
For eighteen months before the crisis date, the credit to GDP ratio moved slightly above its normal period and accelerated about nine months after that. The breakdown of this ratio showed that the growth of domestic credit during this period outperformed the GDP. As seen in the third row of Figure 6.1, the gap was then followed by a slowdown in November 1997. One event that may explain this phenomenon is the government policy to close 16 banks as a part of IMF's rescue package for Indonesia. However, in December 1997, it seems that the gap was shooting up, which created the possibility of a policy implementation to boost the amount of credit available for households and corporations (Kaminsky and Reinhart,

1999; Lang, 2013). The increased gap in credit to GDP was followed by a sudden drop, which indicates the onset of the crisis. Below the credit to GDP ratio, in the fourth row and first column, is the figure of the bank deposits. Before the crisis, the movement was similar to the movement of credit to GDP. However, two months before the crisis erupted, it is evident that the gaps were positive. These gaps suggested that the increasing amount of bank deposits were relative to its normal period. Comparing the movement of the credit to GDP and the bank deposits' gaps, in line with Lang's (2013) findings, it can be inferred that the bank deposits cannot be considered to be the main source of private credit financing.

The top centre column shows the evolution of the real interest rate around the crisis period. It has positive gaps that are relative to the normal period, with lowering gaps a month before and after the crisis date. However, starting from the second month into the crisis period, the gaps sharply increase. In other words, the real interest rate remains positive in the pre- and post-crisis period. This movement suggests that the Central Bank set the high policy rate as a form of tight monetary policy, and that private banks offered a high deposit rate to prevent their customers from withdrawing their money. This movement is also confirmed by the gap explaining the lending to deposit rate ratio. As provided in the second row of the first column, on average, the evolution of the gap of this ratio is lower than when in its normal period. There are two variables involved in this ratio; the lending rate and the deposit rate. When the gap shows a negative trend, it means that the actual rate is below that of the normal period. With this condition, one can observe this further by looking at the value of each variable that constructs the ratio. When the ratio is low, it can be inferred that the value of the numerator, which is the lending rate, is supposedly lower than the denominator, which is the deposit rate. In other words, the deposit rate should have a degree of growth that is higher than the lending rate. Based on the average movement of each interest rate, the lending rate during 1997/1998 reached the highest level of 24% p.a. and the deposit rate reached 31% p.a.

The other figures in the second column examine the evolution of the variables with regards to the external sector. Until sixth months before the crisis erupted, the real effective exchange rate gap in the Indonesian case showed a tendency of lying slightly above the value of the normal period. Figure 6.1 displays the evolution of the exchange rate gap that moved below the average value during the crisis period. The negative gap remained for twelve months, suggesting a long period of recovery. This movement has an association with the explanation of the evolution of international

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reserves, as the Central Bank faced difficulties in defending the domestic currency and the decision to shift to the new exchange rate arrangement in the third quarter of 1997 (McLeod, 1998, p. 34).

With regards to the international reserves, until three months before the crisis outbreak, its gap moved above its normal period. The signal of the declining trend of the reserves can be seen from the beginning of 1997, and this is followed by volatile movements in this variable for eight months before the crisis date. There is a possibility that the Central Bank used its reserves to intervene in the depreciation of the exchange rate, especially in the second semester of 1997. In the second months before the crisis date, the 12-month percentage change of the reserves declined and reached its lowest point in the first month after the crisis outbreak. The interest rate differential's movement was a response to the domestic financial system's situation. The high domestic deposit rate compared to foreign deposit rate, particularly after the onset of the crisis, shows that the monetary authority wanted to attract capital inflow. This phenomenon can be seen from the positive gap relative to the normal value on the second month of the post-crisis period. The first two panels of the third column display the imports and exports to and from the country relative to its long-term rates in the normal periods. On average, the export gap was below its normal period for almost all of the two-year window. First, this may have been caused by the weakening of economic activities overall as the crisis approached. Second, the external competitiveness of Indonesian goods and services was low compared to its trading partners. Before the crisis date, the real effective exchange rate could be considered as overvalued, making domestic products less competitive because their price was higher than foreign ones. On the imports side, the gap was over its normal period but declined just before the onset of the crisis. After the crisis, the gap was below its normal period. The import gap underperformed in the normal period, reflecting the poor performance of the economy during the crisis period. Besides, the weakening of IDR compared to the currencies of their trading partners created another burden for domestic importers as the relative price of foreign products became higher than in the previous period.

The rest of the third column is the real sector that involves the movement of the stock index and economic growth (output). The combination of the overvaluation of the IDR and the low performance of exports, as provided above, may deteriorate the output, as the Industrial Production Index slowed down six months before the crisis outbreak. The gap in the industrial production index widened until the second semester of 1998,

which was followed by a period of a positive gap. The behaviour of the stock index gap in the pre-crisis period are difficult to justify since its movement were shaky. However, it seems that the stock market anticipated the slowing down of the domestic economy by the negative gap starting six months before the crisis and reaching its lowest point around the crisis date. It is possible that the decline of the stock index was caused by the worsening of corporate balance sheets (Kaminsky and Reinhart, 1999). The rise in the lending rate that came to above 20% per annum during 1997/1998 burdened borrowers, especially those who had borrowed at a variable rate. Besides, the weakening of IDR against the main currencies also put another form of pressure on firms who had an external loan denominated in USD or other foreign currencies. With these two simple variables, during 1997–1998, the firms were exposed to interest and currency risks that deteriorated their balance sheets.

Figure 6.2 The gap of Short-term debt to reserves ratio
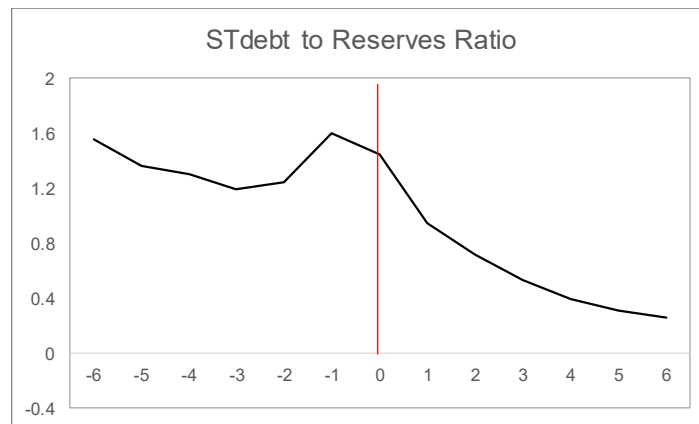
Source: Own calculations based on IFS – IMF and BIS, 2015
Note: The vertical line shows January 1998 or quarter 1 1998 as the crisis date. The horizontal line is the 6-quarter window pre- and post-crisis period.

Furthermore, this study will examine one indicator that is suspected to have a significant impact on crisis eruption, namely short-term external debt. In this study, the short-term external debt to reserves ratio is used to capture the vulnerability of the country in relation to financial crisis (IMF, 2008). The increasing short-term external debt exposed the economic agents in the country to the maturity and exchange rate risk. It is different with the other indicators, which have monthly data; the short-term debt data is available only in the form of quarterly data. Therefore, the analysis of this indicator is done separately from the others and there needs to be

some adjustments. For example, the crisis period on a monthly basis is adjusted to become a quarterly basis[20].

As provided by Figure 6.2, the movement of the gaps of this indicator before the crisis shows the increasing portion of short-term debt compared to the reserves. This phenomenon leads to the country to becoming vulnerable to experiencing financial crisis. When there is a problem that makes the value of domestic exchange rate depreciate, the outstanding short-term debt will sharply increase. After the onset of the crisis, this ratio declines, which suggests the declining of the short-term external debt that is outstanding and the increase of foreign reserves.

6.04   The signal measurement

After examining each variables' gap and its movement, the next step is to assess the performance of the involved variables. The first step is to obtain the threshold value (Guru, 2016), which can be identified by setting the tail region of each variable. The threshold value shows the extreme values of each variable that may reflect the period of crisis. With this method, one can use two critical steps to decide the threshold. The first step is to estimate the tail-quantile of the distribution of a particular variable that will be conducted as the stress probability. For example, when the stress probability is set at 5%, the 95th percentile will be the stress-threshold. The next step is to include all of the observations whose values are above 5% as the extreme observations. In a case where the stress probability is set at 5%, the largest 5% of the observations will be the extreme observations on which the focus of the analysis will be undertaken.

This study considers the threshold within the range 20% as the stress probability. By setting the value maximum to 20% as the critical region, the observations of each indicator that exceeds the threshold are considered to be the extreme observations. However, to locate the rejection region and to decide whether the indicator lies on the upper or lower tail of the distribution, one must refer to the theoretical framework (Kaminsky and Reinhart, 1999). For example, in making the observations on the exchange rate indicator, deep depreciation will affect the values of the gap between the crisis and tranquil periods to become negative. In other words, one will find the

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[20] The crisis period for the monthly data is assumed ranging for 18 months and spans from July 1996 to June 1999; therefore, in the case of quarterly data, it needs to be adjusted to cover the period of the third quarter of 1996 to the second quarter of 1999.

values of the gap as being negative or located in the lower area in the crisis period; the lower the value of the gap, the more severe the condition is. This condition will lead to the decision to select the stress probability in the left quantile of the distribution. If the stress probability is set at 20%, it means that all observations below the 80th percentile will be included as extreme observations. Conversely, when the examination moves on to the real interest rate variable, the higher rate will result in a wider gap between the crisis and tranquil periods. The values of the gap in crisis period will be in upper region or positive; the higher the value of the gap, the more critical the condition is. Hence, the decision related to the stress probability will be in the right quantile of the distribution, and the observations that have a value that is more than this limit will be considered to be extreme observations.

Since the setting of the threshold will determine the border between the normal and crisis condition, it needs careful consideration. The selection of the threshold value is expected to choose the one that can produce a high accuracy signal, a lower value of errors and a comparative N/S ratio. The calculation of this ratio will involve the number of errors that are produced by a variable of interest; the lower the number of errors or the N/S ratio, the better the variable is. The four quadrants of signal performance, as presented in Table 6.1, were proposed by Kaminsky and Reinhart (1999). This quadrant is used to help generate the results.

Table 6.1 The performance of crisis prediction

	Crisis occurs	No crisis occurs
Variable sends a signal	A	B
Variable does not send a signal	C	D

Source: Kaminsky and Reinhart (1999)

In Table 6.1, quadrant A is the number of correct signals when a crisis occurs. The upper right-hand panel (B) is the number of false signals when the variable sends a signal but fails to predict the crisis occurrence. The left bottom panel (C) is the number of crisis occurrences that cannot be captured, and the last one (D) is when the variable does not issue a signal, and there is no crisis event. There are various methods to assess the performance of such variables based on their accuracy to generate a signal (Kaminsky and Reinhart, 1999 and Guru, 2016):

(a)   The percentage of precision [(A+D)/(A+B+C+D)]

(b)   The percentage of correct prediction signal [A/(A+C)]

(c)   Type I error [C/(A+C)]

(d)   Type II error [B/(B+D)]

(e)   Noise to signal ratio [B/(B+D)]/[A/(A+C)]

A variable with a good degree of performance will have a high percentage of precision (a) and correct prediction (b), but low in Type I (c) and II (d) errors, as well as being low in its noise to signal (N/S) ratio. The threshold in Table 6.2 contains information on the rejection region. The decision to choose the threshold will affect the level of the variable's performance and, in some cases, it will involve a trade-off in maintaining a low level of the percentage of the type I error. This is with the consequence that the N/S ratio will increase, or vice versa. Besides, the choice also involves the decision maker's preference on risk when the person is risk averse; then they will prefer to have a threshold that produces a low Type I error (Guru, 2016).

6.05   The performance of variables

From the groups of variables that have been observed in this study, bank deposits will be excluded from the observation since it provides a different interpretation and the wrong type of signal in the period of crisis. The signal of this variable shows a different result compared to the common understanding, which implies the negative movement of bank deposits. However, the empirical data shows that the movement of bank deposits is positive, and the gap also outperforms than the gap in the normal period. In the end, it gives the wrong signal and becomes a noisy indicator.

Table 6.2 provides the summary of the twelve variables that will be examined to predict financial crisis based on the method that has been developed by Kaminsky and Reinhart (1999). The interest rate variables, namely the interest rate differential and real interest rate, show the ability to predict the crisis occurrence more accurately than the other variables. The two variables are also able to recognise the crisis with a minimum number of errors. These results suggest the importance of the role of monetary authority in the crisis period, especially by setting an interest rate policy. An appropriate level of interest rate will affect the banking sector's lending and borrowing processes, and how firms maintain the solvency of their balance sheets. Moreover, the level of the domestic interest rate will also affect investors' decisions, which may encourage the flow of capital to the domestic financial market.

Table 6.2 The performance of variables of interests

Variables	Threshold value	Precision	Prediction	Type I error	Type II error	N/S ratio
Real interest rate	> 0.88	0.92	0.49	0.51	0.00	0.00
Int. rate diff.	> 0.86	0.91	0.46	0.54	0.01	0.02
M2/reserves	< 0.08	0.91	0.43	0.57	0.00	0.01
Exc.rate	< 0.06	0.90	0.38	0.62	0.01	0.04
STdebt to reserves	> 0.89	0.88	0.69	0.31	0.09	0.12
Growth	< 0.02	0.89	0.35	0.65	0.01	0.04
Lending to deposit rate	< 0.05	0.86	0.43	0.57	0.00	0.00
Stock index	< 0.05	0.85	0.32	0.68	0.07	0.20
Credit/GDP	> 0.94	0.85	0.03	0.97	0.01	0.52
Imports	< 0.05	0.84	0.30	0.70	0.07	0.23
Reserves	< 0.10	0.81	0.19	0.81	0.09	0.47
Exports	< 0.10	0.77	0.30	0.70	0.15	0.52

Source: Own calculations
Note: except for ST-debt to reserves ratio, all computed variables cover 252 observations
for each variable. In the threshold value column, a '<' sign represents that the stress
condition or rejection region is placed at the left quantile or the bottom tail of the distribution
(Kaminsky and Reinhart, 1999)

Among other variables, the one that has the highest level of prediction is the short-term external debt to reserves ratio. This is not surprising since external short-term debt is one of the variables that is suspected as being the cause of the Indonesian 1997/1998 financial crisis. However, in relation to the future vulnerability of the financial system, this variable might not be the leading indicator but could serve as a variable to detect the vulnerability of the financial system.

There are three variables under the external sector indicator that have a lower ranking of N/S ratio compared to the others, which are exports, imports, and reserves, and one variable with a lower ranking of N/S ratio under financial sector, which is the credit to GDP ratio. Based on the calculations, these variables show a low level of precision at capturing the crisis period, a low percentage in predicting the crisis occurrence, and high N/S ratios. In other words, these variables cannot be included as the leading indicators to predict the probability of a crisis event. Instead, they are variables that are good for measuring the level of distress when the crisis is going on. Furthermore, Borio and Drehmann (2009) emphasised the need to consider variables that have the ability to detect signals of instability before (*ex-ante*) the crisis actually erupts.

6.06   Discussion

In general, several variables are accurate at precisely identifying a crisis period and provide a lower N/S ratio, suggesting that these variables can cope with the problem of errors. However, based on the results above, there are two issues concerning this instrument. First, even though EWI is good at measuring and evaluating the behaviour of the variables of interest during the crisis period (*ex-post*), so far, this study finds that the ability to predict the level of instability before (*ex-ante*) the crisis erupted was low. One should recall that the main ambition of the effort to construct the instrument is to predict financial crises. Hence, this objective should become one consideration in assessing this instrument's potentiality as a financial instability measurement. Second, with a lower ability to predict the crisis, EWI is not sufficient to effectively gauge the potential occurrence of financial crises. This issue has a serious consequence for the authorities since they will not be able to prepare for adverse events that may occur in the near future. Even when they can predict the crisis, the time frame is too tight, and so it become too late to take action.

There are several points that may explain the above issues. First, it is highly possible that some of the variables chosen are inadequate to be used in the analysis; even though Kaminsky and Reinhart (1999) argued that the decision to use the variables was based on the relevant theoretical frameworks. It could be the case that the frameworks are based on a weak theoretical basis (Tymoigne, 2010) or may not explain the financial crisis precisely.

Second, there is the problem of endogeneity. Kaminsky and Reinhart (1999) had the objective that the variables are expected to provide adequate information for policy makers to take the necessary actions to handle the crisis. However, when most of the ability and performance of these variables are low, it is suspected that the variables are those that were affected by the adverse economic condition. In line with this finding, Tymoigne (2010) argued that the chosen variables in measuring and defining financial fragility in this method are the variables that are the manifestation of, or indicate the impact from, a crisis.

Third, in exploring financial instability, one should consider the paradox of tranquillity (Lavoie, 2014, p.20), which explains that stability is destabilising. The state of a financial system that seems to be stable, strong, and in a state of good performance can be transformed into an unstable and fragile system. In this context, it is highly possible that the variable does not send a pre-crisis signal due to the good performance of the economy and the signal of distress is issued just after the outbreak of the crisis, which may lead to the delay in policy response.

Fourth, the gap measurement is based on the information available up to a particular period; hence, the financial instability assessment relies heavily on the average measurements or trends calculated during the normal or tranquil period. This point leads to the need to have a long enough observation period with several crisis events in the past, so that one may get enough information by exploring the behaviours that were present in each crisis episode before. Also, the observation of a variable will provide a better result when there is an effort to incorporate the behaviour of other variables (Tymoigne, 2010).

When it comes to defining financial instability, there is an argument for considering the important elements of a financial system (Illing and Liu, 2006; Hakkio and Keeton, 2009; Hollo *et al.*, 2012; Louzis and Vouldis, 2013). The basic concept of financial system development consists of three broad areas: instruments, institutions, and markets. These areas are very dynamic, which can be shown by its huge and sophisticated development. As a consequence, the ability of an economy to maintain its stability should be based on the dynamic characteristic of the financial market. The financial crisis' impact should be measured by the real economy's level of severity. Based on this discussion, the next chapter will explore the other instrument that can be used to predict the occurrence of a financial crisis and its ability to measure the level of instability in the financial sector. This instrument focuses on this sector as most of the crisis has its origin from or is triggered by the fragility of this sector. Since the financial sector has a dynamic character, the observation needs to involve high-frequency data.

6.07   Conclusion

Increasing financial instability and the frequency of crisis occurrence motivates economists to develop an instrument to predict crisis events. One approach that has been initiated and is meant to give a signal of crisis occurrence is an EWI. In this approach, macro-indicators were assessed and picked to become the best variables of crisis leading indicators. This method has become the foundation for the next generation of financial crisis measurement tools. This empirical analysis provides a contribution to the literature by exploring the construction of an EWI instrument in the case of Indonesia. The instrument was built mostly to focus on the banking crisis leading indicators. Following on from Kaminsky and Reinhart (1999), this study has attempted to explore the relevant indicators that also cover other areas, such as the external and real sectors.

Referring to the output of the analysis, there are several findings that can be presented. With regards to the construction of the EWI, this study finds that the EWI is good at assessing the behaviour of the variables of interest during the crisis period (*ex-post*), but the ability to send the signal of financial crisis in advance (*ex-ante*) is considered low. Therefore, this instrument cannot fulfil its prime objective as a potential predictor of financial instability. Besides, by exploring several factors that contribute to the low ability of the EWI to predict a crisis, this chapter has found that the chosen variables are inadequate to serve as the leading indicators because there is the possibility of an endogeneity problem. Besides, the methodology in constructing this instrument needs to be assessed by focusing on the financial sector that may become the source of the problem. Furthermore, to get a better result, it needs a longer observation period to capture the complex behaviour of such events as well as the crisis occurrences in the past.

There are challenges concerning the accuracy and precision of this instrument. The sophistication of modern financial systems puts pressure on this effort. Taking into consideration the weakness of this instrument, it is worthwhile examining the development and characteristics of the financial sector. There is another method in assessing the financial sector instability which is by developing the financial stress index. It has been argued that the construction of the composite index will help the decision-makers to recognise peculiar movements in the financial system that may trigger adverse economic conditions.

Chapter 7
Generating an instrument to measure financial instability

7.01   Introduction

The EWI that was designed to predict financial crisis failed to perform adequately in capturing the adverse conditions in the financial system. The chosen variables that were expected as leading indicators of crisis had a low level of performance in sending out the signal of the domestic financial system's vulnerability. This study lists several points concerning this issue, for example, the potential problem of endogeneity, the choice of variables being undertaken without a strong theoretical framework, and a technical issue associated with the determination of the methodology.

The recent methods for financial instability measurement offer an argument for constructing a composite index, which, it is argued, can predict and measure the state of the financial system's stability (or instability). The development of a financial instability index was initiated in 2002 when Bordo *et al.* (2002) developed an annual Financial Conditions Index. Following on from these authors, the approaches to generating the composite index have evolved. The discussions of the way this index is constructed concern areas including the level of instability or stress of a financial system, the area of measurement, and the potential variables involved.

Based on the current development of the financial instability index, this chapter explores this index by involving the financial system components that are measured by the financial market indicators. Following Hollo *et al.* (2012) and Louzis and Vouldis (2013), this study focuses on two methods for developing the financial instability index by employing the indicators as a representation for each component of a financial system. Hollo *et al.* (2012) maintained that a sign of instability can be captured by analysing the movement of several financial indicators, which tend to become more volatile in a period of instability. To pursue this objective, this study uses several daily financial indicators focusing on the Indonesian financial system. In so doing, this study attempts to compare two different methods for generating the financial instability index. These are the principal component analysis (PCA) method and the cumulative distribution function (CDF) method.

This study's contribution to the literature on financial instability measurement is associated with the effort to develop an instrument that uses daily data. The use of higher frequency data is expected to give a more detailed level of movement and to capture the dynamic nature of the financial market. So far, the construction of the

index or financial market pressure is conducted by employing quarterly or monthly data. This effort, to the best of my knowledge, has been the first attempt to construct a composite daily index of financial instability for Indonesia. Besides, this chapter has also explored two current methods and has compared their performances to determine which is the better crisis predictor. Before getting into the analysis, the following section will discuss the methods that have been developed by some economists. After briefly discussing the latest methods, the description of the data and the way it is used to generate the Indonesian financial instability index will be presented. This section will be followed by the discussion on the results, and the assessment of the indices' performance.

7.02   The importance of the financial system in a country

When a country faces financial instability[21], the financial system potentially transmits a negative effect on the economy. This affects the public and private sectors within the country in relation to achieving their targets (Hollo *et al.*, 2012). This statement contains two different ideas about financial instability's impact on a country's economy. Firstly, financial instability can impede the function of all elements of a financial system, which then affects the financial services that it offers. Secondly, since the financial system cannot fully provide their services to all sectors of the country, corporate actions and public investments are impaired. Hence, a households' consumption, the rate of investment and economic growth will decline. In this context, Hollo et al. (2012) put financial systems at the core of their analysis. According to the IMF, the financial system can be defined as a system that shows the interaction between economic units and financial institutions in providing and obtaining financial facilities (IMF, 2006, p. 11). Zysman (1994, p. 57) emphasised the nature of a financial system that involves a sophisticated structure and covers the tasks to channel funds from savings into investments, and to distribute the funds to the borrowers or spenders. In a similar vein, Demirgüç-Kunt and Levine (2001, p.3) defined financial structure as the combination and interconnection of operations among the three pillars of the financial systems that consist of institutions, markets and instruments. Illing and Liu (2006) maintained that these elements had a

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[21] Hollo, et al (2012) used the term financial stress to describe the state of financial instability. There are two levels of stress that are introduced: *firstly*, systemic risk that is a potential episode of a negative effect that may occur and that it may threaten the financial system. *Secondly*, systemic stress which is defined as the systemic risk that has been materialized.

significant impact on the strength and stability of the financial systems. When there is an adverse event and this affects the financial systems' elements, the financial conditions of the economic agents and financial institutions will deteriorate since their financial flows and balance sheets will be disrupted.

Hollo *et al.* (2012) explained that there are, at least, two levels of measurements that should be considered when developing the financial instability index, namely the upper and lower levels. These levels will provide guidance in determining the measurement coverage and the variables that will be used in the assessment. The upper level is meant to explore the coverage and conditions of the financial system, which consist of the market structure, institutions acting as financial intermediaries, and financial infrastructures. From this level, it is possible to break down each of these components into the lower level that can then be transformed into an individual indicator of financial instability or sub-indices. In other words, the upper level is an aggregate of lower level computations. Hollo *et al.* (2012) argued that in determining the composite index, the lower level should represent the important parts of a financial system; this includes the financial intermediaries, money markets, equity markets, bond markets, and foreign exchange markets. In order to capture the developed countries' financial systems, the authors include the derivative markets in their analysis. Based on this explanation, the indicator that will be developed is expected to capture the conditions of the selected financial system.

At a certain level, the characteristics of financial market's segments of a country will be a factor that has an important role in the construction of this indicator. Illing and Liu (2006) and Hakkio and Keeton (2009) argued that one should emphasise these segments that are comprised of banking, foreign exchange, debt markets, and equity markets.

The measurement of financial instability focused on an abnormal situation in the financial market and the main signs[22] as shown by an index (Hakkio and Keeton, 2009; Hollo *et al.*, 2012; Louzis and Vouldis, 2013). Based on these studies, there are some factors that create instability. For example, increasing levels of volatility, increasing asymmetric information, and a decline in the willingness of economic agents to hold illiquid financial assets (flight to liquidity) and risky assets (flight to

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[22] A number of authors (Hakkio and Keeton, 2009; Hollo, et al, 2012; Louzis and Vouldis, 2013; among others) emphasised the signs that were exhibited by the index or sub-indices as the symptoms associated with the episode of crisis.

quality). These factors will be compiled through the financial system market segments, which are comprised of the banking sector, debt markets, equity market and foreign exchange markets. Several previous studies developed the financial instability index that has been summarised in Table 7.1.

Table 7.1 The list of previous studies

Author(s)	Objective and coverage	Research method	Type of data
Bordo *et al.* (2002)	The U.S. financial instability index (FSI)	Calculating the sub-indices on the banking system's conditions, business failure indicator, and interest rate.	Annual
Illing and Liu (2006)	Developing the FSI for Canada by comparing several FSI methods	Using PCA, CDF, credit weight, variance equal-weighted average A crisis episode is detected when the index is above two standard deviations.	Daily financial market data from four sectors in the country over the period 1981–2005
Cardarelli *et al.* (2009)	Developing a quarterly FSI for 17 developed countries	Using the variance-equal weighted average An episode of a financial crisis is identified when the FSI is above one standard deviation from its long-term trend.	Market data from banking sector, securities, and foreign exchange markets, ranging from 1998 –2009
Hakkio and Keeton (2009)	Developing a composite index of FSI for Kansas City	Using PCA to generate the composite index.	Monthly U.S. financial market data ranging from 1990–2009
Louzis and Vouldis (2013)	Developing the systemic financial stress index for Greece	These authors adopted the previous studies and used time-varying correlations between the financial market segments.	Combining daily market and monthly balance sheet data using Greece's financial market and economic data ranging from 1987–2011
Bank Indonesia (2014)	Developing an FSI for the Indonesian Financial System	Using a method, called statistical normalisation	Monthly data focusing on the banking sector

Source: Own construction

The factor that affects the construction of the financial instability index is the characteristics of each financial market segment. It is not an easy task to capture the behaviour of economic agents; even though, there is now a range of variables offered to measure the financial pressure. However, by investigating each segment of the financial market, it is expected that the index can capture every event that has occurred in the financial market. According to Hakkio and Keeton (2009), Hollo *et al.* (2012), and Louzis and Vouldis (2013), the data that will be used to develop the index should follow some requirements. For example, it must have a relatively long time frame, so that the data is sufficient to capture the movement of certain indicators, especially in the period of financial distress. The authors also suggested that the data needs to have a high frequency. They argued that the daily or weekly data has to be able to measure the instability in real time. Furthermore, they also emphasised that the higher frequency data predicts the crisis and depicts a movement of the financial instability more precisely than low-frequency data.

7.03   Data and methodology

There are many variables that can represent the current condition of a financial market, whether or not it is under stress. However, the typical developing country's challenge in relation to this is the availability of data, particularly high-frequency data over the long-term. As a result, only a few of the financial markets' variables can be utilised in this chapter. The chosen variables are expected to draw a picture of the financial market's instability condition and offer an observation period sufficient to cover the period of Asian financial crisis in 1997/1998. In this study, the construction of the financial instability index intends to use four market segments, namely the money market, the bond market, the foreign exchange market and the equity market. However, taking into consideration that the bond market was only developed in early 2000, this study develops the index by using three market segments in the period before 2003 and using the full number of segments after that. Following the previous studies (Hakkio and Keeton, 2009; Hollo *et al.*, 2012; Louzis and Vouldis, 2013; among others), the market segments that will be investigated have specific characteristics, such as:

- The movement in the money market will be captured by the volatility of the interbank market rate. A sharp increase in the money market rate will create pressure for banks, who need short-term funding. Another variable that will

be involved in this section is the interest rate differential between domestic and foreign interest rates.

- The level of equity market activity can be seen by the volatility of the stock exchange index, which is argued to show the investors' behaviour in response to financial market uncertainty. Following Hollo *et al.* (2012), this study will employ the idiosyncratic risk that will be divided into two groups: the non-financial sector that is expected to represent the real sector in the country, and the financial sector that represents the condition of the financial institutions. In addition, the sharp decline of stock market indices that indicates pressure on the financial market will be adopted. This variable is measured by CMAX transformation (Hollo *et al.*, 2012; Louzis and Vouldis, 2013):

$$CMAX = \frac{index_t}{\max[index \in (index_{t-j}|j = 0,1,2)]}$$

Where $index_t$ is the stock market index at time *t.*

- The movement of the daily foreign exchange will measure the foreign exchange market. When the domestic currency depreciates sharply, it may create pressure for the country's balance sheet. If this phenomenon occurs over a longer period, in the real sector, many importer companies or foreign debt borrowers will suffer and encounter difficulties in their payment obligations. This study will utilise the movements of IDR against several major foreign currencies; these are USD, JPY, RMB and EUR.

- The activity of the bond market is measured by the volatility of the on-the-run government bonds. This study will use the 10-year-government bond yield movements as the variable of interest. It is expected that the yield volatility of this variable acts as a sign of investor demand for riskless financial assets. The other variable that will be used is the change in foreign ownership of government bonds that is believed to show the phenomenon of a flight to quality in the securities market.

The summary of the variables interest that are used in this chapter including their sources have been provided in the Appendix D.I

7.03.1 Calculating the sub-indices

There are several methods for calculating the sub-indices when developing the financial instability index. This study has tried to use and compare the results of two methods proposed by Hollo *et al.* (2012) and Louzis and Vouldis (2013). The first method generates the sub-indices using PCA, and the second method employs a CDF.

(i) PCA method

PCA is a method used to analyse several variables that are highly correlated and represent one or more common factors (Elsayed, 2013). The use of PCA has the objective to lessen a large data set, to take the important information of the data, and to simplify the features that are contained in the data set (Abdi and Williams, 2010). From these objectives, one may conclude that this method has advantages. For example, (i) the various dimensions of the data can be simplified, but the information that is contained in each variable can be maintained; (ii) this method allows for the transformation of the data set or for the correlated variables to become new or uncorrelated variables, which are commonly called 'Principal Components' (PCs). This method can be described using the following equations (Ruiz-Porras, 2009):

$$b_1 = \alpha_{11}a_1 + \alpha_{21}a_2 + \cdots + \alpha_{n1}a_n$$

$$b_2 = \alpha_{12}a_1 + \alpha_{22}a_2 + \cdots + \alpha_{n2}a_n$$

$$\ldots\ldots$$

$$b_n = \alpha_{1n}a_1 + \alpha_{2n}a_2 + \cdots + \alpha_{nn}a_n$$

In these equations, $(a_1, a_2, \ldots, a_n)$ is the data set or correlated variables and $(b_1, b_2, \ldots, b_n)$ is the new or uncorrelated variables. Davies and Fearn (2004) and Herve and Williams (2010) explained the rules of PCs: (i) the first principal component, which referred to as b_1 is the new variables that constitute and describe the large proportion of the variability in the data set or have the largest variance; (ii) The second principal component, b_2, is placed at the right angles of or being orthogonal to the first principal component and constitutes the remaining variability; and (iii) the third, b_3, and subsequent principal components must be orthogonal to the second or previous PCs. These new variables have values that are commonly called as 'scores'.

In order to calculate the composite index using PCA, the first step is to generate the sub-indices, which consist of at least three variables of interest within each sub-index.

In their paper, Louzis and Vouldis (2013) offered a method by using the principal component analysis in constructing the sub-indices based on each group of the market segments that will be observed. In this analysis, each variable within the relevant market segment conducted as the correlated variable will be estimated to produce the sub-index of the market segment. This study only involves the first principal component in the calculation. Once the value of sub-indices has been obtained, all of the sub-indices will be scaled in a range from 0 to 100. Prior to this step, each index is standardised by adjusting it with the sample mean and the standard deviations. In order to lessen the number of outliers in the transformation process, if necessary, these sub-indices can be filtered. The transformation of these sub-indices uses the following formula (Louzis and Vouldis, 2013):

$$s_{it} = \frac{100}{[1+\exp(\widetilde{s_{it}})]}$$

where $\widetilde{s_{it}}$ is the original standardized sub-indices prior to the transformation. The result will show the level of crisis severity; the higher the index, the more distressed that the financial condition is. The summarised statistics of each variable as the data input to be processed under PCA method has been provided in Appendix D. II. The results of the transformation of the data into sub-indices can be summarized in Table 7.2, as follows:

Table 7.2 Summary statistics of sub-indices: PCA

Variable	Obs	Mean	Std. Dev.	Min	Max	Stationary
Foreign exchange	5216	47.802	14.788	32.995	99.984	Stationary
Money market	5216	48.618	20.118	23.823	99.193	Stationary
Stock market	5216	48.577	19.568	21.085	98.587	Stationary
Bond market	3239	50.753	18.856	0.004	99.150	Stationary

Source: Own calculations

(ii) CDF method

According to Hollo *et al.* (2012), alongside its advantages, the use of PCA in generating the index also contains some drawbacks. Hollo *et al.* (2012) claimed that PCA methods tend to exacerbate the problem of sub-sample robustness. According to the authors, this problem occurs due to the sensitivity of the PCA in relation to the outliers. Hollo *et al.* (2012) constructed the sub-indices using a method, called the cumulative distribution function (CDF).

CDF is a method used to portray the distribution of the variables by looking at which one can compute the cumulative probability of the variables. CDF can be used to calculate the probability of a random variable, whose value is less than or equal to another specified value. CDF allows us to generate a function that plots the values of the observations in terms of their percentile rank. In its basic form, the cumulative distribution function of a random variable S is the function given by, for example, $F_n(s) = P(S \leq s)$. The first step is to put all of the observations in order according to their rank. This step will be followed by calculating the probability of a variable (S) using the given function that takes on the value below or equal to s. In its application, referring to the previous function, this probability can be obtained by dividing the rank of each observation with the total number of the observations.

The CDF method is argued to have more advantages compared to the PCA method, since it can be an alternative method for the construction of the financial instability index, especially when the problem of data availability emerges, and the range of the data differs. Following Hollo *et al.* (2012), to generate the index, one needs to rank the data within the observations and then to manipulate it using the following function:

$$S_t = F_n(s_t) := \begin{cases} \dfrac{r}{n} \text{ for } s_{[r]} \leq s_t \leq s_{[r+1]}, \quad r=1, 2, 3,....,n\text{-}1 \\ \\ 1 \text{ for } s_t \geq s_{[n]} \end{cases}$$

Where s_t is the set of a raw data with n total number of observations, *r* is the ranking number of s_t, and the S_t is the stress indicator that is transformed to the stress factor. The set of raw data s_t in this study is the dataset of each variable that belongs to the relevant market segment. The value of each variable is manipulated by generating the ranks of the data and calculating its probability according to the above function. Basically, in the CDF, the value of $F_n(s_t)$ is constrained between 0 at the minimum level and 1 at the maximum. This transformation can be used to predict the probability of a certain event. In this case, the transformation will be used to construct and measure the sub-indices of each market segment, which has scale range from 0 to 1. The highest scale or the value of 1 is considered to be a rare or extreme value. Therefore, the result of the computation of each variable that has the value of 1 is considered as being in a crisis period.

The results of the transformation of each variable become the input to construct the sub-indices. This process can be done by using the arithmetic mean of each group,

once aggregated to calculate the composite index. The summary of the results are as follows:

Table 7.3 Summary statistics of sub-indices: CDF

Variable	# of Obs.	Mean	Std. Dev.	Min	Max	Stationary
Foreign exchange	5216	0.730	0.280	0.046	1	Stationary
Money market	5216	0.754	0.184	0.223	1	Stationary
Stock market	5216	0.752	0.189	0.193	1	Stationary
Bond market	3239	0.747	0.198	0.045	1	Stationary

Source: Own calculations

7.03.2 Generating the composite index

After developing the sub-indices for each indicator, the next step is to generate the composite index. The most common method for generating the composite index is to use PCA, and involving the sub-indices. In this method, the value of all of the sub-indices will be calculated to highlight the data variation. It is possible to generate a component score that is calculated from certain variables at a selected point in time. However, the existence of outliers can hamper the analysis since this method will capture the particular outliers as part of the observation's pattern or characteristic (Hollo, 2012). Besides, PCA needs a sufficient number of variables as inputs. Even though it is advised that it should involve a minimum of three variables in a row, there is no precise answer as to how much data should be considered sufficient (OECD, 2008b).

The other method used to generate the composite index is time-varying cross-correlation (Hollo et al., 2012; Louzis and Vouldis, 2013). With this method, two sub-indices are combined to get the cross-correlation coefficient. One purpose of this method is to measure how strong the correlation between two sub-indices is. Following on from the portfolio theory (Louzis and Vouldis, 2013), it is argued that a strong correlation will have two consequences. On the one hand, if everything is going well, all of the variables will support each other to make the financial condition much better. On the other hand, if there is an adverse effect, highly correlated variables may aggravate the financial system since these variables will tend to move in the same direction. According to Louzis and Vouldis (2013), a strong correlation between the sub-indices will provide a useful guide to giving a systemic risk measurement. The time varying correlation matrix $(\rho_{ij,t})$ can be estimated by implementing several econometric techniques, for example, using multivariate

generalized auto-regression conditional heteroscedasticity (MGARCH) (Louzis and Vouldis, 2013), integrated generalized auto-regression conditional heteroscedasticity (IGARCH) and an exponentially weighted moving average (EWMA) (Hollo et al., 2012). Following on from Hollo et al. (2012), this study will use the EWMA method in estimating the time-varying correlation matrix. This method is widely used to forecast daily volatilities and the correlations of stock prices. In its calculations, EWMA involves a smoothing parameter and different weight for the different variances or, in practical terms, the more recent observation will have a greater weight. According to Alexander (2008), it is argued that this method will lessen the bias of the forecast of volatility as a result of the occurrence of a shock or extreme movement in the financial market.

With this method, the first step is finding the covariance, variance and volatility of each sub-index at time t using the formulas as follow (Hollo $et\ al.$, 2012):

$$\sigma_{ij,t} = \lambda\sigma_{ij,t-1} + (1 - \lambda)\tilde{s}_{i,t}\tilde{s}_{j,t}$$

$$\sigma^2_{i,t} = \lambda\sigma^2_{i,t-1} + (1 - \lambda)\tilde{s}^2_{i,t}$$

$$\rho_{ij,t} = \frac{\sigma_{ij,t}}{\sigma_{i,t}\sigma_{j,t}}$$

Where i and j are equal to the number of each financial sector or market, t represents the number of sample under observation, $\tilde{s}$ represents the value of each sub-index at time t minus its mean, and the parameter λ represents the smoothing factor that has constant value of 0.93.

The composite index used to measure financial instability can be developed based on the value of each sub-indices. Questions may be raised when the characteristics of one financial market segment are different from others, and this fact would then need to be incorporated. One way that can be used is by adding weights in each sub-index depending on the importance of each market segment in the financial system. However, if each market segment is considered to have an equivalent role, one can put a similar weight across all of them. Hollo et al. (2012) emphasised that the results between the methods will not differ significantly. Considering the weights and the sub-indices, the formula used to generate the financial instability index is as follows:

Financial Instability Composite Index = $\sqrt{s_t C_t s'_t}$

where C_t is the time-varying cross-correlation coefficient $\rho_{ij,t}$ matrix.

7.04 The results

This study attempts to list important events, which originate from the domestic financial market or the one that comes from the global financial market. These events have been described in Chapter 2. The first event is the East Asian financial crisis in 1997/1998, which was considered to be a new type of crisis since it differed from the Mexican crisis that was triggered by increasing government debt (Hale, 1998, p.266; Ito, 2007). The second event is the domestic financial market crisis or mini-crisis of 2005. The mini-crisis occurred because of the increasing global oil price that put pressure on the domestic economy.

The third event is the occurrence of the GFC that started from U.S. subprime mortgages, which was then followed by the European debt crisis in 2008. The way that the GFC has impacted Indonesia can be identified via two main, financial and trade channels (Bank Indonesia, 2009). From the financial channel, the increasing uncertainty in the global financial market and the tendency of the profit losses that was faced by the financial market investors led investors to take the short position in the domestic capital market. Oh (2011) argued that the massive reversals in 2008 from the Indonesian financial market were mainly caused by the process of deleveraging as a consequence of US sub-prime mortgages. At the same time, there was a shift in the investors' risk preference from risk acceptance to becoming more risk averse, which drove the flight to quality. As a result, the domestic capital market became under pressure as the stock index and the price of government bonds declined sharply during quarter four of 2008. From the trade channel, the sub-prime mortgages made the US economy slow down. This phenomenon led to the decline of US imports by Indonesia, which then influenced Indonesia's trade balance. As Indonesia's trading partners are concentrated in several countries, and the top three of them are the US, Japan and China, when a problem occurs in one of these countries, Indonesia's trade account will be affected.

The external crisis episodes described above had a direct or indirect impact on the Indonesian economy, and most of these were transmitted through the financial market. Each event affected the domestic financial market, which can be seen from its indicators that will usually show a different behaviour in crisis periods. This chapter has tried to capture the movements of each indicator and to portray the impact that there has been on each sector, namely the money market, stock market, bond market, and the foreign exchange market. The domestic and global events that

occurred, and that might have influenced the Indonesian financial system, have been listed in Appendix D.III.

Figure 7.1 The financial instability composite index
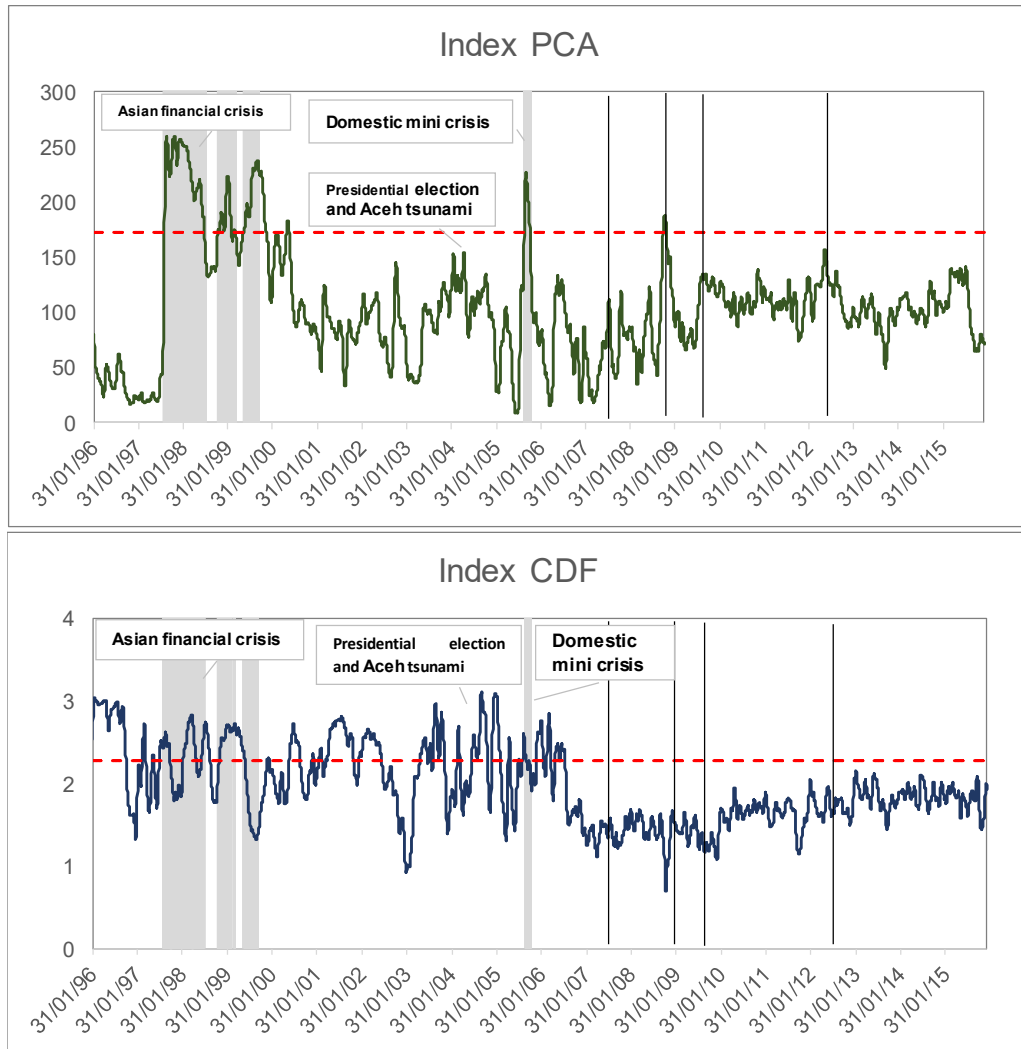
Figure 7.1 depicts the two composite indices that have been constructed using CDF and PCA. To the best of my knowledge, this is the first attempt to construct daily Indonesian financial instability index using two different methods. From Figure 7.1, the composite index using the PCA method can provide better information on how high the index is when the financial system faces distress. The index can capture the

important events that have occurred between 1997 and 2010 that had a direct impact on the Indonesian economy, for example, the Asian financial crisis and the domestic mini-crisis. As a response to the outbreak of the European debt crisis, this index would be able send a warning signal that allows the policy makers to take the necessary actions to defend the domestic economy. With regards to the U.S. crisis, this index shows a positive movement in 2013 when the U.S. government had planned to review the lower interest rate policy.

From this figure, the CDF composite index sent a warning signal in 1996 before the Asian crisis occurred in 1997/1998. This index has also captured the crisis episodes during the observation period, including the so-called mini-crisis of the domestic financial system in 2005. However, it appears that the results via the CDF method are somewhat sensitive since the composite index shows many signals without confirmed crisis episodes. Based on Figure 7.1, besides the above-mentioned crisis episodes, there were domestic events that were not considered to be at the level of a financial crisis, but that have been portrayed by this method. Firstly, in 2002 and 2003, there were a series of terrorist attacks that had an impact on the country's financial indicators. However, the decline of the index and some of the financial indicators was not too severe in how they changed their behaviour. Secondly, during 2004, the CDF index was higher compared to its previous period, and the two market segments that provided the contribution for this high-level composite index were the stock and debt markets. Two domestic events are thought to have created this pressure. The first event was the general election, that was known as the first direct Presidential election, which is one of the biggest democratic events. The Presidential election was a kind of test case for Indonesia's political stability, which would create anxiety, especially for financial market investors. The second was the first terrorist attack where people from various countries were killed and injured. This event became a test case for the Indonesian authorities to maintain national security and political stability. The third event was the Aceh tsunami in December 2004 that could be categorised as a large natural disaster and used up great amounts of Indonesian resources in the recovery. Even though these two events did not have a direct relationship with the financial markets, they could still change the financial conditions.

Responding to GFC and the U.S.'s low-interest policy, Figure 7.1 shows that these indices are still below the long-term average and therefore, below the threshold. The carry trade mechanism can explain this phenomenon in responding to the financial market's condition. During the occurrence of the sub-prime mortgage crisis, the

financial market was depressed since most of the investors held on to their money, and undertook a flight to liquidity strategy. In the medium term, the condition of the developing countries' financial markets, which were characterised by higher interest rates, became milder, especially when the U.S. government adopted the Quantitative Easing policy. The U.S. government's policy to maintain a lower interest rate created the opportunity for the developing financial markets, like that of Indonesia, to enjoy a huge amount of portfolio inflow.

Considering the above explanations, it can be inferred that there is a very short time frame between the transmission of a signal and the occurrence of an actual event. With such a short period, authorities will face difficulty in preparing and formulating the necessary actions to handle the problem that has emerged. Besides, when the policy has been announced, it will also need to have a certain period to make an impact on the financial system. In other words, it may be too late to take action since the problem has built up long before the signal of crisis is sent (Tymoigne, 2010).

7.05 The signal measurements

To examine the performance of the indices in providing sufficient information on crisis episodes, following Guru (2016) this study will use the extreme value approach. This method is intended to identify the series of data within an observation period that has the value that exceeds the one in the normal period. Chapter 6 has briefly explained this method, which contains several steps. The first step toward obtaining the extreme value is setting the threshold value that will be used to find the value of the index that is considered to be as in a normal situation and the value of the index that would indicate a crisis. The setting of this threshold needs to involve a careful consideration of the trade-off between the number of extreme observations and the performance of the index. If the threshold is too high, some events probably cannot be captured; but when it is too low, there will be too many signals that may send incorrect information. This study chose 10% of the highest observations as the extreme condition for the crisis, which resulted in 520 extreme index values.

Following the method adopted by Kaminsky and Reinhart (1999) for assessing the performance of the output of the analysis, this study also uses the four quadrants of signal performance to help generate the results and to provide accuracy, as provided in Table 6.1. Table 7.4 presents the information of this assessment, by comparing the performance of the two indices. The PCA method seems to outperform the CDF method and obtains higher scores in all aspects. Two aspects that bring the CDF

method's performance below the PCA are that its ability to predict is too low, and that it produces higher Type I errors. The example of errors that can be detected in the CDF method can be demonstrated by looking at Figure 7.1 above.

Table 7.4 The performance of the two methods: PCA and CDF

Method	Threshold value	# of obs. above threshold	Precision	Prediction	Type I error	Type II error	N/S ratio
Index PCA	> 90%	520	0.883	0.448	0.552	0.030	0.067
Index CDF	> 90%	520	0.802	0.207	0.793	0.079	0.381

Source: Own calculations

However, these indices do not offer a better performance compared to EWI. The ability to predict the crisis occurrence is similar to the EWI, even though some of the leading indicators of EWI have a better degree of precision and N/S ratio than the indices.

The idea to develop the composite index comes from the need for analysing domestic conditions efficiently and effectively. By having the composite index, the user only focuses on one indicator and, if it is necessary to get into more detailed data, the composite index can be expanded to include the sub-indices. Nevertheless, the dynamic nature of the financial system's condition requires continuous improvements on these methods of analysis through considering several aspects. However, when recalling several problems in constructing the EWI as provided in Chapter 6, it is highly possible that the construction of these indices also faces the same problem. Concerning the issue of the index's low performance, this study suspects that this method is also facing endogeneity problems; in other words, the variables involved are the ones that are influenced by the dynamics of the crisis itself. When an analysis uses the influenced variables, the results will be misleading. As an example, the use of foreign ownership in government bonds intends to capture the increasing pressure on the domestic bond market. When foreign ownership is declining sharply, it shows the distress of the financial system and will cause the instability index to increase. However, the decisions of foreign investors are also affected by their expectations, risk preference and the market's condition. If the market's condition, their preference, and expectations are not in favour of the domestic financial market at that time, they will pull their funds out of Indonesia that may cause the Indonesian financial system to become under pressure. Therefore, it could be the case that the movement of foreign ownership weakly predicts a future crisis, but strongly reflects the dynamics of the financial market.

Other than the problem of endogeneity, this study has also identified several issues associated with the construction of the index. First, it is probable that the variables chosen cannot fully represent the market segments that are to be measured. Unlike more developed countries that have high-frequency data over a sufficiently long period, most developing countries' financial markets do not have this privilege. There are two possibilities concerning this matter: it seems that the developing countries realise the importance of maintaining good data after facing an economic disaster, or that their domestic financial markets have only been developing during the 1990s. This fact should be admitted as one of the disadvantages of measuring the developing countries' crisis episodes, as this needs reliable and wide-ranging data to work most effectively. The problem of limitations in the variable chosen leads to the consideration of putting in additional variables to capture the current financial market's situation. For example, the stock-bond correlation (Hollo et al., 2012), and non-deliverable forward (NDF).

Secondly, the methodology should be revisited periodically to provide better measurements. The ultimate goal of the measuring of financial instability is to predict the occurrence of financial instability and crisis, and to capture the stress level of a given financial system (Illing and Liu, 2006). The challenge arises when the policy makers use this measurement. The need to understand the stress levels and to decide whether a current situation should be called an extreme or normal situation is crucial at the level of implementation. To make sure of having the best presentation and measurement, it is expected that the index should also incorporate stress testing to capture the movements of the variables in the future.

By understanding the methodology and obtaining the results of the financial instability measurements, one may notice that there are some limits in achieving the main objective of the construction of the instrument. According to Tymoigne and Wray (2014, p. 256), the effort to predict the occurrence of an event is a difficult, or worse, is an impossible task. Since predicting a future crisis is difficult, a possible way to deal with this challenge is to change the objective of the construction of the financial instability measurement from predicting the occurrence of a financial crisis to detecting the state of the financial system. It is expected that the detection of the state of the financial system will provide information to the authorities in advance. By detecting the condition of the financial system, the authorities can better prepare for the tendency of there being an unstable financial system over time. This is made possible by undertaking pre-emptive measures through finding and locating the

causes of increasing financial fragility. In brief, this method may become an alternative method for the construction of a financial instability measurement. To understand the performance of this method in dealing with a crisis occurrence and how the instrument is to detect the state of fragility that has developed, the next chapter will discuss and explore the details of this method.

7.06   Conclusion

This chapter's contribution to the literature is the attempt to construct the daily financial instability index for Indonesia. Different methods have been examined and compared to gain an insight in to which instrument performs better in predicting a crisis. The financial crisis – it has been argued – may occur when the financial system is in a state of instability, so that measuring the level of instability is expected to predict the severity of financial system.

When the episode of a financial crisis occurs more frequently but the available instruments to predict these events fail to send reliable signs in most cases, economists are motivated to find a more powerful tool to deal with financial crisis prediction. Some economists try to construct an index to predict the crisis occurrence and measure the financial system's condition. This study has tried to explore the construction of this index by involving the financial system segments.

Based on the results, this study has found that the movement of the index can capture the crisis episodes. However, one should be careful in examining the prediction level and dealing with the problem of typical type II errors, and the ability of this index as a crisis predictor (*ex-ante*). In addition, this chapter has explained the problem of endogeneity as one of the issues associated with construction, and has also identified another problem in the process of choosing the relevant variables.

Furthermore, it appears that the index captured the crisis event just before or at the time of the crisis eruption. As a result, the authorities may face a difficult situation in designing policies to respond the signal of crisis, especially if the signal is sent so close to the crisis outbreak (Tymoigne, 2010). According to Tymoigne and Wray (2014, p. 256), predicting the occurrence of a crisis is a difficult thing to do. Hence, rather than focusing their efforts on predicting financial instability, one possible way to deal with financial instability is to detect its potential occurrence. To deal with this proposal, the next chapter will discuss financial instability assessments by examining another approach under the Financial Instability Hypothesis.

Chapter 8
Assessing financial fragility under the Financial Instability Hypothesis

8.01   Introduction

The efforts to predict financial crises and measure the level of financial instability have shown developments in the techniques that have been used. The focus of the measurement involves wide range of indicators or variables. In the case of Indonesia, the results show that the ability of these instruments to capture the crisis occurrence is high but the performance to predict the crisis occurrence is low. This study identified several problems in this construction. These include the potential endogeneity of the chosen variables, and the process of choosing variable based on a weak theoretical basis. To deal with these issues, this chapter will explore and discuss another approach under the framework of Financial Instability Hypothesis (FIH).

Hyman Minsky (1986; 1995) proposed the FIH as a framework to understand how financial stability evolves into instability and then crisis. This framework emphasises the importance of assessing economic agents' balance sheets that provide the information on the future cash commitments as covered on the liabilities side and the revenues on the asset side. From the balance sheets, the attitudes of lenders toward providing and borrowers toward obtaining more debt, can be found. In other words, by assessing the balance sheets, one can explore the behaviour of economic units and how they interact each other. The interconnection among each economic unit is then expected to explain the transmission mechanism for positive or negative effects on other units.

The intention to increase the production capacity of a company or the need to invest in a certain area will require additional funding, which can be found from internal or external sources. When a company chooses to obtain external financing, they need to find commercial banks to obtain loans. Lavoie (2014, p.187) argued that the loan process can be the source of instability. Departing from this argument, this chapter will explore the mechanism of lending and borrowing and how it has impact on the stability of the financial system. Furthermore, this chapter considers the interactions between six groups of economic agents that have a significant role in the economy, namely the government, the Central Bank, the Commercial or private banks, households, the private sector, and the foreign sector.

The contribution of this study to the literature is on the investigation of Indonesian financial system's state of instability using FIH. The existing analyses of the financial instability measurement in Indonesian case mostly use the common methods, two of them are discussed in Chapter 6 and Chapter 7. In other words, the empirical study that uses FIH and focuses on the Indonesian case are not easy to find. For the best of my knowledge, this is the first study to observe Indonesian financial crisis and its state of financial system ranging from 1990s to 2015 employing the FIH. Thus, this study fills the gap by empirically developing the ideas in constructing a financial instability index based on FIH and examining the balance sheets approach with the recent available and, to a certain extent, using quarterly data.

Following the introduction, this chapter explains the basic framework by exploring several economic units' balance sheets and emphasises the factors that connect these units. Based on this framework, the later part discusses the commercial banks' balance sheets in more detail. The choice of commercial banks as the focus of the discussion is simply because this unit has interactions with almost all the other units and mostly through debt mechanisms. The next section is the discussion of the portfolio and risks approach to analysing some variables related to the lending-borrowing process, as well as a description of the empirical data that supports the FIH. The last section will discuss the construction of financial instability measurement to detect the state of the domestic financial system.

8.02   The simplified balance sheets approach

The FIH underlines the importance of exploring private sector balance sheets since it can explain the period of fragility, especially when the companies' balance sheets and their ratio of financial indicators have worsened (Lavoie, 2014, p.253). This argument expands the use of balance sheets that, so far, have only been employed as a tool to measure the performance and achievement of a company. In addition, this argument also emphasises the importance of the balance sheets for forming the missing link between the macro or aggregate level and the micro or individual level in explanations of financial fragility. By exploring this connection, the source of fragility and the way it creates adverse conditions for an economy can be examined and explained.

The balance sheet describes an entity's assets and liabilities that should be balanced, which suggests that the increasing assets corresponds to the increasing liabilities. From its structure, the balance sheet contains assets and liabilities, and hence the

company's net worth. An entity's asset consists of several components that are purchased or developed to generate revenues or make profit from the daily operations. These components are the company's properties, fixed assets, and financial assets. When the total amount of asset is higher than liabilities, the value of the economic units is increase. On the other side of the balance sheet is liabilities that show the way the assets are financed. Liabilities contain several elements to support the entity's operations and finance the entity's commitments. The funds to finance the operations may come from internal source or external sources. Several components of liabilities are wages, taxes expenditure, accounts payable, accrued interests, and so on. In other words, liabilities correspond to the source of funds, while asset provides information on the use of the funds. If financing comes from external sources, the balance sheet presents the type of debt that is obtained and this transaction should be balanced with a change on the assets side. Other than this, the relationship between the balance sheet and the income statement lies in the structure of repayment on commitments, income as a source of fund to fulfil the obligations, and refinancing mechanisms (Minsky, 1990), which are specifically viewed from the internal structure of a corporation.

The balance sheet and income statement of the economic agents portray the economic agents' financial condition in a particular period of time. However, the balance sheet may provide the necessary information when compared with the previous period. Furthermore, it is also beneficial when one tries to trace the balance sheet's element and when comparing it with other businesses, one will find substantial information on the interconnections among economic agents. As a simple example, the company's debt will directly explain the relationship between the banking sector, representing the lender, and the private sector, representing the borrower. Besides, when a private company holds government bonds, this activity will be recorded on the asset side of the company and the liability side of the government.

The main assumption that frames the discussion on the lending and borrowing mechanism is the endogeneity of money, which emphasises that the creation of money is determined by the demand for credit or loans (Howells, 2007; Fontana and Setterfield, 2010b, p. 147; Lavoie, 2014, p.187). In doing business, firms may expand their capacity that subsequently needs additional funds, which can be financed from internal or external source. Because of this expansion, if the internal source of funds is not sufficient to finance its activities, the firms will be forced to find an alternative

source of finance. In most cases, firms use a loan from a private bank. Hence, the effort to finance the firm's expenditure corresponds to the creation of a loan (Sawyer, 2010, p. 135). This loan may generate problems especially when there is an event that triggers the occurrence of default that may cause the firm fails to pay its loan obligations. Here, the lending-borrowing process plays a crucial part since it can generate financial instability (Lavoie, 2014, p.187).

Figure 8.1 The interconnections of economic units' balance sheets: simplified
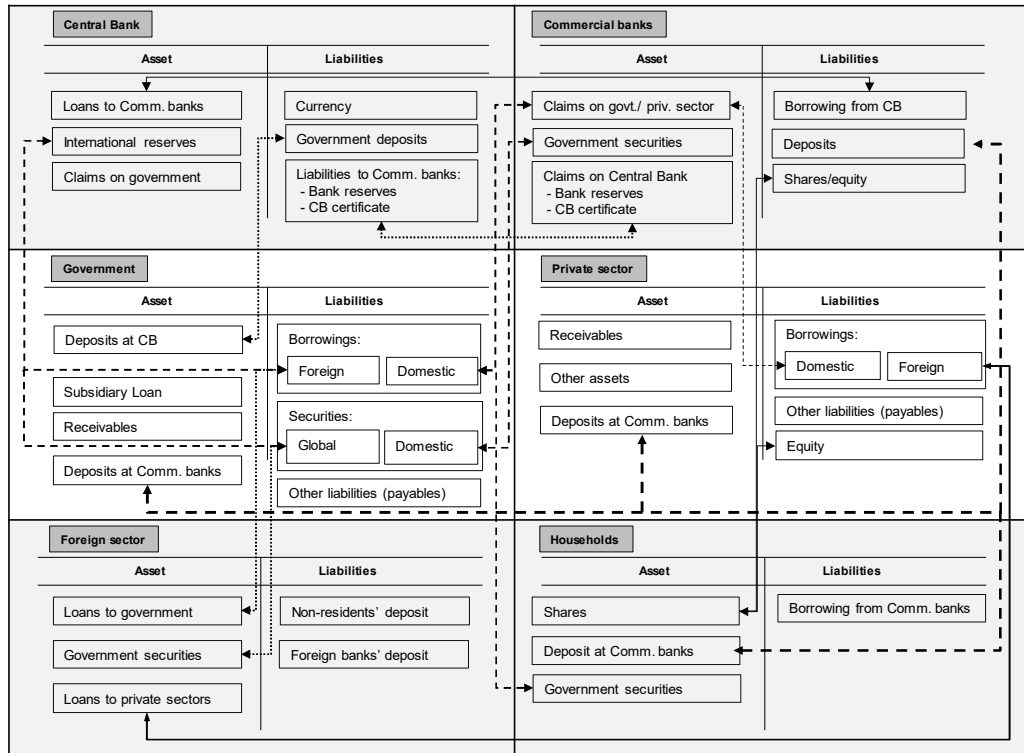
Source: Own construction

To obtain a broad picture of the mechanisms and relationships among economic agents, this chapter will explore six sectors that consist of the banking sector, the private non-financial sector, the Central Bank, the government, households and the external sector, as presented in Figure 8.1. Even though the discussion will be complicated, it is expected to provide a closer description of the real condition. While in some part these interactions describe common mechanisms across the globe, but at some specific cases, the interconnections amongst economic units use the Indonesian situation.

8.02.1 The Central Bank

This section presents the Central Bank's balance sheet based on its common structure. The asset side consists of the claims of the private and public sectors, as well as the foreign reserves. While the liabilities side consists of the base money, demand deposits, government deposits, and the Central Bank (CB) certificates held by the Commercial Banks. The CB certificates[23] is the short-term debt instrument denominated in the local currency. The Treasury bills that are held by the commercial banks can be sold to the Central Bank in return for the bank reserves. In other words, the Treasury bills have a similar function to a money market instrument to conduct open market operations. From its structure, the Central Bank balance sheets also show the double-entry bookkeeping principle, for example, the changes in the Central Bank claims on the commercial banks will correspond to the changes in the bank reserves.

In this analysis, the Central Bank has a central role in the lending-borrowing mechanism, especially as the lender of last resort for the banking system. However, the Central Bank did not have direct interaction with the private sector or households; rather, it has the task of providing the banking sector's reserves. The role of the Central Bank was to meet the commercial banks' requests so that the supply of base money was available when the commercial banks required it (Knittel, 2007, pp. 258-259; Sawyer, 2010, p. 137). In this case, the Central Bank's role is that of lender of last resort.

Besides, the Central Bank also plays an important and active role in foreign reserves management via the sterilization process. The sterilization mechanism is commonly used by the Central Bank by selling the CB certificates (government securities) when there are capital inflows and purchasing the CB certificates (government securities) when there are capital outflows. This is a typical mainstream argument for the role of the Central bank in affecting the monetary base. In so doing, it is expected that the amount of the stock of base money can be managed (Lavoie, 2006, p.29; Weise and Barbera, 2010, p. 229; Lavoie, 2014, p.464)

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[23] In the Indonesian case, from 1984 this debt instrument has been issued by the CB as a money market instrument. When the Treasury bills were issued in 2007 by the government, the CB gradually discontinued the CB certificates issuance programme -especially those that have maturity similar with the T-bills - to avoid domestic market segmentation.

8.02.2 The commercial banks

The interrelationship between commercial banks and the other sectors is substantial in this discussion since the role of commercial banks is to supply credit to private companies and households. Private companies and households will use the loans obtained from the commercial banks to finance their expenditure. As previously stated, this study uses the endogenous money framework that emphasises the loan as the origin of the process. However, in its daily activities the banking sector may encounter conditions when the availability of cash is lower than the demanded credit or the amount of deposits' withdrawn. This condition may lead the commercial banks to experience liquidity problems, which can be responded to by obtaining loans from other banks or asking for additional reserves from the Central Bank (Knittel *et al.* 2006, p. 259; Fontana and Setterfield, 2010b, p. 146).

From commercial banks' balance sheets, it can be seen that commercial banks have a broad relationship with other economic units. This framework shows the function of a commercial bank as a financial intermediary that goes between the depositors and borrowers, as well as managing short-term with long-term assets. The commercial banks are financial institutions that facilitate the depositors' money and then channel it to the firms or individuals who need it. Furthermore, the commercial banks conduct the significant function in money creation by granting new loans to borrowers. In this role, the commercial banks act as 'the creator of credit flows' (Lavoie, 2014, p.188). When firms or individuals demand credit, the commercial banks will assess their eligibility and check the potential borrowers' collateral. The decision to grant a loan to a borrower will directly affect both lenders' and borrowers' balance sheets. Once the loan commitment is withdrawn by the borrower and spent to finance expenditure, the money increases the aggregate demand (Fontana and Setterfield, 2010b, pp. 148-149; Lavoie, 2014, p.188).

8.02.3 Private companies

The essential part of the relationship between the commercial banks and the private sector is that of lending and borrowing. To increase its production capacity, a company can find the financing source that comes from commercial banks. When a company looks for direct borrowing, it will propose to the commercial banks. However, commercial banks as lenders will not directly approve this proposal. There are some activities that should be done by both parties before the loan creation, for example, the company should find the potential lender; meanwhile, the bank has to conduct the appraisal to respond to the company's proposal. In so doing, the

commercial bank has to collect all available information about the potential borrowers to get the good assessment result, especially for calculating and evaluating the company's solvency (Bellofiore and Ferri, 2001, p. 66). A critical point will be reached in the lender-borrower relationship when both parties sign the loan agreement. By signing the document, they agree to the term and conditions of the loan, such as the amount of the loan, the rate of interest and fees, the instalment of principal payments, and the settlement of the dispute.

In the lending-borrowing framework, the interaction between lender and borrower can take many forms. Besides one-off borrowing, the lender may offer a line of credit, which opens the possibility of long-term access to finance for the borrower. The line of credit will be offered when the performance of the borrower is found to be good. This type of borrowing gives an advantage to the borrower since they have more flexible access to the financing source with the flexible amount of funds. The cost of the lent funds is usually agreed in advance, whether it is a fixed cost or a variable one. Both of these costs reflect the changes in the market rate by requiring the borrower to pay a certain amount to cover the movement in the financial market – in the case of fixed costs – and an additional mark-up on top of the reference rate – in the case of variable costs. As time goes by, when the debt outstanding has increased, the lender usually imposes a higher cost for the funds to compensate for the perceived risk of the borrower (Lavoie, 2006a, pp.67-68).

8.02.4 The government sector

Similar to the private sector's balance sheet, government assets are comprised of non-financial assets and financial assets. However, since it is difficult to assess the value of non-financial assets, most governments' balance sheets only cover financial assets and liabilities. The government balance sheets indicate that the government and the Central Bank have a close interaction in various ways. The first form of this interaction is the role of the Central Bank as the government's fiscal agent. In conducting this role, the Central Bank becomes the underwriter of the government's securities issuance. In addition to this, the Central Bank also conducts itself as an administrator of the government's securities issuance, especially in clearing and settlement. In dealing with tax revenues, the government account in the Central Bank receives tax payments from households and firms. These payments usually go through taxpayers' accounts in commercial banks, which are then transferred to the government account in the Central Bank. When the government runs its activities, and needs to pay the contractors or repay its debt obligations, then the government

withdraws the money from its account in the Central Bank. The second relationship is the role of the Central Bank in collecting the foreign currency flows. When the government issues global bonds or obtains foreign loans, the funds will go to the government account in the Central Bank.

8.02.5 Households

Households' balance sheets may be thought to have a much simpler structure than that of the other economic agents, but that is not the case. Within the households' balance sheets, the asset consists of the income, interest income and deposits with the commercial banks. In modern society, one may find that households also own the government securities, private bonds, or shares in firms. From its balance sheet elements, households have a precautionary motive by having the deposits in the commercial banks. In other words, as argued by Godley and Lavoie (2006), the deposits become a 'buffer' for households that anticipates them receiving less than their expected income. On the other hand, households' liabilities consist of mortgages and/or bank loans. They finance their expenditures with their total income plus loans obtained. In this case, these households sacrifice some of their income to pay debt obligations in each period.

8.02.6 The foreign sectors

The foreign sector's balance sheet in Figure 8.1 is a simplified one. In the real world, the mechanisms and parties involved are much more sophisticated. This diagram intends to bring to light the broad mechanism of foreign entities' role within the domestic financial system. Currently, most economic agents within the country have a relationship with their foreign counterparts, for example, the export-import of goods, lending-borrowing activities, selling-buying of financial assets, and sending money. One thing that makes a difference amongst economic agents in doing business is the magnitude of the transactions. In this mechanism, the Central Bank is one entity that makes a significant contribution to managing the international reserves. As every transaction that involves foreign currency will affect the foreign reserves, which is an asset component of Central Bank's balance sheet. Some transactions that potentially increase the number of foreign reserves are the purchasing of domestic financial assets by non-residents, export transactions, external loan withdrawals by domestic institutions, and worker's remittances. Meanwhile, the selling of domestic financial assets by non-residents, import transactions, and payment of debt obligations, bring about a decline in international reserves.

The connection between the foreign sector and the Central Bank's foreign reserves as a consequence of the above transactions may disrupt the Central Bank's balance sheet. To manage its balance sheet, the Central Bank needs an instrument known as the compensation thesis. According to Lavoie (2014, p.479), the compensation thesis can be defined as the change in the foreign reserves amount that is then be followed by the other change in other components of its balance sheet. The process of compensation involves four channels which entail that the balance sheet is maintained: the reduction of the commercial banks' loan to the Central Bank, the reduction in the government claims, an increase in government deposits, or the increase in CB certificates.

8.03   The commercial banks' balance sheet

Departing from the simple description on the balance sheets above, one unit that has interactions with most of the economic units is the commercial banks. In its daily operations, the commercial banks have a close relationship with the Central Bank, the government, and the private sector. By exploring the commercial banks' balance sheets, it is expected that the relationships between the commercial banks and the private sector, and between the commercial banks and the Central Bank, can be explained.

The first relationship is between the commercial banks and the Central Bank, which can be drawn from, for example, the bank reserves. The bank reserves are the asset of commercial banks and, with double entry bookkeeping, at the same time the reserves become the liability of the Central Bank. The reserves allow the Central Bank to conduct monetary operations by buying the T-bills held by the commercial banks or by issuing the Central Bank's certificates to the commercial banks. By selling T-bills to the Central Bank, the commercial banks have the opportunity to hold bank reserves (Lavoie, 2006a, p.62). Aside from the purpose of conducting monetary operations, bank reserves are meant to secure the withdrawal of the deposits by customers, which in certain cases may in large amounts.

For the Indonesian case, Table 8.1 shows the banks' reserves and its changes and, in line 6, this table describes the decline of the banks' reserves in 2008 and 2009. It can be inferred that during this period there might have been a massive withdrawal by the banks' customers, which could affect the condition of the commercial banks. However, during this period, there was no commercial banks that collapsed, and no banking crisis occurred. Hence, one needs to examine the other items on the balance

sheets that are suspected to increase. In the same period, one component of the commercial banks' balance sheets titled claims to the Central Bank, which is the ownership of CB certificates escalated about 60%. On the other words, there was a decision by commercial banks to shift its demand deposits to CB certificates, which offer a better interest rate for those who purchase or hold it.

The second relationship is between the commercial bank and the private sector. From the commercial banks' liabilities side, Table 8.1 provides the development of time deposits and demand deposits for the selected years between 1990 and 2015. One of the roles of a monetary authority is to set the interest rate in order to manage the rate of inflation (Bellofiore and Ferri, 2001, p.6). A high policy interest rate may reduce the potential interest margin that can be obtained by the commercial banks. As a consequence, a commercial bank will tend to maximize their profits by increasing the total number of loans given to borrowers to increase their revenues or increasing the cost of borrowing. Table 8.1 provides this claim by showing the negative change of claims of commercial banks to the private sector (line 5) in 1999. This declining trend suggested that the loans to the private sector were slowing down in this period as the lending rate was increasing.

Furthermore, increasing time and demand deposits, especially prior to 1997/1998 Asian financial crisis, reflects the mobilization of domestic funds' by setting a higher real interest rate (Komatsu, 1996, p.84). However, in 2004 the amount of time deposits declined substantially to IDR 418,578 billion. One likely reason for this sharp decline is the development of the securities market, which offered a higher return than the deposits. Looking at the other commercial banks' balance sheets components, namely the claims to the private sector, it seems that the increasing amount of credit to the private sector is not determined by the amount of the deposit that is received by the commercial banks. It is suspected that the commercial banks do not need to accumulate the deposits to provide the private sector's financing needs. As long as the borrower is credible enough and has appropriate underlying assets, the credit will be granted by the commercial banks. This will be discussed further in the next section.

Table 8.1 The commercial banks' balance sheets

Items	1990	1994	1995	1996	1997	1998	1999	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015Q2
Assets (IDR billions)																			
Claims on Public sector	8,119	10,242	11,547	16,467	21,580	27,613	268,677	273,698	256,718	241,418	258,051	215,236	228,450	207,940	184,249	189,306	221,362	248,510	319,143
Δ Claims on Public sector	- 0.071	- 0.066	0.422	0.426	0.310	0.280	8.730	- 0.206	- 0.403	- 0.060	- 0.069	- 0.166	0.061	- 0.090	- 0.114	0.027	0.169	0.123	0.040
Claims on priv.& fin. sector	97,322	200,459	247,480	299,261	386,777	512,662	245,277	599,100	749,527	849,338	1,067,673	1,398,936	1,528,982	1,896,677	2,370,080	2,910,987	3,518,497	3,953,656	4,149,447
Δ Claims on priv.& fin. sector	0.599	0.233	1.543	0.209	0.292	0.325	0.522	0.307	1.609	0.133	0.257	0.310	0.093	0.240	0.250	0.228	0.209	0.124	0.044
Reserves	2,866	3,756	5,140	11,881	17,369	34,221	42,075	96,656	145,599	195,747	255,148	215,450	118,488	325,408	486,515	452,809	550,341	592,456	603,493
Δ Reserves	0.105	0.115	0.368	1.311	0.462	0.970	0.230	0.338	1.929	0.344	0.303	- 0.156	0.450	1.746	- 0.495	- 0.069	0.215	0.077	0.002
Other claims (of which CB certificate)	…	…	…	…	…	…	…	…	85,734	177,449	202,572	163,547	265,100	314,710	333,049	388,376	245,196	359,024	313,403
Δ other claims	…	…	…	…	…	…	…	…	…	1.07	- 0.14	- 0.19	0.62	0.19	0.06	0.17	- 0.37	- 0.46	0.13
Liabilities (IDR billions)																			
Time deposit	46,150	98,372	130,891	174,968	186,311	358,649	408,580	418,579	564,054	616,802	664,318	819,791	894,280	1,003,054	1,121,962	1,245,869	1,425,153	1,729,883	915,652
Δ Time deposit	0.512	0.190	0.331	0.337	0.065	0.925	- 0.139	- 0.293	0.269	0.094	0.077	0.234	0.091	0.122	0.119	0.110	0.144	0.214	- 0.505
Demand deposit	1,618	1,561	2,239	8,056	12,095	27,110	65,147	204,204	227,571	276,196	355,272	359,291	413,672	483,879	568,436	661,963	729,440	766,567	1,829,226
Δ Demand deposit	- 0.013	0.064	0.434	2.598	0.501	1.241	1.403	0.595	1.591	0.214	0.286	0.011	0.151	0.170	0.175	0.165	0.102	0.051	1.202
Saving deposit	…	…	…	…	…	…	…	298,898	284,485	336,135	443,272	503,080	603,320	714,487	864,557	1,027,226	1,152,952	1,234,588	1,190,429
Δ Saving deposit	…	…	…	…	…	…	…	…	…	0.182	0.319	0.135	0.199	0.184	0.210	0.188	0.122	0.071	0.017
Foreign liabilities	12,645	23,687	26,952	29,744	70,434	97,842	44,413	80,142	68,321	71,315	93,808	113,521	95,645	134,270	173,570	208,622	321,942	417,392	448,403
Δ Foreign liabilities	2.960	0.213	0.138	0.104	1.368	- 0.389	- 0.546	- 0.419	0.147	0.044	0.315	0.210	0.157	0.404	0.293	0.202	0.543	0.296	0.009

Source: Indonesian Banking Statistics

8.04 The private sectors' balance sheet

In order to conduct the analysis, this chapter uses a simple financial analysis by presenting the movements of each financial ratio that shows and gives information on the area of firms' financial leverage and solvency. Ross *et al.* (1999) explain that in measuring the capacity of a firm to repay its obligations, a researcher mostly focuses on the comparison between the availability of assets and the liabilities. The indicator that is being used to evaluate the firm's liquidity is the current ratio, which is calculated by dividing the current assets by its current liabilities. It is expected that the higher this ratio, the easier it is for the firm fulfils its obligations. When the value of its ratio is less than 1, it can be inferred that the problem may arise, since the firm is unable to pay its obligations on time. The other indicators that provide information on the ability of a firm to repay its debt are the leverage ratio, which at certain level it also reveals the firms' reliance on external financing in comparison to the equity. There are two advantages to this indicator: from the creditors' point of view, the indicator makes it possible for them to evaluate the firms' financial condition so that, they will be protected from a financial problem, for example, from the firm's insolvency. From the firms' point of view, the use of this indicator helps them conduct self-assessment before making any decision to borrow funds from financial institutions.

At the aggregate level, there is no data available that can support the measurement of these indicators. One possible way is to get into an individual company's balance sheet and income statement. Extending the work of Cozzi and Toporowski (2006), this study collected data from 63 listed non-financial companies in the period of 1991–2015. These companies represented sectors in the IDX, which comprise of mining, basic industry and chemicals, consumer goods, property, infrastructure utilities and transportation, trade and services, and miscellaneous industries. Following Cozzi and Toporowski (2006), this data will be used as a proxy value for the whole country's economy and it is expected that the data represents the aggregate country data.

The selection of companies that are used in this study is based on four considerations. Firstly, as the discussion on the banking sector balance sheets has been done in the previous section, it includes only non-financial companies. Secondly, the initial public offering of the companies was made in 1991 so that they conform to the observation period of this analysis. Thirdly, it is expected that all the listed companies that are chosen have stock market quotation up to 2015. In other

words, the company does not have any experience of being delisted from the IDX. Fourthly, the sample of these companies represents each of the different sectors of the economy. Because of the limited number of firms engaged in agriculture, this sector is included with miscellaneous industries. However, most of the companies in the agricultural sector failed to be included as their initial public offerings were done after the crisis period.

Figure 8.2 The current and debt ratios

Source: Own calculations

Note: these ratios are calculated based on the balance sheet and income statement data of more than 60 listed non-financial companies.
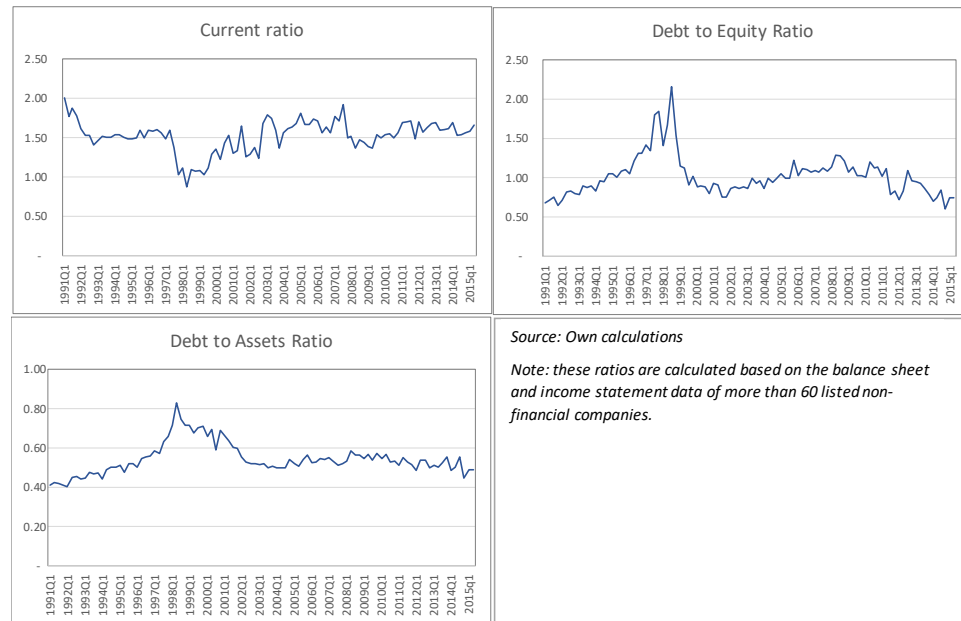
Based on Figure 8.2, the first indicator is the current ratio, which compares the current liabilities to the current assets. During the period of 1990-1995, the indicator of the current ratio had a value of more than 1 for all sectors. The movements of this indicator were modest and took the average value of 1.5. In 1997/1998, even though the average value was still around 1, there was a declining trend in this indicator, which slowed down to reach its lowest value for the entire observation period. The general cause for this declining trend was increasing current liabilities. Based on the structure of the companies' balance sheets, the growth of current liabilities exceeded the growth of current assets. Focusing on the detailed structure of this variable, some sectors that experienced the lowest ratio are those that relied on imported goods or needed to purchase machinery. One factor that gave impact on this condition was the weakening of domestic currency. The imported components of the process of production might increase the current liabilities. Most of the companies will come across this problem when their revenues are mostly denominated in domestic

currency while the companies must repay their debt obligations in USD or another foreign currency.

By investigating the current ratio, one can gauge the ability of this company to deal with short-term liabilities. In other words, this ratio shows how a company can tackle its liquidity problem. The movements of the Indonesian current ratio show that during 1997/1998, there was a weakening of the liquidity of the private sector. The inability of a company to meet the repayment of its obligations and to fail to extend the period in which the obligation is due, may create a debt default. At the national level, this condition will trigger financial fragility in the whole economy. In the post-crisis period, the average of the current ratio has been recovered and reached its position above the critical value. The value of this indicator was consistently maintained beginning from 2002 to the present.

The second indicator is the debt ratios that consists of the debt to assets ratio and debt to equity ratio. The debt ratios try to find the movement of the companies' debt and compare it to the assets or equity. In general terms, this ratio is meant to capture the companies' ability to meet its obligations using all of its assets or equity. The higher these ratios, the higher the risk a company faces. Considering there is insufficient data on each company's debt, this study uses the total liabilities as a proxy for the amount of the debt. This approach is in line with the broader definition of debt as provided by Ross *et al.* (1999, pp.23-24). These authors explain that liabilities have similar characteristics to debt, for example, they have contractual obligations, needs a cash payments, and a finite time-period.

Figure 8.2 depicts how the debt to asset ratio was increased during the Southeast Asian financial crisis of 1997/1998. Before the crisis period, this ratio had experienced a positive trend that indicated potential problems. The increase in this ratio showed the trend of firms' decisions to finance their assets from an external source of funds (Cozzi and Toporowski, 2006). It could be inferred that the positive trend of the debt to asset ratio revealed the insolvency of a firm, as well as the increased financial and credit risk. When the insolvency occurred, and was experienced by most of the private sector, it led to the financial condition of a country becoming fragile as experienced by Indonesia in 1997/1998.

The debt to equity ratio also measures the company's leverage and the level of financial risk[24]. The higher the ratio, the higher the risk of this company. Arnold (2002, p. 18) points out that the ratio of debt to equity also shows the potential probability of the company failing to uphold the shareholders' rights. In addition, the company with a high ratio of debt to equity may fail to repay its obligations, either in the short-term or long-term, and this opens the company up to possible insolvency problems. As presented in the right column of Figure 8.2, the movement of the average debt to equity ratio increases during the financial crisis, but recovers and is stable afterwards.

8.05   The increasing costs and risks

Figure 8.3 depicts one operation that connects two or more economic units through the financing processes of debt issuance and the lending-borrowing mechanism. These two external forms of financing come from different sources, namely loan markets and securities markets. However, they are similar in the way that the issuer or borrower needs to repay the debt obligations, which consist of the principal and other obligations payments, for example, paying the interest and other fees. The debt obligations will be the borrowers' concern since these obligations may increase the interest expense and when the borrowers' revenues or incomes are stable, the increasing expenses will have impact on the declining profit. There are two aspects that involve in the lending-borrowing mechanisms, namely the cost of borrowing and risks. The next subsections will discuss these aspects in detail.

8.05.1 The cost of borrowing

There are two aspects of company's debt that can increase the cost of borrowing. Firstly, the internal factor, which is related to the inability of a company to manage its cost and risks. As an example, the interest rate payment is classified as a cost, and an interest rate in the form of a variable rate contains the market risk. A company that has a loan with a variable rate will be exposed to changes in the reference rate. When the reference rate increases, the company should pay additional expenses to its lenders. Hence, if a company cannot manage its cost and risks properly, this company will be burdened by additional costs in the following period.

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[24] Cozzi and Toporowski (2006) defined financial risk as the risk that is borne by stockholders when the firm finances its operations by issuing or obtaining debts.

Secondly, the external factor that increases the cost of borrowing is related to the lenders or investors' views. The lenders or investors' views play an important role in the financing process, especially when it affects the investors' or lenders' willingness to provide future debt commitments, and if the debt commitment is available, it is likely to come at a higher cost. The increasing cost is meant to cover the risk that potentially appears in the borrowing process. Hence, the increasing indebtedness affects the private sector creditworthiness, and this is usually reflected in the margin of the interest rate or an additional fee called the insurance premium fee. The higher the margin or fee, the less creditworthy a borrower is.

Figure 8.3 The lending rate and composite rating
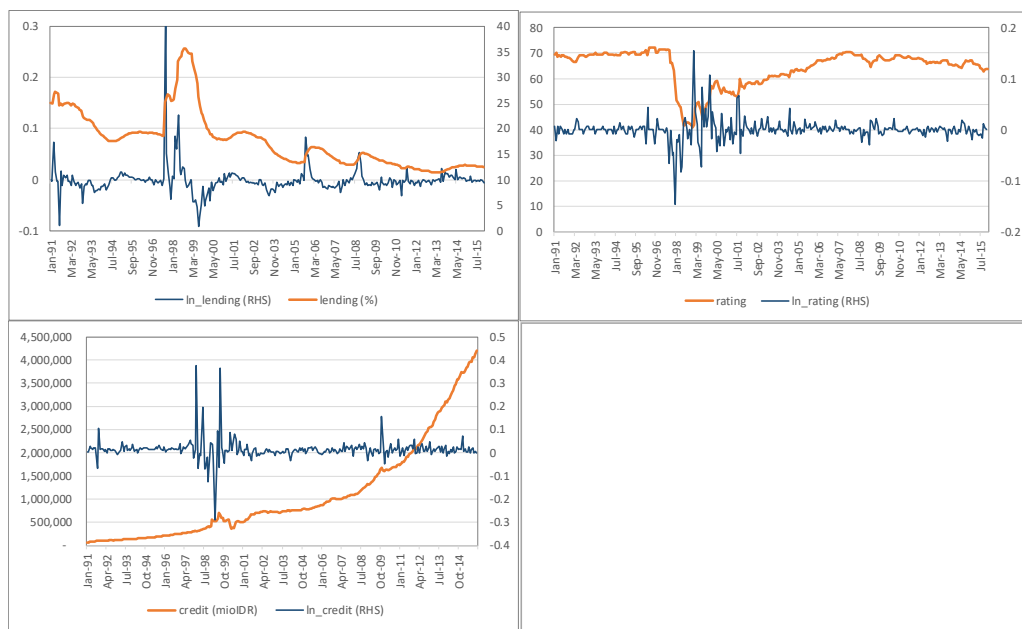
Source: Own calculations based on IFS – IMF, ICRG and BIS

It is taken that the rating represents the borrower's risk, the lending rate represents the cost of borrowing, and the amount of domestic credit is a proxy for the total debt. Figure 8.3 describes the tendency of the movement of the lending rate, the composite rating index, and the amount of credit[25]. From this figure, it seems that the rating and

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[25] This study utilizes the lending rate to describe the potential cost of borrowing from domestic banks. The ICRG composite index is meant to show the investors' view of the financial system but since there is no data on the private sector credit rating, this study uses the ICRG composite index to represent the condition of the private sector. In order to describe the movement of private sector borrowing, this study takes data from the Bank of International Settlements. The change in the private sector debt is used to emphasise this movement throughout the observation period.

the lending rate are negatively related. When the rating is declining, the lending rate is increasing. It can be inferred that the negative view of investors or lenders is reflected in the cost of borrowing. Before the period of 1997/1998, the interest rate was stable and tended to decline at some points. The growth of credit to the private sector was also relatively stable. The significant movements of these three indicators is shown in the period of 1997 up to 2000 when turbulence hit the country. Figure 8.3 also captures the signal of an increase in private sector borrowing that occurred in the middle of 1996. This positive movement of private sector debt can be interpreted as an increasing demand for loans from the banking sector. The increasing demand for loan was then responded by the banking sector by increasing the lending rate. This phenomenon will create a burden for the private sector when they have to pay the interest for both the new and on-going loans, especially for those that use variable or floating interest rates.

8.05.2 The liquidity and refinancing risks

After discussing the cost of borrowing, this subsection will focus on the risks that embedded in the private sector and commercial banks' transactions. In examining the private companies and commercial banks' balance sheets, this study finds that there is a tendency of increased risks, namely liquidity and refinancing risks[26]. To capture this phenomenon, this study uses two different measurements, namely the loan to deposits ratio for the banking sector, and the portion of short-term debt for the private sector.

The loan to deposit ratio reveals the commercial banks' lending to private companies compared to the funds from its customers' deposits. Assuming that a portion of banks' lending comes from the deposits, it should be noted that the process of the funds channelling into the lending-borrowing mechanism may create a maturity mismatch since the deposits that are collected by the commercial banks can be withdrawn at any time by the customers. On the other hand, the loan may be used to finance a longer-term investment project. This is the reason commercial banks need to maintain the ratio at a certain level - to avoid liquidity problems. Based on its formula, when this ratio is more than 1, it shows the liquidity problems of the commercial banks, since they provide the private sectors' loans using funds from the money

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[26] Theoretically, there are several types of risks consisting in market risks, refinancing risks, counterparty risks, etc. However, this study only focuses on liquidity and refinancing risks.

market. Conversely, the low ratio of loan to deposits indicates the lower revenues that will be obtained by the commercial banks. There is no precise level that can be used as a benchmark for the optimum level of loan to deposit ratio.

Figure 8.4 Loan to deposit ratio (%)
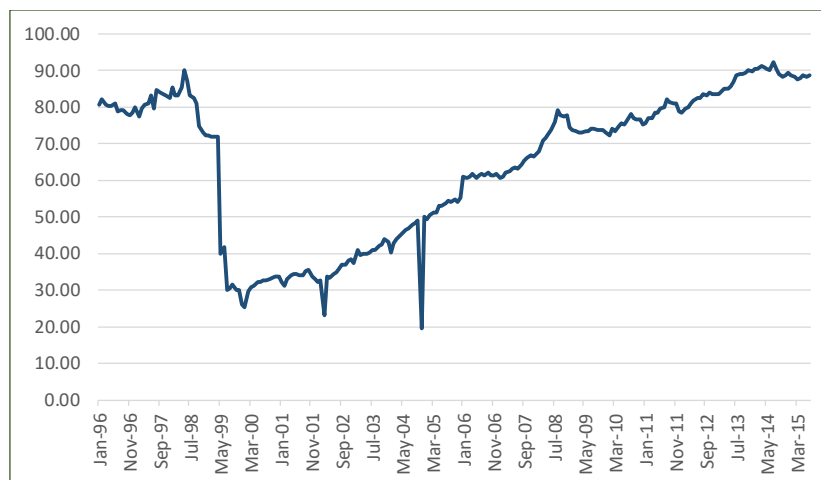
Figure 8.4 provides the movements of this ratio, which is still below 100% throughout the period. Theoretically, this level suggests the use of deposits to serve the loans that are demanded by the private sector is manageable. Following the crisis period in 1997/1998, however, in December 1999 there is a sharp decline of this ratio to reach less than 30%. Does this indicate a problem or show an improvement of this ratio? The data series demonstrates that the amount of deposits did not change much at that time. The stable positive growth of the deposits shows that the mobilization of domestic resources was running well in the financial crisis period. On the other hand, difficulties were faced by the private sector that experienced the slowing down of the economy. The declining performance of the private sector brought each company to reconsider, or in most cases postpone, the plan to expand the business. Besides, the financial, political and social instability presented another challenge for the private sector. All these factors affected the intention of the private sector to find external financing through obtaining new debt. Instead, most of the companies tended to use internal financing to expand their businesses or recover from losses that incurred during the crisis period.

Starting from the end of 2001, this ratio moved more positively. The amount of private credit and deposits increased but the ratio was still under 10%. Even though the

liquidity risk was under control, considering that the global financial condition was not stable during 2014–2015, the authority should have paid more attention to adverse effects that may occur. These adverse effects would have included, the slowing down in domestic economic activities, the weakening of domestic currency starting from January 2015, and other countries' economic policy that affected domestic financial and real sectors, i.e. China and the U.S.

In addition to the liquidity risk, this study also briefly describes private sector's behaviour in choosing the type of financing. On the private sector balance sheets, the liabilities are divided into two groups, which consists of short-term and long-term debts. There are at least two different relationships that involve a company and its counterpart. The first relationship is between a company and another company. In doing business, a company may receive the short-term borrowing from other companies in the form of trade payable. The following mechanism can describe this activity. To maintain the production line as expected, some of the companies get the support or provision from their suppliers or vendors, for example, the suppliers are allowing them to postpone the payment of business supplies. The company receives a short-term debt from the suppliers in the form of trade payable. The second relationship is between the company and commercial bank, as the lender, that occurs in terms of the lending – borrowing mechanism. The common practice also allows a company to borrow from a commercial bank to finance its activities, including paying the advance payments to its suppliers and salaries for the employees; however, this type of debt will take a lower portion of company's total debt. Additionally, this type of financing is over a short period.

The problem may come to surface when short-term debt dominates the outstanding debt of a company and, in the aggregate level, the private sector mostly uses short-term financing for their activities. These scenarios are more likely to occur, firstly, if the outstanding debt of the company is increasing, which would increase the concern of the lender. The lender usually responds to this tendency by lessening some commitments, increasing the lending rate, and shortening the loan's maturity. Secondly, if the private sector, in the country level, fails to obtain the approval from the commercial banks to get longer term financing. This happens when the performance of the borrowers is not good enough to impress the lenders due to having a bad record. Thirdly, if the economic condition of the country is not good enough to expand the business plan. When a country's financial system experiences turbulence, the lenders usually make the borrowers should meet more demanding

criteria. So, the access to financing, especially loans that are cheaper and that have longer maturity, is more difficult for the borrowers.

Figure 8.5 The ratio of short-term to total borrowing (%)
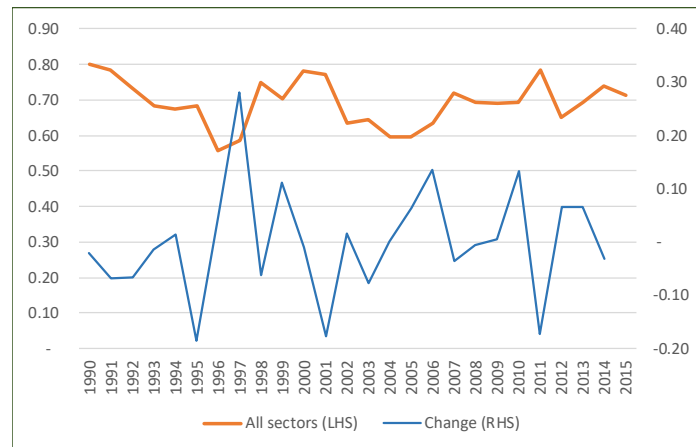
Figure 8.5 depicts the portion of the short-term liabilities that is used as a proxy for short-term debt to total liabilities. The portion of these liabilities is more than 50%, which is precarious from the risk management point of view. In Minsky's term, most of the business-entrepreneurs use speculative and Ponzi schemes to finance their investments. Looking at its movements, this indicator experienced a negative trend in the period of 1990-1996, showing improvements in risk management and the increased performance of internal financing. Following this period, the financial crisis led this ratio to increase and reach its highest level during the observation period. Besides the crisis period, in 2007 and 2011 this ratio was also increasing.

8.06   The build-up of instability

For the purpose of expanding its business, a firm will take corporate action. It is argued that the investment will yield a profit. When firm's performance and the business environment is good, the firm has a tendency to expand business, expecting more income or profit in the future. As previously explained, the intention to expand the business should match the access to finance the company has. The options available for the firm are internal or external finance. In most cases, external finance is used, which may be obtained from the banking sector. The firm as a borrower and the commercial bank as a lender expect that the condition for the next period is good for investment. As the project succeeds, the optimism will flourish among the parties

involved. However, this optimism can create carelessness, especially when commercial banks lower their risk preference on the borrowers, therefore allowing a borrower will get a loan more easily.

Figure 8.6 The debt-equity ratio and macro-indicators
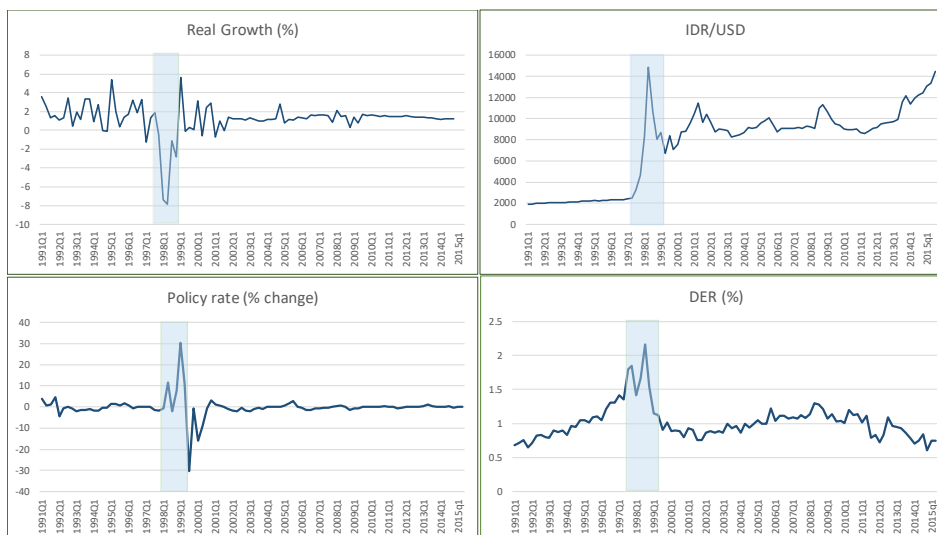
Source: Own calculation
Note: The debt equity ratio is calculated using the sample of more than 60 listed non-financial companies.

The relationship between the balance sheet and income statement lies in the structure of repayment on commitments, income as a source of fund to fulfil the obligations, and the refinancing mechanism (Minsky, 1990), which is specifically viewed from the internal structure of a corporation. The FIH emphasises the occurrence of a financial crisis that is triggered by the economic agents' expansion in a robust economic condition. In the good economic environment, the firms experience high profit, economic agents feel comfortable do business, and investors' confidence also rises (Dymski and Pollin, 1992; Wolfson, 2002).

Figure 8.6 shows four variables that are expected to help us understand the crisis episode within the framework of the FIH. The positive and high growth is likely to attract the businesspeople to expand their production capacity by obtaining external financing. The period of 1991-1995 shows a positive trend in the debt to equity ratio. However, when the policy interest rate increases and the borrower has the variable rate debt, there is a possibility of an increasing cost that the borrower faces to service their debt. If the amount of the loan is sizeable, the borrowers will struggle to survive financially as they are exposed to the increasing cost and risk. This phenomenon happened in Indonesia during 1997/1998, when the borrowing cost increased

sharply, and the debt to equity ratio then increased. It is most likely that the borrowers had loans in variable rate since the increasing rate of interest was followed by an increasing gearing ratio. The positive correlation[27] between debt to equity ratio and policy rate suggests that the Central Bank should have considered the ability of corporations in serving their obligations when it wanted to increase the interest rate. Brancaccio and Fontana argued (2013, 2015) that the rate the Central Bank policy sets has a direct effect on firms and companies' solvency. In addition to the increasing cost of borrowing, the companies had to shoulder another burden as the domestic currency depreciated against the USD. The currency risk may have also put pressure on the corporations, especially for those who had a loan from abroad. In terms of domestic currency, the total debt of the firms increased.

Figure 8.7 The non-performing loans (%)
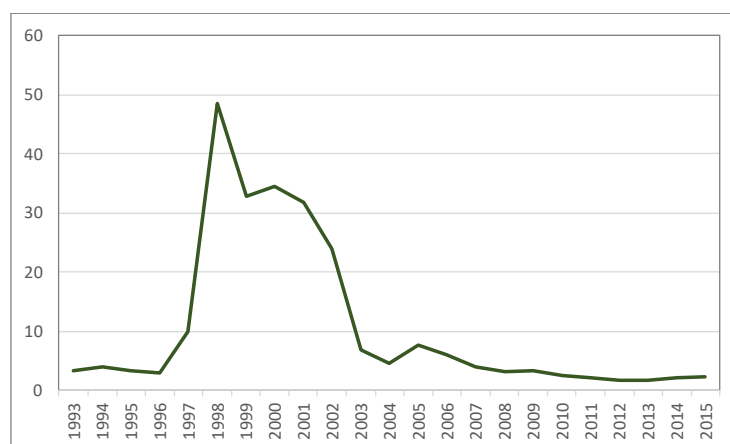
Source: Own construction based on Word Bank data and various publications
Note: The figure of 1997 is the approximate NPLs up to first semester of 1997
(Pangestu, 2003).

In conditions where the interest rate is high, companies are severely burdened by the cost of borrowing and, as a result, its ability to serve the debt liabilities declines. This

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[27] Using a simple regression model involving the variables of the debt to equity ratio, growth rate, exchange rate and policy interest rate, it is shown that the estimation output is as follows:

$$der_t = 1.007 + 0.21 intrate_{t-1} + 0.24 excrate_{t-1} - 0.02\ growth_{t-1} + 0.27 break + e_t$$

$$[0.054]*** \qquad\qquad [0.055] \qquad\qquad [0.04]$$

R-squared=0.393 Adj.R-squared=0.367 S.E.of regression= 0.202 No.of obs=100

*Note = ***, **, * indicates significant at 1%, 5%,10% level*

phenomenon will trigger a growing amount of bad debts, or non-performing loans. In line with the above explanation, Figure 8.7 shows how the percentage of non-performing loans during 1997/1998 escalated, reaching the highest level for more than 20 years. In addition to this, Takayasu and Yokoe (1999) indicated some possible causes of the high level of non-performing loans in Indonesia as follows: (i) the quality of assessment was low since the loans were provided for the affiliated companies, (ii) there was a lack of transparency, (iii) the funds were used to finance non-productive investments.

Based on the discussion above, one may understand the interconnection of economic agents in the Minskyan framework. This framework describes the lending-borrowing process that may trigger financial instability. Even though there is no formal model to explain the process of financial fragility, in certain cases, the descriptions as have been provided in the previous sections can show the worsening of the financial condition prior to the crisis period. So far, the discussion has focussed on the interconnections between the commercial banks and the concerned agencies in the framework of the lending-borrowing mechanism. In discussing the external fragility, however, the starting point is to recall the mechanism as depicted in Figure 8.1. Within this mechanism, the other unit that also plays a significant role in the financial system is the Central Bank. The mainstream views argue that the Central Bank takes an active role in the foreign reserves management in order to influence the monetary base. The Central Bank may sell and purchase securities when there are capital flows. This mechanism will be discussed in detail in Chapter 11.

8.07   Financial fragility measurement

This sub-section tries to measure financial fragility drawing on the FIH. Following the work of Schroeder (2002, 2009), this study explores three macroeconomics variables: the rate of interest, the operating profit, and the investment. Before getting into the analysis, this study will present the basic assumption for this measurement.

8.07.1 The analytical base

Schroeder (2002, 2009) and Blancas (2007) used Foley's approach to analysing financial fragility and started with a firm's balance sheets and cash flow identity. The first aspect of the model is the balance sheet. To simplify the analysis, the main components of the balance sheet are the assets (*A*) and liabilities (*L*), which may

produce the firm's net-worth (W) by subtracting those two balance sheet components.

$$W = A - L$$

The firm's net-worth is positive when the assets are greater than the liabilities. The positive change in a firm's assets can be made through investment. However, the firm has to find the source of financing, whether it comes from internal or external source of funds, to finance its investment project. One component that may influence the firm's liabilities is the firm's borrowing, i.e. the used of an external source of funds. In other words, the borrowing will reduce the firm's net-worth. Hence, the change in net-worth equals to the difference between the change in assets and the change in liabilities. There is another way to obtain a change in net-worth, which is by exploring the statement of cash flow.

In general, the statement of cash flows contains an identity that shows the firm's source of funds, which is obtained from the operating profit (P) and new additional debt (D), and the use of these funds in investments (I) and the servicing of debt (S).

$$P + D \equiv I + S$$

Based on this identity, there are three types of financing units as described by Minsky:

- The hedge financing unit is a firm that has a greater profit than its investment plus the expense for servicing its debt, or, can be formulated as $P \geq I + S$.

- The speculative unit is a firm that has profit greater than its debt service, but the profit cannot cover the sum of its investment plus the expense for servicing its debt. The speculative unit can be formulated as $P \geq S$, but $P \leq I + S$.

- The Ponzi financing unit is a firm that has profit lower than its debt service, and needs to borrow to meet its debt obligations. The formulation for the Ponzi financing unit is $P \leq S$.

The cash flows identity can be expressed in an alternative way by subtracting both sides with the operating profit (P):

$$D = I - P + S$$

Supposed that π is the rate of profit that can be obtained by dividing the operating profit (P) with the firm's assets (A), g is the growth of a firm's assets that can be obtained by dividing the investment (I) with firm's assets (A), and r is the debt service

rate that is equal to the debt service (*S*) divided by the debt outstanding (*B*). From these equations, one can formulate new additional borrowing as follows:

$$D = (g - \pi)A + rB$$

Schroeder (2002, 2009) emphasised that in the aggregate or at the country level, the formula is also similar, but with some changes in each component. The capital stock (K) replaces the assets (A), by which one may derive the average increase in investment, *g.* The operating surplus can be used to represent the profit, π and the same method also applies to the total debt service. The author argued that the evolution of these three variables and their combinations demonstrate the tendency of a financial system to become fragile or unstable. By considering the movements of the trends in each variable, the authorities can gain insight into a country's vulnerability. This tendency can be seen from the conditions as follows:

- An economy is classified as hedge financing when its profit (π) is higher than the investment (*g*) plus the debt service (*r*). Comparing each variable, there are two possibilities within this combination: π > *g* > *r* or π > *r* > *g.*
- An economy is classified as speculative financing when the rate of profit (π) is lower than the rate of accumulation (*g*), but higher than the debt service rate (*r*). Hence, the combination of the variables becomes as follows: *g* > π > *r.*
- While, for Ponzi financing unit, there are some possible combinations that show the rate of debt service outperforms the other two variables: *r* > π > *g* or *r* > *g* > π, and when the rate of accumulation is higher than the rate of debt service and the rate of profit: *g* > *r* > π.

Overall, the above conditions do not necessarily bring country into crisis. The measurement is expected to send the signal of a country's condition, which helps the authorities to identify the state of the country and if necessary formulate a policy.

8.07.2 The empirical analysis

In implementing this measurement, this study aims to estimate three main variables: the profit, the investment, and the debt service. However, instead of finding the nominal level of these variables, this study will use the incremental rates. In this case, the incremental rates are defined as the rate of change in each variable (Schroeder, 2002 and 2009; Blancas, 2007). Schroeder (2009) argued that incremental rates are more useful for providing information on the structural change of an economy, whether it tends to be categorized as a Hedge, a speculative or a Ponzi financing system. The reason of utilizing incremental rate lies on its sensitivity to capture the

fluctuation of the variables in which it is much better than those at the nominal or country levels. In so doing, this study employs Indonesian annual macroeconomic data for the period of 1993 to 2015.

The first variable is the incremental rate of profit (π'). According to Schroeder (2009), the variable π is the change in the annual profit (ΔP) as a ratio of the change in the capital stock (ΔK). In this case, the change in capital stock is equal to the level of the previous period of investment (I_{t-1}).

$$\pi' = \frac{\Delta P}{I_{t-1}}$$

In the calculation, there is no information on the income approach to GDP and hence, the data on a country's profit is very limited or unavailable. To deal with this, the country's profit is estimated by subtracting the nominal GDP from the annual wages and tax. The amount of wages is calculated from the average annual wages multiplied by the number of individuals employed, which includes self-employed individuals. For the investment variable, this study uses the series of annual gross fixed capital formation as the proxy for the capital stock. The data are retrieved from WDI–the World Bank, the Indonesian Central Statistics Agency, and IFS–IMF.

The second variable is *the* incremental rate of investment (*g'*). This variable is calculated by dividing the change of the investment (ΔI) with the change of capital stock. As previously defined, the capital stock equals the previous period of investment (I_{t-1}). With this definition, the incremental rate of investment can be formulated as follows:

$$g' = \frac{\Delta I}{I_{t-1}}$$

The *third* variable is the incremental rate of debt service (r'), which is the change in debt service (ΔS) divided by the change in the outstanding debt (ΔB). The change in the outstanding debt in this case is equal to the amount of new borrowing that was agreed in the previous period, with the following formula: $\Delta B = B_t - B_{t-1}$, where $B_t - B_{t-1} = D_{t-1}$. Based on this definition, the formula for incremental rate of debt service is as follows:

$$r' = \frac{\Delta S}{D_{t-1}}$$

According to Schroeder (2009), the incremental rate of debt service for each unit of new borrowing is equivalent to the lending interest rate. However, to see the short-

term movement of the interest rate, she uses the inter-bank rate that is considered to be sensitive to changes in the financial market condition. Following her analysis, this study compares two types of interest rate, which are the lending rate and the inter-bank rate, before applying it in the analysis. The movements and the directions of these two interest rates are similar, yet, the inter-bank rate has a more responsive movement than the lending rate. The annual figures for the one-month Jakarta Interbank Overnight Rate (JIBOR) are taken from the Indonesian Central Bank and Bloomberg.

Figure 8.8 depicts the change of these three variables. This figure shows that prior to the Asian financial crisis in 1997–1998, the movement of these variables was relatively stable, with a relatively low interest rate. With relatively high GDP growth in 1994, the level of profit could be maintained higher than the other two variables. This condition led the country to become a hedge financing unit. In the following year, however, this condition changed slightly when the amount of investments increased and outperformed the profit and interest rates. Between 1995 and 1996, the country could be classified as a speculative financing unit. In 1997, when the Asian financial crisis started, the profit rate and investment rate changed drastically to become lower than the interest rate. Starting from the third quarter of 1997, the monetary authority adopted a high interest rate policy as a response to the volatility of Indonesian macro-economic indicators, for example, a sharp depreciation of exchange rate and low international reserves.

Figure 8.8 The incremental rate of investment, profit and interest
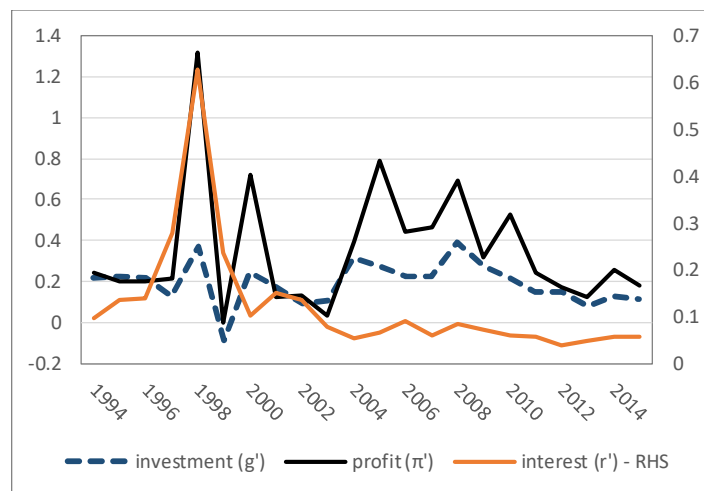
Source: Own calculations

In the aftermath of the crisis, there were some periods that show volatile movements in each of these three variables, such as in 2001 and 2002. Figure 8.8 shows that at the beginning of the 2000s, the positive changes in profits and investments are still below the rate of interest, which suggests the condition of a Ponzi financing unit. In the rest of the observation period, Indonesia is categorized mostly as a hedge financing unit, with the profits rate higher than investment rate and the interest rate. In 2004, investment rate reached 0.31, while the profit rate was about 0.39 and the interest rate at 0.054. It can be inferred that in this year, every unit of money that was spent on new investment would give a profit that was sufficient to cover or meet the new debt obligations (Schroeder, 2009).

Figure 8.9 Financial fragility '*seismogram*'

Year	Hedge		Speculative	Ponzi		
	$\pi > g > r$	$\pi > r > g$	$g > \pi > r$	$g > r > \pi$	$r > \pi > g$	$r > g > \pi$
1994						
1995						
1996						
1997						
1998						
1999						
2000						
2001						
2002						
2003						
2004						
2005						
2006						
2007						
2008						
2009						
2010						
2011						
2012						
2013						
2014						
2015						

Source: Own calculations based on Blancas (2007)
Note: π is the incremental of profit; g is the incremental of investment; r is the interest rate.

To make the change in these variables clearer, Figure 8.9 presents the dynamics of a financial system's condition as explained by sub-section 8.07.1. This figure is created by comparing the value of each variable, and the results will show which category the country should be classified as, whether it is hedge, speculative or Ponzi

financing unit. After comparing the value of each variable, the results are quite interesting. The first part of this figure demonstrates the volatility of country's condition. The financial crisis in 1997 was preceded by speculative financing in 1995–1996. However, in 1998 the classification changed to hedge financing. When the country was in a fragile condition and entered crisis, the authorities tried to solve the problem. The authorities realized that the level of private investment might be lower[28] than the previous year and this required them to take necessary actions. One of the policies was to increase the government budget to compensate for the slowing down of investment, so that national output could be maintained. The increasing government expenditure in 1998 could prevent the national output from decreasing further. It was believed that the positive change in national output would lift Indonesia's profits. However, this condition did not last long as from 1999 the investment and profit fell below the interest rate and so Indonesia became a Ponzi financing unit.

In addition to the above explanation, Figure 8.9 shows that Indonesia entered a Ponzi financing state in 2001 and 2002, when the rate of interest was higher than the other two indicators. Since the estimation of profit is made using the GDP, it is suspected that the slowing down of the change in investment may affect the low rate of profit. From the historical data, in 2001 domestic investment declined to reach minus 36% and led to the decline in total investment by about 4%. Moreover, in 2002 both foreign direct and domestic investments declined from the previous year, reaching minus 41% and minus 56%, respectively. There are some events that may have had a role in slowing down the firms' expansion. Recalling the series of domestic events as already have been described by Chapter 7, there are at least two events that influenced the investment, namely the political instability during the Presidential succession in 2001 (Malley, 2002) and the terrorist attack in 2002. It seems that investors and corporations wait until these events were resolved to invest their funds.

Figure 8.9 shows that Indonesia was stable and could be categorized as a hedge financing unit during 2005 to 2015. However, when it is compared with Figure 8.8, it is interesting to note the movements of profit rate in this period. With relatively stable interest rate and investment rate, there are positive changes in profit rate between 2005 and 2015 though the trend was for this to slow down. This figure may suggest

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[28] Based on historical data, the private investment value, which is obtained from subtracting the public investment from country's total investment declined between 1997 and 1999.

the tendency of a lower rate of return from every unit of money invested. It is suspected that the declining rate of growth, as the GFC erupted within this period, affected this condition. If there is a sudden positive change in the interest rate that can alter the debt service obligations, with the other two variables are being equal, the country can enter a fragile financial condition. Hence, even though the country's condition is classified as a hedge financing unit, the authorities should have paid attention to the detail, such as the movements of other macro-economic or financial market indicators.

These two figures (Figure 8.8 and 8.9) give a new perspective in measuring Indonesian financial instability. These figures offer useful information for the authorities to take action, if there is any suspicion that the economy may worsen. Taking the example of the above case study in the year of 1995 and 1996, when the level and the incremental of profit were seen to lower, this condition can lead the country to become a speculative unit. With this condition identified, the authorities were supposed to apply policies to tackle the source of the problem. If the problem lies in the decline of the national output, from the fiscal policy side, the government can manage the state budget to accelerate economic activity. The monetary authority may use the policy interest rate to transmit monetary policy that boosts economic activity. However, with the dynamic condition of the financial system, it seems that this measurement needs to be enhanced to capture more detail of the variable interests. This enhancement to the measurement can be done by improving the frequency of each variable, for example by using quarterly rather than annual data.

8.08   Conclusion

As a response to the weaknesses of the crisis predictors that developed in two previous chapters, this chapter attempts to discuss financial fragility using a simple balance sheets framework. The main assumption of this discussion is not to predict the occurrence of crisis but to detect the state of financial instability. This chapter's contribution to the literature is by exploring the financial system instability using FIH and examining the interconnections and the roles of several economic agents in Indonesia's case.

Based on a simple analysis of the lending-borrowing process, there are several findings in this study. First, this study finds that the relationships among these units are quite sophisticated. These relationships explain that should a problem occur in one economic unit, this problem can be transmitted to the others. Second, by using

the balance sheet approach, it can help economists to understand the build-up of the financial instability and financial crisis. The development of relevant financial ratios before, during and after the Southeast Asian financial crisis shows the transformation from a normal condition to financial instability and financial crisis. In a specific case, the ratio of debt to equity portrays a good example of how financial instability could result in financial crisis in 1997/1998. Besides, the balance sheet approach emphasises the importance of portfolio and risks management to show the economic agents' financial condition.

Third, the increasing outstanding debt, both at the country level and at the individual level, may aggravate the financial system. The increase in debt outstanding may affect the lenders or investors' view towards borrowers. With certain amount of debts, the changes of the interest rate may create additional burdens for the borrowers. There is also the potential for the financing risk to exacerbate the borrowers' balance sheets and income statements. Finally, due to the increasing debt obligations, the borrowers could face difficulties in repaying these expenditures as their profits decline. Additionally, the commercial banks may experience the increasing numbers of non-performing loans. This finding supports Minsky's FIH that during the tranquil period, the firms have a tendency to increase the levels of external financing, but when optimism changes to the pessimism, the financial system will suffer from a crisis episode.

This empirical chapter offers a new idea of measuring the state of Indonesia's financial instability by constructing the financial instability 'seismogram'. From the empirical results, the measurement shows the state of fragility in this case. The fragility condition began in 1997 when the economy can be classified as a Ponzi financing unit. Before entering the Ponzi state, in 1995 and 1996, Indonesia was considered a speculative financing unit. With this evidence, this measurement may help the authorities to recognise the signal of financial fragility in advance, so that they have the capability to prepare for it by setting policies. Overall, this measurement may require some improvements, for example, in the attempt to use the higher frequency data.

Chapter 9
The capital flight measurement

9.01 Introduction

One aspect of financial liberalisation is capital account liberalisation, which often is included in structural adjustment policies. Capital account liberalisation permits the flow of capital from one country to another. The word liberalisation emphasises the crucial part of the reform which minimises – or in an extreme case, eliminates – the role of the government in influencing the flow of capital and the mechanisms in the financial system, such as the determination of the value of domestic currency against its foreign counterpart and the degree of freedom for foreign investors in purchasing the domestic financial instruments (Grabel, 2006, p.404). Through the implementation of financial liberalisation, the domestic economy has wider access to international financial markets. This system opens up the opportunity for all economic agents, both local and global market players, to get involved in financial market activities, including buying and selling financial assets.

Between 1970 and 1980, financial liberalisation was widely implemented under arguments that the inflow of foreign capital, amongst other factors, would confer benefits to the liberalising country. In connection with the assumptions of neoclassical views, the advocates of financial liberalisation claim that it enables improved efficiency and the distribution of funds across the global financial market. Moreover, the economic agents have better access to funding sources and an opportunity to diversify their portfolios (Singh, 2003). Based on data from the Institute of International Finance (2016), the trend of capital flows into emerging market economies has been increasing. By the end of 2002, the net private flows that entered the emerging market were recorded to reach USD 202billion, with a further increase to USD 1,285billion in 2007. In the period of 2010–2013, the net private inflows to the emerging markets showed positive trends. The series of data show that the movements of capital were very volatile, leading to a vulnerable situation, especially when there were reversals of capital inflows and capital outflows.

The movements of capital from the domestic financial market in the forms of capital outflows and negative inflows are usually extremely high during the crisis period. However, the condition worsens when the data portraying these flows are not available. Chapter 2.05 emphasises this message in the case of Indonesia throughout the crisis period. There are no sufficient data that become the source of

information for decision-makers to know the financial market situation. Hence, it deems necessary the presence of an alternative way or instrument to calculate or measure the flow of capital that may be unrecorded properly.

Departing from this problem, this chapter intends to apply the method in mind of investigating and measuring the unrecorded flows by utilising the 'capital flight' formula. This empirical chapter is expected to provide a contribution to the literature by exploring the method in calculating capital flight in the case of Indonesia and accordingly utilising the most current and, to some extent, higher frequency data series. This study calculates the trade misinvoicing involving 150 trading partners countries using monthly data. Furthermore, the previous studies focused on exploring the capital flight from Indonesia are subject to the limited data availability or are performed on a yearly basis. As a result, these studies are unable to describe the detail movements of capital flight, which may lead to an indefinite policy prescription.

The rest of this chapter presents the theoretical framework of capital flight that covers the definitions, methodology and several empirical studies on capital flight. The next chapter provides a short description of Indonesian private capital flows, followed by the methodology intending to be used in this chapter. The last section provides discussion and the conclusion.

9.02   Capital flight: an alternative approach to investigate capital outflows

Nowadays, the flow of capital between countries is increasing in its magnitude and frequency. These movements of funds have two different outcomes: it may provide the domestic financial system with a source of funds, but it potentially creates a problem of triggering financial instability. One of the unsolved issues within the management of capital flows is the existence of unrecorded capital outflows, commonly understood as capital flight. This type of flows increases the complexity in estimating the capital flow to or from the country and setting the policy to handle the management of capital flows.

Considering the unclear and complex mechanisms involved in capital flight, economists have not come to a coherent, agreed upon conclusion on its definition. There is the argument on differentiating capital flight from the type of transactions carried out, suggesting that capital flight should be distinct from normal transactions. Based on this argument, capital flight covers the illegal transaction, and therefore

should be distinguished and separated from legal transactions (Ajayi, 1997). This definition leads to the question of how illegal transactions can be translated into the empirical analysis for there is no sufficient data on such transactions.

The unavailability of data in supporting the search for the amount of capital flight inspires economists to identify another definition and method for facilitate the calculation of capital flight in the real world. Cuddington (1986) defined the short-term speculative capital that flows from the domestic financial market, using the term 'hot money'. In this definition, capital flight was classified as capital flows that are unrecorded. Cuddington (1986) argued that the process of measuring capital flight was both challenging and difficult. To make this term doable in the empirical research, the author suggested that economists can measure capital flight by considering different variables, such as errors and omissions, and trade misinvoicing. Furthermore, Dooley (1988) offered a definition of capital flight as an increase of external claims without yielding income for the country since the assets are beyond the control of the authorities (Ajayi, 1997; Beja, 2005). Beja (2005, p. 56) argued that capital flight is the unrecorded capital that flows away from the country and which may, in some cases, involve illegal activities.

Based on the above descriptions, Epstein (2005) formulated a definition of capital flight with consideration to the motive of flight and its determinant. In so doing, the definition of capital flight is presented as follows:

'The transfer of assets abroad to reduce the loss of principal, loss of return, or loss of control over one's financial wealth due to government-sanctioned activities…[that] involves the motives for capital outflows [so] it is inherently difficult, if not impossible, to measure accurately…' (Epstein, 2005, p. 1)

This definition underlines the motive of flight that can be caused by the effort to avoid government regulations and as involving an illegal activity.

Claessens & Naude (1993) showed four well-known methods in measuring capital flight. According to the authors, the first approach belongs to the World Bank, which uses the residual method. In this method, capital flight is calculated through the use of the balance of payment identity. The residual is obtained by finding the difference between different sources of funds, which cover the net official inflows and flow of FDI and the uses of such funds, which cover current account deficit and addition international reserves. Capital flight can be identified when the sources of funds are greater than the uses of funds. Meanwhile, when the result is negative or when the uses of funds are greater than sources of funds, it is classified as 'inward capital flight'

(Claessens & Naude, 1993). The second technique is referred to as the Dooley method. The objective of this method is to obtain the stock of foreign assets held by the private sector but which do not yield any income to the country. The calculation can be performed by summing capital outflows based on the balance of payments assets, which then undergo adjustment by adding net errors and omissions. Through this method, the adjustment of unrecorded claims will also be included in the measurement. The unrecorded claims can be obtained by calculating the first difference of the outstanding external debt plus the cumulative of the balance of payment liabilities. Finally, the third variable included is the capitalised non-FDI income, which covers the flow of other investments divided by the domestic market interest rate. The third measurement technique is the hot money method, which involves the calculation of net error and omissions, other short-term capital, other bonds and corporate equities. The fourth technique is trade misinvoicing. Through this approach, country export misinvoicing and import misinvoicing are calculated and adjusted from a CIF (cost, insurance, freight) basis to FOB (free-on-board) basis.

So far, there are various studies that aim at measuring capital flight. Claessens & Naude (1993) provided an extensive discussion by comparing the results of capital flight based on some commonly used methodologies, as previously explained. Their study involved 84 countries in the period of 1971 up to 1990. The authors found that the phenomenon of capital flight is global; however, those regions experiencing higher amounts of capital flight compared to others are North Africa and the Middle East, as well as Sub-Saharan Africa.

Ajayi (1997) carried out a research on capital flight, with Nigeria presented as a specific case study. The author used four different methods, namely the World Bank, the Morgan and Trusty, the Cline, and the Duwendag methods. The observation used yearly data ranging from 1972 to 1989. This research found that each method gives different results, and the contribution of misinvoicing to the measurement of capital flight tends to increase in the case of Nigeria.

Beja *et al*. (2005) wrote a paper to examine capital flight in the case of Thailand. Through the adoption of the residual approach and the employment of yearly data spanning 1980–2000, the authors explained that the problem of capital flight was seen to increase during the Southeast Asian crisis of 1997/1998. The authors found that increasing capital flight is also recognised as having a positive association with the implementation of financial liberalisation.

Boyce and Ndikumana (2008) examined the link between capital flight and external borrowing in the case of Sub-Saharan African Countries. The study was done to observe 40 African countries over the period 1970–2004 using the adjusted residual approach. According to the authors, in the case of Sub-Saharan countries, the capital flight phenomenon is strongly linked with external borrowing.

In the case of Indonesia, the studies examining the capital flight are very few. Istikomah (2003) explored the factors determining capital flight in Indonesia during 1990–2000. This author estimated capital flight using World Bank's residual method, with its application alongside the use of quarterly data. Yuniarti (2005) observed the relationship between capital flight and external debt for the period 1974–2002. In her paper, capital flight was computed as using the adjusted residual method as suggested by Boyce & Ndikumana (2001). In calculating trade misinvoicing, the author examined nine trading partner countries.

9.03   The net capital flows at a glance

The issue of capital flows becomes an important aspect for policy-makers and economists, particularly when the behaviour of these data is relevant to understanding the fluctuations of macroeconomic indicators, such as the exchange rate and international reserves. Figure 9.1 describes the movements of Indonesian short-term capital flows. In this figure, the data is represented by portfolio investments, other investments and the current account. This figure shows the country's experience of portfolio investments, which were seen to sharply decline in 1997/1998—the period when the financial crisis erupted. From 2003 onwards, a large swing in portfolio investments can be observed. Despite its volatile movements, starting from 2003 up to 2015, the average capital inflow is positive. However, one may see that there are some negative movements, especially in the period following the GFC. Figure 9.1 provides an example of such downward movements, firstly in the middle of 2008 when the European debt crisis occurred, and, secondly, at the beginning of 2011, when there was uncertainty in the financial market following the downgrading of Greece's credit rating.

Figure 9.1 Current account and short-term investment (millions USD)
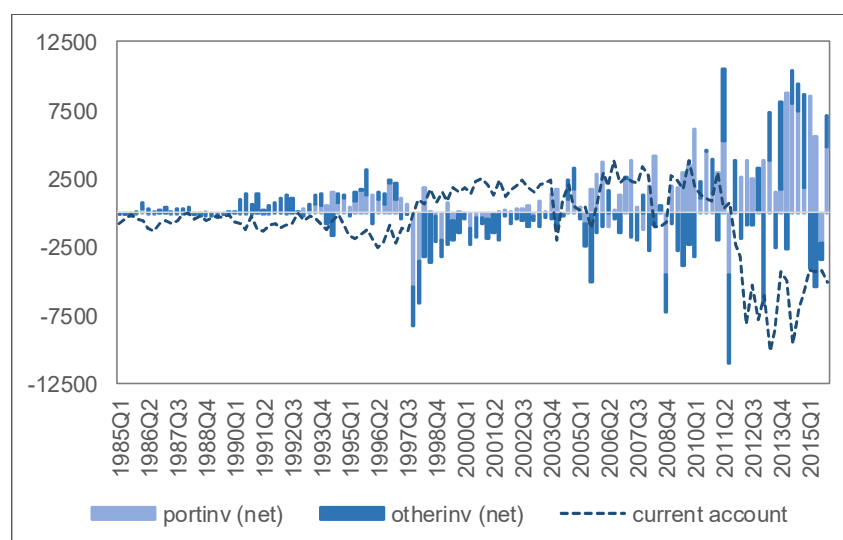
Figure 9.1 also depicts other investments that demonstrate very similar movements to private capital flow. The figures for such types of flow can be obtained from one component of the balance of payments, referred to as other investments, by excluding the monetary authority and general government financing. It therefore only covers the banking and other sector flows (Bluedorn et al., 2013; Kaltenbrunner and Painciera, 2015). From this figure, the private sector flows can be seen to slightly increase at the beginning of the 1990s, which is likely to be an impact of the financial system reforms of the 1980s and 1990s. In line with such reforms, the number of banks developed remarkably, with foreign financing increasingly entering the domestic financial market. In the third quarter of 1997, the private flows were seen to be negative, suggesting the repayment of external debt obligations. From Figure 9.1, one may observe that a number of other investments before 2011 were negative. There are several explanations for this phenomenon: firstly, there were an increasing number of private sector units and banks that borrowed from abroad and had to pay back their loan obligations during this period; secondly, according to the Balance of Payments and International Investment Position Manual (IMF–BMP manual), other investments take the form of other equity, which may be defined as the equity in quasi-corporations for branches and notional units for land ownership if the share of voting power is less than 10% (IMF, 2007, p. 111); there is a suspicion that the domestic private sector invested their money in this type of financial assets; and thirdly, it could be the case that the domestic banking sector also provided borrowing facilities for non-residents.

However, Figure 9.1 only portrays those transactions that were recorded, both in the financial account and trade account, and therefore does not show the real figures of capital flow in terms of those unrecorded. In examining this data, this chapter will use the residual method and adjusted residual method.

9.04   The estimation of capital flight

This study seeks to estimate the figures for capital flight from Indonesia to foreign financial markets during the observation period. In so doing, it is worthwhile following the methodology developed by the World Bank (Beja, 2005, p. 64), as refined by Boyce and Ndikumana (2001, 2008).

The point of discussing the measurement of capital flight lies in distinguishing 'ordinary capital outflows' and capital flight, which also has the content of capital outflows. In order to obtain the figure for capital flight, this study uses the method most commonly applied by the World Bank (Beja, 2005, p. 70–71) for defining and measuring capital flight. In addition, there is another tool to able to measure capital flight, which involves adding the component of trade misinvoicing to the capital flight measurement proposed by the World Bank.

Based on its name as the residual method, the World Bank formulates capital flight using the change in external debt outstanding ($\Delta debt_t$) and adding this variable to the net Foreign Direct Investments (FDI_t). These two variables construct the first part of the formula, which is argued as representing capital inflow. The second part of the formula consists of the current account deficit (CA_t) and the change in the international reserves ($\Delta Intres_t$), which combine to represent the capital outflows components. Referring to its name, capital flight can be obtained by deducting the second part from the first part. Therefore, the formula is presented, as follows:

$$KF = (\Delta debt_t + FDI_t) - (CA_t + \Delta Intres_t)$$

In order to measure capital flight, one needs to adjust the figures of export and import (Ndikumana and Boyce, 2008). The adjustment is needed since there is the case of trade misinvoicing, particularly for developing countries. This study calculates the trade misinvoicing by finding the export and import discrepancies. The first step is focused on idetifying the total import and export discrepancies. This step can be obtained by comparing the value of a country's imports (*M*) and the value of a trading partners' imports (*PX*) from the country, and the value of a country's exports (*X*) and the value of trading partners' exports (*PM*) to the country. When applying this method,

one should consider the adjustment factor of export and import data, as most developing countries value their exports as FOB; on the other hand, imports are valued as CIF. According to the IMF (1993, p. 10), the adjustment factor is 10% of the import value of the importing country. Total import discrepancies (*DM*) and export discrepancies (*DX*) are seen to be equal to the misinvoicing (*MISINV*). The formula for calculating misinvoicing is as follows:

$$DX_t = PX_t - cif * X_t$$

$$DM_t = M_t - cif * PM_t$$

$$MISINV_t = DX_t + DM_t$$

Hence, the adjusted capital flight is equal to:

$$AdjKF = KF_t + MISINV_t$$

In this calculation, with the case study of Indonesian trade misinvoicing, this study uses data from the Direction of Trade Statistics (DOTS)–IMF covering the period 1985–2015. In addition to this, the calculation of capital flight mostly uses data from IFS–IMF, except the data of short-term external debt, which is retrieved from BIS.

9.05   Empirical analysis

There are two steps involved in measuring capital flight: the first step is calculating trade misinvoicing, which is computed from the discrepancies in a country's total exports and imports with its trading partners; the second step is calculating the residual total capital inflows. This step computes the first difference of the country's external debt outstanding plus the net foreign direct investments and capital outflows, which involve the current account balance and the change in international reserves (Boyce and Ndikumana, 2001; 2008; Beja, 2005, pp. 63–65).

Figure 9.2 The estimation of trade misinvoicing (millions USD)
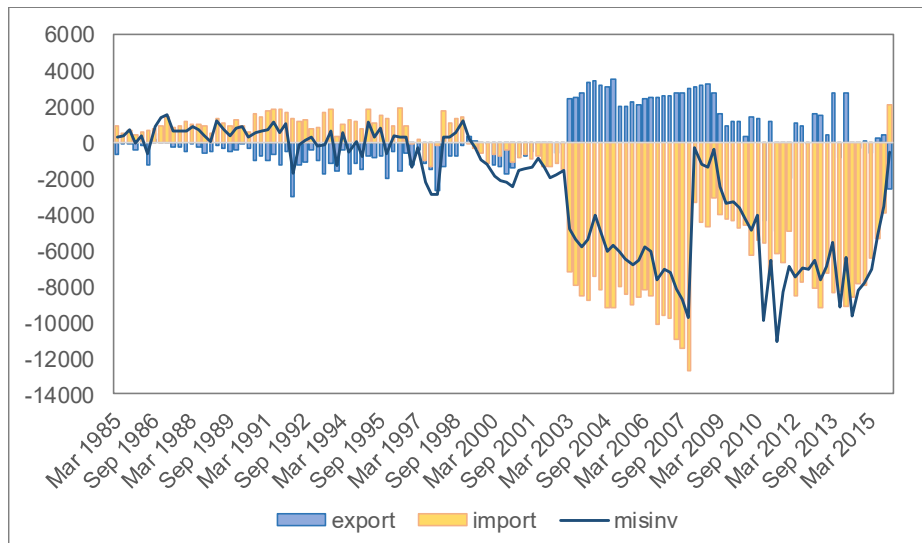
The first step is computing the trade misinvoicing of Indonesia based on the monthly data of the DOTS–IMF. In performing this step, one should select Indonesian trade partners, which in 2015 consisted of approximately 154 countries. The imports misinvoicing is intended to calculate the value of import discrepancies by comparing trading partners' exports with the country's imports. The exports misinvoicing calculates the value of export discrepancies by comparing trading partners' import from the country with the country's exports to its trading partners. The total of imports misinvoicing and exports misinvoicing are converted to the quarterly data, allowing the similar level of data with other balance of payments variables[29] in measuring the capital flight. The estimation of invoice faking in the trade transactions is provided in Figure 9.2.

The positive misinvoicing, especially when there are export under-invoicing and import over-invoicing, may suggest that the country suffers from capital outflows. The way to recognise this phenomenon is by focusing on the export or import figures. A positive sign of export misinvoicing shows underinvoicing, whilst a positive sign of import misinvoicing shows import overinvoicing. The export underinvoicing may occur when the exporters do not fully declare the value of the transactions, which mostly are worth less than the real value of the exported items. Conversely, the export overinvoicing is a condition when exporters overstate the value of the export

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[29] Most of the balance of payments data are in yearly and quarterly data.

to get an additional allocation of export credits (Baker *et al*., 2014, p. vi). One reason that may emerge may be owing to the fact that the parties involved are trying to avoid tax payments to maximise profit. This practice also occurs in import underinvoicing by declaring a lesser value of imported goods to incur a lesser tax payment. According to Baker *et al*. (2014, p. vi and p.7), import underinvoicing is a smuggling practice when a corporation uses a legal mechanism to import goods illegally. The import underinvoicing also applies to corporations that seek to get the tax exemption or a lower tariff. On the other hand, importers use the import overinvoicing to drive up the company's production costs as the imported goods have higher prices than domestic ones; this allows them to get lower corporate taxes.

Based on the results, this study finds that there is a positive trend of trade misinvoicing, especially between 1985 and 1999. Within this period, capital outflows have occurred from the source of trade misinvoicing, which was positive import or import overinvoicing, and negative export or export underinvoicing. Bearing in mind that finding the figures for capitals outflows in Indonesia before the end of the 1990s was problematic, Figure 9.2 depicts the positive movements during the 1980s and 1990s. The figure of positive capital flight may portray the illicit capital outflows during this period. Throughout this period, during the Southeast Asian crisis, Indonesia experienced negative trade misinvoicing. The trade misinvoicing during this period stemmed from negative imports or import underinvoicing and positive exports or export overinvoicing. This negative misinvoicing can be considered as illicit capital inflow. There are several explanations for this phenomenon. Firstly, it is suspected that the increasing amount of money came to the domestic financial market unrecorded in an effort to take advantage of the very high deposit rate, which reached 50% per annum in the third and fourth quarter of 1998. Therefore, should these funds be deposited, the funds' owners will get additional profits from interest income. Secondly, in the crisis period, the IDR was depreciated; this caused an impact on the imported goods, which became more expensive. One way of maintaining affordability in terms of the price of goods was to make an invoice faking by declaring a lesser value of imported goods.

From Figure 9.2, the tendency of negative trade misinvoicing beginning from 2000 onwards should be treated carefully, since this trade misinvoicing has given the country additional funds that may, in turn, harm a trading partner's economy. These capital inflows are also quite fragile since they are very flexible and, in most cases, beyond the authority's ability to manage them. When there is a policy that makes the

corporations feel uncomfortable, there may be a sudden reversal of inflow from trade misinvoicing. In the period of 2000 onwards, the negative trade misinvoicing can be determined by two factors: firstly, the import underinvoicing, where importers intend to avoid tax and accordingly declare the value of goods as below the market or actual price; and secondly, the export overinvoicing, where exporters from trading partners' countries intend to get exports subsidies from their governments. Another mechanism of the export overinvoicing is the intention to keep the proceeds of transactions away from their countries in an effort to avoid higher tax. These exporters can ask their trading partners to make a payment using a bank account in the trading partner's country, or in another safe haven country (Baker *et al.*, 2014). This estimation, as shown in Figure 9.2, uses the assumption that all the trade transactions used USD as the preferred currency. In the real case, however, export and import transactions may utilise the other currencies agreed upon between the parties involves. Hence, there is a possibility that this estimation contains discrepancies as a consequence of the use of USD as an assumption in the computation.

Figure 9.3 Capital flight: 1985Q1–2015Q4 (millions USD)
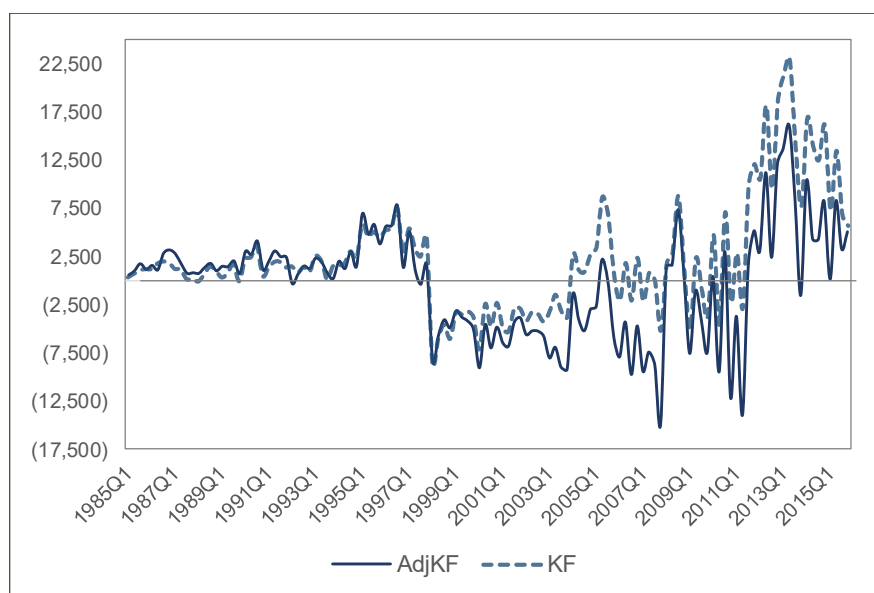
Source: Own calculations based on IFS-IMF, DOTS-IMF and BIS

The next step focuses on calculating capital flight with two methods: firstly, the residual method (KF); and, secondly, the adjusted capital flight (AdjKF). The residual method is a calculation involving the capital inflow component minus outflow. In order to obtain the adjusted capital flight, the result obtained from the residual method will

be added to the amount of trade misinvoicing. Figure 9.3 shows that the trend and patterns revealed by these two methods are relatively similar; in other words, if the concern is focused on exploring the motivation for capital outflows, both methods can be used. However, if the concern is to investigate the amount of capital flight, one should pay attention to the methods and results in order to garner more precise information, given that there is no method able to give adequate or precise figures for capital flight.

A positive capital flight shows the movement of capital from the domestic financial market. The positive changes in outstanding external debt have a major effect on positive capital flight. The outstanding external debt figures are obtained from Bank for International Settlements' data with regards to the international claims to the domestic institutions, which consists of direct borrowing and securities. In the capital flight framework, it should be noted that the predicted debt payment cannot be considered capital flight; therefore, the residual approach deducts all possible non-flight sources (Boyce, 1990, p. 43).

From Figure 9.3, in general, there are three phases differentiated in the observation period. The first phase is the period spanning the 1980s to the 1990s with positive capital flights. The positive capital flight during this period was mainly contributed by the change in debt or debt flows, where the change of this debt also determined the movement of capital flight. The opening of capital account liberalisation may be one of the causes and may explain the increasing debt flow during this period. With the removal of the restrictions to obtaining the funds from abroad, the private sector was achieving easy access to foreign funding. As a result, foreign borrowing was increased sharply; this also caused another consequence, whereby the value of loan withdrawal moved positively. However, by the end of the 1990s, the debt flows were taking a negative value. Starting from the third quarter of 1997, the change in debt was seen to be negative, meaning that the value of debt repayment was greater than its disbursement. There are few possible reasons that may emerge: Firstly, it could be the case that some borrowers did not disclose their actual outstanding debts to the authorities; secondly, the domestic agents faced difficulties in finding new sources of funds in the global financial market with acceptable costs. Referring to the value of capital flight during this period, it can be inferred that the above result can be used to represent the missing value of capital outflows, or at least, gives the idea of the behaviour of the capital outflows.

The second phase is 2000–2003, with negative signs of capital flight. During 2000–2003, when the country was recovering from the crisis period, capital flight was seen to be negative. Based on the IMF's Balance of Payments data, within this period, the current account was positive, leaving a negative capital account. Comparing the Balance of Payments figure with the result above, one may find that the contributors of the value of the capital flight are the debt flows and the misinvoicing, both of which have negative signs. The negative misinvoicing, in this case, is significantly determined by import underinvoicing and export overinvoicing.

The third phase is 2004–2010, when the movement of capital flight is volatile as, for some periods of this phase, capital flight is positive, whilst for other periods, it is negative. It can be inferred that the situation of global financial condition amidst the GFC has an impact on the patterns of capital flight in Indonesia. The positive figure of capital flight in 2007/2008 portrays this impact. This figure means that the illicit capital flows went out from the domestic financial market.

Finally, the period spanning 2011–2015 has positive signs, which shows the episodes of capital flight from the country. Focusing on the period of 2011–2015, the magnitude of flight is quite high when compared to the previous period. The movement of capital flight in this period is mostly positive. During 2011 up to 2012, capital flight is seen to be relatively high; however, in the following years, the volatility of capital flight was seen to be lower. It is suspected that some policies aimed at handling capital flows provide the impact to lessen capital flight. When the authority does not have sufficient tools to handle the movement of capital, the country's economy could be in a dangerous situation. Hence, the regulations covering capital ownership and capital movement could be beneficial.

9.06   Conclusion

Capital account liberalisation permits the flow of capital from one country to another. Through the implementation of external financial liberalisation, the domestic economy has wider access to international financial markets. However, the movement of capital from the domestic financial market in the forms of capital outflow and negative inflow are usually extremely high during the crisis period. Moreover, the condition worsens when the data portraying these flows are not available.

The objective of this chapter was to identify an alternative method to measuring unrecorded flow through the utilisation of the 'capital flight' formula. This chapter

contributes to the literature by exploring the method to calculate capital flight in the case of Indonesia whilst utilising the most current data series. In so doing, this study calculates the trade misinvoicing—one of the variables to be included in the calculation involving 150 trading partner countries' monthly data over the period of 1985–2015.

Using residual and adjusted residual methods, this chapter provides the process applied when calculating capital flight. From the calculation of trade misinvoicing, the results suggest that there are motives of either exporters or importers to maximise their profits through direct involvement in the misinvoicing practice. In computing capital flight, this study finds that, during the period of the 1980s through to the 1990s, the flow of external debt or external debt changes dominantly determined the value of capital flight. It is suspected that the government's decision to abolish the restrictions on the private sector to obtain external borrowing as part of external liberalisation contributes to this issue. When the crisis erupted in 1997, the capital flight figure moved to the negative area; this implies that there are more illicit inflows than illicit outflows. Starting from 2011, the movement of capital flight is recognised as positive. This development suggests that there are flows of funds out from the country. The declining capital flight in the following years is suspected as being one of the effects of the government's policies in managing capital flow. However, this policy has a strong impact on the financial system if there are other additional regulations of capital ownership and capital movement.

Chapter 10
The effectiveness of monetary policies in managing the capital flows

10.01 Introduction

As previously discussed in Chapters 2 and 5, external liberalisation leads to the need for a greater awareness of the authorities and the way that they manage capital flows. In most developing countries, the problem mainly lies in the inability to deal with a sudden reversal of capital inflow, and the subsequent massive capital outflows. The obvious example of this phenomenon is the series of financial crises which occurred in some countries commencing the end of the 1990s onward. One of the regions that suffered from this phenomenon was the Southeast Asian countries. Since then, financial crisis that have been caused by sudden reversals of capital inflow and massive capital outflow has threatened almost all countries. As a result, advocates of capital mobility have received challenges and critiques from their opponents since the mobility of capital among countries was found to trigger the financial crisis.

After experiencing a series of financial crises, the need to construct a strategy to mitigate the risks and to lessen the impact of financial crisis became increasingly more important (Grabel, 2005, p. 360). To respond to this necessity, Grabel (2005, p. 366) proposed some measures that arguably, could appropriately cope with the current problems. It is expected that developing countries will have the ability to deal with adverse conditions as various policy options become more available. There is also an alternative policy available that offers broader measure than just controlling capital mobility. This broader measure consists of capital management techniques. This refers to a combination of capital flow management and the implementation of prudential financial regulations (Epstein, 2009; Fritz and Prates, 2013), which have the purpose of promoting financial stability, selecting desirable financial flows, and enhancing the autonomy of economic policies (Epstein, 2009). However, there is an argument that questions the effectiveness of the implementation of the management of flows (Cardenas and Barrera, 1997; Concha et al., 2011; Clements and Kamil, 2009).

Departing from the debate on the effectiveness of capital flow management, this thesis has explored its implementation. Learning from the previous crisis of 1997/1998 and several events that have potentially threatened the economy since, this thesis has endeavoured to examine the impact of capital flow management in

Indonesia, especially the strategy for preventing massive capital outflows and negative inflows. The focus of the analysis is on the policy options that are used by the authorities to deal with this problem, which consist of an exchange rate policy and the implementation of a minimum holding period. To the best of my knowledge, this study has been the first effort to explore the policy's effectiveness in handling the surge of capital flows to Indonesia by employing the most up to date and to examine its impact on the foreign ownership of government bonds.

The rest of this chapter will present a summary of the framework designed to handle the capital flows, the definition of capital flow management and the progress of its implementation. This section will be followed by a description of Indonesian capital flow management by exploring the policies that have been taken on by the authorities. The following sections will provide the data and methodology, while the last sections will discuss the empirical results, findings and conclusions.

10.02 The frameworks to handle the capital flows

Capital mobility between countries is possible because of the implementation of capital market liberalisation, which offers an attractive mechanism for developing countries to attain higher economic growth (Stiglitz *et al*., 2006; Coelho and Gallagher, 2013). The proponents of capital market liberalisation argue that the cross-border flows of capital enable developing economies to have a wider access to cheaper funds. This system also opens up the opportunity for all economic agents, both local and global market players, to become involved in financial market activities including buying and selling financial assets. In addition, it helps countries to increase the stability of their financial system by offering a diversified source of funds.

However, the implementation of capital market liberalisation is not free of criticism. The capital flows to the developing countries are suspected to be a trigger for crisis episodes. It is argued that the behaviour of capital flows is pro-cyclical, which means that the funds will go to the countries when everything is fine and reverse to their origin when there is an economic downturn (Kaminsky *et al*., 2005; Stiglitz *et al.,* 2006). This phenomenon may create a sudden reversal of capital inflow. Focusing on this phenomenon, Epstein (2009) emphasised studies that found a close relationship between capital mobility and sudden reversals of capital inflows between 1800 and 2008. The occurrence of a sudden reversal of capital inflows is possible, especially when portfolio investments dominate the composition of capital flows.

A country that has an open economy will have connections with the rest of the world, which allows for the country to be exposed to several risks. Grabel (2006, pp. 404-408) explained the five typical risks that a country will be exposed to, which consists of currency risks, flight risks, fragility risks, contagion risks and sovereignty risks. The currency risk is the risk that is embedded in the domestic currency since it may depreciate sharply. The decline of domestic currency value is often worsened by conditions such as herding behaviour and inadequate international reserves. The second is flight risk, which is defined as the possibility of large amounts of liquid assets flowing out from the domestic financial market. This phenomenon commonly occurs in the financial markets of developing countries. The third is the fragility risk that shows the vulnerability of a country in coping with an adverse event. This risk corresponds to the country's indebtedness, which is very sensitive to the movement of the interest and exchange rate. The fourth is the contagion risk that refers to the possibility of a country handling macroeconomic problems that originate from abroad. The fifth is the sovereignty risk that shows the constraints on the government in dealing with financial crisis. These risks sometimes are connected, and when these risks are realised simultaneously, the country's condition becomes complicated.

To deal with these risks, a country may exercise the instruments available to mitigate them. Based on the lessons learned from the previous crisis, there are several policy options that are relevant to current situations (Grabel, 2006, pp.403-419). The first proposal is a combination of 'trip-wires' and 'speed-bumps', which refers to the use of EWI and crisis prevention instruments. When the signal shows a potential problem, the authorities have to respond by prescribing the appropriate policies. However, a challenge may emerge due to the precision of the signal in measuring or predicting the crisis occurrence. The second proposal aims to manage capital flows through the imposition of a tax on each transaction to purchase securities in the domestic financial market. The third proposal tries to replicate the implementation of the Chilean unremunerated reserve requirements to stabilise the capital flows (Grabel, 2003). The fourth is the management of foreign exchange by emphasising the importance of the restrictions on currency convertibility. A currency has full convertibility when it can be easily changed to another currency without considering the purpose of the exchange. To manage foreign exchange, the monetary authorities may impose a measure that allows for full convertibility for every transaction for a current account, but restricts the convertibility for transactions from a capital account. The purpose of this policy is to discourage financial market investors from purchasing or selling liquid assets freely. Hence, it may reduce the possibility of capital flight and

reduce the pressure or volatility on the domestic currency. In addition, by curbing the volatility of the exchange rate, the restrictions on currency convertibility is argued to increase the autonomy of the monetary authority (Coelho and Gallagher, 2013).

In line with these proposals, Epstein *et al*. (2005, pp. 299–300) emphasised the term 'capital management techniques' to describe the financial policies that deal with capital flows. This term refers to the implementation of two policies: capital controls and the prudential management of domestic financial institutions. Capital management techniques are argued to be instruments used to maintain the stability of the domestic financial market, to improve the types of financing, and to strengthen domestic policy autonomy. In addition, Kawai *et al.* (2012) emphasised the importance of regulatory measures to deal with or limit the volatility of capital flows. According to the authors, capital flow management covers the policies that manage the foreign ownership of short-term bonds (India), adopt the minimum holding period for the Central Bank (CB) certificates and set the maximum amount of foreign borrowing (Indonesia), implement the maximum amount of foreign exchange derivative transactions, restrict the use of foreign currency loans (Korea), and to impose on the withholding of tax on capital gain from foreign capital assets (Thailand). From these examples, most of the countries mentioned have considered the importance of policy design, especially when dealing with foreign investors. The effort not to discriminate against the foreign investors has become an important point to distinguish between capital control and prudential capital flow management (Kawai *et al*., 2012, p.43; Grabel, 2012, pp. 63–64).

10.03 Capital flows management: definition and its implementation

The term capital flows management is increasingly used as a substitute for the term 'capital control'. Kaltenbrunner (2016) explained that, historically, the term used to describe the policy to restrict capital mobility across the border evolved over time, from capital control through to capital account management, capital account regulations and most recently, to capital flows management. Capital control can be defined as policy restrictions, which are imposed on international transactions (Neely, 1999); Kawai *et al*. (2012, pp. 42) defined capital flows management based on the IMF framework. In a broader perspective, according to the IMF (2011), capital flows management is the instrument that can be used by countries to mitigate risks in accordance with the problem of capital inflows. The IMF (2011) suggested that a country may implement capital flows management without making any discrimination

based on the investors' residency. However, residency based measures can be adopted if the other policy options have been implemented or are not practicable to the country's condition (IMF, 2011).

The need to rebrand capital control to become a milder and more neutral policy instrument lies on the reason for the financial market investors' reluctance, as capital control implementation suggests a potential cost and the negative response of international financial institutions (Grabel, 2016, p.182). Countries that open their economies to become integrated into the global financial market face problems due to the increase of short-term flows. This phenomenon is caused by the decisions of global investors who always try to maximise their profits by finding the most favourable financial market or the one that offers higher returns. Grabel (2016, p.199) underlined that the decision to adopt capital flows management is not only frequently considered by some developing countries but recently, several developed countries have been concerned to apply it. As time goes by, the success story of countries that have adopted this policy has attracted other countries to follow the strategy, which then may be adapted based on their specific condition.

So far, there are only few countries that have adopted capital flows management or are using its earlier version, known as capital control. Before and during the Southeast Asian crisis erupted, examples of countries that restricted the flows of capital are Chile, Colombia, Malaysia and to some extent, Brazil. The outbreak of the Southeast Asian crisis became a milestone for countries to evaluate their policies that dealt with capital flows. However, the countries that have severely experienced financial crisis were under the IMF assistance, which always focused on the free-market principle. As a consequence, the implementation of capital control was impossible when it came to being fully adopted by the crisis countries especially in the early 2000s. When the GFC occurred, there is a tendency for the increased mobility of capital to the developing countries, especially when the low-interest rate policy was implemented in developed countries. This phenomenon has led to the increasing concern of the ability of these emerging economies to cope with the potential problems of sudden reversals. One alternative strategy that has been considered by the authorities is carrying out capital flows management.

Grabel (2016, pp. 187-189) discussed the reasons behind countries using capital flows management. Firstly, the policy is meant to strengthen the domestic financial system from external vulnerability. When a country faces good economic performance, this measure is important to prevent the adverse events that may occur

and surge the domestic market. One can find examples in the experience of Brazil. It is one of the countries that used capital control by imposing a tax on non-FDI inflows in 2009, which was then continued by broadening its coverage to include derivative transactions (Fritz and Prates, 2014; Grabel, 2016, p. 188–189). In the same period, some Latin American countries, namely Ecuador, Argentina, Venezuela and Peru imposed policies to restrict capital flows. Secondly, authorities can use control on capital outflows to stop the financial system from collapsing. The countries that have applied this policy include Iceland in 2008 and Cyprus in 2013. However, the fine-tuning mechanisms in the implementation of capital flows management can be found in several countries, especially when and where the authorities feel that the threat that comes from capital flows is in decline. The decision of the Brazilian government to reduce its tax on non–FDI inflows is one example of the fine-tuning mechanism.

The management of capital flows leaves room for a discussion on the effectiveness of its implementation. Some studies that have focused on the implementation of capital control in the aftermath of the Southeast Asian crisis provided mixed findings. Edison and Reinhart (2000) studied the effectiveness of capital control in Malaysia and Thailand during the crisis period. These authors employed the monthly and daily data available to get an insight in to the impact of capital control on the macroeconomic indicators such as foreign exchange reserves and capital flows. Specifically, these authors also examined the effectiveness of capital control to curb the volatility of exchange rate. In their paper, Edison and Reinhart (2000) concluded that capital control is found to be ineffective for Thailand, but in the case of Malaysia, the implementation of capital control helped the government to shield its financial system from greater exchange rate volatility. Edwards and Rigobon (2005) evaluated the effectiveness of the implementation of capital control in Chile during the 1990s. The authors used high-frequency data ranging from January 1991 up until September 1999. They found that the Chilean government's policy to control the capital inflows was effective in reducing the impact of external shocks on the volatility of the exchange rate. Therefore, the implementation of capital control supports the Chilean financial system in maintaining its stability.

Goldfajn and Minella (2007) explored the implementation of capital control in Brazil during 1974–2004. In this paper, the authors described the development of Brazilian macroeconomic management in that it showed a level of pervasive control during the 1980s and moved to capital account liberalisation in the 1990s. However, the Brazilian authorities intended to implement capital control on capital inflows to

prevent the appreciating pressure on its currency (Edwards, 2007, p.10). Following the Southeast Asian crisis and Russian currency crisis, Brazil revoked its capital control policy and adopted an inflation targeting policy. The authors concluded that capital account liberalisation allowed for the domestic economy to have an improved economic fundamental.

Recent papers have described the effectiveness of capital control in achieving a more stable financial market. Sigurgeirsdottir and Wade (2014) presented the government's efforts to tackle the financial crisis that occurred in Iceland in 2008. This process involved a policy to control capital outflows, which can be considered as having effectively brought the country back from its crisis. The authors emphasised the significance of capital control as an instrument in preventing a small-open economy from entering financial disaster.

Coelho and Gallagher (2013) investigated the effectiveness of capital control in two countries –Thailand and Colombia – during the period 2007 to 2009. Based on their analysis, the authors concluded that Colombia and Thailand succeeded in implementing the URR. In examining some of the macro and financial market indicators, Coelho and Gallagher (2013) found that capital control can curb the movement of asset prices, especially in Colombia. However, in the case of Thailand, capital control could not achieve its objective.

10.04 Capital flows management: the Indonesian case

Before discussing the policy options that can be used to tackle volatile financial market conditions, there is one issue that should be considered when discussing the flows of capital. This issue pertains to the degree of capital mobility that a country has. The flow of funds between countries or regions is possible when a country opens its financial market and allows for financial transactions with the rest of the world. Based on its magnitude and frequency, capital mobility between countries has been increasing in the last 30 years. However, the exact amount of funds that come and go from these countries is difficult to measure (Edwards, 2004). To measure the degree of capital mobility, some economists (Leamer, 1988; Sach and Warner, 1995; Chinn and Ito, 2002; Edwards, 2004) have used the level of openness for capital flows. Chinn and Ito (2002) constructed an index of capital openness using the IMF's classifications, as provided in its AREAER.

Figure 10.1 depicts the development of capital openness of Indonesia starting from 1970. Based on the movement of this index, there are at least three different periods that reflect the government's policies concerning the exchange rate regime, capital accounts and current account management. Chapter 2 described this chronological event, which will be summarised in the following explanations. The first stage covered the period 1970 to 1982 as being the earliest development of the financial system. At this stage, almost all of the relevant indicators for openness do not show Indonesia to be a fully open financial system. During this period, the government imposed a restriction on capital flows for concerned institutions and state-owned enterprises that were obtaining external borrowing. This policy was meant to maintain the level of indebtedness and to ensure their ability to service debt obligations in the future (Cole and Slade, 1996, p. 44).

Figure 10.1 The Indonesian Capital Account Openness Index
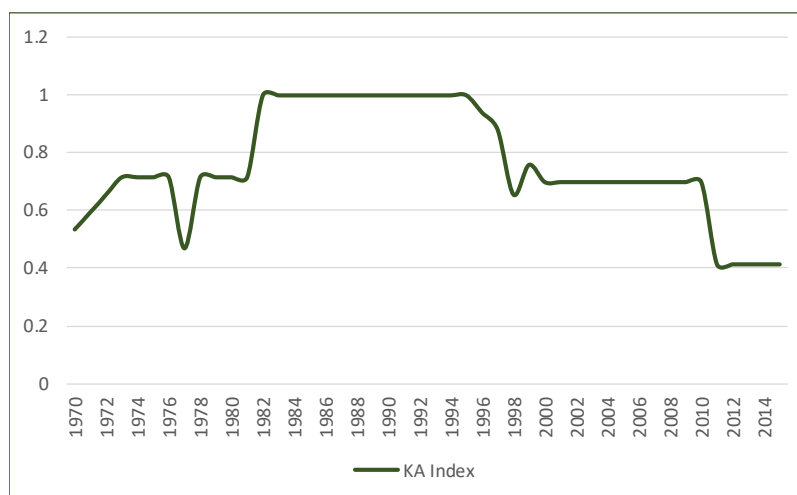
Source: Chinn and Ito (2013)

The second period covered 1983 to 1996 when the financial liberalisation policy was implemented. In the middle of the 1980s, the government tried to encourage capital inflows in the form of FDI through selective deregulation. This was done to ease foreign companies into investing and operating in Indonesia, under domestic ownership requirements. At this point, foreign investors could not invest in the domestic stock market, and financial institutions were also prohibited from obtaining foreign borrowing. Subsequently, the financial reform package at the end of the 1980s changed the banking sector policy, capital market, and the regulation of capital flows. The domestic financial market was opened to portfolio investments, and foreign investors were invited to invest in the equity market. The deregulation

package also covered permission for the state-owned enterprises and domestic companies to borrow from abroad. However, this policy created a problem as direct borrowing from the banking sector was mounting, creating a macroeconomic complication, and in particular, a high rate of inflation (Johnston *et al.*, 1998) and an increasing amount of outstanding external debts. To respond to this problem, the government imposed a restriction on the banks' short-term foreign exchange liabilities with up to a two-year maturity (Johnston *et al.*, 1998).

Following this period, when financial crisis hit the country in 1997 and 1998, there were massive capital outflows in the form of portfolio investments, as well as short-term foreign debt. Efforts were taken by the authorities to gain international support and to maintain investors' confidence in order to recover from the crisis. One idea under discussion was the proposal to implement capital controls following the success story of Malaysia in curbing the crisis impact. Many of the financial market players in Indonesia refused this proposal since the new mechanism might have impeded their business motives. As has been previously discussed, liberalisation in Indonesia had just come to its peak five years before the crisis outbreak and to adopt this proposal, one economist argued, was regressive and would endanger *'…the country's credibility of its overall commitment to open economic policies…'* (Soesastro, 1998, p. 317). Subsequently, this proposal was not followed through with, particularly when the financial market sent a signal of disagreement and the economic situation became worse with a further depreciation of the IDR and the decline of the stock market index (Soesastro, 1998, p.317). This event described how sensitive the financial market was to such issues, suggesting that the government should pay attention to formulate a policy more prudently. Another example on the imposition of capital control is in Thailand, in 2006 (Kawai *et al.*, 2012, p. 42). By the end of 2006, Thailand imposed a URR on equity and short-term investments that had maturities within a year. However, in a day, this regulation was revoked, especially for the equity flows, following the sharp decline of the stock index. This decision became a good example of how hard it is to implement capital controls smoothly in a time of instability or crisis, since it may trigger a worsening economic situation. It can be inferred that during a period of instability, the adoption of a new policy may create an uncertain situation where investors lose confidence and so, are reluctant to continue to invest. The policy might have been more accepted if it had been adopted in a normal situation and is well-communicated with sufficient dissemination of the mechanisms involved.

The crisis also forced a step forward for the Indonesian monetary authority's management of domestic currency. Starting from the early 1970s, the policy of allowing the IDR to be freely convertible in global transactions covered the mechanism of IDR internationalisation. The IDR internationalisation meant that the authorities permitted the use of IDR in the global market for export and import activities, investment and in financial market operations (Sarwono, 2005, p. 171). According to Sarwono (2005), the domestic speculators mostly replicated the non-residents decisions in exchange rate trading. Whilst the activity of domestic traders could be managed and monitored by the Central Bank, the trading activity of the non-residents in the global financial market was beyond the Central Bank's remit. Based on the Central Bank's analysis, the internationalisation of the IDR had an adverse impact on making the IDR more volatile. Considering this problem, in 2001, the Central Bank decided to restrict transactions of IDR in the global financial market that were conducted by non-residents.

Responding to the GFC, the Indonesian authorities announced a series of policies aimed at stabilising the domestic financial market. These policies focused on stabilising the exchange rate and managing the short-term flow of funds, for example, the regulations on the minimum holding period for CB certificates (IMF, 2012) and the regulation on the ceiling of foreign borrowing.

Learning from the period of 2008 to 2009 when the volatility of capital flows was higher than in the previous period, the authorities prescribed policies to address the increasing foreign capital inflows and anticipating capital outflows. Two policies for capital flow management in Indonesia were exchange rate management and the CB certificates' minimum holding period. These two policies aimed to stabilise or to reduce the volatility of the domestic currency against foreign currencies, particularly USD. The monetary authority had an administrative scheme established that was designed to restrain the short-term influence of these flows, which were very volatile, by containing their scale and influencing their composition.

With regards to the first policy option, the monetary authority had an alternative policy for curbing the volatility of the exchange rate. Firstly, the Central Bank announced that the maximum amount of banking sector foreign borrowing was limited to 30% of its capital. The regulation that was enacted in 2011 had already been introduced in 2005, but in 2008 it was revoked by the Central Bank on the eve of GFC that then triggered the massive negative inflows, and the domestic financial market then needed a source of financing (Bank Indonesia, 2011). Consequently, when the global

financial market recovered as well as the level of capital inflows, the Central Bank needed to reinstate the 2005 regulation in order to maintain the macro-prudential practice. The main aim of this regulation was to encourage the banking sector to obtain long-term foreign financing rather than short-term foreign financing. Secondly, the government applied the currency inconvertibility measure by restricting the use of foreign currencies in domestic market transactions and imposed a policy to incentivize exporters to convert their export proceeds into the domestic currency.

The regulation of the minimum holding periods had been enacted in 2010 to anticipate and prevent the massive reversal of capital flows (Grabel, 2012, p. 61; Sarwono, 2014). In its implementation, the Central Bank tried to refine this policy based on the current developments in the global financial market condition. In other words, this fine-tuned mechanism should reflect both domestic needs and the global financial system's condition. As an example, when the global financial system signalled an increasing flow of capital to the domestic market, the Central Bank's measure was expected to lengthen the ownership and transaction period of the CB certificates. It is argued that in order to strengthen the domestic financial market, the CB certificates should have a longer minimum holding periods to minimise the transacted securities in the secondary market. Table 10.1 illustrates several amendments to the minimum holding period.

Table 10.1 The adjustment of the minimum holding period

Date	Measure
1. June 16, 2010	Imposition of the 1-month minimum holding period on the ownership of CB Certificates
2. May 9, 2011	Imposition of the 6-month minimum holding period on the ownership of CB Certificates
3. September 10, 2013	Imposition of the 1-month minimum holding period on the ownership of CB Certificates
4. October 26,2015	Imposition of the 1-week minimum holding period on the ownership of CB Certificates

Source: Own construction

10.05 Data and methodology

The signal of instability in the global financial market appeared from the second quarter of 2006 onwards, when U.S. economic indicators, such as the employment rate and the economic growth rate, were below the previous year's rate. From this time forward, there was a growing concern within the U.S. economy and about the

way that the U.S. authorities responded to this condition, leading to uncertainty in the global financial market. The big question among financial market investors was whether there would be a significant change (increase) in the Federal Reserve reference rate within this period (Hollo *et al.*, 2012). Subsequently, the sub-prime mortgage crisis occurred, which then followed by the crisis on the European continent. The crises then may have triggered adverse effects in the other financial systems. As a small open economy, Indonesia also faced a problematic period in handling and maintaining the stability of its macroeconomic indicators. Some policies were enacted to prevent the country from experiencing difficulties. In this case, the authorities focused on calming down the volatility of the exchange rate, and in relation to the financial market, it tried to maintain the stability of the equity and bond markets.

Previous studies (Clements and Kamil, 2009; Concha *et al.*, 2011; Coelho and Gallagher, 2013) have expressed concerns over the effectiveness of macro-policies by assessing the implementation of the monetary policies designed to achieve capital control. In their paper, Clements and Kamil (2009) examined the effectiveness of capital controls, their impact on capital flows and the volatility of the exchange rate using Colombia as a case study. Coelho and Gallagher (2013) assessed the effectiveness of capital controls in managing the excessive inflows of capital, minimising the inflows of short-term financial assets, stabilising the volatility of the exchange rate, and increasing monetary autonomy. They used Colombia and Thailand as the focus of the study.

To examine the effectiveness of macro-policies in coping with capital flows management, this study will use the Indonesian financial market and macroeconomic data starting from the early 2000's up to 2015. The choice of monthly data lies on the need to capture the movement of financial market data in more detail, especially concerning volatility and the response to the imposition of the policy. It is argued that high-frequency data such as monthly, weekly, and daily data has the ability to capture and explain the heterogeneity of the observation much better than low-frequency ones. This is possible since higher frequency data can be collected without or with a minimum level of aggregation. To represent the financial system, this study has observed the implementation of two monetary policies on the movement of the exchange rate.

10.05.1 The effectiveness of capital flows management: the evidence from the asset prices

As pointed out by Levine (1997), the objective of implementing capital flows management policies is to help the domestic capital market reduce the potential of an assets bubble. Coelho and Gallagher (2013) examined the effectiveness of monetary policies on the movement of asset prices. Following the authors, this study has investigated the effectiveness of monetary policies in dealing with the volatility of asset prices. This chapter argues that the policies used in managing capital flows has an impact on curbing the volatility of asset prices. The following function describes the relationship of the variables of interest:

$$stock = f(regindex, inflation, growth, policies)$$

where stock index volatility ($stock$) will represent the asset price volatility. This empirical chapter will examine the impact of the changes in the regional index ($regindex$) that is represented by the natural logarithms of the FTSE Asia Pacific, excluding Japan, on the volatility of stock market. The positive estimate shows that the regional index has contributed to the increase in the domestic index's fluctuation. Besides the regional index, two additional macro-indicators, namely inflation ($inflation$) and growth ($growth$), will also be employed. The higher inflation rate is argued to have given rise to future uncertainty, which can affect the investors' decisions to invest their money in the domestic financial market. When the rate of inflation has been persistently increasing over time, the real value of money will decrease. Hence, the positive coefficient of the estimate shows that the inflation rate affects the increasing stock index's volatility. Economic growth is a variable that measures the economic activity in a country and can show the overall performance of the economy. Increasing growth will motivate investors to invest in the country. The positive coefficient estimate will affect the volatility of the asset prices. In this model, there are two policies involved; the implementation of a restriction on the foreign currency debt ceiling ($dummy\_restrict$) and the minimum holding period ($dummy\_holding$) of the CB certificate. It is expected that these two policies will provide a negative effect on the dependent variable, which means that the policies will have an impact when it comes to reducing the volatility. In so doing, this study will estimate using the following model:

$$stock_t = \delta_0 + \delta_1 regindex_t + \delta_2 inflation_t + \delta_3 growth_t + \delta_4 dummy\_holding$$
$$+ \delta_5 announce\_holding + \delta_6 dummy\_restrict + \delta_7 announce\_restrict + \varepsilon_t$$

The dummy of the date of the announcements ($announce\_holding$ and $announce\_restrict$) have been introduced in this model. It is expected that there will be a slowing down of the volatility of the stock index in response to the announcements.

The variables of interest in this model consist of:

- The asset prices will be represented by the volatility of the stock index returns ($stock$). This variable has been calculated by using the standard deviation of the natural logarithm of the IDX.

- The index for the regional stock market ($regindex$), which is the natural logarithm of the FTSE Asia Pacific, excluding Japan. There is one issue of endogeneity if this study uses FTSE Asia Pacific since the regional index that is involved in the model ideally excludes the observed country. Coelho and Gallagher (2013) suggested that endogeneity can be ignored considering that the domestic market capitalization and size of the stock market is quite small compared to the total size of the Asian market.

- The inflation rate ($inflation$) has been measured by the monthly percentage change in the consumer price index. The increasing rate of inflation may dampen the investment decisions. Therefore, the positive coefficient estimate means that this variable has an impact on the increasing stock index volatility.

- This study has employed a monthly index of industrial production to represent the growth rate ($growth$). In this case, the variable growth has been measured by using a 12-month percentage change. The increasing growth is argued to have a positive impact on investment decisions; therefore, the negative coefficient estimate means that this variable will lessen the stock index volatility.

- The announcement ($announce\_holding$ and $announce\_restrict$) was the date when the policies were introduced. The first policy is the minimum holding period of the CB certificate. The authority introduced this policy in June 2010, followed by several fine-tuning policies as described in the previous section. The second policy is the exchange rate policy on the banking sector's maximum foreign borrowing that was introduced in June 2005, and was revoked in October 2008. This policy was reinstated in January 2011. It is expected that there was a negative effect on the stock index on the date of the policy announcements.

10.05.2 The effectiveness of capital flows management: the evidence from the exchange rate movements

One of the objectives of the adoption of capital flows management is reducing the volatility of the exchange rate and curbing the currency from further appreciation or depreciation (Coelho and Gallagher, 2013). The hypothesis of this empirical examination is that the policies in managing capital flows have an impact on curbing the volatility of the exchange rate. By managing the policy rate at a favourable level, the monetary authority is expected to be able to maintain the exchange rate level. Clements and Kamil (2009) and Coelho and Gallagher (2013) used an econometric technique called the generalised autoregressive conditional heteroscedasticity (GARCH) model, which allows for the estimation of the volatility of high-frequency data. Cardenas and Barrera (1997) used the ordinary least square (OLS) to examine the impact of capital controls on financial assets, while Concha *et al*., (2011) employed the error correction and GARCH models to analyse the effectiveness of capital controls on capital flows, and the volatility of exchange rate.

This study has examined the effectiveness of the aforementioned policies to handle the capital flows based on the above objective. Following Coelho and Gallagher (2013), the volatility of exchange rate can be determined by several macro indicators. The independent variables that are being tested consist of the interest rate differential ($intrate$), country rating ($rating$), commodity price (wti), and the policies associated with the management of capital flows. The interest rate differential ($intrate$) is a variable that can portray the direction in which financial market the money will go. When a developing country has a higher interest rate than other developed countries, with all other things being equal, the investors will tend to invest their money in the developing country. The increasing inflows of capital will affect the appreciation of domestic currency. A variable that can be used to represent the investors' view on a financial market is country rating ($rating$). The improvement of the country rating variable can provide a guide for the financial market investors in deciding where to invest. The improvement of the rating is associated with the potential of the exchange rate appreciation. As suggested by Clements and Kamil (2009) and Coelho and Gallagher (2013), the price of a certain commodity that dominates a country's international trade can be used to represent the commodity price (wti). Based on the historical data, the commodity that represents the highest proportion of Indonesian international trade is oil. Over the last five years, the portion of imported oil has reached 22% on average. Meanwhile, the export of oil has been recorded to reach

19% on average. Two policies involved in tackling the capital flows will be examined, which are the minimum holding period ($dummy\_holding$) and maximum foreign borrowing ($dummy\_restrict$). It is expected that these two policies can curb the volatility of the exchange rate. To analyse the effectiveness of the monetary policies on the dependent variable, this will be studied by estimating using the following model:

$$excrate_t = \delta_0 + \delta_1 intrate_t + \delta_2 rating_t + \delta_3 wti_t + \delta_4 dummy\_holding$$
$$+ \delta_5 announce\_holding + \delta_6 dummy\_restrict + \delta_7 announce\_restrict + \varepsilon_t$$

The dummy of the date of the announcements have been included in this model. It is expected that there was a slowing down of the appreciation of the domestic currency in response to the announcements.

This model involves the following indicators:

- The volatility of the exchange rate ($excrate_t$) has been calculated from the standard deviation of the natural logarithm of the nominal exchange rate (IDR/USD).
- The interest rate spread ($intrate_t$) has been calculated by subtracting the domestic interest rate with the U.S. interest rates. This study has used the first difference (period to period change) of interest rate spread. Thus, the changes in the interest rate differential affects the increasing fluctuations of the exchange rate.
- The country rating is used to represent the expectations of the investors; when its change is positive, it is expected that the domestic currency will experience an appreciation. The positive coefficient estimate means that this variable has given rise to exchange rate volatility.
- This study will also examine the association of commodity price movements with the exchange rate. This study has utilised the West Texas Intermediate (WTI) price (wti_t) as the proxy for the commodity price. The changes in the monthly WTI quotation will be used in the analysis. The positive coefficient estimate has contributed to the increasing volatility.
- The capital management policies ($dummy\_restrict$ and $dummy\_holding$) have been represented by the dummy variables on the date that the foreign exchange debt ceiling and minimum holding period came into effect. This date is June 2005 until October 2008, and January 28, 2011 up until the present, which is when the Central Bank introduced the regulations to set the ceiling for foreign borrowing.

Meanwhile, for the minimum holding period that started from June 2010, the dummy variables will take the value of 1 when the policies are implemented, and zero otherwise.

10.06 Results

10.06.1 The evidence from asset prices

The regression in order to examine the impact of the government policies in dealing with capital flows on the asset prices will involve the policies of the minimum holding period and the exchange rate policy on the banking sector's maximum level of foreign borrowing. This analysis will involve several variables of interest that consist of three macro-indicators and two dummy variables to represent the government policies. Each variable has 192 observations. The process of estimation will use an OLS since it offers a relatively simple analysis but could provide a good result as long as the assumptions are fulfilled. The first step in doing this method is to test whether all of the variables involved are stationary, to avoid spurious regression when any errors are correlated. In doing this step, this study uses the ADF unit root test. ADF is one of the methods that can be used to test for a unit root in a time series data set. In interpreting the result, when a tested variable has a negative value in the computed t-statistic that is lower than the critical value, this variable will be less likely to have a unit root. In this analysis, all of the variables of interest are stationary. The summary statistics and results of the unit root test has been provided in Appendix E.I.

The first step in estimating the model using the OLS method is done by conducting a diagnostic test to ensure that the assumptions of the linear regression have not been violated. This study has performed several diagnostic tests, such as multi-collinearity, heteroscedasticity and serial correlation tests. This study does not carry out the normality test, since the sample size is large enough, covering more than 100 observations. With such a large amount of data, the assumption of normality will not create a major problem (Pallant, 2007, pp. 179-200; Ghasemi and Zahediasl, 2012). In this estimation, it seems that the proposed model does not face any issues with the multi-collinearity problem. The diagnostic test of multi-collinearity shows that the values of Variance Inflation Factor (VIF) are very low, as provided in Appendix E.I. A problem may arise in the estimation when the assumption of no serial correlation is not solved properly. In the present serial correlation, the coefficient estimate is not efficient, and its standard error may be inaccurate (Brooks, 2014, p.199). However, based on the diagnostic test, there is evidence of serial correlation. The output of the

serial correlation LM test shows that the probability of F (2,181) is 0.000, which is below the p-value of 0.05. The LM test has a value of 148.5, which is above the critical value (χ^2 =5.99). It can be therefore inferred that this model shows the present of serial correlation.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	316.7592	Prob. F(2,181)	0.00
Obs*R-squared	148.5565	Prob. Chi-Square(2)	0.00

Another problem that can be detected is the heteroscedasticity, which may have an impact on standard bias errors. Referring to the output of the White test for detecting heteroscedasticity, the value of the Lagrange Multiplier (Obs*R-squared=21.19) exceeds the critical Chi-squared (χ^2 =14.07) with the p-values being below 0.05. In addition, the probability of the F-statistics is also below 0.05. From these two tests, the model suggests the presence of heteroscedasticity. The violation of the homoscedasticity assumption may lead to a misleading conclusion, since the standard errors are biased (Brooks, 2014, 185).

Heteroskedasticity Test: White

F-statistic	3.263035	Prob. F(7,183)	0.0027
Obs*R-squared	21.19438	Prob. Chi-Square(7)	0.0035
Scaled explained SS	14.57289	Prob. Chi-Square(7)	0.0419

To deal with this problem, this study has used the robust variance estimator to control for the presence of serial correlation and heteroscedasticity[30].

Based on the regression results as provided in Table 10.2, after controlling for heteroscedasticity and autocorrelation, the model shows that the regional index has a negative but insignificant coefficient estimate. Several variables that have positive and statistically significant coefficient estimates are growth with a 10% level of significance, dummy holding with a 5% level of significance, and dummy restricting with a 1% level of significance. In this model, the policies to manage capital flows ($dummy\_restrict$ and $dummy\_holding$) provide negative signs to show the independence of the domestic stock market from the regional one, and the ability of the policies to cool down the rising domestic index. The negative signs of these two policy areas may curb the volatility of the index.

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[30] In doing this estimation, the analysis uses statistical software Eviews9. The robust standard error is estimated by the Heteroscedasticity-Autocorrelation Consistent (HAC).

Table 10.2 Asset prices – OLS regression (robust standard errors)

Variable	Coefficient	Std. Error
regindex	-0.0189	0.009
inflation	-0.141	0.026 [†]
growth	-0.066	0.080 [*]
dummy_holding	-0.006	0.039 [**]
announce_holding	-0.0243	0.008
dummy_restrict	0.008	0.006 [***]
announce_restrict	-0.021	0.018
constant	0.117	0.005 [***]
R-squared	0.493	
Adjusted R-squared	0.474	
S.E. of regression	0.020	
Sum squared resid	0.073	
No.of obs.	192	

Source: Own calculations
Note: ***, **, * indicate statistically significance at the 1%, 5%, and 10% levels;
while,† is significance at 20% level

The other aspect of the regression results is the announcement of the policies that are represented by the variables - $announce\_restrict$ - regarding the exchange rate policy - and $announce\_holding$ - regarding the minimum holding period. The results above depict the failure of these two variables to have a 10% level of significance.

10.06.2 The evidence from the exchange rate movements

This section will examine the impact of the government policies on curbing the volatility of the exchange rate. As discussed in section 10.05.02, three macroeconomic variables and two dummy variables have been used to represent the government policies, and have become the independent variables in this model. For each concerned variable, the data range is from January 2000 to December 2015, which covers 192 observations. Based on the results of the unit root test, all of the variables of interest show an ability to reject the null hypothesis of a unit root. This result suggests that these variables are stationary. The summary statistics of the variables involved in this model and the results of the unit root test have been provided in Appendix E.II.

This analysis also performs the diagnostic tests to ensure that the assumptions of the linear regression are not violated. This study also tries to examine the presence of some of the potential problems regarding the OLS, for example, multicollinearity, serial correlation, and heteroscedasticity. This study does not perform the normality test since the sample size is large enough and covers 192 observations.

To detect the potential problem of multicollinearity, this study runs the value of the VIF, and its output has been provided in Appendix E.II. Considering that these variables of interests have values of VIF that is less than 3, it seems that there is no problem of multicollinearity. After checking the multicollinearity, the next diagnostic test is the problem of serial correlation. The diagnosis of serial correlation problems has been conducted using the Breusch-Godfrey serial correlation test.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	*721.916*	*Prob. F(2,182)*	*0.000*
Obs*R-squared	*170.507*	*Prob. Chi-Square*	*0.000*

The output of this test shows that the probability of F(2,183) is 0.000, which is below the p-value of 0.05. Furthermore, the output of the Lagrange-Multiplier (LM) test is 170.5 with a probability of Chi-square equals 0.000. Since the value of the LM test is above the critical Chi-squared (χ^2 =5.99) and the associated p-values are below 0.05, it can be inferred that the model rejects the null hypothesis of no serial correlation. In conducting the test to detect the presence of heteroscedasticity, this study employs the heteroscedasticity White test.

Heteroskedasticity Test: White

F-statistic	*13.550*	*Prob. F(7,184)*	*0.000*
Obs*R-squared	*65.307*	*Prob. Chi-Square*	*0.000*
Scaled explained SS	*89.383*	*Prob. Chi-Square*	*0.000*

Based on the White test for detecting heteroscedasticity, the output of the Lagrange Multiplier (Obs*R-squared=65.307) exceeds the critical Chi-squared (χ^2 =14.07) with the p-values being below 0.05. This output suggests that the model cannot reject the assumption of no homoscedasticity. To control for the presence of heteroscedasticity, this study performs the robust standard error to estimate the second model.

Table 10.3 provides the regression results with robust standard errors. From seven variables of interests, only two of them - namely the policy of minimum holding period ($dummy\_holding$) and the announcement of maximum foreign borrowing ($announce\_restrict$) - are significant at 20% level. In this analysis, the policy of

establishing a ceiling on foreign borrowing ($dummy\_restrict$) together with the announcement of the minimum holding period ($announce\_holding$) are both significant at 1% and have a negative coefficient of estimate. It can be inferred that on the day, with these policies being effective, they can have an impact on lessening the volatility of the exchange rate and/or curb the increasing volatility.

Table 10.3 Exchange rate - OLS regression (robust standard errors)

Variable	Coefficient	Std. Error
intrate	0.003	0.007
rating	0.200	0.189
wti	-0.0002	0.0002
dummy_holding	-0.009	0.007 [†]
announce_holding	-0.032	0.011 [***]
dummy_restrict	-0.032	0.009 [***]
announce_restrict	-0.004	0.003 [†]
Constant	0.068	0.009 [***]
R-squared	0.330	
Adjusted R-squared	0.305	
S.E. of regression	0.028	
Sum squared resid	0.145	
No. observation	192	

Source: Own calculations
Note: - ***, **, * indicate statistically significance at the 1%, 5%, and 10% levels.
            while,† is significance at 20% level

Recalling the results of the estimations of the first model, it seems that the policy of the minimum holding period ($dummy\_holding$) has a low level of significance when it is included in the second model. In other words, this variable - even though it is economically and statistically significant - its effect on the dependent variable is weak. This phenomenon can explain that the policy of the implementation of the minimum holding period does not have a strong impact on the dependent variable. It is suspected that there is a chance for financial market investors to avoid this regulation and to make use of another financial instrument. The following sub-section will explore this further.

10.06.3   Shifting to another risk-free instrument

It is a common practice for investors to try to find another instrument to invest in that offers good returns with low risks. In Indonesia, the monetary authority has a money

market instrument, the CB Certificate, which aims at enabling better monetary policies and liquidity management. Individuals and institutional investors use and purchase this instrument to place their funds since it provides interest, and is considered to be a risk-free instrument. Other than the CB Certificates, there are other financial instruments that are issued by the government and that are also considered risk-free financial instruments. Even though the characteristics of each instrument are different, these two types of instrument - namely CB certificates and Treasury bills or Treasury bonds - represent the two choices of instrument used by investors to invest their funds in Indonesia. When the Central Bank adopted the policy of a minimum holding period for CB certificates, this policy put an additional conditionality on the investor's side that made the instrument less favourable than the others. Faced with this kind of situation, it is suspected that investors will shift their preferences to another risk-free instrument, which is government bonds.

To examine this phenomenon, this study has explored the movement of foreign investors' ownership in government bonds. In order to examine the issue, this section will involve several financial market variables, namely yield spread ($yieldspread$), rating ($rating$), EMBI ($embi$) and the policy to impose the minimum holding period ($dummy\_holding$). The following function describes the relationship of the variables of interest:

$$for\_ownership = f(yieldspread, rating, embi, policy)$$

Foreign investors became the focus of the analysis since it is easy for them to pull out their funds and move them to the other places. In addition to this, the activities and decisions of foreign investors may have shaped the behaviour of domestic investors in the financial market. Hence, by focusing on the movement of foreign investors, it is expected that this study can obtain an understanding of the characteristics of the investors. In so doing, this section will investigate the association between the capital management policies and the decisions of foreign investors. The foreign investors' decisions will be represented by the movement in relation to the foreign ownership of tradable government bonds ($for\_ownership$). The intention of foreign investors to invest in the domestic bond market is determined by the expected gain or returns that they will get. The spread ($yieldspread$) between the developed countries yield and the domestic bonds' yield may guide foreign investors. In addition to this variable, the country rating ($rating$) will represent the investors' preference to invest their money. In common cases, the better the rating, the more money will go into the domestic financial market. The Emerging Market Bond Index

($embi$) is one variable that may guide the investors to compare their portfolios. Increasing the EMBI spread indicates a problem in the domestic financial market that can push the investors to sell their financial assets, leading to the decline of foreign ownership. These variables will be analysed together using the following equation:

$$for\_ownership_t = \delta_0 + \delta_1 yieldspread_t + rating_{t-1} + \delta_2 embi_t + \delta_3 dummy\_holding_t + \varepsilon_t$$

The variables of interest in this model consist of:

- Foreign ownership ($for\_ownership_t$) is the monthly ratio of government bonds held by non-residents to the total outstanding of government bonds (in the first difference).
- The bond's yield spread ($yieldspread_t$) is calculated from the difference between the Indonesian government bond and the U.S. government bonds with a similar maturity. It is expected that widening the spread will attract more investors.
- The sovereign rating ($rating$) is expected to represent the investors' preference in investing their funds in the domestic stock market. The rating ranges from 0–100; 0 is the lowest and the riskiest place to invest. The increasing sovereign rating gives a sign towards an improvement in country's condition.
- The emerging market bond index, which is the JP Morgan EMBI ($embi_t$) global spread for Indonesia, is used in the form of its period to period changes. The monthly data of the EMBI represents the expectations of the investors; when its change is positive, it is expected that the foreign ownership of government bonds will decline.
- In this model, there will be one policy involved, which is the minimum holding period ($dummy\_holding$) of the CB certificates.

There are five variables, which consist of 150 observations each. The number of observations is consistent with the range of the analysis, from July 2003 up to December 2015. The variable that has the highest standard of deviation is the EMBI spread, which suggests that EMBI has data that is widely spread and dispersed. All of the variables that have been included in the model have been checked by the unit root test to observe the existence of the unit root. The ADF test has been carried out to examine the variables. The results show that all of the variables can reject the null hypothesis of a unit root. These results suggest that all of the variables are therefore

stationary. The summary statistics of the variables involved in this model and the result of the unit root test have been provided in Appendix E.III.

This analysis also investigates the potential problems that may arise in the estimation by performing diagnostic tests. The first diagnostic test is to check whether there is a potential problem of multicollinearity. In this case, all variables of interest have a lower value of VIF (all VIF values are below 2). The result of the multicollinearity diagnostic test is provided in Appendix E.III.

Also, the test for serial correlation using the Breusch–Godfrey serial correlation test shows that the output of the Lagrange-Multiplier (LM) test is 1.072 is lower than the Chi-square critical value (χ^2=5.99), suggesting the rejection of serial correlation.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.51478	Prob. F(2,142)	0.5987
Obs*R-squared	1.07253	Prob. Chi-Square(2)	0.5849

After examining the potential problem of multicollinearity and serial correlation, it is also necessary to check the existence of heteroscedasticity by conducting the White heteroscedasticity test. The output of the test shows evidence that there is a problem of heteroscedasticity when the model cannot reject the null hypothesis. Based on the result, the F–statistic and Chi–square have *p*–values lower than 0.05.

Heteroskedasticity Test: White

F-statistic	4.95062	Prob. F(4,144)	0.0009
Obs*R-squared	18.013	Prob. Chi-Square(4)	0.0012
Scaled explained .	58.5591	Prob. Chi-Square(4)	0

To deal with this problem, the regression has been done by running robust standard error estimates. Table 10.4 shows the result that all of the variables are statistically significant. The country rating as the independent variable has a positive coefficient estimate and is significant at 10%. The positive association between rating and foreign ownership explains that foreign investors will consider the country's performance and situation before making the decision to invest. In the case of EMBI spread, the coefficient estimate is negative and significant at 10% level. This negative sign suggests that increasing the EMBI spread has an association with the decline of foreign ownership. In other words, the widening spread will have an impact on the decision of foreign investors to pull their money out of Indonesia.

The effect of the variable $dummy\_holding$ on foreign ownership is economically and statistically significant. The positive coefficient estimate implies that this policy gave rise to the foreign investors' ownership of government bonds. This finding supports

this chapter's argument that foreign investors take advantage to make placements using another risk–free financial instrument, which is government bonds. In other words, the increasing amount of foreign ownership on government bonds is the result of the implementation of the minimum holding period on the CB certificates. When the Central Bank imposed this policy, there was no such restriction that was applied to government bond ownership. This finding shows the potential of the coordination loophole between the government and the Central Bank that affects such policies to make them become less effective.

Table 10.4 Foreign ownership – OLS regression (robust standard errors)

Variable	Coefficient
yieldspread	-2.1031 **
	[0.986]
rating $_{(t-1)}$	1.9959 *
	[1.198]
embi	-0.0405 *
	[0.0238]
dummy_holding	4.9440 ***
	[1.383]
C	1.4279 **
	[0.619]
R-squared	0.2098
Adjusted R-squared	0.1879
S.E. of regression	7.43
No. obs	149

Source: Own calculations
Note: ***, **, * indicate statistically significance at the 1%, 5%, and 10% levels.
The numbers in brackets are the robust standard error.

The second variable is the yield spread that has a negative coefficient of estimate, and it is statistically significant at 5% level. There are two perspectives when interpreting this result. On the one hand, one may directly conclude that the widening spread between the domestic and foreign spread will not attract foreign investors. This view is supported by the results of the estimation as shown above.

On the other hand, there is another explanation for this issue. At first, one needs to investigate the structure and development of bonds' yield spread. There are two variables involved in the determination of the yield spread; the domestic securities' yield and the foreign one. The improvement in the domestic financial market and

economic and political stability could reduce the domestic securities' yield. Even though the yield spread tends to be narrow, the investors' appetite is maintained since they feel comfortable in making an investment. For example, when the domestic financial market provides a good investment environment, subsequently investors will be keen to invest in the market. Figure 10.2 displays this phenomenon. In 2004, the yield spread was around 8% and reached around 5% in 2015. The change in the yield spread suggests that over 11 years, the trend of the yield was negative or declining. However, looking at the development of foreign ownership, this variable persistently increased and reached its highest point in 2015. Therefore, the negative value of the coefficient estimates of the yield spread does not mean that the Indonesian government bonds became less attractive.

Figure 10.2 Yield spread and foreign ownership
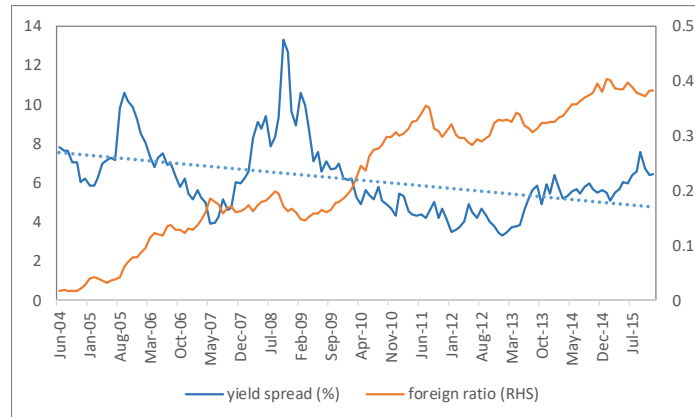
Source: Own calculations
Note: the dotted line is the trend line of yield spread
The foreign ratio is the ratio of foreign ownership over the total tradable government bonds

10.07 Conclusion

The vulnerability of experiencing crisis episodes brings up concerns for developing countries and their financial markets, particularly in coping with capital outflows. After a series of financial crisis occurrences, there is a need to construct a strategy to mitigate the risks and to lessen the impact of financial crisis. One available option is the implementation of capital controls or capital flows management.

This empirical chapter provides a contribution to the literature by examining the association between the policies in handling capital flows, its impact on the exchange rate and stock market volatility. This study is the first to examine the implementation

of these policies and to link their impact on other variables in the capital market. In this case, the foreign ownership of government bonds.

This chapter has tried to examine the effectiveness of capital flows management in Indonesia, especially the strategy to manage the capital inflows, preventing massive capital outflows. There are several findings in relation to this analysis. First, during these periods, Indonesia implemented a mixture of policies to manage the capital flows. These policies are exchange rate management and the implementation of a minimum holding period. Based on the empirical analysis, this study finds that the implementation of these policies to some extent is effective in handling the capital flows. However, the effect of the policy to impose minimum holding period to curb the volatility of exchange rate is not too strong. This statement leads to the second finding, which shows the positive and significant coefficient estimate of the variable of the minimum holding period in association with foreign government bonds. This finding implies that foreign investors shift their investments from CB certificates, which become the subject of the minimum holding period regulations on government bonds, which have no such restrictions. This finding also presents the potential of a coordination loophole between the government and the Central Bank that makes the policy become less effective.

Chapter 11
The application of the compensation thesis

11.01 Introduction

In the context of a closed economy, when a commercial bank grants credit to firms or households as borrowers, these customers will be in debt to the bank which here acts as the lender. From the borrower's perspective, possessing a loan requires that they pay the debt obligations regularly since they have signed the contract. In some cases, the borrowers find that the loan creates a burden. Hence, when borrowers have excess money, they will try to reduce their outstanding loan obligations or place this excess in a financial instrument with an expectation of obtaining capital gain. This mechanism does not only apply to the relationship between the private sector or households and the commercial banks, but also can be found in the relationship between commercial banks and the Central Bank. The availability of excess reserves in commercial banks' balance sheets motivates them to reduce their loans from the Central Bank or place the money in risk–free financial assets in an effort to avoid the opportunity costs of holding reserves (Lavoie, 2014, p. 467). Such a decision is commonly referred to as a reflux mechanism, which is a change in one component of the Central Bank's balance sheet, and will be compensated by a movement of other components within this balance sheet (Lavoie, 2014, p. 462).

In the context of an open economy, the Central Bank's policy to set the domestic interest rate will have an impact on the capital that flows to or from a country. As an example, under the fixed exchange rate regime, a higher rate of domestic interest rate, compared to a foreign one, will trigger capital inflows, which, in turn, cause an increase in foreign reserves and thereby create a positive movement in the Central Bank's assets. The positive changes on the asset side will correspond to the liabilities side. Mainstream views maintain that, as a result of increasing foreign reserves, the amount of base money and money supply will increase (Lavoie, 2012). However, there is another argument that offers a different explanation. According to Lavoie and Wang (2012), in a country that adopts a fixed exchange rate regime, should there be any excess liquidity resulting from international transactions, there is a compensation mechanism. Such a mechanism is similar to the reflux mechanism; however, this is applied in the open economy. The compensation thesis can be described as any change in foreign assets that can affect the movement of another assets component in an opposite way, or the liabilities components in the same direction.

The framework of the compensation thesis lies in Endogenous Money Theory. One of the key features of Endogenous Money Theory is the argument that money-creation arises when there is a demand for credit, which is satisfied by commercial banks. In this argument, commercial banks have an active role to play in the creation of money, owing to the fact they are the entity that grants loans to the private sector. Hence, according to Endogenous Money Theory, the Central Bank does not have an active role in determining the supply of reserves; rather, it has a control on the interest rate.

This study is expected to provide a contribution to the literature on the implementation of the compensation thesis from two perspectives. Firstly, theoretical and empirical analyses, both of which focus on the implementation of compensation thesis, and Endogenous Money Theory in the Indonesian context is very rare. Most of the studies under these topics utilise developed countries as case studies. Secondly, this is the first empirical study to examine and investigate the implementation of the compensation thesis in the case of Indonesia. Hence, this paper may fill a gap in the literature by exploring this topic of discussion with Indonesia as a specific country study.

This chapter intends to examine the compensation thesis implementation using the Indonesian Central Bank's balance sheets' monthly data spanning the period 2001–2015. The observation period only covers 15 years as a result of the monthly data availability. It is expected that the result will clarify the mechanisms of the compensation thesis in real conditions. Following this section, there will be a short discussion as to the open–economy theoretical framework. This chapter will also explore the Central Bank's balance sheets, which is then followed by a discussion on the data and methodology. The last section will present the results based on the analysis undertaken.

11.02 A summary of open–economy discussions

The mainstream theoretical framework that enables us to discuss interactions in an open–economy is the Mundell–Fleming model. This model is widely used; its intention is to explain the foundations of the mechanism of monetary policy and the choice of exchange rate regimes. This mechanism substantially influences the stability of the exchange rate, the level of foreign reserves, as well as the stock of money. The Mundell–Fleming model involves three equilibria: the market for goods and services (IS curve), the money market (LM curve) and the balance of payments

(BoP) curve (Pilbeam, 2013, p.74; Lavoie, 2014, p.463). This model is the extension of the IS–LM model, presented by combining the previous model with the balance of payments to get an open–economy analysis (Pilbeam 2013, pp. 74–83; Lavoie, 2014, pp. 462–466). The IS schedule depicts the equilibrium positions of the production of goods and services in terms of combinations of output and the level of interest rate. In this curve, the association of the output level with the interest rate level creates a negative slope, suggesting that the decline in the rate of interest will affect the increase of national output. In an open–economy framework, the exchange rate has an association with the IS schedule through the export–import mechanism. The depreciation or devaluation of domestic currency will make domestic products cheaper than foreign goods, which, in turn, may lead to the increasing of domestic exports and the shifting of the IS schedule to the right. The LM schedule is the association between money and liquidity, which explains that the equilibrium of the demand and supply of money will affect the level of interest rate. The positive slope of the LM schedule suggests that the increasing national income will affect the demand for money, which at a given level of money supply will increase the interest rate so as to maintain the money market equilibrium. The third is the BoP schedule, which represents the relationship of output and the level of interest, meaning that the balance of payments is at its equilibrium level.

In an environment of perfect capital mobility, the Mundell–Fleming model explains the process of how macro–policies work. This model divides the analysis using reference of two exchange rate regimes (Pilbeam, 2013, pp. 82–83; Lavoie, 2014, p. 462). The first framework presents the mechanism under the flexible exchange rate regime. When the government decides to adopt fiscal policy expansion, it raises government expenditure and shifts the IS schedule to the right. Following the shift of the LS schedule, the level of interest rate also rises and thereby creates a capital account surplus, which subsequently leads to the appreciation of the domestic currency. The appreciation of domestic currency decreases the level of domestic exports, which creates a declining national output. Under the flexible exchange rate regime, expansionary monetary policy increases the money supply, which diminishes the level of the interest rate. The lower level of interest rate encourages foreign investors to pull out their money from the country, which may lead to the depreciation of domestic currency. In the current account side, however, the weakening of domestic currency may lift the level of exports of the domestic goods, since they will become much cheaper compared to foreign goods. Consequently, this process ends with the higher level of output.

Within a fixed exchange rate regime, the expansionary fiscal policy has a direct impact by increasing the government expenditure that shifts the IS schedule to the right and accordingly affects the interest rate to go up. The increasing interest rate may have an impact on the attraction of capital to flows into the country and may appreciate the domestic currency (Pilbeam, 2013, pp. 82–83). The increasing value of the domestic currency compared to its counterpart encourages the Central Bank to purchase foreign currency. This decision will add to the Central Bank's foreign exchange reserves and potentially raise the money supply or shift the LM schedule to the right with a new level of output. On the other hand, this model argues that expansionary monetary policy does not have any significant impact on raising the output. The monetary expansion will affect the LM schedule and shift this curve to the right, leading to a balance of payment deficit. This condition occurs because the domestic interest rate is lower than the world level, and it encourages investors to sell their financial assets and place their money in other countries whose levels of interest rates are higher. This situation weakens the value of the domestic currency and requires the authority to step in by selling the foreign exchange reserves since it needs to maintain the level of domestic currency.

In summary, there are two alternatives to dealing with different exchange rate regimes. A country that uses the fixed exchange rate regime will not be able to affect the level of output by using monetary policy. Under this exchange rate regime, fiscal policy is more effective. On the other hand, monetary policy is much more effective under the floating exchange rate regime. This conclusion leads to the Mundell–Fleming trilemma that a country only can achieve two out of three policy options comprising independent monetary policy, free capital flows and a fixed exchange rate.

According to Lavoie (2001) and Lavoie and Wang (2012), the Mundell–Fleming model, particularly under the fixed–exchange rate regime, is inspired by the gold standard mechanism. The authors argued that this mechanism guides the monetary authority to deal with surplus or deficit in the balance of payment, which is referred to as the rules of the game. Furthermore, Lavoie (2001) and Lavoie and Wang (2012) emphasised the definition of the rules of the game, based on Ethier (1988), as follows:

"A balance of payment deficit should be fully reflected in a reduction in supply of money, and a surplus should be fully reflected in an increased money supply"

Under the fixed exchange rate regime, a higher rate of domestic interest rate relative to a foreign one will trigger capital inflows. This condition eventually leads the country to have a balance of payment surplus, which generates an increase in foreign reserves and creates a positive movement in the Central Bank's assets. The positive changes on the asset side will correspond to the liabilities side and, mainstream views will argue, the amount of base money and the money supply will increase (Lavoie and Wang, 2012). The policy option to deal with this condition is the open market operation by sterilisation. Referring to the explanation in Chapter 8 section 8.02, this operation can be defined as the monetary authority policy to influence the monetary base as a result of a change in foreign assets by selling or purchasing the government's securities. As pointed out by Nurkse (1944, pp.66–68), the rules of the game emphasised the need to use sterilisation policy to cope with changes in the Central Bank's foreign reserves by undertaking simultaneous changes in the money supply. Within this mechanism, it can be inferred that the Central Bank may take control of the money supply; however, questions should arise on the way in which the Central Bank provides money to or withdraws money from the financial market and how the Central Bank determines the amount of money they need to supply.

11.03 The compensation thesis

The argument on the active role of the Central Bank to control the money supply in the above way does not align with the tenets of the heterodox approach that focuses on the argument for demand–led money creation. Under the framework of endogenous money, the need to finance the investment projects leads the private sector to obtain loans (Sawyer, 2010, pp.134–136; Fontana and Setterfield, 2010b, pp.146–147). When the private sector and households get the loans, the money supply expands and then circulates. However, this process will be possible when the commercial bank decides that the borrowers are worthy of receiving the loan. In the implementation, as long as the borrower fulfils their creditworthiness requirements, the commercial bank will provide the loan. Consequently, when the demand for loans is high, the commercial banks give their efforts to meet this demand and seek out any necessary reserves (with the Central Bank), if required by the Central Bank (Sawyer, 2010, pp.132–137). The Central Bank supplies the reserves and facilitate the commercial banks' demand. At this stage, the active role in the creation of money comes from the commercial bank.

In the context of an open economy, Nurkse (1944) completed an analysis on 26 of the Central Banks' balance sheets and how the balance sheets components demonstrated change. The author claimed that the movement of foreign assets had an association with the changes in domestic credit. This finding has a different conclusion with the rules of the game, which argues that the increase in foreign reserves (gold) would be followed by an increase in the monetary base. Furthermore, the transmission mechanism in Nurkse's analysis examines whether or not the Central Bank plays an active role in the money supply. According to Nurkse (1944), in this mechanism, the one that has the initiative is not the Central Bank; the balance sheets of the Central Bank shows this process as the movements in foreign assets will be compensated for in other elements of the liabilities. In other words, Nurkse's findings are in line with the endogenous money framework, which emphasises that money supply is driven by the demand for credit.

Figure 11.1 The mechanism of compensation thesis
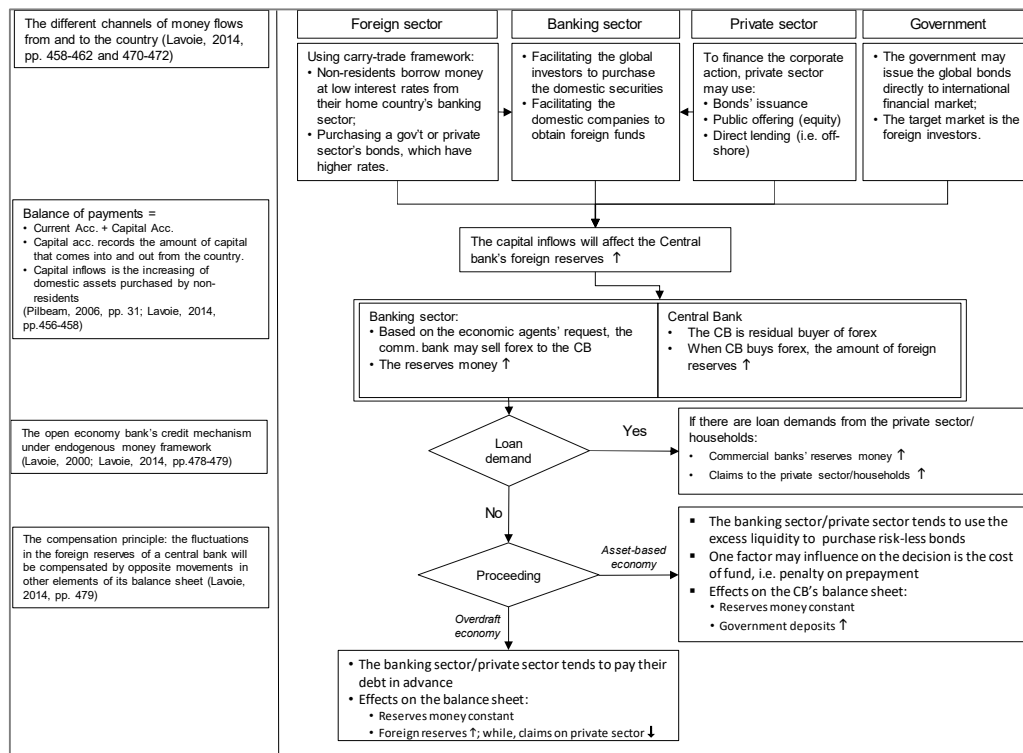
Source: Own construction based on Lavoie (2001 and 2014)

Figure 11.1 illustrates and summarises the compensation thesis that engages in foreign transactions (Lavoie, 2001, 2014, pp. 458–462, 470–472). There are at least four channels through which the capital inflows to the country, these affect the changes in the Central Bank's foreign reserves. The first channel is through foreign

investors who want to invest their money in the domestic financial market. When the domestic interest rate is higher than the foreign one, foreign investors tend to place their funds in the domestic market. These investors may then purchase domestic financial assets. The second channel is through the banking sector, which facilitates other sectors in obtaining external funds, for example, the private sector or households that seek funds from abroad. In this case, the commercial banks facilitate their customers to find the source of financing from the global financial market. The third channel is the private sector, which might look for the external financing sources directly. Through this channel, the private sector can get foreign financing from three options, such as through obtaining a direct loan from the foreign banks, issuing global bonds, and making a public offering. Lastly, the government sector might obtain foreign borrowing or issue global bonds to foreign investors. This transaction involves the transfer of money from foreign investors to the government, which increases the government's balance sheets.

Based on the mechanism depicted in Figure 11.1, it is possible to describe an example of the process of the compensation thesis involving the domestic private sector and the banking sector. As transactions are conducted in foreign currency whilst the daily operation uses domestic currency, this unit asks the bank to convert their receipts into local currency. After converting these receipts, the commercial bank calls the Central Bank. The Central Bank receives the foreign currency, which increase its foreign assets and its liabilities, adding up the bank reserves. The commercial banks, on their balance sheets, record the exchanged money in the bank reserves on the assets side and the deposits on the liabilities side. Following this step, there are two different channels by which excess reserves are used. Each channel shows the system adopted by the country, which consists of the asset–based economy and the overdraft–economy. The former is the financial system in which economic agents hold sufficient financial assets to manage their income and financing needs. Meanwhile, the latter is the financial system in which firms rely on advances from commercial banks, and commercial banks rely on loans from the Central Bank (Lavoie, 2006b, pp. 18–19).

In the case of an overdraft economy, after having the additional cash on their balance sheets, commercial banks have excess reserves. The excess reserves that are held by commercial banks will not affect their ability to offer credit to their customers. In this system, however, most commercial banks have loans from the Central Bank. Hence, when commercial banks have excess reserves, logically they will prepay or

make an early repayment of their debt obligations to the Central Bank. On the other hand, if the commercial banks do not have any excess reserves, the system allows the commercial banks to access the Central Bank to get a loan, especially when there are new loan proposals from borrowers. Through this mechanism, there will be no impact on the Central Bank's balance sheets. According to Lavoie (2001), in an overdraft economy the increasing foreign assets will be followed by the claims on domestic private banks.

The second type of economy considered relevant to this part of the thesis is the asset–based economy. The following explanation describes the mechanism of the compensation thesis in an asset–based economy. After receiving domestic currency from the Central Bank, commercial banks try to find a source of income using this money. They may use the excess reserves on their balance sheets to offer new loans, especially when the demands for loans from the private sector or households are increasing. If there is no demand from other economic units, the excess reserves may be used by commercial banks to purchase a risk–free asset, such as government securities. However, this decision is different from the overdraft economy. In the asset-based economy, it is common that there is a penalty or additional cost for early repayment or prepayment of a loan. When the cost of prepayment is greater than the cost of saving, economic agents tend to place their excess liquidity in the financial assets, as in the case of government bonds, for example. In this case, the mechanism is similar to the process of sterilisation; however, it is not a Central Bank initiative; rather, the commercial banks are the initiators of the mechanism.

To know how the mechanism works in the real world, the next section will discuss the empirical analysis by exploring the Indonesian Central Bank's balance sheet. This analysis is strongly inspired by the work of Lavoie and Wang (2012) who examine the compensation thesis in the case of China. At the time of writing, there is a paper with a similar nature—notably that developed by Bozhinovska (2015)—which examines the compensation thesis in the case of Macedonia.

11.04 The Indonesian Central Bank's balance sheet

As stipulated in the Central Bank Law year 1999, the Indonesian Central Bank has the main goal of achieving and maintaining the stability of the domestic currency value. According to Kenward (2013), however, this provision does not send a clear message in terms of what area on which the Central Bank needs to focus, whether

on maintaining low inflation or keeping the exchange rate stable. Following the enactment of this law, with the IMF's assistance, the Central Bank began to use inflation targeting as its monetary instrument at the beginning of 2000. Starting from 2005, the implementation of inflation-targeting made another milestone as its operational target was changed from base money to the adoption of the Taylor-rule reference rate (Kenward, 2013; Nasution, 2015, p. 56). This reference is referred to as 'BI rate', which is expected to be reflected in the overnight interbank rate and followed by the change in other interest rates, such as lending rate. In setting the target, the Central Bank is in consultation with the government, and announces this target when the government and Parliament discuss the macro-assumptions for the next year budget. More recently, the Central Bank changes the BI rate as the reference rate and uses the BI 7-day repo rate (BI 7DRR), which has the tenor of 7 days. According to Bank Indonesia (2016), the reason for this decision hinges on the intention to speed-up the transmission of the policy rate to the financial market. The changes or adjustments of BI 7DDR may have an impact on inflation via several channels (Bank Indonesia, 2016). Firstly, it will have an effect on bank deposits and lending rates. When this new reference rate declines, the lending rates will go down, which could lower the cost of lending. Secondly, the changes in BI 7DRR can cause an impact on asset prices. If the reference rate decreases, this may alter asset prices. Third, the adjustment of this rate will affect the movement of the exchange rate. Any increase in the reference rate may increase the interest differential, which then can attract foreign investors to invest in the domestic financial market.

Table 11.1 The Central Bank's balance sheet: selected items

					(IDR bio)
	Jan-02	Jan-04	Jan-10	Jan-14	Jan-16
Assets	**685,967**	**673,549**	**1,060,692**	**1,641,082**	**1,692,736**
Foreign assets	291,610	309,776	653,989	1,232,540	1,442,907
Claims on government	288,076	267,856	279,402	354,073	241,495
Claims on banks and other FI	54,475	52,177	20,864	48,132	7,869
Other assets	51,806	43,740	106,437	6,337	409
Liabilities	**685,967**	**673,549**	**1,060,692**	**1,641,082**	**1,692,736**
Monetary base	132,296	185,385	469,691	849,783	884,788
Foreign liabilities	120,289	107,626	84,093	44,141	105,132
OMO (CB certificate)	104,385	166,764	315,420	246,403	234,626
Government deposits	95,261	63,938	83,227	136,664	83,377
Other items	233,736	149,836	108,261	364,091	384,813

Source: Own calculations based on IFS–IMF, CEIC and Indonesian Banking Statistics, 2015

Table 11.1 presents a simplified version of the Central Bank's balance sheets and compares the structure of each period. The main contribution of the Central Bank's assets comes from foreign assets and the claims on the government. The claims on the government can be seen, for example, in the form of government securities ownership (Bank Indonesia, 2015). By law, the Central Bank cannot purchase government securities from the primary market, but rather the secondary market[31]. The liabilities side consists of reserves money, foreign liabilities, government deposits, the CB certificates and other items. Currently, the amount of base money and CB certificate issuance represent the largest proportion of liabilities. The Central Bank uses the CB certificate issuance to perform open market operations. This element also provides information as to the sterilisation process, as conducted by the Central Bank. From the liabilities side, the historical data shows the CB certificate issuance can be used as an example of the compensation process, especially between 2009 and 2011. From Table 11.1, the size of the CB certificate issuance is quite high, representing almost 50% from foreign reserves.

The structure of this simplified balance sheet is apt for application of the compensation thesis, as the table consists of components representing economic agents in the real world. In the case of the Central Bank's balance sheets, the elements occupying the biggest proportion of the assets side are the foreign assets and claims on the government. According to Lavoie and Wang (2012), the way to differentiate between an asset-based economy and an overdraft economy, besides the explanation in Section 11.02, lies in two factors. The first factor is the claims on domestic institutions; when substantially bigger than the other elements, the country can be considered an asset-based economy; the second factor is the possibility of commercial banks and other financial institutions getting advances from the Central Bank. If the commercial banks have access to the Central Bank, the country can then be considered an overdraft economy. Based on this argument, Indonesia can be classified as an asset-based economy since the total number of advances to the commercial banks and other financial institutions is relatively small.

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[31] According to Law No. 3/2004 pertaining to Bank Indonesia, the Central Bank cannot buy the government securities in primary market to finance budget deficit (Nasution, 2015, p.29). However, to be excluded from this regulation is the purchase of short-term government securities for monetary control operations and the purchase of government securities as part of the stipulation of the emergency financing facility for banking sector (Bank Indonesia, 2004). In addition, having the role as the lender of last resort, Indonesian Central Bank may provide short-term financing for a commercial bank, which faces a liquidity problem.

11.05 Empirical analysis

Following Lavoie and Wang (2012) and Bozhinovska (2015), this study employs five indicators in the Central Bank's balance sheets. These are the foreign assets (FA), the moentary base (MB), the total claims on the domestic institutions (CL), the Central Bank's certificate (CB), and the liabilities of the Central Bank to the Government or the Government Deposits (GOV). The monthly data series is taken mostly from the International Financial Statistics. Before the 2000s, the monthly data availability was inconsistent, and the first data that can be obtained consistently begins from December 2001. Accordingly, this chapter employs the period of the data ranging from December 2001 to December 2015.

Figure 11.2 presents the historical data of five variables interest that will be included in the model. According to the compensation principle, the positive movement of foreign assets will be compensated for by the movement of other components; these changes will not bring about changes in the reserves money. The changes of a component on the asset side may affect the other components of the asset or the other components on the liabilities side. For example, the increasing size of foreign assets may be followed by the decline in claims to the domestic sector or the increase in the size of government deposits or CB certificates issuance.

Figure 11.2 Selected elements of Central Bank's balance sheet (IDRbio)
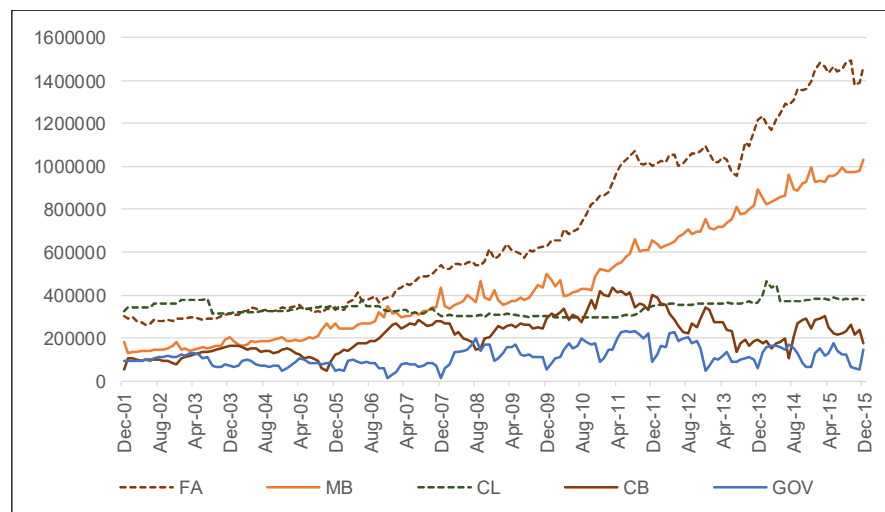
Source: IFS–IMF and CEIC

In investigating the research objective, this study will use the ARDL model that was developed by Pesaran *et al.* (1999, 2001). The detailed explanation of this econometric technique is provided in Chapter 5. By using the ARDL model, it is

possible to investigate the relationship among the variable interests, since the result of the estimation allows the researcher to establish the long-run relationships between these variables. In addition to this, one advantage of the ARDL is that it may use a different order of integration (Ononugbo, 2012, p. 202). In general, the ARDL model can be formulated based on the following basic equation

$$\Delta y_t = \alpha_0 + \sum \beta_i \Delta y_{t-1} + \sum \gamma_j \Delta x_{1t-j} + \sum \gamma_j \Delta x_{2t-k} + \delta_0 y_{t-1} + \delta_1 x_{1t-1} + \delta_2 x_{2t-1} + \varepsilon_t$$

This model can provide a result when the values of the maximum lags are selected appropriately. The selection of the lags values can be done using the ordinary selection criteria, for example, Akaike Information Criteria (AIC) or Schwartz Information Criteria.

The first step in using this method is to perform an examination of the order of integration of each variable involved in the model, either in a stationary that is I(0), or non-stationary, I(1). This step is considered critical since it determines whether or not the estimation can use ARDL. If the orders of integration of all variables involved are similar I(0), the method used will be the error correction model (ECM). If there is a mixture of the order of integration amongst the variables, one can employ ARDL.

This study checks the presence of unit root using the ADF test that will be validated by the Phillip-Peron (PP) test. In this step, one may define the variable's integration order, which is expected to be in the same order of integration. Based on the test that has been done and shown in Table 11.2, the results of the unit root tests show that the t-statistics for these variables have a different order of integration. Since the results are inconclusive, this study proceeds with ARDL.

Table 11.2 Unit root tests

Variables	ADF			Phillips-Perron		
	Level	1st difference	Decision	Level	1st difference	Decision
FA	1.276	-10.596 ***	I(1)	1.428	-11.652 ***	I(1)
MB	1.102	-12.681 ***	I(1)	2.666	-21.476 ***	I(1)
CL	-2.351	-14.157 ***	I(1)	-2.18	-15.123 ***	I(1)
CB	-2.435	-14.625 ***	I(1)	-2.348	-14.606 ***	I(1)
GOV	-4.087 ***	-10.578 ***	I(0)	-4.001 ***	-18.936 ***	I(0)

Source: Own calculations

The critical step in the ARDL and bounds testing is the method of constructing the model that will clarify the objective of this chapter in examining the implementation of the compensation principle in Indonesia. The relationship between the variables

involved needs to be taken into account and considered with care. It is worthwhile recalling the interrelations of each balance sheet element used in the models. Based on the compensation principle, the change in foreign assets will be compensated for by the change of other elements in the Central Bank's balance sheets, whether it is on the assets side or the liabilities side. With this description, the foreign asset is the element that is expected to influence the change in other elements, as they represent a bivariate relationship. With one explanatory variable (FA) and four dependent variables (*MB, CB, CL, GOV*), there are four models involved in the analysis. This step is in line with the study of Bozhinovska (2015). Hence, the models developed can be formulated as follows:

Model 1: $\Delta mb_t = \alpha_0 + \sum \beta_i \Delta mb + \sum \gamma_j \Delta fa_{1t-j} + \delta_0 mb_{t-1} + \delta_1 fa_{1t-1} + \varepsilon_t$

Model 2: $\Delta cb_t = \alpha_0 + \sum \beta_i \Delta cb_{t-1} + \sum \gamma_j \Delta fa_{1t-j} + \delta_0 cb_{t-1} + \delta_1 fa_{1t-1} + \varepsilon_t$

Model 3: $\Delta cl_t = \alpha_0 + \sum \beta_i \Delta cl_{t-1} + \sum \gamma_j \Delta fa_{1t-j} + \delta_0 cl_{t-1} + \delta_1 fa_{1t-1} + \varepsilon_t$

Model 4: $\Delta gov_t = \alpha_0 + \sum \beta_i \Delta gov + \sum \gamma_j \Delta fa_{1t-j} + \delta_0 gov_{t-1} + \delta_1 fa_{1t-1} + \varepsilon_t$

Referring to the explanation in Chapter 5, this study uses AIC to determine the lags value of the model. The number of lags that may provide the best model is the one that has minimum scores. In this case, AIC is selceted since it does not depend on the number of observations[32]. Even though AIC may present the problem of over-fitting, the AIC model can capture the data underlying trend. Besides, AIC better fits the data than the other selection criteria.

Based on this result, the next step is to undertake the bounds test in order to examine the long-run relationship between variables in the model. To get this information, we need to compare the computed *F*-test with the upper and lower bounds conducted as the critical value. When the value of the *F*-statistics is smaller than the lower bound, the conclusion would be no long-run relationship; when the value of the *F*-statistics is bigger than the upper bound, on the other hand, there would be a long-run relationship. From Table 3, it can be seen that there is one model that finds a cointegrating vector, which is the fourth model. In contrast, the other three models, namely Model 1, Model 2 and Model 3, fail to show the existence of the long-run relationships at the 5% level.

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[32] The basic formula for Akaike Information Criteria (AIC) is AIC = -2*ln(likelihood) + 2*k, where k is the degrees of freedom.

Table 11.3 Bounds test results

Model	Selected model	F_stat	Critical values		Remarks
			lower bound	upper bound	
1 MB_FA	ARDL(3,0)	4.86	4.94	5.73	No long-run relationship
2 CB_FA	ARDL(2,3)	4.73	4.94	5.73	No long-run relationship
3 CL_FA	ARDL(4,1)	3.83	4.94	5.73	No long-run relationship
4 GOV_FA	ARDL(1,1)	10.26	4.94	5.73 ***	Long-run relationship exist

Source: Own calculations
Note: - The choice of trend regressors (unrestricted intercept and no trend) is set based on
the critical value of Pesaran et al. (2001).
- *** indicates statistically significant at the 1% levels.

Table 11.4 presents the error corrections mechanism, which indicates the adjustment level of the variables involved; this means the bigger the negative value of the error correction term, the faster the adjustment process. Based on the results, Model 4 provides a negative error correction coefficient with the value of –0.217, which has negative signs and the value is statistically significant. The error correction term of Model 4 implies that there will be a correction of any disequilibrium that takes the value around 0.22 over a period of a month.

Table 11.4 Error corrections and long run coefficient

	Model	Coeff.	Std. Error	t-stat.	Prob
Model 4	*Error correction*	-0.217	0.0478	-4.543	0.000
	Long-run coeff.	0.0433	0.0251	1.72	0.087

Source: Own calculations

The following equation describes the long-run relationship between the variables in Model 4:

$$GOV_t = 17.06 + 0.043FA_t$$
$$[2.98] \qquad [1.72]$$

R-squared = 0.160   Adj.R-squared = 0.150   No. obs=168
Note: the numbers in brackets are the t-statistics

The long-run coefficients give us information as to the existence and direction of the relationship between each balance sheet's components. As suggested by the compensation thesis, the change in foreign assets should affect the change of the other assets' components in the opposite direction or the liabilities' components in the same direction. Based on the empirical results, the long-run relationships of Model 4 describe the change in the Central Bank's foreign assets will positively affect the change of government deposits on the liabilities side. The above equation

suggests that the coefficient of estimates of FA in model 4 (GOV_FA) is statistically significant at the 10% level.

11.06 Discussion

After completing an investigation based on the empirical data, the results show that the compensation thesis implementation does exist in the Indonesian Central Bank operations. There are at least two arguments that can be supported by these findings. The first one is the application of the Endogenous Money Theory, which emphasises the demand-led principle. Model 1 (*RM_FA*), which is expected to explain the long-run relationship between reserves money and foreign assets fails to capture this association. The results of Model 1 show that there is no cointegration, which therefore implies that foreign assets do not determine the reserves money. This result differs from common understanding concerning (i) the positive relationship between foreign assets and reserves money, and (ii) supply-led money creation.

Secondly, this finding supports the claim that the compensation thesis is also applicable to a floating rate regime. Indonesia is one country that applies the floating exchange rate[33] arrangement from 1997/1998, with the analysis showing that the compensation thesis works under this regime.

Referring to Figure 11.1, the first channel of the capital inflows to the domestic financial market goes via foreign investors that want to invest their funds in the domestic financial system. There are several alternative mechanisms of foreign investors for purchasing the Indonesian financial assets. One of the alternatives is described by the intention of foreign investors to buy commercial banks' securities, which subsequently affects the total number of foreign assets and the claims on commercial banks. However, based on the empirical analysis, Model 3 *(CL_FA)* shows that there is no long-run relationship between foreign assets and claims on domestic institutions. One possible explanation is associated with the classification of Indonesia as the asset-based economy. This system suggests that the increasing

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[33] Recalling the definition of floating exchange rate as provided in Chapter 2, in this case the floating exchange rate should be distinct from free-floating exchange rate. According to the IMF (2015), the floating exchange rate regime is defined as the exchange rate mechanism by which the Central Bank can intervene to lessen the steep changes and avoid extreme fluctuation of its exchange rate (IMF, 2015)

foreign assets that comes from the domestic institutions transactions has small impact on the movement of the claims to the domestic institutions.

The second channel is the capital inflows via the government decision to issue the government bonds in the global financial market. When the government sells global bonds to foreign investors, the funds go to the government account in the Central Bank, which increases the government deposits and foreign assets. Based on the results of the empirical analysis in section 11.04, Model 4 (*GOV_FA*), which explains the relationship between foreign assets and government deposits shows its coefficient estimate that is statistically significance. In general, the result shows that the foreign investors and government take the active role in this mechanism.

11.07 Conclusion

This chapter provides a contribution to the literature by observing the implementation of the compensation thesis under the Endogenous Money Theory, which takes the Indonesian case as a focus of the study. Two theoretical frameworks that have different perspectives on the Central Bank's role in the money supply are presented.

The mainstream analysis argues that in order to deal with the excess of money supply, the Central Bank may sell or purchase securities in a process that is commonly referred to as sterilisation. This mechanism states that the Central Bank should play an active role in taking control of the money supply. In contrast, the Endogenous Money Theory maintains that the demand for credit will lead to money creation; thus, the Central Bank should not influence the supply of money. There is a framework referred to as the compensation thesis; this can help us clarify this debate. The compensation thesis is defined as the changes in one component of the Central Bank's balance sheets will be compensated by an opposite movement of assets' components or the liabilities' components in the same direction.

The objective of this study is to examine the implementation of the compensation principle in the Indonesian case. The analysis uses the Indonesian Central Bank balance sheets monthly data over the period 2001–2015. Using an econometric technique known as ARDL, this study finds that the compensation thesis applies in Indonesian case. This finding supports the endogenous money, and demand-led principles for there is no long-run relationship between foreign assets and reserves money. The results also confirm the mechanism within the compensation thesis, which shows that a fluctuation in a component on the assets side will affect the change of the liabilities component in the same direction.

Chapter 12
Conclusion, Policy Implications, and Further Research

This chapter will offer some conclusions and summarise the findings, as well as the policy implications that can be drawn from the empirical analysis. In addition to this, this chapter also highlights several contributions that have been made by this study.

12.01 Conclusion

Before the financial crisis of 1997/1998, Indonesia was included by the World Bank amongst the countries that represented "East Asian Miracles". Prior to the 1997/1998 crisis, Indonesia enjoyed a real GDP growth rate in the range of 5% to 7% for about ten years. Some economists (Goeltom, 1995; Hill, 1996; James and Stephenson, 2002) believed that this achievement was due to the economic and financial reforms in Indonesia. It was in the middle of the 1980's when the reforms were implemented and focused on reorienting the economy to reduce its dependence on the oil sector and to expand the role of the private sector. To meet these purposes, key elements of the reform were implemented in the 1980s that stressed the development of the money market, enhanced bank supervision, and improved the functioning of the banking system. The financial sector reform was accelerated by allowing greater foreign participation in the financial sector. Foreign banks were permitted to open branches, and foreign investors were able to participate in other types of financial institution and the insurance business. Subsequently, the authorities liberalised capital inflows by removing the limits on bank borrowing from non-residents, and foreigners were permitted to invest in the stock market. During this period, restrictions on foreign direct investments were also loosened, and foreign investors were allowed to sell foreign exchange directly to commercial banks (Sharma, 2003, p.128). However, an unexpected event occurred following these reforms that changed the economic condition drastically. Since then, just like the other developing countries, it appears that Indonesia has been prone to financial crisis.

Considering the current development of the financial system, the occurrence of a crisis is believed to have been contributed to by financial instability in the financial system. An alternative theoretical framework that can explain this phenomenon was developed by Hyman Minsky and is called the Financial Instability Hypothesis (FIH). He constructed his argument using a closed-economy approach and emphasised the disadvantages of a robust economic condition, as this can then become the source of instability. Arestis and Glickman (2002) expanded on Minsky's FIH with an open-

economy approach that explored the existence of capital mobility between countries. If the FIH provided the alternative explanation of the series of financial crisis episodes during these 30 years, how should we define the mainstream argument? Under mainstream views, there are three main models that try to formalise how a financial system becomes vulnerable. All of the models explain the mechanisms of crises by investigating its causes and by connecting the numerous variables that are suspected to trigger financial crisis. To answer this question, this study has tried to make a comparison of the basics features of these two frameworks.

To this end, this research had the main objective of investigating financial instability in the case of the Indonesian financial system. This objective was subsequently divided into three objectives as provided in the first chapter of this thesis. By addressing the main objective, this study can highlight the key implications for Indonesian policies, such as identifying the methods that can be used to measure the level of instability and to predict another coming crisis. In the following section, this chapter will present the policy implications based on the findings of the research. The last section will be the conclusion and offer suggestions for further research.

12.02 The findings and policy implications

There are several findings and policy implications that can be derived from the investigation. The following sections will present the findings based on the three objectives as provided in Chapter 1.

12.02.1   In search of the source of financial instability

One key element of the financial reforms that is famously known as financial liberalisation is argued to be able to help a country accelerate and improve its economic performance. Chapter 5 discussed this aspect and summarised the mainstream views that financial liberalisation can support economic performance by lowering the cost of capital (Bekaert and Harvey, 2000), increasing economic growth (Quinn and Toyoda, 2008), and lessening crisis occurrences (Beck *et al.*, 2006). However, the financial sector indicators offered some evidence that financial liberalisation tends to make a country more fragile. The private sector's tendency to use short-term debt, the increasing volatility of capital inflows and the stock index in the post-liberalization period could have been the key factors that triggered financial instability in Indonesia. Moreover, this study found that some variables that represent financial liberalisation have a positive association with the volatility of the exchange rate. In order to offer a detailed analysis, this study constructed a monthly Financial

Liberalization Index (FLI), which was one of the main contributions of this thesis to the literature. Furthermore, this study maintained that it is difficult to conclude that financial liberalisation had a positive effect on the Indonesian economy.

As a response to the data on capital outflows unavailability before 1997/1998, this study intended to find an alternative method of measuring capital outflows. In so doing, this study has tried to extend the research by calculating capital flight from Indonesia. To the best of my knowledge, this has been the first effort to formalise the method for identifying capital flight in the Indonesian case using higher frequency data and involving 150 trading partners' countries. Based on the result of analysis, the movements of capital flight were volatile, especially during the GFC. This development suggests that the authorities need to pass regulation concerning capital ownership and capital movement. When the authority does not have sufficient tools to handle the movement of capital, the country's economy is in a dangerous situation.

Considering the importance of the impact of capital flows on the domestic financial system, it is necessary that the authorities continue to improve the policies for managing the flows of capital. The policies involving capital flows management are necessary to avoid or lessen the impact of sudden changes of flows that can potentially have a negative impact on the economy.

12.02.2 The financial instability measurement

To prevent a financial system experiencing a crisis period, one of the solutions is that a country needs to maintain the stability of its financial system. There are several aspects to supporting financial stability, such as, (i) the process and method of developing a system that enables the authorities to effectively monitor, evaluate and assess the financial system conditions; (ii) a method to equip the authorities in constructing policy, and other economic agents in anticipating financial market situations; and (iii) ways to increase country's resiliency so that it can cope with an adverse situation. Kaminsky and Reinhart (1999) proposed EWI's that gauge the vulnerability of economic conditions by examining the movement of selected variables during the normal period. Using empirical data on the Indonesian economy and applying the EWI, Chapter 6 identified the weakness of the framework, which is the low performance of the method in predicting the crisis occurrence. However, this method was useful for evaluating the patterns and behaviour of some of the economic variables.

This study has incorporated several important elements of a financial system in building the instrument to predict financial crisis and to measure financial instability. The reason for focusing on the elements of the financial system lies on its dynamic characteristics and the fact that it is a complex system. Chapter 7 described the methods for generating the financial instability index and presented the two kinds of methods that were used: CDF and PCA. Referring to the results, the composite index using the PCA method outperformed the CDF since it gave better information on how high the index was when the financial system faced distress. There are several advantages to using the PCA composite index, especially that this index can capture the important events that occurred during 1997–2010 that had a direct impact on the Indonesian economy. These events are the Asian financial crisis, the domestic mini-crisis, and the GFC. On the other hand, the CDF composite index captured most of the domestic events but was less sensitive to foreign financial occurrences.

Chapter 8 explored the financial instability from the FIH point of view. By examining a number of indicators in Indonesian banking and non-bank private sectors - for example, the debt to equity ratio, loan to deposit ratio, private sector short-term debt, and a simple portfolio analysis - this study found that during the normal period, there was a tendency for increasing the external financing or direct borrowing. The increasing amount of debt outstanding, especially ones that had a shorter maturity, may have had a negative impact on the financial system. This chapter also assessed the structural changes of the Indonesian financial system by constructing the financial instability index based on the FIH. This index showed the evolution of the state of the fragility of the Indonesian financial system in 1997. Even though this analysis was not done using a formal model, the results can accurately depict the country's condition, especially prior to the outbreak of the financial crisis.

The attempt to generate the composite index is important for the Indonesian authorities. By using the index, the policy makers can get an insight into the domestic and external financial conditions. This measurement can be a source of help for the authorities, either the government or the Central Bank, in considering what the appropriate policy response might be if there is a signal of instability. In addition to this, the analysis of the banking sector and the non-bank private sector balance sheets, as well as the dynamic financial fragility method, can improve their understanding of the state of the domestic financial system.

12.02.3   The policies assessment in dealing with capital flows

The mobility of capital is possible, especially when there are no restrictions or regulations that hinder it. Developing countries also make efforts to attract capital into their countries. However, there is a potential problem that emerges, especially when the amount of capital massively flows out from a country.

Chapter 9 explored the effectiveness of monetary policies in coping with the capital flows. Based on the findings, these policies can show their associations with the dependent variables, such as the movement of the exchange rate and the movement of asset prices. However, the effect of the minimum holding period is considered weak. This study investigated the cause of this weak association and found that, based on the examination of the foreign ownership of government securities, the implementation of a minimum holding period for CB certificates had an impact on the decision of investors, who shifted their funds from CB certificates to government bonds. This decision explains the way by which an investor always tries to avoid regulations that potentially reduce their profits or increases their risks. The investors' decision to shift their investment in to government bonds will increase the risk of the government's debt management, particularly when these investors are non-residents. For this reason, macro-coordination among the authorities is necessary to avoid increasing costs and risks.

Concerning the compensation thesis, Chapter 11 discussed what the Central Bank should do to deal with capital flows. The findings from the empirical analysis concluded that the compensation thesis, to a certain extent, does hold in the case of Indonesia. This finding explains the existence of long-run relationships between foreign assets and the government deposits. The mechanics of these variables can be summarised by showing the changes in the Central Bank's foreign assets will affect the change of government deposits. When the country accepts capital inflows, the movement of foreign assets will be compensated by the positive movement of the government deposit on the Central Bank balance sheet. Additionally, this chapter found that there is no long-run relationship between foreign assets and the monetary base. Based on the demand-led principle, the increase of foreign assets will not have an impact on the reserves money.

12.03 Contributions of this study

This research has made several contributions to the literature on financial instability and financial crisis, which can be itemised as follows:

a. Chapter 3 and 4 demonstrated the difference between two competing frameworks, namely the mainstreams views and the FIH. These chapters explored at least five features, which consist of the definitions of financial instability, the factors that possibly cause the instability, the common policies recommendation to be undertaken by the authority, the response to the monetary policy, and the way that financial instability has been measured.

b. Chapter 5 constructed a monthly FLI for Indonesia. So far, most economists have generated an annual index. By collecting detailed information on the Indonesian financial reform policies or events that have had an impact on the index construction, a monthly assessment can be made to construct the monthly FLI. The availability of a higher frequency index is useful when figuring out the detailed development of a country's financial system.

c. Chapters 7 and 8 explored ways to measure the level of instability using two different methods. The first method is the financial instability composite index that is derived from four sub-indices that represents the four markets in the domestic financial system. Chapter 7 presented the financial instability composite indices for Indonesia that were constructed using daily data. It is argued that the daily index shows a more detailed level of movement and therefore can provide better information. Meanwhile, Chapter 8 examined the financial instability measurement by focusing on the balance sheets and its ratios. In addition, this chapter examined the dynamic of financial fragility by developing the financial fragility measurement. The empirical analysis shows that the measurements can evidence the Indonesian state of fragility.

d. Chapter 9 provided a key contribution by calculating capital flight based on two formal methods. From the results that have been generated, the movement of historical capital flight from 1985 to the present can be therefore be observed.

e. Chapter 11 contributed to the literature as the first empirical test of Indonesian monetary policy using the compensation thesis. Most of the studies under the compensation thesis have focussed on developed countries and the European region. Hence, the examination of the implementation of the compensation thesis in the Indonesian case fills this gap in the literature.

12.04 Limitations and further research suggestions

a. One of the requirements for constructing instruments to measure financial instability is having a relatively long period that sufficiently captures the movement in the variables of interests. In applying the method to the case of Indonesia, there is a limitation on fulfilling these requirements, especially in relation to the data availability for a longer period, since the high-frequency data for several financial markets indicators was only available after the early 2000s. As a result, the intention to capture these variables' and their behaviour in the pre-crisis period was not possible. For countries that have access to financial market data, the problem of limitations in the involved variables can be minimised. There are some alternative indicators available in the financial market that can be explored further and used in the measurement, for example, the stock-bond correlation, and non-deliverable forward (NDF). In this study, these variables have not been incorporated in the model since they are available in a shorter period compared to the variables of interest that have been observed.

b. In developing the financial instability composite index, this study treated all of the financial market segments as having a similar weight, assuming that each market segment had an effect on the movement or development of the whole financial market. Hence, there was an opportunity to expand the method by incorporating a weighting for each segment, based on the importance of each market segment in the financial system.

c. The financial instability analysis opened up the opportunity to construct the financial instability index by referring to the evolutionary or dynamic approach. A certain effort has been made by Tymoigne (2014) to measure the index for each economic agent. However, the challenge in measuring the degree of instability using the FIH lies in data availability as some necessary information was difficult to obtain (Tymoigne, 2011).

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Appendix A

Dimension/ Policy areas	Sub-dimension	Sub-dimension scoring guide (Raw score)	Score total
Credit control	Credit programme	[0] if the allocation of credit is determined by the Central Bank. [1] if the credit allocation is eliminated or does not exist.	[4] : Fully liberalized [3] : Largely liberalized [2] or [1] : Partially repressed [0] : Fully repressed
	Ceiling on Reserve Requirement	[0] if the reserve requirement >20%. [1] if the reserve requirement between 10% - 20%. [2] if the reserve requirement <10%.	
	Subsidized sector	[0] if the commercial banks have to provide credits to a certain sector at subsidized rates. [1] if the mandatory requirement of credit at subsidized rates is eliminated or does not exist.	
Credit ceiling			[0] : Fully repressed if ceiling on credit expansion is imposed by the Central Bank [1] : Fully liberalized if no restriction exists
Interest rate Liberalization	Deposit	[0] if the government sets a ceiling. [1] if the rate is fluctuating within a band. [2] if the rate is freely floating.	[4] : if lending and deposit rates are determined at market rates. [3] : if one of this rate is freely floating, but the other one is subject to band. [2] or [1] : if one of these rates is determined by market rates, but the other one is under the government ceiling. [0] : if both of these interest rates are set by the government.
	Lending	[0] if the government sets a ceiling. [1] if the rate is fluctuating within a band. [2] if the rate is freely floating.	
Banking sector entry	Foreign bank branch	[0] if there is tight restrictions on the entry of foreign banks. [1] if foreign banks are allowed to do business in domestic financial system, but nonresidents equity shares should be >50%. [2] if no restriction on the equity ownership of domestic banks by nonresidents; or there is an equal treatment for foreign banks and domestic banks; or unlimited number of branching for foreign banks.	[5] or [4] : Fully liberalized. [3] : Largely liberalized. [2] or [1] : Partially repressed. [0] : Fully repressed.
	Banned of new domestic banks	[0] if there is any restriction on new entry of domestic banks. [1] if there is no restriction on new entry of domestic banks.	
	Branching restriction	[0] if there is any branching restriction. [1] if no branching restriction.	
	Banking sector activities	[0] if the banking sector activity only in the banking activities. [1] if banking sector is allowed to become universal banks.	
Capital account transaction	Exc. Rate	[0] if a special exchange rate regime exists. [1] if the exchange rate system is unified.	[3] : Fully liberalized. [2] : Largely liberalized. [1] : Partially repressed. [0] : Fully repressed.
	Restric. KI	[0] if there is significant restriction on capital inflows. [1] if banks have access to foreign borrowing without any restriction.	
	Restric. KO	[0] if there is significant restriction on capital outflows. [1] if there is no significant restriction on capital outflows.	
Privatization			[3] : Fully liberalized, if no state banks exist. [2] : Largely liberalized, if most banks are privately owned. [1] : Partially repressed, if many banks are privately owned but major banks are state-owned. [0] : Fully repressed, if major banks are all-state owned banks.
Securities market	Development measures	[0] if there is no securities market. [1] if securities market is starting. [2] if there are policies to develop securities market (primary dealer system, yield curve nechmarking, etc.) [3] if there is any policy to develop derivative markets or to broaden the investors or completing the deregulation in stock exchange.	[5] or [4] : Fully liberalized. [3] : Largely liberalized. [2] or [1] : Partially repressed. [0] : Fully repressed.
	Foreign ownership	[0] if there is a restriction on foreign equity ownership [1] if foreign ownership is allowed, but it cannot exceed 50% [2] if there is no restriction on the majority share of foreign ownership [3] if there is any policy to develop derivative markets or to broaden institutional investors	
Banking sector supervision	Capital Adequacy Ratio	[0] if the capital adequacy ratio (CAR) is not implemented. [1] if the Basle risk-weighted CAR is implemented.	[6] : Highly regulated. [5] or [4] : Largely regulated. [3] or [2] : Less regulated. [1] or [0] : Not regulated.
	CB independent	[0] if there is lack of legal framework for the independence of the Central Bank in supervising the banking sector [1] if if the objective of the Central Bank in supervising the banking sector is clearly defined	
	Supervisory	[0] if the Central Bank does not have adequate legal framework in conducting an deffecctive supervision to the banking sector. [1] if the legal framework of on/off-site examinations is available, but is insufficient. [2] if the Central Bank performs an effective and sophisticated examinations.	
	supervisory coverage	[0] if some financial institutions are excluded from banking supervisory agency oversights. [1] if all banks are supervised by the Central Bank without exception.	

Source: Abiad et al. (2008)

Appendix B

I.   The data description

    a.   The currency volatility and financial liberalisation

Variable	Observation	Mean	Stdev	Max	Min
excrate	100	0.074	0.082	0.294	0.004
gdp	100	1.213	1.710	5.647	-7.830
privcre	100	0.183	0.191	0.905	-0.784
idxreturn	100	0.037	0.165	0.681	-0.454
inflation	100	-0.103	0.122	0.006	-0.784
realintrate	100	12.76	9.508	69.52	5.789
fli	100	2.297	0.242	2.500	1.875

    b.   Economic growth and financial liberalisation

Variable	Observation	Mean	Stdev	Max	Min
gdp	100	1.213	1.709	5.648	-7.839
credgdp	100	1.287	0.528	3.001	0.674
m2gdp	100	1.680	0.276	2.539	1.274
idxvol	100	6.097	4.160	16.0	2.425
fli	100	2.298	0.243	2.500	1.875

II.   Coefficient correlation of the variables of interests

    a.   Currency volatility and financial liberalisation

	excrate	gdp	inflation	privcre	realintrate	idxreturn	fli
excrate	1						
gdp	-0.2742	1					
inflation	-0.4079	0.3860	1				
credgdp	-0.4432	-0.3222	-0.1621	1			
realintrate	0.4282	-0.4339	-0.8688	0.2120	1		
idxreturn	0.0000	-0.0638	-0.0290	-0.1915	-0.1820	1	
fli	0.4120	-0.0207	0.1345	-0.2146	-0.2955	0.1020	1

    b.   Economic growth and financial liberalisation

	gdp	m2gdp	credgdp	idxvol	fli
gdp	1.000				
m2gdp	-0.378	1.000			
credgdp	-0.245	0.291	1.000		
idxvol	-0.082	-0.249	0.614	1.000	
fli	-0.021	-0.891	-0.110	0.176	1.000

III. Error correction of the ARDL model

a. Currency volatility and financial liberalisation

ARDL Error Correction Regression
Dependent Variable: D(EXCRATE)
Selected Model: ARDL(3, 4, 0, 3, 4, 0, 0)
Case 3: Unrestricted Constant and No Trend
Sample: 1991Q1 2015Q4
Selected Model: ARDL(3, 4, 0, 3, 4, 0, 0)

| | ECM Regression | |
	Case 3: Unrestricted Constant and No Trend	
Variable	*Coeff.*	*t-Stat*
C	*-0.003*	*-2.928*
D(EXCRATE(-1))	*0.192*	*2.391*
D(EXCRATE(-2))	*0.403*	*5.709*
D(GDP)	*-0.001*	*-1.720*
D(GDP(-1))	*0.007*	*7.219*
D(GDP(-2))	*0.004*	*3.845*
D(GDP(-3))	*0.002*	*2.886*
D(PRIVCRE)	*-0.008*	*-0.657*
D(PRIVCRE(-1))	*0.013*	*1.104*
D(PRIVCRE(-2))	*0.022*	*1.869*
D(REALINTRATE)	*0.000*	*1.243*
D(REALINTRATE(-1))	*0.000*	*-1.228*
D(REALINTRATE(-2))	*0.000*	*-2.106*
D(REALINTRATE(-3))	*-0.001*	*-5.505*
BREAK	*0.027*	*6.610*
CointEq(-1)	*-0.242*	*-7.723*
R-squared	*0.816*	
Adjusted R-squared	*0.782*	
S.E. of regression	*0.007*	
F-statistic	*23.65*	
Prob(F-statistic)	*0.000*	

b. Economic growth and financial liberalisation

ARDL Error Correction Regression
Dependent Variable: D(GDP)
Selected Model: ARDL(1, 0, 3, 0, 0)
Case 3: Unrestricted Constant and No Trend
Sample: 3/01/1991 12/01/2015
Included observations: 97

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coeff.	t-Stat	Prob.
C	23.516	8.542	0.000
D(CREDGDP)	-4.963	-5.068	0.000
D(CREDGDP(-1))	1.905	1.974	0.052
D(CREDGDP(-2))	-1.881	-1.930	0.057
CointEq(-1)	-0.884	-8.555	0.000
R-squared	0.579		-0.001
Adjusted R-squared	0.560		2.002
S.E. of regression	1.328		3.455
F-statistic	31.579		1.948
Prob(F-statistic)	0.00		

Appendix C

List of variables for the construction of early warning indicators

Variables	Data range	Median		Source
		Normal period	**Crisis period**	
M2 to reserves	Jan 1994– Dec 2015	0.009	-0.194	IFS and the Indonesian Central Bank
Lending to deposits rate ratio	Jan 1994– Dec 2015	1.65	1.278	The Indonesian Central Bank
Bank deposits	Jan 1994– Dec 2015	0.14	0.3	The Indonesian Central Bank
Credit to GDP	Jan 1994– Dec 2015	-0.063	-0.058	IFS and the Indonesian Central Bank
Real interest rate	Jan 1994– Dec 2015	7.58	18.2	IFS
Interest rate differential	Jan 1994– Dec 2015	6.45	12.4	IFS
Reserves	Jan 1994– Dec 2015	0.105	0.2	IFS
Real effective exchange rate	Jan 1994– Dec 2015	0.72	5.3	BIS
Exports	Jan 1994– Dec 2015	0.103	0.03	IFS
Imports	Jan 1994– Dec 2015	0.11	-0.05	IFS
Stock index	Jan 1994– Dec 2015	0.004	-0.023	CEIC
Output	Jan 1994– Dec 2015	0.037	-0.003	Index of Industrial Production from OECD statistics

Appendix D

I. The list of variables for the construction of the composite index

Market segments	Variables	Source
1. Money market	- The historical volatility of the interbank money market rate as a proxy for short-term interest volatility. The historical volatility is obtained from the annualized standard deviation of natural log interest rate. Daily data starts on 23 January 1993. - The spread between the policy rate and Federal Reserve's rate. The data starts on 29 January 1993. - CMAX transformation of the interbank money market rate is used to capture the sharp movement of this variable. Daily data starts on 23 January 1993	- CEIC - Bloomberg
2. Bonds market	- The historical volatility of the 10-year-government bond. Daily data starts from 22 July 2003. - The interest rate spread between Indonesian 10-year-government bonds yields with the U.S. 10-year government bond. Daily data starts from 22 July 2003 - The change of foreign ownership of the government bonds that is expected to capture the flight to quality. Data starts from four[th] week of December 2002	- CEIC - Bloomberg - Ministry of Finance
3. Equity market	- The volatility of stock market indices and historical volatility is used. The historical volatility is calculated from the standard deviation of the natural log of the stock index (annualized). Daily data starts from 1 January 1996. - The idiosyncratic risk of the stock prices is calculated from the OLS residual of daily return (financial and non-financial sector) on the log market return. The daily data starts from January 1996. - CMAX transformation of the stock prices is used to capture the sharp movement of the daily stock index. Daily data starts on 1 January 1996	- CEIC
4. Foreign exchange market	- The movement of the daily USD/IDR, JPY/IDR, RMB/IDR and EUR/IDR. The sharp depreciation is expected to put pressure on the economy. Daily data starts from 8 January 1988.	- CEIC - Bank of Japan Statistics - Federal Reserve Bank of St. Louis

II. The sub-indices summary statistics

Variables	# observations	Mean	St.dev	Min	Max	Stationary
Foreign exchange						
USD/IDR	5216	0.125	0.181	0.003	1.730	Stationary
JPY/IDR	5216	0.172	0.171	0.442	1.682	Stationary
RMB/IDR	5216	0.126	0.181	0.005	1.731	Stationary
EUR/IDR	5216	0.155	0.175	0.003	1.730	Stationary
Money market						
Interest rate volatility	5216	0.917	1.5	0	10.4	Stationary
CMAX	5216	0.672	0.23	0.02	1	Stationary
Interest differential	5216	6.40E-06	0.029	-0.53	0.71	Stationary
Stock market						
Risk_non finance	5216	-3.77E-06	0.0139	-0.123	0.097	Stationary
Risk_finance	5216	0.21	0.1148	0.055	0.773	Stationary
Volatility	5216	-5.10E-06	0.012	-0.20	0.094	Stationary
CMAX	5216	0.875	0.1358	0.392	1	Stationary
Bond market						
volatility	3239	0.151	0.133	0	1.39	Stationary
spread	3239	-3.00E-05	0.021	-0.128	0.264	Stationary
ownership	3239	0.0014	0.005	-0.0536	0.0572	Stationary

III. The domestic and global chronological events

No.	Event	Remarks/impact
1.	Q4 1997/ Q1 1998: Asian financial crisis	Domestic currency depreciated, huge negative growth
2.	Q2 1998: Rusian crisis	Recovery period from the crisis
3.	Q4 2001: Argentina Economic Crisis	-
4.	Q3 2002: Bali bombing	Short-term volatility in the stock market
5.	Q1 2003: Iraq war	-
6.	Q3 2004: The first presidential direct election	Short-term volatility in financial market
7.	Q4 2004: Aceh tsunami	Sudden drop in the stock index
8.	Q3 2005: Domestic mini crisis	The decline of the stock market index and the government bond price
9.	Q2 2006: uncertainty towards Federal Reserve increasing interest rate policy	Increase of the domestic interest rate
10.	Q4 2008: Collapse of Lehman Brothers	In short-term, the stock market index was declined sharply.
11.	Q4 2009: European sovereign debt crisis	the stock market index and the price of government bond were volatile
12.	Q3 2011: Global uncertainty	-
13	Q1 2014: Uncertainty on the U.S. interest policy	The IDR was depreciating against USD, the stock market index was volatile, and yield bond was increase

Appendix E

I. The evidence of asset prices

    a. The summary statistics of variables of interests

Variable	Observation	Mean	Stdev	Max	Min
idx	*192*	0.082	0.0206	0.153	0.021
regindex	*192*	0.005	0.060	0.17	-0.29
inflation	*192*	0.074	0.036	0.18	-0.01
growth	*192*	0.037	0.055	0.34	-0.13
dummy_holding	*192*	0.343	0.476	1	0
announce_holding	*192*	0.010	0.101	1	0
dummy_restrict	*192*	0.526	0.501	1	0
announce_restrict	*192*	0.010	0.101	1	0

    b. The unit root test

Variables	ADF test statistic	Critical value	P>|t|	Decision	Stationarity
idx	-2.869	-3.464 **	0.011	Reject H0	Stationary
regional index	-12.818	-3.464 ***	0.000	Reject H0	Stationary
growth	-5.308	-3.464 ***	0.000	Reject H0	Stationary
inflation	-3.354	-3.464 **	0.014	Reject H0	Stationary

    c. The Variance inflation factor (VIF)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
regindex	*5.8E-04*	*1.03*	*1.02*
inflation	*2.1E-03*	*6.96*	*1.35*
growth	*7.7E-04*	*1.64*	*1.12*
dummy_holding	*2.1E-04*	*1.05*	*1.04*
announce_holding	*1.7E-05*	*2.75*	*1.81*
dummy_restrict	*2.0E-04*	*1.02*	*1.01*
announce_restrict	*1.3E-05*	*3.39*	*1.61*

II. The evidence of exchange rate volatility

a. The summary statistics of variables of interests

Variable	Observation	Mean	Stdev	Max	Min
excrate	192	0.047	0.0336	0.151	0.008
intrate	192	-0.006	0.4965	2.060	-2.910
rating	192	0.001	0.02	0.106	-0.046
wti	192	0.059	6.270	15.96	-32.60
dummy_holding	192	0.349	0.476	1	0
dummy_restrict	192	0.526	0.501	1	0
announce_holding	192	0.005	0.072	1	0
announce_restrict	192	0.010	0.101	1	0

b. The unit roots test

Variables	ADF test statistic	Critical value	P>|t|	Decision	Stationarity
excrate	-3.436	-3.464 **	0.011	Reject H0	Stationary
intrate	-6.942	-3.464 ***	0.000	Reject H0	Stationary
rating	-16.917	-3.464 ***	0.000	Reject H0	Stationary
wti	-10.752	-3.464 ***	0.000	Reject H0	Stationary

c. The Variance inflation factor (VIF)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
intrate	1.95E-05	1.158	1.158
rating	5.93E-06	1.113	1.107
wti	1.11E-07	1.050	1.050
dummy_holding	2.68E-05	2.268	1.476
announce_holding	8.27E-04	1.043	1.038
dummy_restrict	2.47E-05	3.146	1.491
announce_restrict	4.06E-04	1.024	1.013

III. The foreign ownership of government bonds and minimum holding periods

a. The summary statistics of variables of interests

Variable	Observation	Mean	Stdev	Max	Min
for_ownership	150	3.681	8.226	39.54	-29.29
yieldspread	150	-0.003	0.747	3.94	-3.01
rating	150	0.018	0.577	2.50	-2
embi	150	-0.463	39.4	241	-114
dummy_holding	150	0.447	0.499	1	0

b. The unit root test

Variables	ADF test statistic	Critical value	P>|t|	Decision	Stationarity
for_ownership	-10.719	-3.474 ***	0.000	Reject H0	Stationary
yieldspread	-11.703	-3.474 ***	0.000	Reject H0	Stationary
rating	-11.691	-3.474 ***	0.000	Reject H0	Stationary
embi	-9.604	-3.474 ***	0.000	Reject H0	Stationary

c. The Variance inflation factor (VIF)

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
yieldspread	0.99	1.49	1.49
rating $_{(t-1)}$	1.13	1.01	1.01
embi	0.00	1.50	1.50
dummy_holding	1.52	1.84	1.01