The Dynamic Impacts of Interest Rate Volatility and Spillover Effect of the U.S. Policy Rate on the Banking Sector Development: Evidence from Selected Emerging Economies

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ABSTRACT

This thesis aims to investigate the dynamic impacts of local interest rate volatility and spillover effect of the U.S. policy rate on the banking sector development (BSD) of emerging countries during the period of 1980-2014. The bounds testing within the autoregressive distributed lag (ARDL) framework is employed using annual data. In addition, the Toda-Yamamoto of causality analysis has also been utilized. The findings suggest that the banking sectors of emerging countries are vulnerable to both local and international interest rates risks. The empirical results indicate that both local interest rate volatility and the U.S. policy rate have negative impacts on the majority of the suggested BSD indicators. These impacts continue to play a significant role in dampening path of the long-term convergence process for the BSD. The outcomes of causality analysis reveal that the U.S. monetary policy affects the BSD of the emerging countries through real interest rate channel. Therefore, these results could have important implications for policymakers to improve the banking systems and to promote economic growth in the sampled emerging economies.

Keywords: Banking sector development, interest rate volatility, spillover effects, bounds test, ARDL approach, causality analysis, emerging economies.

ÖZ

Tez, 1980-2014 döneminde yıllık veriler kullanılarak yerel faiz oranındaki oynaklığın ve ABD politika faiz oranının yükselen ülkelerin bankacılık sektörü gelişimine (BSD) yansıyan dinamik etkilerini araştırmayı amaçlamaktadır. Çalışmada, ARDL (autoregressive distributive lag) eşbütünleşme yöntemi olarak bilinen sınır testi yaklaşımı kullanılmıştır. Ayrıca, Toda-Yamamoto nedensellik analizi de uygulanmıştır. Elde edilen bulgular, gelişmekte olan ülkelerin bankacılık sektörlerinin hem yerel hem de uluslararası faiz oranı risklerine karşı savunmasız olduklarını göstermektedir. Ampirik bulgulara göre, hem yerel faiz oranı oynaklığı hem de ABD politika faiz oranı BSD göstergelerinin çoğunu olumsuz etkilemektedir. Sözkonusu negatif etki, BSD için uzun vadeli yakınsama sürecinin yavaşlatılmasında önemli rol oynamaya devam etmektedir. Nedensellik analizinin sonuçları, ABD para politikasının gelişmekte olan ülkelerin BSD'sini reel faiz oranı kanalıyla etkilediğini ortaya koymuştur. Böylelikle, elde edilen ampirik bulguların örneklenen yükselen piyasa ekonomilerinde bankacılık sistemlerini iyileştirme ve ekonomik büyümeye katkı koyma bakımından politika yapıcılar için önemli olduğu düşünülmektedir.

Anahtar Kelimeler: Bankacılık sektörünün gelişimi, faiz oranı oynaklığı, yayılma etkisi; eşbütünleşme sınır testi, ARDL yaklaşımı, nedensellik analizi, yükselen piyasa ekonomileri.

DEDICATION

THIS THESIS DEDICATED

FOR THE SPIRIT OF MY FATHER AND BROTHER

(May Allah mercy upon them)

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Chapter 1

INTRODUCTION

Most of the economists and policy authorities are considering economic growth (EG) as a "holy grail". Successive governments over time are often concerned about the rates of EG of their countries. Furthermore, the rate of EG has become one of the most important assessment instruments for the governments' performance. In this respect, the attention of many economists and academics has been attracted to explore the relationship between the financial development (FD) and EG. This, in turn, led to considerable debate about the nature of this relationship which produced many of theoretical and empirical arguments during the last decades (see, Greenwood and Jovanovic, 1990; Bencivenga and Smith, 1991; Levine 1997; Levine 2005; Ang, 2008).

The pioneers of the economic development have focused on the role of the banking sector, as a cornerstone of the financial system, in accelerating the EG. They stressed that the well-functioning banking systems are essential and inextricable part of EG process in an economy (see, Bagehot, 1873; Schumpeter, 1912; Hicks; 1969). Parallel to this view, recent empirical studies have concentrated on the link between the banking sector development (BSD) and economic prosperity from various perspectives as it plays a vital role in financing micro level businesses and investments. For instance, Agbloyor et al. (2012) explained the importance of the BSD for merger & acquisition while Raj eta al. (2014) explained how BSD is important for creation of new firms which improve the competitiveness in the market. In general, supporters of these opinions assert that the banking system improves the overall efficiency of the economy (Gheeraert and Weill, 2015). However, some empirical evidences with contradicting results regarding the finance-growth nexus started a debate about which measure of BSD is appropriate for obtaining robust findings (Levine, 2005).

A growing number of literature that has already established the role of macroeconomic stability and financial system for EG process. For instance, there is a consensus among economists that macroeconomic stability is a precondition for the financial system and economic developments (among them, see Aghioion et al., 2004; Creane et al., 2004; Levine, 2005; Pradhan et al., 2014a). However, one of the most important challenges faced by policy makers is how to maintain stable macroeconomic conditions, especially in emerging countries (Hajilee et al., 2015). Among the fundamental macroeconomic factors, interest rate is considered as one of the key variables that has direct link with the financial sector, in particular with the banking sector, and EG (Alam and Uddin, 2009).

In this respect, many of studies have stressed that adopting financial liberalization policies lead to positive relationship between real-interest rates, FD, and economic development (see McKinnon, 1973; Shaw, 1973; King and Levine, 1993; Lynch, 1993; Fry, 1995; Blackburn and Hung, 1996; Beck et al., 2000; Akinboade and Kinfack, 2103 among many others). However, there are other empirical studies which have refused the positive role of liberalizing interest rate in stimulating capital productivity and EG (see Williamson 1987; Warman and Thirwal, 1994; Fry, 1997; Levine, 1997; Demirgüç-Kunt and Detragiache, 1998a, 1998b; Hellmann et al., 2000). Interest rate volatility is an important factor which may adversely affect the banking sector through various channels such as market stock returns, costs & revenues, and through their assets & liabilities especially in case of duration mismatch (Campbell 1987; Yourougou 1990; Zhou, 1996; Flunnery et al., 1997; Elyasiani and Mansur, 1998; Huybens and Smith 1999; Harasty and Rouet, 2000; Joseph and Vezos 2006; Alam and Uddin, 2009; Kasman et al., 2011; Tripathi and Ghosh 2012; Papadamou and Siriopoulos 2014).

Furthermore, there is a large body of empirical literature investigate the impact of interest rate and interest rate volatility provided mixed results about the direction of the impact on the banking sector. For instance, the performance, costs, and risk exposure of the large size banks have not been affected by interest rate risks (Flannery 1981, 1983) and Mitchell (1989). However, Mankiw (1986) illustrated that increase in the lending interest rate could initiate adverse selection for the banks with undesirable impacts on their market values.

Within the global financial liberalization environment, the external shocks have become important in addition to internal fluctuations, especially for emerging markets. In this respect, the US interest rate has been considered as one of the master factors that have spillover impacts on other economies, particularly in emerging economies (For instance, see Andersen et al., 2007; Kawai, 2015 among others).

In line with the above theoretical and empirical arguments that assert the vulnerability of emerging economies, in particular, the banking sector to interest rate risks arising from both local and international sources, the thesis aims to study the joint impacts of local interest rate volatility and the spillover effect of the US interest rate on the BSD of selected emerging market economies, namely, Algeria, Turkey, Indonesia, Korea, Malaysia, Mexico Philippines, Thailand and South Africa. The research is motivated on the grounds that there is limited empirical analysis in this area. In addition, the analysis will shed light on the success of the financial liberalization programs in these economies. Furthermore, the empirical results would have important implications for policy makers to improve the banking system and to promote the economic growth of emerging economies.

The empirical analysis of the study adopts sophisticated econometric approaches that have been selected attentively in according to the main features of the raw data. The first approach is the bounds testing within the autoregressive distributed lag (ARDL) framework of Pesaran et al. (2001). The second approach is the Toda Yamamoto (1995) of the causality analysis under the vector autoregressive (VAR) approach. Each approach has its own advantages which make both appropriate for the empirical analysis of the research. In addition, a set of the recommended diagnostic tests has been conducted to make sure about the robustness of the empirical results.

The thesis attempts to contribute to the related literature by providing empirical analysis about the following queries:

1. How has the BSD indicators of emerging countries been affected by the local real interest rates in the long-term?
2. How has the BSD indicators of emerging countries been affected by the volatility of the local real interest rates in the long-term?
3. How has the BSD of emerging countries been impacted by spillover effects of the U.S.' policy rate in the long-term?

4. How has the BSD of emerging countries been affected by the local economic growth rates in the long-term?
5. How the BSD of emerging countries been affected by the relative size of the banking system in the long-term?
6. Does the joint impact of the local interest rate volatility and the spillover effect of the U.S. interest rate damage the long-term convergence process of the BSD in emerging countries?
7. Does the causal connection tend from the BSD towards EG in emerging countries?
8. Does the causal connection tend from the EG towards BSD in emerging countries?
9. Does a bidirectional causal connection exist between EG and BSD in emerging countries?
10. Is there an absence of a causal connection between EG and BSD in emerging countries?

The study consists of five chapters which have been organized as follows: This chapter is an introduction that provides a general background about the thesis topic. In addition, the motivation and objectives of the study have been detailed in this chapter. The next chapter includes both theoretical and empirical underpinnings that are related to the subject of the thesis. Chapter three presents all the details related to the data including a short briefing about the sampled countries, definition of the variables used, formulation of the model and the econometric methodologies used. In chapter four the empirical findings have been presented. Finally, the concluding remarks have been summarized in chapter five.

Chapter 2

THEORETICAL AND EMPIRICAL LITERATURES

2.1 Theoretical Literature

2.1.1 Financial Development Background

One of the most debated issues among the development economists is the nature of the relationship between the financial development (FD) and economic growth (EG). The related literature over time has showed different arguments regarding the role of the financial system as well as the banking sector in economic development processes. For example, Bagehot (1873) and Hicks (1969) have pronounced that the financial system had played a significant role in accelerating the industrialization in England through the function of capital mobilization. Consistently, Schumpeter (1912) has asserted that well-functioning banks stimulate technological innovation by funding innovative projects which in turn support their chances of success. Blackburn and Hung (1998) have stated that the positive connection between EG and the extent of the financial activities is indisputable. They emphasized that in modern economies the banking institutions and the financial intermediaries play a critical role in channeling savings to feasible projects, thus improving the productivity of capital with accelerating EG. Harrison et al. (1999) have introduced the bank-growth feedback model as a theoretical contribution regarding this relationship, this model argues that as EG increases, the banking transactions and profits increase as well, this which lead to propagating the banking institutions in the economy; more banks promote the competitiveness and specialization of banking sector, at the same time reduce the intermediation costs, and thus, ameliorate allocation of the economic resources. Levine (1997) declares that the financial revolution was the precondition of the industrial revolution. Coricelli (2008) has stated that the financial system is a key source for financing the expansion of the economic activities especially during the boom period. Also, he contends that the temporary credits that provided by the banking sector have an important implications on the firms especially during the bad periods.

On the other hand, Robinson (1952) has argued that the development in the real economic activities is the key source for the FD. According to this argument, increasing the level of economic activities leads to growing the financial arrangements that create more demand for the banking transactions, and thus, promote the financial system development as a response to these changes. In this respect, the endogenous growth theory represents the EG as a mirror of the real side of the economy. Accordingly, the rate of EG is a function of many factors such as financial policies, financial structure, financial arrangements, regulatory environment, technological enhancements, and human capital (see, Greenwood and Jovanovi, 1990; Bencivenga and Smith, 1991). In contrast, Lucas (1988) does not believe any important role of financial system in stimulating economic development level. He underlines that economists "badly over-stress" the role of financial institutions in promoting EG. In the context of the contradicting arguments regarding the finance-growth nexus, Pradhan et al. (2014a, 2014b, and 2014c) have stated that the literature of FD has showed four different hypotheses related to this relationship which can be explained as follow[1]:

2.1.1.1 Supply-leading Hypothesis

The proponents of this hypothesis believe that the development of financial institutions is the main source of EG. They argue that financial sector may spur EG in two ways: (1) raise the efficiency of capital accumulation that increases marginal productivity of capital, (2) increase the saving rate which in turn promotes the investment rate. Based on their argument, the causal relationship should be from the financial sector development indicator(s) towards EG (King and Levine, 1993; Levine et al., 2000).

2.1.1.2 Demand-following Hypothesis

This hypothesis is advanced by Robinson (1952), the key idea of this view is that the EG is the main source of FD, and the vice versa is incorrect. As real economic activities grow, they increase the size of financial arrangements and settlements that are provided by the banking sector and other financial institutions, as a result, developing the financial system. According to this view, the banking sector plays an inconsequential role in stimulating economic development and that is merely a by-product or a result of EG (Pradhan et al., 2014a).

2.1.1.3 Feedback Hypothesis

According to this hypothesis, the development of the financial institutions' spurs the level of EG, and the EG leads to FD. In other words, financial institutions development and EG can complement and reinforce each other Ang (2008). Therefore, there should be a bidirectional causal relationship between FD and EG.

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[1] Pradhan et al. (2014a, p. 467), Pradhan et al. (2014b, pp. 247-248), and Pradhan et al. (2014c, pp. 157-158) have classified these hypotheses. In addition, they provide summary of the related literature that showed the causal relationship between the BSD and economic growth.

2.1.1.4 Irrelevant Hypothesis

In contrast to the previous hypotheses, the *irrelevant hypothesis* argues that the development of the financial institutions' and the EG are not related to each other. Thus, no causal connection will appear among financial and economic development. This view is supported by (Lucas, 1988 and Chandavarkar, 1992).

2.1.2 Functional Approach

The functional approach describes how financial system functions influencing the capital allocation, investment decisions, and in turn the long-run rate of EG. Levine (2005) argues that the financial system plays an essential role to ameliorate market frictions, information acquisition and transaction costs, that are already inherent in the business world. Therefore, the market frictions can be considered as one of the significant motivators of creating financial institutions. Besides, Debreu (1952) and Arrow (1964) have argued that the absence of information and transaction costs indicate no need for financial institutions to emerge. Merton and Bodie (1995) assert that the financial system affects the allocation of funds resources across time and place, in an unstable environment. For example, the banking sector provides a wide base of information about the firms' activities and about the behaviors of the managers' which in turn affect the credit policies and allocation of funds. Allen and Gale (2000) assert that the financial system plays a key role in the modern economy through the resources allocation channel.

Most of the financial institutions can provide many of financial functions, but the issue is how well financial institutions provide these functions. In particular, the FD occurs when the financial products and services, as outcomes of the financial system, ameliorate the effects of market frictions (Levine, 2005). These functions, in turn, affect the EG through the channels of capital accumulation and technological innovation (Levine, 1997). In this respect, Levine (1997, 2005) have detailed five essential functions for financial system that are provided by the banking sector, financial markets, and other financial institutions as following:

2.1.2.1 Identifying Investment Opportunities and Capital Allocation

The responsibility of this function is represented by providing enough information about the available investment opportunities and how it can be financed. Bagehot (1873) has explained the role of financial system in identifying and financing the profitable and innovation projects which in turn contribute to economic achievements of England during the 1800s. Some of the financial development economists have illustrated the role of financial system in reducing the information acquiring costs, particularly, related to investment decisions which affect capital allocation processes in desirable ways (Diamond, 1984; Boyd and Prescott, 1986; Greenwood and Jovanovic, 1990). In fact, the financial intermediaries produce serviceable information about the available investment opportunities much better than individual efforts with favorable implication on sources allocation (Levine, 1997).

2.1.2.2 Monitoring Projects and Exerting Corporate Governance Rules

The inherent conflict of interest between the stakeholders could cause to additional costs regarding acquiring information and monitoring firms which affect investment decisions, capital allocation, and thus impede the EG (Stiglitz and Weiss, 1983). The financial intermediaries can economize monitoring costs and they reduce the information asymmetry significantly when the outsiders monitored firms through the financial intermediaries and not in individual form (Sharpe, 1990). Bencivenga and Smith (1993) have argued that the financial arrangement that enhances firms control process tends to improve capital accumulation and allocation leading to faster EG.

2.1.2.3 Easing Risk Management Exercises

In presence of market frictions, the financial products and services that are offered by the financial entities used to reduce the degree of risk exposure (Levine, 2005). In practice, these products and services can be utilized by the managers and investors to build their risk management strategies which in turn ameliorate risk management practices. In this respect, the financial services play an important role in mitigating liquidity risk which is related with the impossibility to convert the assets into cash at desirable time and prices. Levine (1997) states that the inherent market frictions inhibit liquidity and, thus, encourages liquidity risks to be arising. For example, high-risk (with high-return) ventures require long-term financing, which is not preferred by savers to relinquish control of their savings for long periods. Thus, the financial intermediaries work to pool savings and then re-allocate these savings to finance novel projects with positive reverberation on the whole economy.

2.1.2.4 Pooling and Mobilizing Savings

This function is one of the traditional, but so important, functions of the financial system. By this function, financial sector attracts the savings by using different attractive channels thereafter re-allocate these savings to financing investment projects. Sirri and Tufano (1995) argued that lacking contact to a manifold of financing channels could constrain the production processes to inefficient economic scales. Simultaneously, they assert that mobilizing savings ameliorate allocation of resources with desirable repercussions on the EG.

2.1.2.5 Facilitate Specialization

In addition to ameliorating the effects of market frictions, the financial system can also stimulate technological innovation and specialization. In this regards, Levine (1997, 2005) have explained that the link between financial system and specialization process were the center element of *Wealth of Nations* which is authored by Adam Smith (1776). In the *Wealth of Nations*, Smith (1776) asserts that specialization, labor division, is the key element of productivity enhancements. By doing so, workers will be more creative. In simple terms, specialization process imposes more transaction costs, but the financial system reduces these costs, thus, improving specialization and growth. The following flow chart simplifies the functional approach of the financial systems.

Figure 2.1: Functional Approach of Financial System

2.1.3 Bank-based and Market-based Financial Systems

The financial structure defined as a mix of the financial contracts, markets, and institutions (Levine, 2004). Based on the structure of the financial systems, the countries can be classified as bank-based or market-based. In the former the banking sector plays a main role in an economy (Demirguc-Kunt and Levine, 1999). While in the market-based financial systems, the financial markets join the role of banking sector in the economy (Demirgüç-Kunt and Levine, 1999, 2001). A growing body of literature documents that banking sector and financial markets both together play a significant role in providing the financial functions, which in turn affect the economic development process positively. In this respect, the researchers did not accept distinguishing between financial systems as bank-based or market-based. They believe that banking sector and the financial market are interrelated and have a complementary role in the economy (see, Merton and Bodie, 1995; Demirgüç-Kunt and Maksimovic, 1996; Levine, 1997; Boyed and Smith, 1998; Huybens and Smith, 1999, Allen Gale, 2000)[2].

2.1.4 Interest Rate and Financial Development

The macroeconomic environment has essential influences on the interaction between financial and economic developments. For example, Creane et al. (2004) assert that the economists believe that macroeconomic stability is a precondition for the financial system and economic development. Aghioion et al. (2004) argued that macroeconomic instability impedes emergence of innovation ventures, especially in emerging countries. The majority of these economies are featured by underdeveloped financial systems that are unable to provide enough funds to these investments which in turn hinder the EG. In addition, the authors evidenced that within the macroeconomic instability, well-developed financial system ameliorates the undesirable impacts on the EG process. Mashi et al. (2009) stated that there are a number of channels that can explain the link between financial system development and EG, but the investment and productivity were the most common channels in the literature. Simultaneously, they assert that the real interest rate is one of the most important macroeconomic factors that can capture these channels.

The interest rate has been documented to be one of the key macroeconomic factors that have direct connection with the EG process (Alam and Uddin, 2009). In general, the interest rate can be considered as the cost of capital, the fee charged, and the required rate of return from different point of views of the borrowers, lenders, and investors, respectively. Lynch (1993) argued that positive real-time deposit interest rate is a prerequisite for the FD. However, fragment markets in underdeveloped

[2] The categorization process and the importance of the financial structure in EG have been detailed by Demirgüç-Kunt and Levine (1999, 2001) and Beck et al. (2001).

economies usually produce negative real-deposit interest rates leading to harming repercussions on the saving rates and, thus, on the financial and economic developments. Therefore, the real-interest rates can be a leading factor for clarification of the role of financial system in stimulating the economic productivity (Akinboade and Kinfack, 2014). In order to explain the role of interest rate in the growth process, related of theoretical models are discussed in the following subsections:

2.1.4.1 McKinnon Model

The McKinnon (1973) provides a tractable analytical framework about the inherent positive relationship between FD and EG. This model attributes the existence of this relationship to the complementary association between money and accumulation of physical capital, which is called *"the complementary hypothesis"*. The author examine the impacts of the real-time deposit interest rate on saving, investment, and economic development and contend that if the financial agents and institutions do not have enough access to financing resources, the investments will be restricted to self-finance projects. Indeed, providing the adequate size of finance to innovative businesses needs well-developed banking sector.

In addition, the McKinnon model explains that this task can easily be achieved by performing financial liberalization policies and removing some of the constraints that tie the financial arrangements. Within the financial liberalization procedures, the interest rates will be determined by the market forces rather than monetary policy authorities. These reforms could lead to positive real-interest rate, which will be the motivator factor for the market mechanisms to improve pooling and mobilizing savings. As a result, it stimulates the level of economic development by enhancing both capital accumulation and capital productivity (Blackburn and Hung, 1998).

According to McKinnon (1973), in emerging economies which are characterized by underdeveloped financial systems and high level of government interventions, capital allocation extremely depends on the possibility of pooling savings rather than on the availability of feasible investments. In other words, in these economies many investment opportunities are available, but there is inadequate financing for these investments. Therefore, liberalizing the financial systems boost real interest rates, capital accumulation, mobilization of savings, and thus the level of economic growth of countries.

2.1.4.2 Shaw Model

Shaw (1973) has built his model based on existence of a positive relationship between the level of financial system depth and the level of per capita income. The basic idea of this model is that deregulation of interest rate policy is an essential step for broaden the role of the financial intermediaries which, in turn, motivate the savings and investments processes Fry (1995). Shaw (1973) argues that in the presence of financial repression policies, the role of the financial system will stay underdeveloped. High deposit interest rates will attract large savings from the depositors, increase the size of loanable funds, increase the investment rates, and stimulate EG.

In contrast to McKinnon (1973) and Shaw (1973), known as the McKinnon-Shaw hypothesis or model in the related literature, many researchers have refused the positive role of liberalizing interest rates in stimulating capital productivity and economic growth. For example, Williamson (1986) asserted that there is a dark side related to high positive interest rates; high-interest rates lead to increase the possibility of default loans and costs of corporate monitoring that lead to decrease the willingness of banks to provide credit within those circumstances. Warman and

Thirwal (1994) evidenced the negative impact of real interest rate on the economic development of emerging economies in case of Mexico. Demetriades and Luintel (1996) revealed an adverse association between rates of capital productivity and real interest rates in the emerging countries. Fry (1997) and Levine (1997) have argued that high positive real interest rates lead to undesirable impacts on the investment efficiency. Demirgüç-Kunt and Detragiache (1998a, 1998b) and Hellmann et al. (2000) argued that liberalizing financial systems and deregulation of interest rate policies may lead to fragile banking sectors and increase the possibility of the financial crises. Based on income and substitution effects, Liang and Teng (2006) contend that the role of interest rate in stimulating saving rates is inconspicuous.

2.1.5 Measuring Financial Development

There is a considerable debate about the suitable measure(s) of the financial system development which is one of the most serious challenges for the empirical researchers. In this respect, Edwards has declared that *"defining pertinent proxies for the degree of FD is one of the most challenge issues suffered by empirical studies"* Edwards (1996, p. 21). Most of the empirical studies have utilized the financial depth indicators for measuring the level of the FD. Among the various financial depth gauges, the ratio of liquid liabilities to GDP is observed to be one of the most common-used indicators in the empirical studies (Beck et al., 2001). However, some other financial depth indicators have also been employed in the literature as measures for the financial system development. For example, Giedeman and Compton (2009) have used the proportion of M_2 to GDP, while Dawson (2008) and Huang and Lin (2009) employed the ratio of M_3 to GDP. Yu et al (2012) illustrate that using the ratio of M_3 to GDP is more suitable compared to the ratio of M_2 to GDP. The latter is not suitable enough when a specific country used the money as a store of value.

Yilmazkuday (2011) employed the ratio of the difference between broad and narrow money supply to GDP [(M_3 - M_1) / GDP]. They assert that this indicator is more superior to others used in reflecting the actual activities of the financial system. King and Levine (1993) have explained that the empirical researchers assume there is a positive relationship between the size of financial system (measured by financial depth indicators) and the quality and quantity of the products and services that provided by the financial sector. However, Levine (1997) argues that these indicators do not capture the quality of the financial services.

In this regards, a growing body of theoretical and empirical literature have underlined that the appropriate measure(s) of financial system development that one can reflects the major elements of the financial system functions (Levine, 1999; Levine, 2004; Beck et al., 2010; Beck et al., 2001). In the same direction, Pradhan et al. (2014a) present persuasive discussion about the definition of the FD. They built their theoretical background based on the reviewing and analyzing a large number of related literatures. The authors declare that the theoretical arguments of their study have extremely relied upon one of the most recent and popular literature surveys in FD field which is prepared by Ang (2008). The authors assert that the concept of FD is undoubtedly extensive and it can be expressed as a BSD. Thus, they defined the BSD as *"a process of improvements in the quantity, quality, and efficiency of banking services"* Pradhan et al. (2014a, p. 469). Moreover, they explained that the BSD process contains many of mutual-action activities that in turn cannot be captured by a single indicator. This point of view has been supported by many FD economists (see for instance, Levine 1997; Levine and Zervos, 1998; Levien, et al. 2000; Demirgüç-Kunt, and Levine 2001; Beck and Levine 2004; Bose et al., 2012;

Alper, et al., 2014; Pradhan et al. 2014a, 2014b, 2014c; Akinboade and Kinfack 2015).

However, the recent empirical researchers have controlled the challenges of how to capture the broad concept of BSD by using multi-indicators in their studies. For example, Jalil et al. (2010) adopt three commonly-used indicators of BSD, namely, the ratio of M_2 to GDP, bank credits to the private sector, and total assets of commercial banks to the total assets of central and commercial banks. Regarding the first indicator, they have explained that the high value of this ratio indicates a more financial depth of a particular economy. In this respect, the authors have assert that in the developing economies, the high ratio of M_2 to GDP indicates more liquid currencies are available in that economy, therefore this indicator is more suitable to measure monetization of financial sector rather than depth. This point of view is consistent with the arguments of Demetriades and Hussein (1996). The second indicator is used to capture the perspective of capital allocation. While the third ratio indicates the capacity of the banking sector in mobilizing savings to investment projects and the relative risk measure in compared to the central bank which is selected based on the suggestions of Huang and Lin (2009).

Hakeem (2010) has utilized four indicators of BSD which are liquid liabilities, broad money supply, bank credits provided to the private sector, and total domestic credits, each as a percentage of GDP. He asserted that the first couple of ratios are used to explore the overall depth and size of the banking sector as a financial intermediary which also used to examine the monetization degree in the whole economy. The last couple of ratios are used to capture the role of banking sector in allocating enough credit for productive activities.

Bose et al. (2012) have used a menu of indicators that captured most of the conceptual dimensions of the BSD. The indicators used in this study are liquid liabilities, total domestic credit, bank overhead costs, net interest margin, interest rate spread, bank concentration, central bank assets, and bank capital. They assert that the first two indicators are used to capture the size or the depth of the banking sector. But, the rest of the indicators have been used to control some other effects that may not be captured by the size measures, e.g., the extent of banking regulation quality, information frictions of the credit markets, and degree of financial repression.

Petkovski and Kjosevski (2014) have used three different proxies of BSD namely, private credit provided by the banking sector, the ratio of quasi-money, and interest rate margin which the first two are measured as a percent of GDP. They proclaimed that the BSD is a combination concept and it should be measured by a compound of measures to identify the various aspects that related to the banking activities. The authors asserted that the first ratio is often used to measure the BSD and it is more suitable in case of cross-country studies. This indicator excludes the credits provided to the governments, thus reflects the role of banking sector in promoting the productivity of capital. While the ratio of quasi-money which is calculated as a difference between M_2 and M_1, this ratio is a suitable measure of the predominance of the banking sector especially in developing countries. They built this point of view correspondingly with the claims of Hemming and Manson (1988) and Liu and Woo (1994). The last ratio is selected according to the theoretical arguments of Blackburn and Hung (1998) and Harrison et al. (1999) to represent the banking sector efficiency.

2.2. Empirical Literature

2.2.1. Interest Rate and Interest Rate Volatility

A growing number of empirical studies have been attracted to investigate the influences of interest rate and interest rate volatility on the banking sector. Indeed, the related literature provides contradictory results about the direction of these impacts. There are many reasons behind the variation of the empirical results: different researchers have different variables, methodology, period, and sample. Therefore, the aim of this section is to shed lights on some of the recent empirical studies that studied the impact of interest rate or interest rate volatility on different aspects of the banking sector.

The first strand of literature is regarding the relationship between interest rate and different dimensions of the banking sector, e.g., stock prices, performance, deposits, and development. Some of the earlier studies showed no strong support for existence relationship between interest rate and banking sector. For example, Flannery (1981) examines the impact of interest rate fluctuations on the profitability of the U.S. banks using linear regression analysis. The results indicate no significant impact of interest rate fluctuations towards banking performance. The author attributes this result to good risk management practices based on maturity analysis of the assets and liabilities of the banks. Another study for Flannery (1983) investigates the impact of market interest rate movements on costs and revenues of the banking sector. Based on the empirical outcomes, the costs and revenues of the large size banks seem to be insensitive to market interest rate changes. Besides, Mankiw (1986) have illustrated that the quality of the banks' credit portfolio can also be affected by the interest rate volatility: increase in the lending interest rate leads to reductions in the demand for credit from high-quality creditors and mount the requested credit from the low-quality creditors. That could initiate the adverse selection for the banks with undesirable impacts on their market value. Also, Mitchell (1989) develops a model to analyze bank exposure to interest rate risk during the period of 1976-1983. His conclusions indicate small impacts of interest rate changes on the banking sector. The study attributes this finding to active risk management strategies in the banking sector.

Recently, Simpson and Evans (2003) analyze the relationship between interest rate, exchange rate, and monthly stock returns of the Australian banks during 1994-2002. Different econometric techniques, i.e., cointegration, OLS, and VAR have been applied. They find no evidence for existing cointegration relationship between both short- and long-terms interest rates and the bank stock returns. But, the regression of the OLS method indicates a negative and significant impact of the long-term interest rate on the market stock returns. Naveed (2015) examine the impact of monetary policy shocks, measured by interest rate, on different aspects of the Pakistani banking system, e.g., banks deposits, loans, and performance during the period of 2009-2013. The author has applied VAR approach as well as some other econometric techniques. His results show that the non-conventional banks appear to be insensitive to interest rate changes. But, the conventional banks seem to be sensitive to interest rate shocks. Borio et al. (2015) investigate the influence of monetary policy, represented by short-term interest rate, on the banking profitability in 14 developed economies during 1995-2012. Their results indicate a positive relationship between interest rate changes and banking performance. They argue that the shape of the relationship between short-term interest rate and banks profitability, measured by interest income, is concave implying that the changes in interest rate have a bigger effect when it is approaching zero. Most recently, Mushtaq and Siddiqui (2017) examine the relationship between the bank deposits and real interest rate during the period of 1999-2014. They utilize annual time series data for 23 Islamic and 23 non-Islamic countries. The results of panel ARDL approach provide evidence for the insensitivity of banking sector deposits to interest rate changes in case of Islamic countries, while the impacts become to be positive and significant in case of non-Islamic countries.

In terms of the relationship between BSD and interest rates, some of the empirical researchers have used the interest rates as a control variable in their studies. For example, Jalil et al. (2010) investigate the role of FD in the economic activities for China. They create an index for FD by the principal components analysis (PCA) based on three of the FD measures. This study utilizes annual data during the period of 1977-2006. The real-time deposit interest rate has a place in their model as one of the explanatory variables. The bounds test of the ARDL and the error correction models indicate the coefficients values of the real-deposit rate to be positive, negligibly small, and statistically insignificant. However, their study does not add any explanation related to the role of real interest rate in the FD process. From another angle, Nabi and Suliman (2009) examined the connection between the quality of institutions environment, BSD, and EG in a sample of 22 MENA countries during the period of 1984-2004. Their study explains the role of the lending interest rate as a policy tool in case of lacking quality of the institutions environment, e.g., weakness of law, regulations, and judicial system, the monetary authorities increase the lending interest rate to rationing credit and decelerating the development of the banking sector, and vice versa. The implications of this policy are that decreasing the probability of loans default which in turn safe the banking sector. More clearly, in case of quality institution environment, lending interest rate decreases, more credits provided, develop banking sector, increase capital productivity, enhance allocation of resources, and faster EG. Therefore, from the economic aspect, the interest rate is one of the most effective factors for the policy makers. Agbloyor et al. (2012) examine the role of BSD in mergers and acquisition processes of African countries during the period of 1993-2008. They employ two indicators for BSD which are bank credits provided to the private sector and total bank domestic credits, both as a percent of GDP. The interest rate spread was one of the other variables in their model. The panel data analysis indicates a positive and significant connection between the BSD indicators and interest rate spread. Akinboade and Kinfack (2014) investigated the connection between interest rate, financial deepening (as measured by five of the FD ratios), and EG in Cameron. They use annual data set during 1973-2007, and both Engel Granger and Johansen techniques are applied. The relationships between deposit-interest rate and four of the financial deepening indicators have observed to be negative. In contrast, the relationship became to be positive with the ratio of broad money to GDP. The authors have interpreted their findings as that the financial repression policies (increases in deposit-interest rate) lead to extend the broad money and impede the level of BSD.

The second strand of literature is about the impact of interest rate volatility on the banking stock returns. Most of the empirical results of this strand of literature provide an evidence of a negative association between market stock returns and interest rate fluctuations (see, among them Campbell 1987; Yourougou, 1990; Zhou, 1996; Elyasiani and Mansur, 1998; Harasty and Rouet, 2000; Joseph and Vezos, 2006; Alam and Uddin, 2009; Kasman et al., 2011; Tripathi and Ghosh, 2012; Papadamou and Siriopulos, 2014 among others). For instance, Elyasiani and Mansur

(1998) investigate the sensitivity of the U.S. banking stock returns to changes in the interest rate and its volatility for the period of 1970-1992. The authors employ autoregressive conditional heteroscedasticity in mean (GARCH-M). The empirical findings indicate that the long-term interest rate has a significant reverse effect on stock market returns. Simultaneously, volatility of the interest rate was evidenced to be a primary source of the banking stock returns volatility. Also, Alam and Uddin (2009) examine the relationship between interest rate volatility and banks stock returns in 15 developed and developing countries. They employ both time series techniques and panel data analysis of monthly data for the period of 1998-2003. Their findings reveal a negative and significant association between market stock returns and interest rate volatility. Kasman et al. (2011) analyze the dual impact of interest and exchange rates fluctuations on the stock market returns of the Turkish banks during 1999-2009. They apply both GARCH models and ordinary least square (OLS) estimation method. Their outcomes provide evidence for the sensitivity of the banking stock returns to the interest rate volatility. They affirm that the interest rate volatility is the key determinant of the stock market returns volatility which is compatible with the findings of Elyasiani and Mansur (1998).

Surprisingly, there is only one study about the impact of local interest rate volatility on the BSD of emerging countries, Hajilee et al. (2015) have claimed that their study was the first to investigate this nexus. They apply the bounds test within the ARDL approach for annual data during the period of 1980-2014. The empirical results indicate a negative association between interest rate volatility and BSD in most of the developing countries. However, the relationship observes to be insignificant in cases of Indonesia, Malaysia, and Thailand. Indeed, there are some critiques that could be directed to this study: (1) this study employed only single indicator to measure the

BSD which is liquid liabilities to GDP. In practice, this indicator often is used to measure the financial depth or the overall size of the financial system (Beck et al. 2001). Employing a suitable measure(s) is a prerequisite of accurate conclusions (Levine, 2005). In addition to that, using one indicator is not enough to capture all dimensions of the BSD concept (Pradhan et al. 2014a); (2) the authors have used the GDP to capture the banking-growth nexus, but they have not provided any result regarding this relationship; (3) this study does not perform any of causality analysis to provide extra explanation about the direction of causality between the variables that have debated extremely in the financial development literature.

2.2.2. Spillover Effects

From the economic perspective, the term of spillover effects can be interpreted in the context of financial updates, e.g., the financial liberalization, globalization, and markets integration. The global financial stability report of the international monetary fund (IMF) has documented that, under the modern economic style the emerging markets become highly integrated with the global economies, as a results increase the possibility of negative spillover impacts to these markets (IMF, 2016b). Thus, the implications of increasing the interrelated level among the range of the markets can be interpreted by the term of spillover effects. This term means, in the case of minor changes in the economy of "X" may cause to major changes in the economy of "Y". More clearly, the economic spillover impacts can be elucidated as the economic events in a specific country that occur as a result of changes in a seemingly irrelevant economy. Two basic ideas are related to the term of spillover effects, first this term is most frequently indicates unpleasant effects, second the direction of the effects is most commonly tend from the large advanced economies toward small emerging economies.

Historically, Mundell (1963) introduced theoretical arguments about the spillover effects across countries. He asserts that, by compared two countries to each other, the first is the home country "dominant country" and the second is the neighbor country "responder country", if the dominant country has decided to ease monetary policy, typically their money supply will be increased, at the same time the output of the economic activities will be growing, and depreciating in their exchange rate will be observed. The implication of these changes creates a negative spillover impacts on the responder country by exerting "beggar-thy-neighbor effects"[3].

In this respect, Andersen et al. (2007) assert that the U.S. monetary policy, presented by the U.S. interest rate, considered as a key determinant of the interest rate policy in rest of the World. Besides, Kawai (2015) document that the monetary policy of the U.S. has had noticeable universal spillover impacts, especially in developing economies. He mentions that among the most crucial challenges for these countries is how to cope with frequent modifications in the U.S, monetary policy. The actual challenges could be presented by the negative spillover impacts on their economies, e.g., decreasing in stock prices, depreciating in exchange rates, and foreign and domestic capital outflows which lead to financial crises. Accordingly, many of studies assert the negative spillover effects of the U.S. interest rates on developing economies (see, Calvo et al., 1993; Andrews and Ishii, 1995; Maćkowiak, 2007; Bekaert et al., 2010; Chang and Fernández, 2013; Rey, 2013). These studies have argued that the U.S. monetary policy significantly impacts the financial growth of emerging countries. These arguments are strongly compatible with the aphorism of

[3] A beggar-thy-neighbor policy can be defined as an economic policy through which one country seeks to reform its economic problems by means that tend to aggravate the economic problems of other countries (among other textbooks on international economics, see Chacholiades, page 181 & page 380, 1990).

“when the U.S. sneezes, emerging markets catch a cold” (Chen et al. 2014, p. 3). This saying is supported by the widespread of the last global financial crisis of 2008.

Empirically, Maćkowiak (2007) examine the sensitivity of the macroeconomic fundamentals of eight emerging markets to external shocks and the U.S. interest rates within VAR framework. The empirical results reveal that the U.S. monetary policy rate significantly impacted emerging markets indicating that the most significant source of macroeconomic fluctuations in emerging markets was caused by external shocks. By comparison, in Elyasiani and Mansur’s (2003) examination of the impact of domestic interest and exchange rates and the spillover impacts of the U.S.’ interest rate fluctuations on the banking stock returns of Japan and Germany, their results indicated that the U.S.’s monetary policy created significant spillover on the banking sector of these countries. Uribe and Yue (2006) have used the VAR type of models to investigate the relationship between local interest rate, international interest rate, and economic fundamentals of five emerging economies. Their results indicate that the changes in the U.S. interest rate elucidate about twenty percent of the aggregate changes in the economic activities of the sampled countries. In addition, the U.S interest rate affects the economic activities of the emerging countries through the channel of local interest rate. The authors attribute their findings to the inherent connection between the economic activities of these countries and lending interest rate in international markets. Fernández-Villaverde et al., (2011) and Reyes-Heroles and Tenorio (2015) emphasize that the economic activities and the business cycle of the developing countries have observed to be highly sensitive to external changes, in specific to the fluctuations of interest rates in the international markets. They asserted that the U.S interest rate is one of the main international factors that have influences on the emerging economies.

In contrast, Edward and Susmel (2000) examined the spillover “contagion” effects of the interest rate volatility across a sample of five Latin American countries during the 1990s. The results of bivariate switching models did not provide evidence for existing spillover effects of interest rate volatility across the sampled countries. Also, Miniane and Rogers (2007) did not confirm any spillovers impacts of the U.S. interest rate shocks on the interest rate and exchange rate of Malaysia and Chile.

2.2.3 Banking Sector Development and Economic Growth

A tremendous number of theoretical and empirical studies have examined the role of financial and banking sectors on real income growth of nations (among many others, see Soukhakian, 2007a, 2007b; Nazlioglu et al., 2009; Buyuksalvarci and Abdioglu, 2010; Karacaer and Kapusuzoglu, 2010; Saqib and Waheed, 2011; Chandio, 2014; Kaushal and Pathak, 2015).

The asseveration that the development of the financial system is an essential and inextricable part of the EG has been asserted by many of development economists (see King and Levine, 1993; Levine and Zervos, 1998; Beck et al., 2000; Levine et al., 2000; Levine, 2005 among others)[4]. In line with the theoretical arguments of Bagehot (1873) and Schumpeter (1912) that have documented the historical role of the banking sector in facilitate industrialization and stimulate growth progress, the recent empirical researchers have considered on investigating the connection between BSD and EG. Therefore, the current subsection will present some of the recent empirical literature that used several econometric techniques to investigate the connection between BSD and EG. Levine (2005) asserts that there are numerous

[4] The literature of the finance-growth nexus are fairly a broad, they have not been detailed here. For additional information, please see Ang’s (2008) survey of recent finance-growth literature and Levin’s (2003, 2005) comprehensive overview of empirical work.

empirical studies that investigate finance-growth nexus by applying different methodologies, e.g., Granger causality and VAR models while most of the researchers stress that employing the accurate measure(s) is a precondition of accurate findings.

For example, King and Levine (1993) have affirmed the historical propositions of Joseph Schumpeter (1912) that assert the role of banking sector in ignite industrialization and thus fostering growth progress. Levine and Zervos (1998) showed that the BSD affects EG positively in 47 countries during the period of 1976-1993. Arestis et al. (2001) investigate the connection between EG and both banking sector and financial market developments using VAR mechanism. Their results indicate positive impact of financial market and BSD on the EG of five developed economies. But, the magnitude of the banking sector impact was much larger compared to the impact of the financial market. Implies that the banking sector plays an essential role in stimulate EG in the developed countries. McCaig and Stengos (2005) affirmed the positive relationship between EG and financial intermediary development using both bank credits to the private sector and liquid liabilities as gauges of FD. Pradhan at al. (2014a) examined the banking-growth nexus using both panel cointegration and panel causality techniques. The BSD indicators observed to have a long-run causal impact on EG.

In the context of the *feedback hypothesis*, Nabi and Suliman (2008) examine the banking-growth nexus in MENA countries during the period of 1984-2004. They find a bidirectional causal relationship between BSD and EG. Also, Pradhan at al. (2014b) provide evidence for bidirectional causal connection between BSD and EG in the South-East Asian economies. The same results have been found by Pradhan at al. (2014c) in the Asian countries by using VAR models.

There is a line of empirical literature does not confirm the existence of such causal relationship between BSD and EG. For instance, Petkovski and Kjosevski (2014) examined the banking-growth nexus in the Eastern Europe economies. They utilized three gauges for BSD. The empirical outcomes of dynamic panel analysis indicate a positive relationship between EG and quasi-money ratio as a measure of BSD. In contrast, the relationship becomes negative and significant when the private credit and interest rate margin used as measures of BSD. The study of Chang (2002) has supports the *irrelevant hypothesis*, the empirical results of multivariate VAR models did not confirm any causal relationship between FD and EG in case of China. Hakeem (2010) examines the role of BSD in EG for the Sub-Saharan Africa (SSA) countries during the period of 1970-2000. The outcomes of panel data analysis indicate that the EG observes to be insensitive to the level of BSD. The author attributes this finding to various reasons that related to the SSA economies, e.g., high level of financial repression, governments dominates the economic activities, poor institutional infrastructural, inefficient regulation, and high transaction costs. The role of this factors in impede financial and economic developments has been documented by (De Soto, 2000; Ajayi, 2003; Honohan, 2004; Mishkin, 2007).

From different aspects, the relationship between BSD and merger & acquisition (M &A) processes is examined by Agbloyor et al. (2012). Their results suggest that there are bidirectional causal connections between these elements. The implication is that the development of banking sector is important for stimulating the M &A processes with positive effects on EG, and vice versa. Also, Lin and Huang (2012) investigate the influences of the banking sector volatility on EG processes during the period of 1980-1999. The empirical findings indicate that banking volatility, measured by standard deviation of the private credit ratio, observed to affect the rate of EG negatively. They assert that the banking sector stability and development are essential for sustainable growth. Bose et al. (2012) analyze the influence of the BSD on the size of shadow economies. The empirical results indicate that the BSD (represented by the gauges of depth and efficiency) plays a critical role in shrinking the size of shadow economies.

Chapter 3

DATA AND METHODOLOGY

The first part of this chapter is allocated to data that will first provide a brief information about the sampled countries, namely Algeria, Indonesia, Korea, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey. The detailed presentation about the data such as the sample period and frequency, definitions of the variables used and the formulation of the model will be presented in the second section related to data. The second part of this chapter will present the features of the econometric methodologies used.

3.1 Data

3.1.1 Economic Features of the Sampled Countries

The Algerian economy is mostly classified as oil-based economy with oil and gas resources significantly contributing to the country's earnings and national budget. In 2015 for example, oil and gas makes up about 95% of the Algerian national government earnings and contributed about 60% to its national budget (Focus Economics, 2015). Furthermore, regarding monetary and banking regulations, the Algerian monetary and financial regulatory authority considerably restructured the existing system upon the liberalization and reforms of the country's banking industry beginning in late 1980's. This was followed by the enactment of various banking sector laws such as the law No. 90-10 published around April 14th in 1990 on credit and money matter regulation (Belkacem et al., 2016). These provisions created the financial space for the liberalization of the entire financial system producing the impetus for private banking operations in the country. In 2003, the monetary and financial regulatory body also adopted upon further banking sector reforms in view of the resulting bankruptcies that threatened the banking system (Benahmed-Daho et al, 2015). The GDP growth rate over the period of the study was about 2.83%. Turkey which is another emerging market economy in the Middle East began implementing its financial liberalization programs in collaboration with the IMF and the World Bank in 1980. The monetary authorities have undertaken a series of structural reforms to strengthen its financial sector such as deregulation of interest rates and adopted of managed floating exchange rate system abolishing the fixed exchange rate system with the experience of the 2001 financial crises.

The sample of the study involves also five economies from the Asian region namely, Indonesia, Korea, Malaysia, Philippines, and Thailand. Indonesia which is classified as the largest and most popular economy in this region is ranked 10^{th} on the basis of global purchasing power parity and it has an average economic growth rate of 5.17% during the period of the study (Asian Economic Bulletin, 2003). However, the country has relatively small financial system which is dominated by the banking sector. In 2015, the total share of assets held by the banking sector was about 55% of GDP (IMF, 2017). The rest of the sampled Asian countries have all followed a path of banking reforms and restructure of their financial system at various points of time. In terms of their economic performances, the average economic growth rates during the sample period is 6.42% for Korea, 5.95% for Malaysia, 3.53 % for Philippines, and 5.35 for Thailand. In Mexico, the financial system is dominated by the banking sector. In 2015, the total assets of the financial sector are amounted to be around 90% of GDP, of which the banking sector hold over the half of these assets (IMF, 2016a). The country has an average GDP growth rate of 2.69% over the period studied. Considering South Africa, the financial sector is relatively large and most sophisticated compared to the financial systems in the emerging countries. In 2014, the size of assets held by this sector is about 298% of GDP (IMF, 2014). In addition, the country's financial system is considered to be highly concentrated and interconnected.

3.1.2 Definition of Variables and Formulation of the Model

The current study adopts four indicators to measure the BSD which is in parallel with the FD literature that assert using a single indicator is not enough to capture all the dimensions of the BSD concept. One of these indicators is the "*Index*" which is created by the principal components analysis (PCA). This "*Index*" has been constructed based on three of the widely-used measures of the BSD namely, private credits (*PC*), liquid liabilities (*LL*), and broad money (*BM*). The definition of each of the BSD indicators is presented in panel A of Table 3.1.

In order to translate the theoretical arguments of the impacts of local interest rate volatility and spillover effect of the U.S. interest rate on the BSD of emerging countries, the following functional relationship is carried out:

$$Y_t = f\,(R_t, VR_t, FDR_t, GDP_t, BD_t) \quad (3.1)$$

where *Y* is a measure of the BSD represented alternatively by *"Index"*, *PC*, *LL,* and *BM*, *R* is the real interest rate, *VR* is the proxy of interest rate volatility, *FDR* is the federal discount rate (also called policy interest rate), *GDP* is the gross domestic product per capita growth rate (in constant 2010 dollars), and *BD* is the bank deposits as a percent of GDP. Detailed definitions of the explanatory variables are presented in panel B of Table 3.1.

Table 3.1: Detailed description of the variables.

Symbol	Definitions
Panel A: Definitions of the BSD indicators.	
Index	A comprehensive measure of the BSD, which has been created by the principal components analysis (PCA) based on *PC*, *LL*, and *BM*.
PC	The financial credits that provided to the private sector by the domestic banking sector as a share of GDP. The *PC* indicator can be employed to measure the growth of the banking system. Also, it is one of the most comprehensive measures of financial intermediary development and significantly superior to the other used indicators (Beck, et al., 2000). It may indicate the degree to which the formal banking sector plays a role in the economy (Akinboade and Kinfack, 2015).
LL	The share of liquid liabilities (M_3) of the financial sector to GDP. This measure equals the sum of currency and demand liabilities of the financial intermediaries as a share of GDP. *LL* is a common-used measure of the relative size of the financial intermediaries compared to the size of the whole economy, usually used as an indicator of the financial development or financial depth (King and Levine, 1993; Beck, et al., 2001).
BM	The ratio of broad money to GDP. *BM* is the sum of currency outside banks; the time, savings, and foreign currency deposits; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper. *BM* is one of the commonly-used indicators of the BSD (Pradhan et al., 2014a, 2014b).
Panel B: Definitions of the explanatory variables.	
R	The real time-deposit interest rate which is equal to the time deposits interest rate minus the inflation rate measured by the consumer price index (CPI, the base year 2010).
VR	The proxy of interest rate volatility which is calculated by the historical standard deviation (*SD*) of the real-deposit interest rate (*R*).
FDR	The federal funds rate (policy interest rate) is the interest rate at which banking institutions lend balances at the Federal Reserve to other banking institutions overnight. The *FDR* in the model aims to capture the spillover effects of the U.S. monetary policy.
GDP	The GDP per capita is gross domestic product divided by the average of yearly population number. The values of the GDP are in constant 2010 U.S. dollars. The GDP per capita (real income per capita) was used to capture the banking-growth nexus. The development of banking sector is highly correlated with subsequent GDP per capita (Levine, 1997).

BD	The ratio of bank deposits to GDP. Bank deposits equal the sum of demand, time, and saving deposits at domestic banking system. Deposit money banks comprise commercial banks and other financial institutions that accept transferable deposits, such as demand deposits. The *BD* is the relative size indicator, a measure of the importance of the banking sector (Beck et al., 2001). In general, the *BD* is one of the most significant factors that impact the functional activities of the banking sector which can be considered as one of the key determinants of the BSD.

Note: the definitions of *R*, *PC*, *LL*, *BM*, *BD*, and *GDP* are taken from the World Bank *World Development Indicators* and *Global Financial Development* Databases, 2017. While the definition of *FDR* is obtained from *Datastream*. The values of *PC*, *LL*, *BM*, *BD*, and *GDP* are transformed to the natural logarithmic form.

The time series data is at the annual frequency for the period of 1980 – 2014 producing 35 observations. It is worth noting that, using data with a high-frequency such as quarterly or monthly to increase the number of observations does not affect the robustness of the results in the cointegration analysis, whereas the time span of the recorded data is ultimately most important (Hakkio and Rush, 1991). The data of the *R*, *PC*, *LL*, *BM*, *BD*, and *GDP* were gathered from the World Bank databank, *World Development Indicators* and *Global Financial Development* Databases, while the data for the values of the *FDR* were obtained from *Datastream*.

The sampled emerging countries were selected based on the list of MSCI emerging markets index. This index consists of 23 emerging countries which represent around 10% of globe market capitalization[5]. In addition, it includes the countries from various regions: America, Middle East, Africa, and Asia. The countries were selected according to the availability of the data during the period of the study. Moreover, the period of the study almost covered the financial liberalization era.

[5] As of December 15, 2016, the MSCI listed in its website https://www.msci.com/emerging-markets.

There are several reasons that make emerging markets an interesting place to explore this issue: during the past few decades, majority of emerging countries embarked implementing financial liberalization programs as a step to reform their financial sectors. Deregulation of interest rates was one of the requirements of these programs, which led to increase the degree of interest rate fluctuations in these economies (Edwards and Susmel, 2000). The recent developments in the global economy, e.g., the US mortgage crisis and the European sovereign debt crisis, led to relatively high movements of foreign capital in these economies, causing high fluctuations in their domestic interest rates. As a result, the emerging economies have become more susceptible to external shocks, especially related to the US policy rate. Tow important things are related with financial systems in the developing countries, which have created extra incentives for this study: (i) the banking system constitutes the senior portion of the financial systems in emerging and developing economies (Beck et al. 2010); (ii) the financial systems of these countries are bank-based that means the banking sectors play a pivotal role in their economies (Demirgüç-Kunt and Levine 2001).

The functional relationship in Equation (3.1) will be estimated using each one of the suggested BSD indicators ("*Index*", *PC*, *LL*, and *BM*), alternatively and for each country separately. Levine (2005) has explains that analyzing the countries in an individual form provides much greater depth for the empirical results. Therefore, the functional relationship can be written by four different econometric models as:

Model (A): $Index_t = \alpha_0 + \beta_1 R_t + \beta_2 VR_t + \beta_3 FDR_t + \beta_4 GDP_t + \beta_5 BD_t + u_t$ (3.2)

Model (B): $PC_t = \alpha_0 + \beta_1 R_t + \beta_2 VR_t + \beta_3 FDR_t + \beta_4 GDP_t + \beta_5 BD_t + u_t$ (3.2)

Model (C): $LL_t = \alpha_0 + \beta_1 R_t + \beta_2 VR_t + \beta_3 FDR_t + \beta_4 GDP_t + \beta_5 BD_t + u_t$ (3.3)

Model (D): $BM_t = \alpha_0 + \beta_1 R_t + \beta_2 VR_t + \beta_3 FDR_t + \beta_4 GDP_t + \beta_5 BD_t + u_t$ (3.5)

where α_0 is a constant term, t denotes the time, β_1 is the coefficient of R with expected sign to be either positive or negative; depending on the used indicator, β_2 is the coefficient of VR with expected sign to be negative; reflecting the negative impacts of interest rate volatility on the BSD indicators, β_3 is the estimated coefficient of the U.S. policy rate with expected sign also negative. The estimated value of β_4 and β_5 are expected to be positive. The positive sign of β_4 and β_5 will reflect the elasticity of the BSD with respect to the changes in the *GDP* and *BD*.

3.1.3 Descriptive Statistics

The selected descriptive statistics (mean, maximum value (Max), minimum value (Min) and the historical standard deviation (SD)) of the data used are presented in Table 3.2. The descriptive statistics of the suggested BSD indicators can be used to compare the relative size of the financial and banking sectors for each sampled country. For example, the highest value of *LL* which is used as a measure of financial development or more specifically as an indicator of financial depth is recorded to be 111.54 in case of Malaysia, whereas the lowest value (24.78) has been recorded for Mexico. This implies that the financial system of Malaysia is more developed and has much depth compared to financial system of Mexico. Parallel to these statistics, the value of *PC* which is one of the most popular measures of BSD is observed to be 104.26 for Malaysia and 17.68 for Mexico. The values of *BM* lead to the same indications for both countries as well. However, the SD values of the BSD indicators revealed that the financial and banking sectors of Malaysia seemed to be more volatile than the financial and banking sectors of Mexico. This conclusion can be also confirmed by the difference between the maximum and minimum values of the suggested BSD indicators. For instance, when *PC* is considered as a BSD indicator, the differences between maximum and minimum values are 104.98 for Malaysia versus 19.80 in case of Mexico. Regarding the mean of real interest rate, the negative values have been observed in Algeria, Mexico, and Turkey. Furthermore, the minimum values of *R* have been observed to be negative for all sampled countries. Since the real-time deposit interest rate (*R*) calculated as a difference between nominal interest rate and CPI, the negative values of *R* could indicate that the inflation rates are high relative to nominal interest rates in these emerging economies. This can be also considered under the arguments of Lynch (1993), as he asserts that most of the underdeveloped economies usually produced negative real-deposit rates leading to negative repercussions on the saving rates and economic growth. The SD values of *R* provide a comprehensive picture about historical volatility of the real-interest rates during the period of the study. Among the sampled countries, Turkey with a value of 20.63 showed the highest interest rate volatility during the sample period. In the context of the US policy rate, the difference between maximum and minimum values was about 16% which is relatively high indicating some fluctuations in the U.S. monetary policy during the last few decades. Based on the mean of annual economic growth rates (*GDP*), the sampled countries can be ranked in descending order as: Thailand, Korea, Malaysia, Indonesia, Turkey, Philippines, Algeria, Mexico, and South Africa. According to the SD values of *GDP*, the most volatile economic growth rate was observed in Turkey and the most stable growth rate was in case of Algeria. Based on the descriptive statistics of *BD*, the largest banking system with respect to size of economy is observed in Malaysia while the smallest one was in case of Mexico. Moreover, Appendix F provides a set of graphs of all data used for each sampled country, separately.

Table 3.1: Descriptive statistics.

	BSD indicators			Explanatory variables				
Algeria	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	27.711	54.63	60.28	-4.081	2.625	5.106	2.829	37.572
Max	69.284	78.551	83.824	7.160	7.869	16.294	7.201	53.922
Min	3.904	31.824	33.005	-23.669	0.238	0.250	-2.100	21.069
SD	25.1624	12.799	13.746	6.956	2.234	3.922	2.317	9.222
Indonesia	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	30.539	34.993	39.317	3.4199	3.261	5.106	5.167	31.413
Max	60.816	55.781	59.860	13.900	23.408	16.294	9.880	51.155
Min	9.5281	14.247	17.100	-19.320	0.066	0.250	-13.126	10.832
SD	14.545	11.436	11.765	7.254	4.636	3.922	3.645	11.291
Korea	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	80.006	49.047	71.734	3.334	1.600	5.106	6.418	46.268
Max	148.340	135.484	139.779	12.476	7.672	16.294	13.242	124.435
Min	38.332	28.922	30.181	-1.841	0.078	0.2500	-5.471	24.387
SD	41.693	22.102	44.172	2.817	1.878	3.922	4.067	22.555
Malaysia	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	104.260	111.544	118.486	2.117	1.018	5.106	5.947	102.189
Max	154.892	135.092	140.761	8.466	2.795	16.294	10.002	126.338
Min	49.909	61.571	64.377	-2.314	0.091	0.250	-7.359	52.871
SD	25.527	18.530	19.895	2.155	0.757	3.922	3.860	18.551
Mexico	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	17.682	24.783	32.240	-5.529	5.928	5.106	2.694	21.919
Max	30.914	31.663	51.637	13.363	51.124	16.294	9.233	28.824
Min	11.113	12.132	11.036	-58.937	0.133	0.250	-5.758	9.128
SD	4.6730	4.235	9.220	13.969	9.796	3.922	3.455	4.499
Philippines	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	30.581	43.898	47.176	0.3783	3.171	5.106	3.525	37.828
Max	56.457	68.062	71.615	10.104	23.135	16.294	7.632	60.454
Min	14.854	22.110	24.025	-29.166	0.022	0.250	-7.323	18.101
SD	9.371	13.929	14.733	6.096	4.790	3.922	3.407	13.029
South Africa	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	60.506	47.068	59.625	1.600	1.612	5.106	2.427	51.161
Max	78.294	54.427	80.799	9.615	5.944	16.294	6.620	63.910
Min	42.758	40.079	45.500	-8.118	0.053	0.250	-2.136	42.874
SD	9.348	4.376	10.137	4.212	1.494	3.922	2.339	5.896
Thailand	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	92.620	84.187	89.815	2.908	1.593	5.106	5.353	79.316
Max	166.504	113.687	128.008	12.135	5.588	16.294	13.288	115.264
Min	40.748	39.386	42.011	-7.703	0.259	0.250	-7.633	32.495
SD	31.394	23.595	24.714	4.328	1.324	3.922	4.034	24.515
Turkey	*PC*	*LL*	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
Mean	25.060	29.816	36.252	-0.370	7.939	5.106	4.527	28.126
Max	70.100	50.731	60.722	20.298	65.122	16.294	11.113	52.735
Min	13.588	16.276	18.033	-102.173	0.132	0.250	-5.962	11.795
SD	14.601	10.456	11.930	20.633	12.505	3.922	4.480	11.928

All the variables are as defined previously in Table 3.1 except *GDP*. In this Table, the *GDP* is the growth rate of GDP on annual percentage base.

3.1.4 Principal Component Analysis

The principal components analysis (PCA) technique has been utilized to construct a comprehensive measure for the BSD instead of using individual indicators. The PCA is a statistical technique that allows converting a sequence of correlated variables x_1, $x_2,\ldots, x_n$ into an uncorrelated set of variables z_1, $z_2,\ldots, z_n$ called principal components (PCs) (Nardo et al., 2005). These PCs provide a comprehensive illustration of a phenomenon that cannot be explained by only a single indicator (Hudrlikova, 2013). Therefore, this measure would be a reliable measure reflecting the different dimensions of the BSD concept.

Theoretically, the construction procedure of creating an index through the PCA methodology can be illustrated by 10 steps: (*i*) theoretical framework; (*ii*) data selection; (*iii*) imputation of missing data; (*iv*) choosing multivariate analysis; (*vi*) normalization; (*vii*) weighting and aggregation; (*viii*) uncertainty and sensitivity analysis; (*ix*) back to the data; (*x*) links to other indicators; and (*xi*) visualization of the results (Nardo et al., 2005; OECD, 2008). In practice, constructing composite index involves a few strides as follow: (*i*) building of a data matrix; (*ii*) standardized the variables of the data matrix; (*iii*) computation of the correlation matrix (or covariance matrix); (*iv*) determining the eigenvalues and eigenvectors; (*vi*) and creation of PCs (Hosseini and Kaneko, 2011; Pradhan, 2014b).

Construction of the composite index is based on three widely-used measures of the BSD indicators, namely, *PC*, *LL*, and *BM*. In fact, these indicators are highly correlated with each other[6]. Therefore, the PCA technique can be used to convert

[6] The outcomes of the PCA, correlation matrices, eigenvalues, and eigenvectors, are reported in appendix A.

these indicators into a comprehensive index of BSD. As a first step, construct the data matrix of 35 observations for each variable. Let Γ be a data matrix as $\Gamma = [PC\ LL\ BM]$. In the next step, standardize the Γ by subtracting the average value from each element in the Γ matrix. Then, calculate the covariance matrix (Σ). After that, obtain the eigenvalues and eigenvectors of Σ. The eigenvalues will be $\lambda_1 > \lambda_2 > \lambda_3$ and the corresponding eigenvectors will be $\eta = [z_1\ z_2\ z_3]$. Finally, the comprehensive index of the BSD can be created based on the calculated eigenvalues (λ_i) and eigenvectors (z_i). The eigenvector value, z_1, which is corresponding to the biggest eigenvalue, λ_1, will be the created measure of the BSD labeled "*Index*". Henceforth, the "*Index*" will be referred as one of the BSD indicators.

3.2 Econometric Methodology

3.2.1 Unit Root Testing

In general, examining whether a data series stationary or not is considered as an essential issue for time series analysis. Using non-stationary data could lead to spurious regressions (Brooks, 2008). A series is said to be covariance stationary (or weakly stationary) if it has a constant mean, variance, and autocovariance structure (Brooks, 2008; Tsay, 2010) as explained in Equations (3.6) – (3.8):

$$E\left(Z_t\right) = \mu \tag{3.6}$$

$$var\left(Z_t\right) = \sigma^2 \tag{3.7}$$

$$\gamma_{t-r} = \begin{cases} \sigma^2 & if \quad t = r \\ 0 & otherwise \end{cases} \tag{3.8}$$

where E (Z_t), var (Z_t), and γ_{t-r} denote mean, variance, and autocovariance of the individual series (Z_i).

The Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1981) is employed to test the stationarity order of each of the individual variable ("*Index*", *PC, LL, BM, R, VR, FDR, GDP*, and *BD*). The ADF test can be conducted under three different cases as presented in Equations (3.9) – (3.11) below:

$$\Delta Z_t = \mu + \lambda t + \psi_1 Z_{t-1} + \sum_{i=1}^{p} \phi_i \Delta Z_{t-i} + e_t \qquad (3.9)$$

$$\Delta Z_t = \mu + \psi_1 Z_{t-1} + \sum_{i=1}^{p} \phi_i \Delta Z_{t-i} + e_t \qquad (3.10)$$

$$\Delta Z_t = \psi_1 Z_{t-1} + \sum_{i=1}^{p} \phi_i \Delta Z_{t-i} + e_t \qquad (3.11)$$

where Δ is the first difference operator, μ is drift, *t* is a time trend, *e* is random error-term, which is *iid* ~ (0, σ), white noise.

The ADF test of Equation (3.9) represents the most general case with a drift and trend. The next equation represents the ADF test with a drift and without trend. The most restricted model, without a drift and trend, appears in the last equation. The primary aim of the ADF tests is to examine the null hypothesis of the series is nonstationary versus the alternative one of the series is stationary. The testable hypotheses and the corresponding test statistic are presented below:

$$H_o : Z_t \sim I(1) or \ \psi_1 = 0 \qquad (3.12)$$

$$H_1 : Z_t \sim I(0) or \ \psi_1 < 0 \qquad (3.13)$$

$$test\ statistic = \frac{\psi}{SE\ (\psi)} \qquad (3.14)$$

The null hypothesis will be rejected if the absolute value of the calculated test statistic is greater than the critical value of Dickey and Fuller (1981). Rejection the H_o provide evidence for the stationarity of the series, either at level or at first difference.

3.2.2 The Bounds Testing Approach

The bounds testing within the ARDL approach of Pesaran et al. (2001) is employed to investigate the existence of a long-term level relationships between each pair of the BSD indicators (*Index*, *PC*, *LL*, and *BM*) and the explanatory variables (*R*, *VR*, *FDR*, *BD* and *GDP*). In fact, there are many reasons behind adopting this methodology compared to other widely used methods in the literature such as Engle Granger and Johansen techniques. This approach does not require any pretesting procedure as it can be applied regardless of the integration order of the regressors which can be integrated at their levels *I*(0), integrated at their first differences *I*(1) or mutually co-integrated. This methodology also avoids the simultaneous equations bias and the inability to perform hypothesis testing about the long-term relationship that arises with the Engle-Granger method. In addition, all the variables in the ARDL model are considered as endogenous which in turn avoids the endogeneity dilemma. In contrast to the other methods, this methodology is suitable for small sample sizes. Moreover, the optimum lag length is selected using the information criteria based on a general-to-specific approach that is captured by the data generating process (Pesaran et al, 2001; Tang et al., 2002; Jalil et al., 2010; Awad and Youssof, 2016). Given the mixed order of integration of the underlying variables and the small sample size of 35 observations, the bounds test within the ARDL approach is the appropriate methodology for the empirical analysis of the thesis. Thus, as the first step we estimate the following unrestricted conditional error correction model (UCECM) by the OLS method:

$$\Delta Y_t = c_0 + c_1 D_t + \theta_1 Y_{t-1} + \theta_2 R_{t-1} + \theta_3 VR_{t-1} + \theta_4 FDR_{t-1} + \theta_5 GDP_{t-1} + \theta_6 BD_{t-1}$$
$$+ \sum_{i=1}^{p} \omega_i \Delta Y_{t-i} + \sum_{i=0}^{q} \gamma_i \Delta R_{t-i} + \sum_{i=0}^{q} \pi_i \Delta VR_{t-i} + \sum_{i=0}^{q} \lambda_i \Delta FDR_{t-i} \qquad (3.15)$$
$$+ \sum_{i=0}^{q} \eta_i \Delta GDP_{t-i} + \sum_{i=0}^{q} \delta_i \Delta BD_{t-i} + e_t$$

where all the variables are as defined in Table 3.1, Δ is the first difference operator, c_0 is the constant term, θ_1, θ_2, θ_3, θ_4, θ_5, and θ_6 are the coefficients of one period lagged of the regressors at their levels, and e_t is the random error term with a zero mean and finite covariance matrix. D_t is the banking crisis dummy variable for each specific country defined as:

$D_t = 1$, over the crises periods, 0 elsewhere.

The dummy variable has been entered into the bounds test equation to capture the effects of the banking crisis in each specific country (except South Africa). This, in turn, will improve the robustness of the empirical results[7].

After estimating the UCECM of Equation (3.15) *F*-tests are used to verify the possible existence of a long-term level relationship between the BSD indicators (*Index, PC, LL,* and *BM*) and the determinants (*R*, *VR*, *FDR*, *GDP*, and *BD*) for each country, separately. As presented by Pesaran et al. (2001) the calculated *F*-statistics should be compared with two sets of critical values. The first set of the critical values

[7] The thesis adopts the dummy variables that have been created by the World Bank for each specific country in the sample of the study. The World Bank defined the banking crisis as a "systemic banking sector crisis if two circumstances are met: (i) significant signs of financial distress in the banking system; (ii) significant banking policy intervention measures in response to significant losses in the banking system" (World Bank, 2017). The periods of the banking crises for each country and the estimated coefficients of the dummy variables are presented in Appendix B.

assumes that the integration order of the regressors is $I(1)$, called upper bound, while the next set of critical values assume that the regressors are $I(0)$, called lower bound. The null hypothesis of no level relationship and the alternative hypothesis are formulated as below:

$$H_{0:}\ \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = 0 \qquad (3.16)$$

$$H_{1:}\ \theta_1 \neq \theta_2 \neq \theta_3 \neq \theta_4 \neq \theta_5 \neq \theta_6 \neq 0 \qquad (3.17)$$

The joint significance of lagged level variables provides evidence for the existence of a long-run relationship amongst the variables based on the following decision criteria: if the calculated value of the *F*-statistic lies above the upper bound at a significance level of 0.05 the H_0 will be rejected, and the existence of a level relationship will be confirmed. On the other hand, if the calculated value of the test statistics lies below the lower bound, the H_0 cannot be rejected, this indicates no level relationship exists among the variables. If the test statistics fall within the upper and lower bounds, means that the result is inconclusive and knowing the integration order of the variables is needed. Four main factors may affect *F*-test values: (*i*) the integration order of the variables that are included in the ARDL model; (*ii*) the number of explanatory variables in the ARDL model; (*iii*) whether the estimated ARDL model contains intercept, trend, or both together; (*iv*) sample size (Narayan, 2005).

Furthermore, since the ARDL approach is sensitive to the number of lags, the optimal lag length (*p*) is selected using both the Akaike information criterion (AIC) and the Schwarz-Bayesian criteria (SBC). The ARDL method estimates $(p+1)^k$ regressions for the selection of an optimal lag structure, where *p* is the maximum number of lags that are selected by the AIC and SBC, and k is the number of regressors in the ARDL model (Pesaran et al., 2001)[8].

3.2.3 The Dynamic Long-term Relationship

Once the bounds test affirms the existence of a long-term level relationship between the variables, the next step is to estimate the dynamic long-term relationship by employing the ARDL approach of Pesaran and Shin (1999). Hence, the dynamic long-term relationship model will be estimated under the ARDL approach as presented in Equation (3.18) below:

$$\Delta Y_t = \mu_0 + \mu_1 D_t + \sum_{i=1}^{p} \gamma_0 Y_{t-i} + \sum_{i=0}^{q} \gamma_1 R_{t-i} + \sum_{i=0}^{q} \gamma_2 VR_{t-i} + \sum_{i=0}^{q} \gamma_3 FDR_{t-i} + \sum_{i=0}^{q} \gamma_4 GDP_{t-i} + \sum_{i=0}^{q} \gamma_5 BD_t + u_t \tag{3.18}$$

where all the variables are as defined previously, the γ_i are the long-term coefficient to be estimated. The expected signs of γ_1 to γ_5 will be as the expected signs of β_1 to β_5 of Equations (3.2) – (3.5).

3.2.4 The Dynamic Short-term Relationship

The dynamic short-term relationship under the ARDL methodology can be estimated by the conditional error correction model (CECM) of Equation (3.19) as presented here:

$$\Delta Y_t = \mu_0 + \mu_1 D_t + \sum_{i=1}^{p} \vartheta_0 \Delta Y_{t-i} + \sum_{i=0}^{q} \vartheta_1 \Delta R_{t-i} + \sum_{i=0}^{q} \vartheta_2 \Delta VR_{t-i} + \sum_{i=0}^{q} \vartheta_3 \Delta FDR_{t-i} + \sum_{i=0}^{q} \vartheta_4 \Delta GDP_{t-i} + \sum_{i=0}^{q} \vartheta_5 \Delta BD_t + \vartheta_6 u_{t-1} + v_t \tag{3.19}$$

where μ_0 is a constant, ϑ_1 to ϑ_5 are the short-term coefficients, u_{t-1} is the one period lagged error correction term (*ECT*) which was estimated from Equation (3.18). While ϑ_6 is the estimated coefficient of the ECT with an expected sign to be negative.

[8] Orders of the estimated ARDL models have been reported in Appendix C.

3.4.5 The Causality Analysis

The modified Wald test (MWALD) of Toda and Yamamoto (1995) is applied to examine the causality directions among the variables. This methodology is superior to the conventional Granger causality technique in various ways: (*i*) validity of the outcomes when the time series data have some unit root; (*ii*) can be used regardless of the integration order of the time series data, it can be $I(0), I(1)$, or $I(2)$; (*iii*) is applicable when the variables cointegrated of an arbitrary order or non-cointegrated; (*iv*) the estimation procedure relies upon the standard vector autoregressive model (VAR) which includes the variables in their levels instead of the first differences, thus, avoiding the problems associated with the incorrectly determining the integration order of the variables; (*v*) the *F*-statistic that is used to test for Granger causality is not valid when the variables are integrated or cointegrated, while the test statistics of Toda-Yamamoto approach has the asymptotic distribution to made valid inference (Toda and Yamamoto, 1995; Wold-Rufael, 2005).

The Toda-Yamamoto approach is setup under the idea of estimating the standard VAR model of order ($k + d_{max}$), where the k is the selected order of VAR model and d_{max} is the maximum order of integration. The integration order of the process, $I(d)$, should not be greater than the selected lag length of the model. In order to determine the order of d_{max} accurately, the suggestion of Lutkepohl (1993) is adopted. According to his suggestions, the order of d_{max} can be determined by the rule of $T^{(1/3)}$, where T is the sample size, with T=35 the maximum order of the integration will be approximately 3. In addition, the AIC and SBIC have been used to determine the optimal lag (k) of estimated VAR models. The Toda-Yamamoto applications are formulated in Equations (3. 20) – (3. 25) as follow:

$$
\begin{aligned}
Y_t = {} & c_0 + \sum_{i=1}^{k} c_{1i} Y_{t-i} + \sum_{j=k+1}^{d_{\max}} c_{2j} Y_{t-j} + \sum_{i=1}^{k} \gamma_{1i} R_{t-i} + \sum_{j=k+1}^{d_{\max}} \gamma_{2j} R_{t-j} + \sum_{i=1}^{k} \eta_{1i} VR_{t-i} + \sum_{j=k+1}^{d_{\max}} \eta_{2j} VR_{t-j} \\
& + \sum_{i=1}^{k} \delta_{1i} FDR_{t-i} + \sum_{j=k+1}^{d_{\max}} \delta_{2j} FDR_{t-j} + \sum_{i=1}^{k} \pi_{1i} GDP_{t-i} + \sum_{j=k+1}^{d_{\max}} \pi_{2j} GDP_{t-j} \\
& + \sum_{i=1}^{k} \lambda_{1i} BD_{t-i} + \sum_{j=k+1}^{d_{\max}} \lambda_{2j} BD_{t-j} + u_{1t}
\end{aligned}
\tag{3.20}
$$

$$
\begin{aligned}
R_t = {} & \gamma_0 + \sum_{i=1}^{k} \gamma_{i1} R_{t-i} + \sum_{j=k+1}^{d_{\max}} \gamma_{j2} R_{t-j} + \sum_{i=1}^{k} c_{i1} Y_{t-i} + \sum_{j=k+1}^{d_{\max}} c_{j2} Y_{t-j} + \sum_{i=1}^{k} \eta_{i1} VR_{t-i} + \sum_{j=k+1}^{d_{\max}} \eta_{j2} VR_{t-j} \\
& + \sum_{i=1}^{k} \delta_{i1} FDR_{t-i} + \sum_{j=k+1}^{d_{\max}} \delta_{j2} FDR_{t-j} + \sum_{i=1}^{k} \pi_{i1} GDP_{t-i} + \sum_{j=k+1}^{d_{\max}} \pi_{j2} GDP_{t-j} \\
& + \sum_{i=1}^{k} \lambda_{i1} BD_{t-i} + \sum_{j=k+1}^{d_{\max}} \lambda_{j2} BD_{t-j} + u_{2t}
\end{aligned}
\tag{3.21}
$$

$$
\begin{aligned}
VR_t = {} & \eta_0 + \sum_{i=1}^{k} \eta_{i1} VR_{t-i} + \sum_{j=k+1}^{d_{\max}} \eta_{j2} VR_{t-j} + \sum_{i=1}^{k} c_{i1} Y_{t-i} + \sum_{j=k+1}^{d_{\max}} c_{j2} Y_{t-j} + \sum_{i=1}^{k} \gamma_{i1} R_{t-i} + \sum_{j=k+1}^{d_{\max}} \gamma_{j2} R_{t-j} \\
& + \sum_{i=1}^{k} \delta_{i1} FDR_{t-i} + \sum_{j=k+1}^{d_{\max}} \delta_{j2} FDR_{t-j} + \sum_{i=1}^{k} \pi_{i1} GDP_{t-i} + \sum_{j=k+1}^{d_{\max}} \pi_{j2} GDP_{t-j} \\
& + \sum_{i=1}^{k} \lambda_{i1} BD_{t-i} + \sum_{j=k+1}^{d_{\max}} \lambda_{j2} BD_{t-j} + u_{3t}
\end{aligned}
\tag{3.22}
$$

$$
\begin{aligned}
FDR_t = {} & \delta_0 + \sum_{i=1}^{k} \delta_{i1} FDR_{t-i} + \sum_{j=k+1}^{d_{\max}} \delta_{j2} FDR_{t-j} + \sum_{i=1}^{k} c_{i1} Y_{t-i} + \sum_{j=k+1}^{d_{\max}} c_{j2} Y_{t-j} + \sum_{i=1}^{k} \gamma_{i1} R_{t-i} + \sum_{j=k+1}^{d_{\max}} \gamma_{j2} R_{t-j} \\
& + \sum_{i=1}^{k} \eta_{i1} VR_{t-i} + \sum_{j=k+1}^{d_{\max}} \eta_{j2} VR_{t-j} + \sum_{i=1}^{k} \pi_{i1} GDP_{t-i} + \sum_{j=k+1}^{d_{\max}} \pi_{j2} GDP_{t-j} \\
& + \sum_{i=1}^{k} \lambda_{i1} BD_{t-i} + \sum_{j=k+1}^{d_{\max}} \lambda_{j2} BD_{t-j} + u_{4t}
\end{aligned}
\tag{3.23}
$$

$$
\begin{aligned}
GDP_t = {} & \pi_0 + \sum_{i=1}^{k} \pi_{1i} GDP_{t-i} + \sum_{j=k+1}^{d_{\max}} \pi_{2j} GDP_{t-j} + \sum_{i=1}^{k} c_{1i} Y_{t-i} + \sum_{j=k+1}^{d_{\max}} c_{2j} Y_{t-j} + \sum_{i=1}^{k} \gamma_{1i} R_{t-i} + \sum_{j=k+1}^{d_{\max}} \gamma_{2j} R_{t-j} \\
& + \sum_{i=1}^{k} \eta_{1i} VR_{t-i} + \sum_{j=k+1}^{d_{\max}} \eta_{2j} VR_{t-j} + \sum_{i=1}^{k} \delta_{1i} FDR_{t-i} + \sum_{j=k+1}^{d_{\max}} \delta_{2j} FDR_{t-j} \\
& + \sum_{i=1}^{k} \lambda_{1i} BD_{t-i} + \sum_{j=k+1}^{d_{\max}} \lambda_{2j} BD_{t-j} + u_{5t}
\end{aligned}
\tag{3.24}
$$

$$BD_t = \lambda_0 + \sum_{i=1}^{k} \lambda_{1i} BD_{t-i} + \sum_{j=k+1}^{d_{\max}} \lambda_{2j} BD_{t-j} + \sum_{i=1}^{k} c_{1i} Y_{t-i} + \sum_{j=k+1}^{d_{\max}} c_{2j} Y_{t-j} + \sum_{i=1}^{k} \gamma_{1i} R_{t-i} + \sum_{j=k+1}^{d_{\max}} \gamma_{2j} R_{t-j}$$
$$+ \sum_{i=1}^{k} \eta_{1i} VR_{t-i} + \sum_{j=k+1}^{d_{\max}} \eta_{2j} VR_{t-j} + \sum_{i=1}^{k} \delta_{1i} FDR_{t-i} + \sum_{j=k+1}^{d_{\max}} \delta_{2j} FDR_{t-j} \tag{3.25}$$
$$+ \sum_{i=1}^{k} \pi_{1i} GDP_{t-i} + \sum_{j=k+1}^{d_{\max}} \pi_{2j} GDP_{t-j} + u_{6t}$$

where Y_t is the BSD indicator as defined previously. In Equation (3.20) the null hypothesis is the series R_t, VR_t, FDR_t, GDP_t, and BD_t Granger causes Y_t. In Equation (3.21) the null hypothesis is the series Y_t, VR_t, FDR_t, GDP_t, and BD_t Granger causes R_t etc. For which the H_0 hypotheses are shown in Equations (3.26) – (3.29).

$$H_{0,1}: \gamma_{1i} \neq 0, \eta_{1i} \neq 0, \delta_{1i} \neq 0, \pi_{11} \neq 0, \lambda_{1i} \neq 0 \tag{3.26}$$

$$H_{0,2}: c_{1i} \neq 0, \eta_{1i} \neq 0, \delta_{1i} \neq 0, \pi_{1i} \neq 0, \lambda_{1i} \neq 0 \tag{3.27}$$

$$H_{0,3}: \gamma_{1i} \neq 0, c_{1i} \neq 0, \delta_{1i} \neq 0, \pi_{1i} \neq 0, \lambda_{1i} \neq 0 \tag{3.28}$$

$$H_{0,4}: \gamma_{1i} \neq 0, \eta_{1i} \neq 0, c_{1i} \neq 0, \pi_{1i} \neq 0, \lambda_{1i} \neq 0 \tag{3.29}$$

$$H_{0,5}: \gamma_{1i} \neq 0, \eta_{1i} \neq 0, \delta_{1i} \neq 0, c_{1i} \neq 0, \lambda_{1i} \neq 0 \tag{3.30}$$

$$H_{0,6}: \gamma_{1i} \neq 0, \eta_{1i} \neq 0, \delta_{1i} \neq 0, \pi_{1i} \neq 0, c_{1i} \neq 0 \qquad (3.29)$$

Chapter 4

EMPIRICAL FINDINGS

4.1 Unit Root Results

The purpose of unit root testing is to ascertain that none of the variables were integrated of order two and that the regressand was integrated of order one. If all interesting variables found to be stationary at their levels, then standard estimation methods can be applied and there is no need to employ bounds testing approach. Table 4.1 gives the statistics of the ADF unit root tests for all variables, and for each sampled countries. According to the ADF statistics, the "*Index*", *PC, LL, BM, BD*, and *GDP* are found to be first-order stationary series. In other words, the "*Index*", *PC*, *LL*, *BM*, *BD*, and *GDP* series are found to be nonstationary at their levels, but they become stationary at their first differences. In contrast, the ADF statistics of *R*, *VR*, and *FDR* indicate that the series are stationary at the level form. In summary, the adopted unit root test results showed that all series might be $I(0)$ or $I(1)$ but none of them is $I(2)$. Given the evidence of mixed order of integration, one can proceeds to investigate the existence of a long-run levels relationship using the bounds testing approach. However, Perron (1989) stress that the results of conventional unit root tests might be biased if the time series data involve some structural breaks. Therefore, the modified ADF test has been applied as a robustness test for the conventional ADF test, the modified version of the ADF test takes in account single break point. The results of unit root tests with a breakpoint are strongly consistent with the conventional version and the results are reported in Appendix D.

Table 4.1: The ADF test statistics for unit root testing.

Country	Test statistics (Levels)			Test statistics (First Differences)		
Algeria	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-0.74	-1.60	-1.63	-3.62**	-3.58**	-3.64***
PC	-0.91	-1.28	0.21	-4.79***	-4.73***	-4.77***
LL	-1.10	-1.82	0.21	-4.29***	-3.98***	-4.04***
BM	-1.09	-1.14	0.38	-4.50***	-4.51***	-4.56***
R	-2.21	-2.06	-1.88*	-5.45***	-5.53***	-5.60***
VR	-3.97**	-3.77***	-2.44**	-6.52***	-6.61***	-6.69***
FDR	-5.82***	-3.44**	-2.14**	-4.89***	-4.80***	-5.30***
GDP	-0.66	-0.35	1.01	-3.29*	-3.08**	-2.91***
BD	-2.00	-2.04	0.47	-3.62**	-3.68***	-3.72***
Indonesia	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-1.95	-2.48	-2.28**	-3.36*	-2.88*	-2.82***
PC	-2.24	-2.36	0.30	-4.14**	-4.09***	-4.09***
LL	-1.43	-2.34	0.51	-3.72**	-2.77*	-2.70***
BM	-1.76	-2.39	0.68	-3.79**	-3.07**	-2.95***
R	-4.52***	-4.42***	-3.62***	-6.65***	-6.57***	-6.67***
VR	-3.81**	-3.83***	-2.74***	-5.84***	-5.92***	-6.02***
FDR	-3.27*	-1.41	-1.93*	-5.35***	-5.49***	-5.30***
GDP	-2.02	-0.39	2.86	-4.26***	-4.34***	-2.91***
BD	-1.90	-3.15**	0.87	-4.39***	-2.89*	-2.58**
Korea	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-1.90	0.40	0.17	-3.43*	-3.31**	-2.50**
PC	-1.87	-0.54	1.74	-4.10**	-4.17***	-3.62***
LL	-1.03	1.12	1.33	-6.56***	-0.77	-0.22
BM	-1.88	-0.40	1.70	-4.31***	-4.37***	-3.85***
R	-5.93***	-4.40***	-1.69*	-5.83***	-5.93***	-6.01***
VR	-3.86**	-3.81***	-3.12***	-6.92***	-6.88***	-6.87***
FDR	-5.82***	-1.41	-1.93*	-5.35***	-5.49***	-5.30***
GDP	-0.74	-4.04***	3.17	-5.62***	-4.28***	-1.24
BD	-1.80	0.69	1.68	-2.70	-2.40	-1.82*
Malaysia	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-2.99	-2.52	1.51	-5.07***	-5.11***	-2.78***
PC	-2.36	-1.66	1.14	-4.81***	-5.36***	-5.27***
LL	-2.85	-2.83*	0.65	-4.89***	-4.96***	0.77
BM	-2.88	-2.28	0.47	-5.46***	-5.55***	0.47
R	-3.96**	-2.65*	-1.75*	-6.03***	-6.01***	-1.49
VR	-4.90***	-4.89***	-1.48	-6.30***	-6.42***	-2.58**
FDR	-5.82***	-1.41	-1.93*	-5.35***	-5.49***	-3.09***
GDP	-2.20	-0.51	5.23	-4.74***	-4.81***	5.23
BD	-2.85	-2.62*	0.66	-4.92***	-4.99***	0.79
Mexico	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-2.37	-2.21	-0.52	-4.85***	-4.78***	-4.85***
PC	-2.91	-1.88	-0.01	-5.77***	-5.74***	-5.83***
LL	-1.83	-1.61	-0.06	-3.89**	-3.91***	-3.98***
BM	-2.87	-1.67	0.26	-5.43***	-6.81***	-6.89***
R	-5.18***	-4.26***	-2.14**	-5.29***	-5.29***	-5.31***
VR	-4.88***	-2.29	-1.83*	-9.20***	-9.31***	-9.46***
FDR	-3.21	-1.98	-3.09***	-3.80**	-3.81***	-3.52***

GDP	-2.52	-0.44	1.19	-6.11***	-5.89***	-5.84***
BD	-1.86	-1.40	0.12	-4.08**	-4.09***	-4.15***
Philippines	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-2.45	-1.02	-1.04	-4.16***	-4.16***	-3.94***
PC	-2.98	-1.92	-0.02	-3.65***	-3.65***	-3.70***
LL	-2.04	-1.04	1.78	-3.12**	-3.12**	-2.38***
BM	-1.94	-1.23	2.01	-6.59***	-6.59***	-5.80***
R	-1.96	-3.24**	-2.04**	-7.72***	-7.72***	-7.85***
VR	-3.80**	-1.94	-1.40	-5.22***	-5.22***	-4.66***
FDR	-3.21	-1.98	-3.09***	-3.81***	-3.81**	-3.52***
GDP	-1.53	0.89	1.04	-2.88*	-2.88*	-2.69***
BD	-2.11	-0.92	1.62	-2.96**	-2.96**	-2.32**
South Africa	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-1.64	-0.47	-0.52	-5.65***	-5.74***	-0.52
PC	-1.56	-2.23	1.01	-6.91***	-6.91***	1.01
LL	-2.03	-0.49	-1.10	-4.50***	-4.48***	-1.10
BM	-2.01	-0.91	0.64	-4.09**	-4.12***	0.64
R	-5.14***	-5.24***	-5.28***	-6.95***	-7.08***	-7.20***
VR	-3.77**	-3.04**	-2.47**	-6.32***	-6.42***	-6.52***
FDR	-5.82***	-1.40	-1.93*	-5.34***	-5.49***	-5.30***
GDP	-2.13	-0.90	0.20	-3.72**	-3.76***	0.20
BD	-2.61	-1.28	0.72	-3.96**	-3.97***	0.72
Thailand	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-1.05	-1.20	-0.69	-3.65**	-3.11**	-2.52**
PC	-2.30	-2.43	0.69	-5.06***	-2.87*	-2.44**
LL	-2.23	-2.61	1.42	-3.67**	-3.25**	-2.76***
BM	-2.09	-2.79*	3.59	-4.61***	-4.10***	-2.35**
R	-6.31***	-1.99	-1.53	-5.18***	-5.85***	-5.97***
VR	-3.57**	-3.50**	-2.83***	-8.08***	-8.07***	-8.05***
FDR	-3.21	-1.98	-3.09***	-3.80**	-3.81***	-3.52***
GDP	-1.72	-1.50	2.11	-3.35*	-3.16**	-2.11**
BD	-2.72	-2.51	1.57	-3.49*	-3.18**	-2.54**
Turkey	τ_T	τ_μ	τ	τ_T	τ_μ	τ
Index	-1.80	-0.28	-0.41	-5.36***	-6.17***	-1.06
PC	-0.37	0.71	2.12	-4.66***	-4.42***	-4.20***
LL	-2.45	-0.63	2.12	-5.94***	-6.03***	-5.39***
BM	0.93	1.43	2.04	-4.79***	-8.40***	-7.74***
R	-4.10**	-3.52**	-3.40***	-8.98***	-9.42***	-9.67***
VR	-3.69**	-3.54**	-3.25***	-8.40***	-7.99***	-7.83***
FDR	-3.21	-1.98	-3.09***	-3.80***	-3.81***	-3.52***
GDP	-3.24*	-0.59	3.53	-6.37***	-6.48***	-4.81***
BD	-2.72	-0.96	2.48	-5.49***	-5.58***	-4.89***

"Index", *PC*, *LL*, *BM*, *R*, *VR*, *FDR*, *GDP*, and *BD* are as defined in Table 3.1. τ_T, τ_μ, and τ represent the ADF models with a drift and trend, with a drift and without trend, and without a drift and trend, respectively. ***, ** and * denote the rejection of the null hypothesis at the 1%, 5%, and 10% levels, respectively. The lag lengths have been determined by SBC, not presented to save space.

4.2 Bounds Testing Results

The bounds test of Equation (3.15) was estimated under three different scenarios. These include (i) unrestricted intercept and restricted trends (F_{IV}); (ii) unrestricted intercept and trends (F_V); and (iii), unrestricted intercept and no trends (F_{III}). In other words, the intercept values were unrestricted in all of the scenarios ($a_0 \neq 0$), (refer to Pesaran et al., 2001, pp 295-296). The calculated *F*-statistics, *t*-statistics, and their corresponding critical values are presented in panel A and B of Table 4.2. The *F*-statistics which indicate the possibility or impossibility of rejecting the null hypothesis of no level relationships are indicated for the three scenarios such that. The notation (a) indicates the test statistic lies below the corresponding critical value of lower bound, which means that there is not enough evidence for the existing of a level relationship among the variables since one cannot reject the H_0 and thus there is no need to estimate an ARDL level relationship model. The notation (b) indicates the test statistic lies within upper and lower bounds which mean that the result is inconclusive and knowing the integration order of the variables is needed before estimating the level relationship model. Finally, (c) shows that the test statistic lies above the upper bound critical values, at least for one of the bounds test scenarios, which provides strong evidence for an existing level relationship among the variables since the null hypothesis of no level relationship is rejected. Thus, proceeding to estimate the ARDL level relationship is possible. The results presented in Table 4.2 revealed that for each country there is at least one of the BSD indicators (*Index, PC*, *LL*, and *BM*) that has a level relationship with the explanatory variables (*R*, *VR*, *FDR*, *GDP*, and *BD*). For example, all of the BSD indicators (*Index*, *PC*, *LL*, and *BM*) of Algeria, Indonesia, Malaysia, Philippines, and Turkey have a level relationship with the explanatory variables (*R*, *VR*, *FDR*, *GDP*, and *BD*) since the H_0 of no level relationship is rejected for at least one of the bounds test scenarios (F_{IV}, F_V, and F_{III}). In contrast, for South Africa, there was only one of the BSD indicators that had a level relationship with the explanatory variables which is *LL* since the null hypothesis of no level relationship is rejected at all scenarios (F_{IV}, F_V, and F_{III}) of bounds tests. The results of Table 4.2 are considered as permission to estimate the level relationship model of Equation (3.18) for each variable that affirms the existence of a level relationship with the determinants. The results of the bounds *t*-test allow trend restrictions to be imposed into the model if the *t*-statistics denoted as t_v observed to be significant (see, Pesaran et al., 2001, p 312). It is worth noting here that the BSD index which is created by the PCA has a level relationship with the explanatory variables in all of the sampled countries except South Africa. Based on this, one may conclude that the created "*Index"* is a suitable measure for the BSD compared to the individual measures.

Table 4.2: The bounds test statistics and the corresponding critical values.

Panel A: *F*- and *t*-statistics for testing the existence of a level relationship.

			With Deterministic Trends			Without Deterministic Trends		Is the H_0 Rejected?
Country	BSDIs	*P*	F_{IV}	F_V	t_V	F_{III}	t_{III}	
Algeria	*Index*	1^S	41.111^c	50.350^c	-12.084^c	43.408^c	-11.053^c	*YES*
		2^A	41.879^c	52.293^c	-12.637^c	33.914^c	-10.093^c	
	PC	$1^†$	7.988^c	8.125^c	-4.427^b	9.942^c	-4.645^c	*YES*
	LL	$2^†$	79.649^c	98.434^c	-17.474^c	59.825^c	-13.529^c	*YES*
	BM	1^S	30.207^c	37.608^c	-10.541^c	38.999^c	-10.753^c	*YES*
		2^A	32.777^c	40.971^c	-11.067^c	36.778^c	-10.534^c	
Indonesia	*Index*	$2^†$	12.934^c	16.069^c	-6.530^c	7.914^c	-4.267^c	*YES*
	PC	$2^†$	5.126^c	6.058^c	-2.770^a	5.761^c	-3.003^b	*YES*
	LL	$1^†$	46.623^c	48.016^c	-11.943^c	59.75^c	-12.956^c	*YES*
	BM	1^S	32.273^c	37.962^c	-9.642^c	41.925^c	-10.052^c	*YES*

		2^{A}	24.456[c]	30.528[c]	-8.092[c]	32.026[c]	-8.404[c]	
Korea	*Index*	$1^{\dagger}$	6.337[c]	6.672[c]	-3.320[a]	7.736[c]	-4.391[c]	*YES*
	PC	$1^{\dagger}$	2.160[a]	2.687[a]	-0.369[a]	1.730[a]	-1.811[a]	*NO*
	LL	$1^{\dagger}$	19.345[c]	20.391[c]	-8.191[c]	25.151[c]	-8.453[c]	*YES*
	BM	$1^{\dagger}$	2.659[a]	2.969[a]	-0.739[a]	2.307[a]	-1.919[a]	*NO*
Malaysia	*Index*	$2^{\dagger}$	60.160[c]	64.006[c]	-15.122[c]	25.230[c]	-9.276[c]	*YES*
	PC	$2^{\dagger}$	6.942[c]	7.296[c]	-4.928[c]	2.744[a]	-2.514[a]	*YES*
	LL	1^{S}	38.989[c]	43.211[c]	-8.328[c]	34.199[c]	-6.082[c]	*YES*
		2^{A}	43.469[c]	40.994[c]	-7.522[c]	34.107[c]	-5.965[c]	
	BM	$1^{\dagger}$	70.289[c]	84.143[c]	-17.825[c]	66.133[c]	-16.013[c]	*YES*
Mexico	*Index*	$2^{\dagger}$	10.207[c]	12.743[c]	-3.872[b]	10.887[c]	-4.934[c]	*YES*
	PC	1^{S}	0.393[a]	0.480[a]	-1.086[a]	0.470[a]	-1.225[a]	*NO*
		2^{A}	1.354[a]	1.661[a]	-1.893[a]	1.600[a]	-2.135[a]	
	LL	$2^{\dagger}$	50.195[c]	62.303[c]	-9.710[c]	73.624[c]	-14.235[c]	*YES*
	BM	1^{S}	4.738[c]	5.829[c]	-1.376[a]	6.110[c]	-1.358[a]	*YES*
		2^{A}	3.430[b]	4.095[b]	-1.258[a]	4.111[b]	-1.002[a]	
Philippines	*Index*	$1^{\dagger}$	25.640[c]	29.888[c]	-8.284[c]	7.165[c]	-3.472[b]	*YES*
	PC	$1^{\dagger}$	11.307[c]	12.622[c]	-5.150[c]	3.822[b]	-1.482[a]	*YES*
	LL	$2^{\dagger}$	66.977[c]	82.645[c]	-17.148[c]	78.789[c]	-17.174[c]	*YES*
	BM	1^{S}	7.413[c]	9.043[c]	-4.317[b]	9.507[c]	-4.754[c]	*YES*
		2^{A}	9.160[c]	11.056[c]	-5.352[c]	10.258[c]	-5.238[c]	
South Africa	*Index*	$1^{\dagger}$	0.890[a]	1.112[a]	-1.853[a]	1.145[a]	-1.955[a]	*NO*
	PC	$1^{\dagger}$	3.849[b]	3.937[b]	-3.886[b]	3.939[b]	-3.680[b]	*NO*
	LL	$1^{\dagger}$	9.367[c]	9.705[c]	-5.907[c]	11.733[c]	-6.312[c]	*YES*
	BM	1^{S}	3.859[b]	4.786[b]	-3.778[b]	3.993[b]	-3.420[b]	*NO*
		2^{A}	3.004[a]	3.687[b]	-3.265[a]	2.605[a]	-2.905[b]	
Thailand	*Index*	$1^{\dagger}$	8.125[c]	9.248[c]	-3.299[a]	0.099[a]	-0.175[a]	*YES*
	PC	$1^{\dagger}$	9.566[c]	11.920[c]	-1.443[a]	8.217[c]	1.280[a]	*YES*
	LL	$2^{\dagger}$	19.665[c]	23.897[c]	-9.673[c]	8.733[c]	-5.745[c]	*YES*

	BM	*1*[†]	2.936[a]	3.229[a]	-2.429[a]	3.234[b]	-2.082[a]	*NO*
Turkey	*Index*	*2*[†]	12.000[c]	12.285[c]	-6.522[c]	15.833[c]	-6.791[c]	*YES*
	PC	*2*[†]	4.193[b]	4.724[b]	-3.623[b]	5.485[c]	-3.725[b]	*YES*
	LL	*1*[†]	26.438[c]	45.730[c]	-22.716[c]	63.240[c]	-23.844[c]	*YES*
	BM	*2*[†]	13.630[c]	13.406[c]	-6.790[c]	17.293[c]	-6.931[c]	*YES*

Panel B: Corresponding Critical Values for the bounds testing at a significant level of 0.05.

K = 5	F_{IV}	F_V	t_v	F_{III}	t_{III}
I (0)	3.353	3.673	-3.41	3.037	-2.86
I (1)	4.500	5.002	-4.52	4.443	-4.19

Notes: F_{IV}, F_V and F_{III} represent the *F*-statistics of the model with unrestricted intercepts and restricted trends, unrestricted intercepts and trends, and unrestricted intercepts and no trends, respectively. t_V and t_{III} are the *t*-ratios used to test $\theta_1 = 0$ with and without a deterministic linear trend in Equation (3.18). a, b and c indicate that the statistic lies below the lower bound, within the upper and lower bounds, and above the upper bound at a significance level of 0.05, respectively. *A*, *S*, and *†* represent the optimum lag selection (*P*) according to AIC, SBC, and both together, respectively. *K* is the number of regressors within the ARDL model. The critical values of panel B as taken from Narayan (2005) for *F*-statistics and Pesaran et al. (2001) for *t*-ratios.

4.3 Long-term Dynamic Relationship Estimations

Based on the outcomes of the bounds test we proceed to estimate the long-term level relationship model under the ARDL approach of Equation (3.19) for each one of the BSD indicators that has a level relationship with the regressors (*R*, *VR*, *FDR*, *GDP*, and *BD*) and for each country, separately. The outcomes of the level relationship were presented in Table 4.3. The estimated value of $\hat{\gamma}_1$, the coefficient of *R*, reflects the relationship between real-deposit interest rate and each of the BSD indicators. The nature of this relationship strongly depends on the used BSD measure which shows varying results in the direction of the impact. The negative and significant relationships between the real-deposit rate and the BSD have been observed in Malaysia when the *BM* was the BSD indicator and in Turkey when the "*Index*", *PC*, and *BM* were the BSD indicators. However, for Algeria and Turkey the estimated coefficients of *R* when the *LL* was the dependent variable are observed to be positive and significant at 5% level of significance, but negligibly small. For Indonesia, the estimated $\hat{\gamma}_1$ is also positive when the *PC* was used as an indicator of the BSD, but it was marginally significant.

Regarding the relationship between the interest rate volatility and the BSD indicators, the results are based on the estimated values of $\hat{\gamma}_2$. The empirical findings provide evidence for a negative and significant relationship between at least one of the BSD measures and interest rate volatility for Indonesia, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey. In other words, the BSD affected negatively by interest rate volatility in all of the sampled countries except Algeria and Korea. The high negative impacts of interest rate volatility on the BSD indicators are observed in Indonesia, Thailand, and Malaysia, respectively. For instance, in Indonesia, the estimated value of $\hat{\gamma}_2$ was -0.255 and statically significant at a significance level of 0.05 when the "*Index*" used as an indicator of the BSD. This implies that 1% increase in interest rate volatility led to 25.5% fall in the level of the BSD. Also, it should be noted that the impact of interest rate volatility is the lowest for Mexico and South Africa.

In terms of spillover impacts of the U.S. monetary policy on the BSD of emerging countries which can be observed by the estimated value of $\hat{\gamma}_3$, the coefficient of *FDR* in Equation (3.18). The results of column 6 in Table 4.3 revealed negative spillover impacts of the U.S. monetary policy in two-thirds of the sampled countries that includes Algeria, Indonesia, Korea, Thailand, Malaysia, and Turkey. These results are strongly compatible with saying that "*when the US sneezes, the emerging markets catch a cold*". The high negative spillover impacts were in cases of Turkey and

Thailand, with the estimated values of $\hat{\gamma}_3$ as -0.153 and -0.109, respectively. For instance, any 1% increase in the U.S. policy rate lead to 15.3% fall in the size of the private credits provided by the banking sector of Turkey, thus fall in the degree of BSD in this country. In the same logic, any 1% change in the U.S. policy rate could lead to 10.9% change in the level of the BSD of Thailand in opposite direction. The BSD indicators of Mexico, Philippines, and South Africa are evidenced to be insensitive to the U.S. monetary policy changes.

The relationship between the BSD indicators and EG, measured by *GDP*, can be observed by the value of $\hat{\gamma}_4$ in Equation (3.18). As clearly shown in Table 4.3 the estimated coefficient of the *GDP* was positive and statistically significant for the majority of the sampled countries, namely Algeria, Indonesia, Korea, Malaysia, Mexico, Philippines, Thailand, and Turkey. In other words, the results of Table 4.3 provide evidence for a positive relationship between the BSD indicators and EG in all of the sampled countries except South Africa. For instance, in case of Turkey, the magnitude of the estimated value of $\hat{\gamma}_4$ was 8.065 which is relatively high, this value is recorded when the "*Index*" used as a measure of BSD. In contrast, the lowest positive value of $\hat{\gamma}_4$ recorded to be 0.067 in case of Korea when the *LL* was the dependent variable. Significance and large positive values for $\hat{\gamma}_4$ indicate a high sensitivity of the BSD to the economic growth. This implies that the degree of the BSD is elastic and very responsive to the changes in the level of EG in the emerging economies. The results of the relationship between the BSD and EG are in support with the findings of the FD literature.

In the context of the relationship between the banking deposits, as a control variable, and the BSD indicators can be revealed by the estimated values of $\hat{\gamma}_5$ in Equation

(3.18). The last column in Table 4.3 showed that 23 out of 29 estimated models revealed that the relationship between the various used BSD indicators and the *BD* is positive and highly significant in all these models. In other words, the estimated models provide a strong evidence for a positive association among the BSD processes and the size of the banking deposit in all of the sampled countries except Thailand. The highest estimated coefficient is recorded to be 7.055 in case of Malaysia when the "*Index*" was the BSD indicator, while the lowest value was 0.597 in case of Philippines when the *BM* was the dependent variable.

The variation in the empirical results may be partially attributed to the association between the used indicators and the characteristics of their respective countries. These characteristics include differences in the banking sector structure and/or the banking regulations. Beck et al. (2010) have illustrated that most of the cross-country studies are subject to biases and variations in empirical findings. The reasons of these variations might be because of the differences in the accounting standards, as well as the differences in the degrees of measurement quality among the countries. In addition to that, use different gauges, function form, and econometric technique lead also to ambiguous results.

Table 4.3: Dynamic long-term relationship estimations under the ARDL approach.

BSDIs	$\widehat{c_0}$	$\widehat{\gamma_1}$	$\widehat{\gamma_2}$	$\widehat{\gamma_3}$	$\widehat{\gamma_4}$	$\widehat{\gamma_5}$
Algeria						
Index	-81.770*	0.082	0.331	-0.065	7.955	4.779***
	(1.958)	(0.964)	(1.323)	(0.444)	(1.378)	(2.958)
PC	-22.677***	0.011	0.120***	0.105***	1.854*	2.778***
	(3.336)	(1.314)	(3.285)	(3.451)	(1.885)	(7.885)
LL	-6.228***	0.005**	0.018**	-0.030***	0.960***	0.754***
	(3.14)	(2.106)	(2.145)	(3.130)	(3.582)	(7.995)
BM	-6.622**	0.005	0.002	-0.019*	1.026**	0.710***
	(2.541)	(1.489)	(0.391)	(1.819)	(2.743)	(6.082)
Indonesia						
Index	-7.269	0.002	-0.255**	0.020	-0.686	3.884***
	(0.775)	(0.040)	(2.101)	(0.175)	(0.542)	(6.922)
PC	-20.195***	0.049***	-0.049*	0.099***	3.163***	0.108
	(5.184)	(4.392)	(1.815)	(3.271)	(5.547)	(0.605)
LL	1.514***	-0.001	-0.001	0.006	-0.179***	0.988***
	(4.351)	(0.666)	(0.550)	(1.465)	(3.812)	(28.725)
BM	1.415***	0.001	-0.002	-0.011***	-0.107	0.856***
	(2.944)	(0.872)	(1.291)	(3.483)	(1.469)	(40.133)
Korea						
Index	-19.657**	0.019	0.051	-0.092**	0.403	3.990***
	(2.120)	(0.556)	(1.311)	(2.079)	(0.439)	(7.282)
LL	1.045***	0.002	0.005**	-0.005	0.067***	0.888***
	(4.664)	(1.612)	(2.625)	(0.046)	(2.885)	(50.355)
Malaysia						
Index	-75.256***	0.062	-0.139**	-0.074**	5.330***	7.055***
	(9.688)	(1.416)	(2.487)	(2.222)	(6.328)	(16.876)
PC	-18.273***	0.045	0.065	-0.054***	2.563***	0.526
	(2.835)	(1.473)	(0.858)	(2.467)	(3.473)	(1.451)
LL	-1.668	0.027	0.068	-0.023	0.252	0.935***
	(0.490)	(0.689)	(0.661)	(0.764)	(0.617)	(9.167)
BM	-1.993**	-0.007**	0.005	-0.003	0.301***	0.942***
	(2.268)	(2.077)	(0.052)	(0.875)	(2.929)	(26.893)
Mexico						
Index	-60.594**	0.007	-0.005	-0.063	5.810*	3.010***
	(2.371)	(0.730)	(0.237)	(1.065)	(1.949)	(4.460)
LL	-0.606	0.000	-0.005**	0.002	0.185	0.732***
	(0.243)	(0.010)	(2.146)	(0.240)	(0.637)	(11.359)
BM	-46.877***	0.008	0.017	-0.022	5.541***	0.374
	(2.895)	(0.945)	(1.350)	(0.535)	(2.971)	(1.034)
Philippines						
Index	-40.568***	-0.005	-0.027**	0.008	2.652***	6.492***
	(10.810)	(0.645)	(2.061)	(0.415)	(6.170)	(19.243)
PC	-18.644***	-0.001	-0.018**	-0.002	2.040***	2.446***
	(6.428)	(0.216)	(1.956)	(0.136)	(6.164)	(9.142)
LL	0.868	0.001	-0.007**	0.003	-0.063	0.906***
	(1.484)	(0.406)	(2.531)	(0.947)	(0.998)	(16.023)
BM	3.105***	-0.002	-0.009**	0.006	-0.231*	0.597***
	(2.889)	(0.786)	(2.339)	(1.218)	(1.894)	(6.034)
South Africa						
LL	1.099**	0.000	-0.006**	0.003	-0.083	0.877***
	(2.332)	(0.269)	(2.585)	(0.836)	(1.468)	(23.770)
Thailand						
Index	-37.730***	-0.042	-0.271	-0.107	5.340***	-0.362
	(6.814)	(0.732)	(1.520)	(1.281)	(3.573)	(0.130)
PC	-11.994***	-0.025	-0.243*	-0.109**	3.811***	-2.594
	(3.598)	(0.987)	(1.958)	(2.725)	(3.821)	(1.632)

LL	4.785	-0.027	-0.476	0.060	-0.699	1.257
	(0.306)	(0.257)	(0.277)	(0.297)	(0.316)	(0.942)
Turkey						
Index	-87.860***	-0.040***	-0.074***	-0.153**	8.065***	6.944***
	(3.716)	(3.125)	(3.409)	(2. 207)	(2.941)	(8.406)
PC	-27.017*	-0.042***	-0.081***	-0.090**	2.536**	3.135***
	(1.723)	(3.720)	(3.765)	(2.210)	(2.360)	(5.233)
LL	-1.973	0.002**	0.005	-0.005	0.273	0.950***
	(0.961)	(2.078)	(1.644)	(0.785)	(1.142)	(14.09)
BM	-2.079	-0.006**	-0.004	-0.012	0.349	0.862***
	(0.482)	(2.116)	(0.946)	(0.995)	(0.694)	(5.562)

Notes: $\hat{c}_0$ is a constant. $\hat{\gamma}_1$, $\hat{\gamma}_2$, $\hat{\gamma}_3$, $\hat{\gamma}_4$ and $\hat{\gamma}_5$ are the coefficients of *R*, *VR*, *FDR*, *GDP* and *BD* in Equation (3.18), respectively. ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. Absolute *t*-statistics are presented between the parentheses. The *PC*, *LL*, *BM*, *BD*, and *GDP* are in their natural logarithmic forms.

4.4 Short-term Dynamic Relationship Estimations

The estimates for the short-term dynamic relationship between the BSD indicators and *R*, *VR*, and *FDR* are reported in Table 4.4. Here the interest is about the estimated values of $\hat{\vartheta}_3$ $\hat{\vartheta}_4$, $\hat{\vartheta}_5$ the coefficient of *R*, *VR*, and *FDR* respectively in the CECM of Equation (3.19). The results of Table 4.4 provide mixed evidence regarding the relationship between real-time deposits rate and the BSD indicators in the short-term. The negative values of $\hat{\vartheta}_3$ are observed in Indonesia and Malaysia when the "*Index*" and *BM* were the dependent variables. In Turkey, the negative $\hat{\vartheta}_3$ is recorded when the *PC* was used as an indicator of the BSD. Some other positive values of $\hat{\vartheta}_3$ have been shown, but in general the values were very low. These results are in line with the long-term estimations that revealed unclear in the role of real time deposit interest rate in the BSD processes. The outcomes provide strong evidence for the negative association between BSD indicators and local interest rate volatility in the short-run for all sampled countries except Korea. The short-term spillover impacts of the U.S. policy rate on the BSD indicators are observed to be negative in four countries, namely Algeria, Korea, Malaysia, and Thailand.

Moreover, the last column in Table 4.4 presents the estimated error correction term (ECT), one period lag of the u_{t-1}, in Equation (3.19). As clearly shown the estimated values of the ECT were negative and statistically highly significant in all the estimated models. The negative and statistically significant ECT coefficients provide, even more, evidence of long-term feedback amongst the variables that were presented in Equation (3.1). In addition, the estimated values of $\hat{\vartheta}_5$, the coefficient of the ECT (u_{t-1}) in Equation (3.19), is recorded to be between -1 and -2 in four cases. These are in Indonesia when the *BM* was the BSD indicator, in Korea when the *LL* is the BSD indicator and for Malaysia when the "*Index*" and the *BM* were the dependent variables. It is interesting to provide an interpretation of those values which indicate that the ECTs produce dampened movements in the equilibrium path of the banking development. In other words, instead of the directly monotonically converging to the equilibrium path of the BSD, the error correction process fluctuates around the long-run equilibrium in a dampening way, or it suggests oscillatory convergence (see Loayza and Ranciere 2005; Narayan and Smyth 2006). On the other hand, the majority of the remaining ECT estimations have relatively small negative values. The small magnitude of the estimated ECT indicates sluggishness in the converging system; the BSD needs a longer period to reach steady status. In contrast, some of the estimated ECT coefficients observed to be relatively high (more than 0.50 in absolute value). Those values of ECT indicate that the BSD process converges to its long-term equilibrium path by a relatively high speed of adjustment through the channels of determinants variables (see, Katircioglu, 2010; Katircioglu et al., 2014). For example, in case of Algeria when the *PC* was the BSD indicator, the value of ECT indicates the BSD process converges to its long-term equilibrium path by 96% speed of adjustment through the channels of the determinants variables.

While in Malaysia when the *LL* used as a BSD indicator the convergence process was by 11.5% speed of adjustment.

It is noticeable that high values of estimated ECT have been recorded, mostly, in those cases when the impacts of local interest rate volatility and/or spillover effects were insignificant. The variation in the estimated values of ECT could be attributed to the dissimilarity in the direction of the impact of the explanatory variables. More clearly, there are negative impacts for both local and international interest rate changes, but the impacts of economic growth and bank deposits are positive which could be the reason of the observed variation in estimated values of ECTs. In sum, the empirical findings of ECM application evidenced the damaging role of both local interest rate volatility and spillover effects of the U.S. monetary policy on the BSD process in developing markets.

Table 4.4: Dynamic Short-term relationship estimations under the ARDL approach.

Country	BSDIs	ΔR_t	ΔR_{t-1}	ΔVR_t	ΔVR_{t-1}	ΔFED_t	ECT_{t-1}
Algeria	*Index*	-0.004		-0.048***		-0.009	-0.123***
		(0.956)		(5.310)		(0.721)	(6.408)
	PC	-0.010		-0.077***		0.035*	-0.960***
		(1.401)		(4.957)		(1.780)	(8.455)
	LL	0.004***		0.001	-0.011***	-0.017***	-0.542***
		(4.379)		(0.250)	(5.842)	(6.184)	(9.257)
	BM	0.002		0.003		-0.013**	-0.651***
		(1.365)		(1.043)		(2.590)	(4.771)
Indonesia	*Index*	-0.008**		-0.008		0.072***	-0.439***
		(2.560)		(1.635)		(6.581)	(11.281)
	PC	-0.001		-0.005	0.010**	0.045***	-0.394***
		(0.566)		(1.630)	(2.697)	(5.297)	(10.655)
	LL	-0.003		-0.004		0.003	-0.553***
		(0.580)		(0.442)		(1.428)	(4.125)
	BM	-0.001*		-0.002**		0.010***	-1.005***
		(1.979)		(2.177)		(4.461)	(7.914)
Korea	*Index*	0.010		0.033**		-0.026*	-0.495***
		(0.117)		(2.067)		(1.863)	(7.050)
	LL	0.002		0.003		-0.001	-1.663***
		(0.102)		(0.119)		(0.690)	(15.776)

Malaysia	*Index*	-0.023	-0.083**	-0.190***		-0.087**	-1.121***
		(0.912)	(2.089)	(3.268)		(2.270)	(5.458)
	PC	0.013**		0.002		-0.014**	-0.378***
		(2.521)		(0.193)		(2.330)	(5.850)
	LL	0.004***		0.002		-0.002**	-0.115***
		(4.375)		(1.228)		(2.176)	(5.538)
	BM	-0.016***		0.002		0.001	-1.878***
		(3.621)		(0.200)		(0.166)	(13.686)
Mexico	*Index*	0.005		0.021***		0.005	-0.701***
		(1.274)		(3.342)		(0.163)	(5.527)
	LL	0.002	-0.006**	-2.708***		0.005	-0.301***
		(1.390)	(2.708)	(3.567)		(0.338)	(3.621)
	BM	0.003		0.012***		-0.016	-0.584***
		(1.609)		(3.982)		(1.038)	(4.825)
Philippines	*Index*	-0.006		-0.030**		0.017	-0.939***
		(0.935)		(2.449)		(0.909)	(4.406)
	PC	0.002		-0.011*		0.003	-0.695***
		(0.056)		(2.024)		(0.349)	(5.047)
	LL	0.006		0.001*	-0.002***	0.010	-0.349***
		(1.426)		(1.919)	(3.682)	(1.125)	(5.092)
	BM	-0.002		-0.009***		0.007	-0.905***
		(1.128)		(2.798)		(1.367)	(5.192)
South Africa	*LL*	0.004		0.009	-0.002***	0.008	-0.351***
		(1.074)		1.520	(3.487)	(0.923)	(5.220)
Thailand	*Index*	0.002	-0.014***	-0.035***		-0.024**	-0.249***
		(0.405)	(2.834)	(3.022)		(2.556)	(7.500)
	PC	0.001		-0.025***		-0.017***	-0.179***
		(0.531)		(4.732)		(4.293)	(10.079)
	LL	-0.004		-0.006***		-0.001	-0.155***
		(0.898)		(4.683)		(1.648)	(7.961)
Turkey	*Index*	-0.002		-0.025***		-0.015	-0.350***
		(0.539)		(3.582)		(0.789)	(5.401)
	PC	-0.005***		-0.022***		-0.006	-0.258***
		(3.289)		(6.383)		(0.661)	(7.232)
	LL	0.006***		0.007**	0.001***	0.004***	-0.292***
		(3.570)		(2.748)	(3.062)	(3.390)	(5.057)
	BM	-0.009		-0.001		-0.004	-0.628***
		(1.032)		(0.831)		(0.681)	(4.554)

Notes: *ECT* is estimated coefficient of the error correction term, (u_{t-1}), in Equation (3.19). ***, ** and * denote the significance level of 0.01, 0.05 and 0.10, respectively. Absolute *t*-statistics are presented between the parentheses. The *PC*, *LL*, *BM*, *BD*, and *GDP* are in their natural logarithmic forms.

4.5 Causality Analysis Results

The outcomes of the causality analysis of Toda and Yamamoto (1995) tests that were presented in Equations (3.20) – (3.25) have been presented in Table 4.5. These results provide a comprehensive picture for the existence of any causal relationships among the considered variables and about the directions of these relationships. The results of Table 4.5 provide evidence for a set of unidirectional causal relationship among the variables as follow: (1) from "*Index*" towards: *R* for Algeria and Philippines; *VR* only in Philippines; *FDR* only in Indonesia; BD in Malaysia; (2) from *PC* towards: *R* in cases of Algeria and Mexico; *FDR* only for Indonesia; *GDP* only for Mexico; *BD* in Mexico; (3) from *LL* towards: *R* in Algeria; *VR* in Korea and Turkey; *FDR* in Korea, Philippines, and Thailand; GDP in case of Algeria; (4) from *BM* towards: *R* in Philippines; *VR* in Algeria and Philippines; *FDR* in Thailand; GDP only for Philippines; BD in both Malaysia and Thailand; (5) from *R* towards: "*Index*" in Thailand; *PC* for Indonesia and Malaysia; *LL* for Mexico and Turkey; *BM* in case of Thailand; *VR* in Indonesia and Malaysia; GDP for Malaysia, Thailand, and Turkey; BD in cases of Mexico, Thailand, and Turkey; (6) from *VR* towards: "*Index*" only in Mexico; *PC* in cases of Algeria, Indonesia, South Africa, and Turkey; *LL* only in Mexico; *BM* in Korea and Mexico; *R* in cases of Algeria and South Africa; *FDR* for Algeria, Mexico, and Thailand; *GDP* in cases of Philippines and Turkey; *BD* in Mexico; (7) from *FDR* towards: "*Index*" in Korea, Philippines, and South Africa; *PC* in Korea, Malaysia, Mexico, South Africa, and Thailand; *LL* in cases of Indonesia and Turkey; *BM* in Indonesia, Korea, Mexico, and South Africa; *R* for Philippines and South Africa; *VR* in case of Malaysia; *GDP* only in South Africa; *BD* in Mexico and Turkey; (8) from *GDP* towards: "*Index*" in Malaysia, Mexico, and Thailand; *PC* in cases of Indonesia, Malaysia, Thailand, and Turkey; *BM* in both

Korea and South Africa; *VR* in cases of Indonesia, Malaysia, and Mexico; *FDR* in Korea and Malaysia; *BD* in Malaysia and South Africa; (9) from *BD* towards: "*Index*" for Korea and South Africa; *PC* only in Thailand; *LL* in Indonesia and Korea; *BM* only in Philippines; *R* in Algeria, Indonesia, and Philippines; *VR* in cases of Korea, Philippines, and Turkey; *FDR* in Korea, Malaysia, and Thailand; *GDP* in cases of Algeria and Turkey.

Table 4.5: The MWALD statistics of Toda-Yamamoto approach.

ALGERIA						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		1.338	0.562	0.398	0.295	1.308
		[0.512]	[0.754]	[0.819]	[0.862]	[0.519]
R	14.636***		10.171***	9.090**	2.480	19.238***
	[0.000]		[0.006]	[0.010]	[0.289]	[0.000]
VR	0.688	0.666		1.278	5.634*	0.716
	[0.708]	[0.716]		[0.527]	[0.059]	[0.698]
FDR	4.383	3.042	10.969***		8.016**	3.862
	[0.111]	[0.218]	[0.004]		[0.018]	[0.145]
GDP	0.360	0.557	4.332	1.162		0.315
	[0.835]	[0.756]	[0.114]	[0.559]		[0.853]
BD	0.020	1.215	0.412	1.625	0.576	
	[0.989]	[0.544]	[0.813]	[0.443]	[0.749]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		3.952	6.762**	0.769	0.809	3.907
		[0.138]	[0.034]	[0.680]	[0.667]	[0.141]
R	5.781*		3.898	2.517	0.003	7.121**
	[0.055]		[0.142]	[0.284]	[0.998]	[0.028]
VR	0.158	0.734		1.591	3.606	2.711
	[0.924]	[0.692]		[0.451]	[0.164]	[0.257]
FDR	2.656	6.675**	10.099***		7.025**	1.181
	[0.265]	[0.035]	[0.006]		[0.029]	[0.553]
GDP	1.189	1.229	5.110*	0.953		2.504
	[0.551]	[0.540]	[0.077]	[0.620]		[0.285]
BD	4.159	1.771	5.815*	1.543	0.351	
	[0.125]	[0.412]	[0.054]	[0.462]	[0.838]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		0.045	0.338	0.370	0.491	1.877
		[0.977]	[0.844]	[0.830]	[0.782]	[0.391]
R	5.758*		2.773	1.286	0.013	3.680
	[0.056]		[0.249]	[0.525]	[0.993]	[0.158]
VR	1.499	0.956		1.043	2.550	1.602
	[0.472]	[0.619]		[0.593]	[0.279]	[0.448]
FDR	1.099	5.638*	9.016**		4.369	1.238
	[0.577]	[0.059]	[0.011]		[0.112]	[0.538]
GDP	10.224***	3.431	3.632	5.669*		11.092***
	[0.006]	[0.179]	[0.162]	[0.058]		[0.003]
BD	1.701	0.248	0.942	0.797	0.818	
	[0.427]	[0.883]	[0.624]	[0.671]	[0.664]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		3.081	1.571	3.041	0.558	3.489
		[0.214]	[0.455]	[0.218]	[0.756]	[0.174]
R	3.643		2.563	0.543	0.384	0.905
	[0.161]		[0.277]	[0.762]	[0.825]	[0.636]
VR	5.130*	0.858		4.043	8.502**	7.009**
	[0.076]	[0.651]		[0.132]	[0.014]	[0.030]
FDR	0.341	5.411*	8.733**		5.603*	0.476
	[0.842]	[0.066]	[0.012]		[0.060]	[0.788]
GDP	0.354	0.210	2.378	0.266		0.369
	[0.837]	[0.900]	[0.304]	[0.875]		[0.831]
BD	2.720	2.014	1.847	0.743	0.153	
	[0.256]	[0.365]	[0.396]	[0.689]	[0.926]	
	[0.006]	[0.916]	[0.823]	[0.318]	[0.043]	
INDONESIA						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		0.970	2.555	1.554	1.283	1.569
		[0.615]	[0.278]	[0.459]	[0.526]	[0.456]
R	3.525		0.715	0.132	5.617*	5.318*
	[0.171]		[0.699]	[0.935]	[0.060]	[0.070]
VR	3.242	5.848*		2.944	6.482**	3.251
	[0.197]	[0.053]		[0.229]	[0.039]	[0.196]

FDR	8.848**	0.058	6.161**		14.874***	9.078**
	[0.012]	[0.971]	[0.045]		[0.000]	[0.010]
GDP	1.271	8.514**	0.004	2.841		1.661
	[0.529]	[0.014]	[0.999]	[0.241]		[0.435]
BD	0.273	0.679	0.328	3.275	0.418	
	[0.872]	[0.711]	[0.848]	[0.194]	[0.811]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		6.907**	9.340***	0.488	12.799***	2.959
		[0.031]	[0.009]	[0.783]	[0.001]	[0.227]
R	2.847		1.022	0.292	7.177**	5.126*
	[0.240]		[0.599]	[0.864]	[0.027]	[0.077]
VR	2.336	5.374*		4.237	7.538**	1.453
	[0.311]	[0.068]		[0.120]	[0.023]	[0.483]
FDR	7.343**	0.021	5.559*		14.360***	5.837*
	[0.025]	[0.989]	[0.062]		[0.000]	[0.054]
GDP	1.320	8.339**	0.068	2.427		1.534
	[0.516]	[0.015]	[0.966]	[0.297]		[0.464]
BD	0.504	1.372	0.012	4.951*	0.247	
	[0.777]	[0.503]	[0.993]	[0.084]	[0.883]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		0.348	2.219	13.170***	0.315	10.749***
		[0.839]	[0.329]	[0.001]	[0.854]	[0.004]
R	0.793		1.117	4.540	3.306	4.340
	[0.672]		[0.572]	[0.103]	[0.191]	[0.114]
VR	2.595	3.317		10.594***	4.586	2.668
	[0.273]	[0.190]		[0.005]	[0.100]	[0.263]
FDR	1.415	1.109	0.761		1.438	1.261
	[0.492]	[0.574]	[0.683]		[0.487]	[0.532]
GDP	3.778	8.784	0.506	5.344*		4.308
	[0.151]	[0.012]	[0.776]	[0.069]		[0.116]
BD	2.956	0.970	0.367	9.121**	0.262	
	[0.228]	[0.615]	[0.832]	[0.010]	[0.876]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		1.574	0.007	9.181**	0.149	4.498
		[0.455]	[0.996]	[0.010]	[0.928]	[0.105]
R	0.216		2.940	0.722	4.612	0.866
	[0.897]		[0.229]	[0.697]	[0.099]	[0.648]
VR	0.490	2.077		7.347**	3.893	0.978
	[0.782]	[0.353]		[0.025]	[0.142]	[0.613]
FDR	0.188	0.921	1.236		0.849	0.138
	[0.910]	[0.630]	[0.538]		[0.653]	[0.933]
GDP	0.783	6.318**	0.695	6.209**		1.181
	[0.675]	[0.042]	[0.706]	[0.044]		[0.554]
BD	1.420	2.244	0.337	7.565**	2.049	
	[0.491]	[0.325]	[0.844]	[0.022]	[0.358]	
KOREA						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		3.199	1.455	12.076***	3.170	22.735***
		[0.201]	[0.482]	[0.002]	[0.204]	[0.000]
R	2.996		2.218	2.881	0.897	2.592
	[0.223]		[0.329]	[0.236]	[0.638]	[0.273]
VR	0.464	1.112		2.047	0.387	0.444
	[0.792]	[0.573]		[0.359]	[0.823]	[0.800]
FDR	2.683	1.102	1.855		6.645**	0.851
	[0.261]	[0.576]	[0.395]		[0.036]	[0.653]
GDP	1.147	0.293	2.561	1.769		1.401
	[0.563]	[0.863]	[0.277]	[0.412]		[0.496]
BD	2.074	2.534	2.723	1.892	2.398	
	[0.354]	[0.281]	[0.256]	[0.388]	[0.301]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		4.608*	1.009	23.894***	4.248	1.379
		[0.099]	[0.603]	[0.000]	[0.119]	[0.501]

R	1.122		2.419	1.910	0.678	0.841
	[0.570]		[0.298]	[0.384]	[0.712]	[0.656]
VR	0.160	1.011		1.724	0.728	0.695
	[0.922]	[0.603]		[0.422]	[0.694]	[0.706]
FDR	2.613	0.729	2.065		5.864*	1.214
	[0.270]	[0.694]	[0.356]		[0.053]	[0.544]
GDP	0.670	0.353	3.175	1.686		0.614
	[0.715]	[0.838]	[0.204]	[0.430]		[0.735]
BD	1.328	1.731	3.888	1.656	1.584	
	[0.514]	[0.420]	[0.143]	[0.436]	[0.452]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		0.348	3.751	1.155	3.835	74.634***
		[0.840]	[0.153]	[0.561]	[0.146]	[0.000]
R	3.016		0.279	1.275	2.799	0.267
	[0.221]		[0.869]	[0.528]	[0.246]	[0.875]
VR	6.482**	3.252		3.413	0.592	6.964**
	[0.039]	[0.196]		[0.181]	[0.743]	[0.030]
FDR	5.663*	1.104	0.541		5.316*	5.711*
	[0.058]	[0.575]	[0.762]		[0.070]	[0.057]
GDP	2.419	0.920	3.409	3.044		1.300
	[0.298]	[0.631]	[0.181]	[0.218]		[0.521]
BD	2.783	0.477	2.717	0.564	4.364	
	[0.248]	[0.787]	[0.256]	[0.754]	[0.112]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		3.497	4.801*	7.415**	5.343*	0.683
		[0.174]	[0.090]	[0.024]	[0.069]	[0.710]
R	3.875		1.815	2.486	0.505	2.234
	[0.144]		[0.403]	[0.288]	[0.776]	[0.327]
VR	0.569	1.086		2.230	0.404	0.544
	[0.752]	[0.580]		[0.327]	[0.817]	[0.761]
FDR	1.962	0.953	1.766		6.004**	1.887
	[0.374]	[0.620]	[0.413]		[0.049]	[0.389]
GDP	1.445	0.311	2.301	1.464		1.072
	[0.485]	[0.855]	[0.316]	[0.480]		[0.585]
BD	1.499	2.298	2.312	1.105	1.866	
	[0.472]	[0.316]	[0.314]	[0.575]	[0.393]	
MALAYSIA						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		2.930	1.229	2.758	4.920*	2.495
		[0.231]	[0.540]	[0.251]	[0.085]	[0.287]
R	0.687		0.090	0.450	0.704	0.277
	[0.709]		[0.955]	[0.798]	[0.702]	[0.870]
VR	1.551	8.951**		2.628	4.659*	2.642
	[0.460]	[0.011]		[0.268]	[0.097]	[0.266]
FDR	0.330	2.274	1.550		1.861	0.665
	[0.847]	[0.320]	[0.460]		[0.394]	[0.717]
GDP	0.197	10.883***	2.964	1.463		0.622
	[0.905]	[0.004]	[0.227]	[0.481]		[0.732]
BD	10.909***	1.886	0.586	1.995	5.382*	
	[0.004]	[0.389]	[0.745]	[0.368]	[0.067]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		2.547	2.615	5.209*	7.714***	5.430*
		[0.279]	[0.270]	[0.073]	[0.021]	[0.066]
R	1.457		0.354	0.401	0.592	0.446
	[0.482]		[0.837]	[0.818]	[0.743]	[0.800]
VR	0.405	8.551**		2.410	4.397	1.868
	[0.816]	[0.013]		[0.299]	[0.110]	[0.392]
FDR	0.380	2.433	0.464		1.222	0.092
	[0.826]	[0.296]	[0.792]		[0.542]	[0.954]
GDP	1.167	11.761***	3.784	1.711		2.784
	[0.557]	[0.002]	[0.150]	[0.425]		[0.248]
BD	8.963**	3.393	1.460	2.509	4.906*	

	[0.011]	[0.183]	[0.481]	[0.285]	[0.086]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		3.585 [0.166]	2.090 [0.351]	1.270 [0.529]	3.788 [0.150]	1.304 [0.520]
R	0.488 [0.783]		0.366 [0.832]	0.572 [0.751]	0.164 [0.921]	0.419 [0.810]
VR	1.381 [0.501]	9.358*** [0.009]		4.775* [0.091]	7.529** [0.023]	1.761 [0.414]
FDR	0.742 [0.690]	3.646 [0.161]	2.908 [0.233]		2.795 [0.247]	0.597 [0.741]
GDP	0.802 [0.669]	13.382*** [0.001]	2.483 [0.288]	0.900 [0.637]		1.033 [0.596]
BD	1.341 [0.511]	3.133 [0.208]	1.736 [0.419]	1.006 [0.604]	3.149 [0.207]	
Model D	BM	R	VR	FDR	GDP	BD
BM		1.784 [0.409]	0.525 [0.769]	1.084 [0.581]	0.560 [0.755]	0.446 [0.799]
R	0.710 [0.701]		0.099 [0.951]	0.494 [0.780]	1.194 [0.550]	1.397 [0.497]
VR	0.090 [0.955]	7.862** [0.019]		0.216 [0.897]	1.306 [0.520]	0.820 [0.663]
FDR	4.570 [0.101]	0.293 [0.863]	0.628 [0.730]		5.474* [0.064]	5.347* [0.069]
GDP	0.106 [0.948]	12.47*** [0.002]	3.743 [0.153]	0.690 [0.708]		0.002 [0.998]
BD	8.278** [0.015]	2.072 [0.354]	0.691 [0.707]	0.607 [0.738]	3.345 [0.187]	
MEXICO						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		14.279*** [0.000]	5.571* [0.061]	3.239 [0.197]	6.903** [0.031]	2.105 [0.349]
R	11.025*** [0.004]		19.605*** [0.000]	2.194 [0.333]	3.818 [0.148]	2.367 [0.306]
VR	0.980 [0.612]	16.669*** [0.000]		1.018 [0.600]	10.623*** [0.004]	0.626 [0.731]
FDR	2.559 [0.278]	8.360** [0.015]	5.740* [0.056]		0.096 [0.953]	2.028 [0.362]
GDP	3.791 [0.150]	0.548 [0.760]	1.421 [0.491]	0.719 [0.697]		5.712* [0.057]
BD	3.253 [0.196]	23.656*** [0.000]	11.954*** [0.002]	4.492 [0.105]	6.665** [0.035]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		3.197 [0.202]	1.447 [0.484]	5.709* [0.057]	5.582* [0.061]	1.422 [0.491]
R	11.934*** [0.002]		36.610*** [0.000]	5.077* [0.079]	6.841** [0.032]	3.312 [0.190]
VR	1.385 [0.500]	33.520*** [0.000]		2.233 [0.327]	6.249*** [0.043]	7.436** [0.024]
FDR	4.466 [0.107]	7.442** [0.024]	8.075** [0.017]		0.484 [0.784]	0.520 [0.770]
GDP	10.519*** [0.005]	2.440 [0.295]	4.005 [0.134]	3.090 [0.213]		10.463*** [0.005]
BD	4.652* [0.097]	17.478*** [0.000]	3.525 [0.171]	3.021 [0.220]	10.118*** [0.006]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		9.393*** [0.009]	7.172** [0.027]	2.951 [0.228]	2.738 [0.254]	0.393 [0.821]
R	4.167 [0.124]		22.387*** [0.000]	4.536 [0.103]	0.380 [0.826]	4.481 [0.106]
VR	1.512 [0.469]	15.028*** [0.000]		3.498 [0.173]	16.680*** [0.000]	1.034 [0.596]
FDR	3.001	8.472	5.112*		0.471	2.625

	[0.223]	[0.014]	[0.077]		[0.789]	[0.269]
GDP	0.192	0.135	0.001	0.426		0.254
	[0.908]	[0.934]	[0.999]	[0.807]		[0.880]
BD	0.382	11.247***	9.755***	3.793	1.387	
	[0.825]	[0.003]	[0.007]	[0.150]	[0.499]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		11.700***	7.526**	4.682*	2.099	1.158
		[0.002]	[0.023]	[0.096]	[0.350]	[0.560]
R	5.865*		12.131***	2.584	0.914	1.493
	[0.053]		[0.002]	[0.274]	[0.633]	[0.473]
VR	4.565	8.347**		3.642	16.494***	0.956
	[0.102]	[0.015]		[0.161]	[0.000]	[0.619]
FDR	1.217	5.775*	2.365		0.471	1.095
	[0.543]	[0.055]	[0.306]		[0.790]	[0.578]
GDP	0.259	0.350	0.237	0.778		0.162
	[0.878]	[0.839]	[0.888]	[0.677]		[0.922]
BD	2.646	9.974***	9.096**	7.187**	2.846	
	[0.266]	[0.006]	[0.010]	[0.027]	[0.241]	
PHILIPPINES						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		0.579	1.059	5.874*	4.018	2.022
		[0.748]	[0.588]	[0.053]	[0.134]	[0.363]
R	8.623**		1.046	5.130*	2.535	9.154**
	[0.013]		[0.592]	[0.076]	[0.281]	[0.010]
VR	8.345**	1.048		5.977*	2.319	8.514**
	[0.015]	[0.591]		[0.050]	[0.313]	[0.014]
FDR	3.164	2.509	7.968**		0.650	15.934***
	[0.205]	[0.285]	[0.018]		[0.722]	[0.000]
GDP	1.693	2.622	7.270**	1.707		1.500
	[0.428]	[0.269]	[0.026]	[0.425]		[0.472]
BD	1.685	1.512	0.349	5.266*	1.058	
	[0.430]	[0.469]	[0.839]	[0.071]	[0.588]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		0.484	1.111	3.927	3.138	2.384
		[0.784]	[0.573]	[0.140]	[0.208]	[0.303]
R	2.454		1.047	5.043*	1.479	1.497
	[0.293]		[0.592]	[0.080]	[0.477]	[0.472]
VR	2.618	0.628		6.113**	0.979	1.962
	[0.270]	[0.730]		[0.047]	[0.612]	[0.374]
FDR	3.751	2.020	5.431*		0.255	8.430**
	[0.153]	[0.364]	[0.066]		[0.880]	[0.014]
GDP	0.507	2.310	5.908*	1.995		0.670
	[0.776]	[0.315]	[0.052]	[0.368]		[0.715]
BD	1.618	1.709	0.276	4.378	1.503	
	[0.445]	[0.425]	[0.870]	[0.112]	[0.471]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		1.204	0.034	4.008	0.719	0.193
		[0.547]	[0.983]	[0.134]	[0.697]	[0.907]
R	0.441		0.713	2.773	1.436	0.468
	[0.801]		[0.699]	[0.249]	[0.487]	[0.791]
VR	0.258	0.310		4.002	0.755	0.337
	[0.878]	[0.856]		[0.135]	[0.685]	[0.844]
FDR	7.025**	2.059	2.880		0.892	5.958*
	[0.029]	[0.357]	[0.236]		[0.640]	[0.050]
GDP	0.076	2.384	5.651*	1.281		0.189
	[0.962]	[0.303]	[0.059]	[0.527]		[0.909]
BD	0.516	1.523	0.061	3.288	1.146	
	[0.772]	[0.466]	[0.969]	[0.193]	[0.563]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		0.779	1.218	3.665	2.561	4.607*
		[0.677]	[0.543]	[0.160]	[0.277]	[0.099]
R	9.022**		1.221	3.985	2.821	7.573**

	[0.011]		[0.542]	[0.136]	[0.244]	[0.022]
VR	13.240***	1.877		4.326	2.811	11.245***
	[0.001]	[0.391]		[0.115]	[0.245]	[0.003]
FDR	4.426	2.734	1.816		0.226	1.022
	[0.109]	[0.254]	[0.403]		[0.892]	[[0.599]
GDP	4.671*	2.688	8.007**	1.113		4.024
	[0.096]	[0.260]	[0.018]	[0.572]		[0.133]
BD	2.012	1.830	0.042	1.944	1.978	
	[0.365]	[0.400]	[0.979]	[0.378]	[0.371]	
SOUTH AFRICA						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		2.416	1.364	8.370**	7.317**	10.97***
		[0.298]	[0.505]	[0.015]	[0.025]	[0.004]
R	2.005		5.839*	3.709	0.161	0.225
	[0.366]		[0.054]	[0.156]	[0.922]	[0.893]
VR	0.109	0.283		0.676	0.272	0.540
	[0.946]	[0.867]		[0.713]	[0.872]	[0.763]
FDR	1.270	0.479	1.524		0.326	0.504
	[0.529]	[0.786]	[0.466]		[0.849]	[0.776]
GDP	9.493***	3.051	0.673	3.123		1.337
	[0.008]	[0.217]	[0.714]	[0.209]		[0.512]
BD	0.629	0.728	0.520	1.113	4.066	
	[0.730]	[0.694]	[0.770]	[0.573]	[0.130]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		0.793	8.714**	10.937***	2.723	2.461
		[0.672]	[0.012]	[0.004]	[0.256]	[0.292]
R	0.117		6.244**	4.876*	0.370	0.005
	[0.942]		[0.044]	[0.087]	[0.830]	[0.997]
VR	0.028	0.752		0.132	0.065	1.336
	[0.986]	[0.686]		[0.935]	[0.968]	[0.512]
FDR	0.462	0.351	2.027		0.410	0.515
	[0.793]	[0.838]	[0.362]		[0.814]	[0.772]
GDP	1.291	1.671	0.348	4.819*		0.659
	[0.524]	[0.433]	[0.840]	[0.089]		[0.719]
BD	1.121	0.265	1.483	0.695	19.170***	
	[0.570]	[0.875]	[0.476]	[0.706]	[0.000]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		2.578	1.880	0.440	6.548**	1.213
		[0.275]	[0.390]	[0.802]	[0.037]	[0.545]
R	1.650		7.057**	4.582	0.818	0.249
	[0.438]		[0.029]	[0.101]	[0.664]	[0.882]
VR	0.499	0.761		0.272	0.250	0.061
	[0.778]	[0.683]		[0.872]	[0.882]	[0.969]
FDR	0.181	0.063	4.189		2.243	0.828
	[0.913]	[0.968]	[0.123]		[0.325]	[0.660]
GDP	8.669**	2.706	1.691	5.384*		3.287
	[0.013]	[0.258]	[0.429]	[0.067]		[0.193]
BD	0.282	0.147	1.776	0.666	7.373**	
	[0.868]	[0.929]	[0.411]	[0.716]	[0.025]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		3.197	0.760	5.237*	19.045***	4.136
		[0.202]	[0.683]	[0.072]	[0.000]	[0.126]
R	0.451		6.383**	6.525**	0.198	1.677
	[0.797]		[0.041]	[0.038]	[0.905]	[0.432]
VR	0.764	0.659	0.228		0.113	0.153
	[0.682]	[0.719]	[0.891]		[0.944]	[0.926]
FDR	2.235	0.312	2.679		0.402	0.094
	[0.327]	[0.855]	[0.261]		[0.817]	[0.953]
GDP	2.429	2.857	0.336	3.491		2.397
	[0.296]	[0.239]	[0.845]	[0.174]		[0.301]
BD	0.192	0.201	1.130	0.654	10.456***	
	[0.908]	[0.904]	[0.568]	[0.720]	[0.005]	

THAILAND						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		5.795*	0.142	2.666	4.969*	3.469
		[0.055]	[0.931]	[0.263]	[0.083]	[0.176]
R	0.357		0.456	0.736	1.993	1.224
	[0.836]		[0.795]	[0.692]	[0.369]	[0.542]
VR	0.095	2.491		1.153	1.635	1.934
	[0.953]	[0.287]		[0.561]	[0.441]	[0.380]
FDR	3.405	13.568***	9.787***		3.345	4.954*
	[0.182]	[0.001]	[0.007]		[0.187]	[0.084]
GDP	1.025	3.782	0.855	0.359		0.129
	[0.598]	[0.150]	[0.651]	[0.835]		[0.937]
BD	4.154	6.458**	0.605	1.920	1.754	
	[0.125]	[0.039]	[0.738]	[0.382]	[0.415]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		0.007	0.742	9.688***	12.104***	9.933***
		[0.996]	[0.689]	[0.007]	[0.002]	[0.007]
R	0.254		0.259	1.270	1.550	1.258
	[0.880]		[0.878]	[0.529]	[0.460]	[0.533]
VR	0.003	1.980		1.190	1.364	3.084
	[0.998]	[0.371]		[0.551]	[0.505]	[0.213]
FDR	0.380	8.098**	5.094*		1.670	3.921
	[0.826]	[0.017]	[0.078]		[0.433]	[0.140]
GDP	0.551	2.282	0.999	0.083		0.756
	[0.759]	[0.319]	[0.606]	[0.958]		[0.685]
BD	0.657	2.326	0.891	0.427	1.204	
	[0.719]	[0.312]	[0.640]	[0.807]	[0.547]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		3.772	0.400	2.105	0.207	0.267
		[0.151]	[0.818]	[0.348]	[0.901]	[0.874]
R	3.839		0.823	3.082	2.461	2.148
	[0.146]		[0.662]	[0.214]	[0.292]	[0.341]
VR	1.282	4.020		0.337	1.076	0.993
	[0.526]	[0.134]		[0.844]	[0.583]	[0.608]
FDR	10.151***	2.753	2.686		3.987	9.616***
	[0.006]	[0.252]	[0.261]		[0.136]	[0.008]
GDP	0.736	5.061*	0.494	1.622		0.937
	[0.692]	[0.079]	[0.781]	[0.444]		[0.625]
BD	0.128	3.042	0.325	2.666	0.177	
	[0.937]	[0.218]	[0.849]	[0.263]	[0.914]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		5.675*	0.188	1.912	0.190	0.963
		[0.058]	[0.910]	[0.384]	[0.909]	[0.617]
R	2.372		0.161	5.825*	2.518	3.631
	[0.305]		[0.922]	[0.054]	[0.283]	[0.162]
VR	0.110	4.167		0.232	0.892	1.555
	[0.946]	[0.124]		[0.890]	[0.640]	[0.459]
FDR	4.696*	2.395	2.420		3.116	2.108
	[0.095]	[0.301]	[0.298]		[0.2106]	[0.348]
GDP	2.927	7.650**	1.236	2.960		0.619
	[0.231]	[0.021]	[0.538]	[0.227]		[0.733]
BD	7.539**	8.175**	3.032	3.410	0.223	
	[0.023]	[0.016]	[0.219]	[0.181]	[0.894]	
TURKEY						
Model A	*Index*	*R*	*VR*	*FDR*	*GDP*	*BD*
Index		1.791	2.291	4.132	1.950	0.190
		[0.408]	[0.318]	[0.126]	[0.377]	[0.909]
R	0.825		1.135	1.869	0.361	0.852
	[0.661]		[0.566]	[0.392]	[0.834]	[0.653]
VR	3.333	0.099		0.002	1.029	1.333
	[0.188]	[0.951]		[0.999]	[0.597]	[0.513]
FDR	0.612	0.408	0.997		1.419	0.929

	[0.736]	[0.815]	[0.607]		[0.491]	[0.628]
GDP	0.103	8.125**	7.586**	3.356		3.047
	[0.949]	[0.017]	[0.022]	[0.186]		[0.217]
BD	0.940	3.958	0.442	4.773*	0.839	
	[0.624]	[0.138]	[0.801]	[0.091]	[0.657]	
Model B	*PC*	*R*	*VR*	*FDR*	*GDP*	*BD*
PC		0.1370	4.860*	2.861	6.086**	1.411
		[0.933]	[0.088]	[0.239]	[0.047]	[0.493]
R	0.570		3.286	1.717	0.561	0.774
	[0.751]		[0.193]	[0.423]	[0.755]	[0.679]
VR	3.180	0.225		0.002	1.119	0.517
	[0.203]	[0.893]		[0.998]	[0.571]	[0.772]
FDR	1.179	0.236	1.316		1.078	1.935
	[0.554]	[0.888]	[0.517]		[0.583]	[0.379]
GDP	0.456	9.201**	8.499**	4.451		9.361***
	[0.795]	[0.010]	[0.014]	[0.108]		[0.009]
BD	0.311	3.744	0.077	4.441	0.417	
	[0.855]	[0.153]	[0.962]	[0.108]	[0.811]	
Model C	*LL*	*R*	*VR*	*FDR*	*GDP*	*BD*
LL		6.335**	0.119	5.985*	0.041	4.896*
		[0.042]	[0.942]	[0.050]	[0.979]	[0.086]
R	0.918		3.834	2.242	0.545	0.550
	[0.631]		[0.147]	[0.325]	[0.761]	[0.759]
VR	9.800***	3.892		2.844	0.902	9.228***
	[0.007]	[0.142]		[0.241]	[0.636]	[0.009]
FDR	2.758	1.061	0.314		1.902	2.827
	[0.251]	[0.588]	[0.854]		[0.386]	[0.243]
GDP	1.946	4.647*	2.695	2.815		1.025
	[0.377]	[0.097]	[0.259]	[0.244]		[0.599]
BD	6.702**	7.061**	0.202	7.861**	0.058	
	[0.035]	[0.029]	[0.903]	[0.019]	[0.971]	
Model D	*BM*	*R*	*VR*	*FDR*	*GDP*	*BD*
BM		2.158	3.453	4.504	2.110	0.620
		[0.339]	[0.177]	[0.105]	[0.348]	[0.733]
R	0.242		1.629	2.046	0.164	0.700
	[0.885]		[0.442]	[0.359]	[0.921]	[0.704]
VR	1.962	0.521		0.020	0.119	0.965
	[0.374]	[0.770]		[0.989]	[0.942]	[0.617]
FDR	0.082	0.351	0.871		1.044	0.584
	[0.959]	[0.839]	[0.646]		[0.593]	[0.746]
GDP	0.036	3.162	2.012	2.006		1.279
	[0.981]	[0.205]	[0.365]	[0.366]		[0.527]
BD	0.740	4.208	1.566	5.861*	1.788	
	[0.690]	[0.122]	[0.456]	[0.053]	[0.408]	

Notes: The *PC*, *LL*, *BM*, *BD*, and *GDP* are in their natural logarithmic forms. *p*-values are presented between brackets. ***, **, and * denote the levels of significance at 0.01, 0.05, and 0.10, respectively. The null hypothesis is that variable *X* (presented in rows) does not cause variable *Y* (presented in columns).

Moreover, the Toda-Yamamoto applications revealed set of bidirectional causal relationships among the variables of the study that make connection between: (1) [*FDR*⇔ *R*] in cases of Algeria, Mexico, and Thailand; (2) [*FDR* ⇔ *GDP*] for Algeria and Indonesia; (3) [*FDR* ⇔ *VR* and *BD*] in Indonesia and Philippines; (4) [*R* ⇔ ”*Index*”, *BM*, and *VR*] in Mexico; (5) [*R* ⇔ *GDP*] in Indonesia; (6) [*VR* ⇔ *GDP* and *BD*] in Algeria; (7) [*GDP* ⇔ “*Index*” and *LL*] in South Africa; (8) [*BD* ⇔ *PC*] in Malaysia; (9) [*BD* ⇔ *LL*] in Turkey; and [*BD* ⇔ *GDP*] in Mexico.

Table 4.6 summarized the causality analysis results. As clearly shown in panel A of Table 4.6 there are causality relationships running from real-time deposit interest rate towards, at least, one of the BSD indicators in cases of Indonesia, Korea, Mexico, Thailand, and Turkey. While the causal impact from *VR* running to at least one of the BSD indicators have been observed in Algeria, Indonesia, Korea, Mexico, South Africa, and Turkey.

The spillover impacts of the U.S. monetary policy on the BSD in emerging markets have been affirmed in all of the sampled countries except Algeria. In other words, there are causal relationships running from the U.S. policy rate towards at least one of the BSD indicators in cases of Indonesia, Korea, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey. In addition, some of the causal associations connect the *FDR* with the *R* and *VR* in the majority of the sampled countries during the period of the study. These results asserted that the spillover effect of the U.S. monetary policy could affect the BSD process in emerging markets through the local interest rate channels. Also, the last two columns of panel B in Table 4.6 showed some significant causal relationship running from *FDR* towards *GDP* and *BD*. Thus, the spillover effect of the U.S. monetary policy could affect the BSD process in emerging markets through the local *GDP* and *BD* channels as well.

Regarding the linkage between the BSD and EG, which have been debated in the literature over time, the results are summarized in panel C of Table 4.6. The unidirectional causality relationships that run from one of the BSD indicators towards EG measure have been observed only in Algeria and Philippines. In contrast, the unidirectional causality that runs from EG, measured by *GDP*, towards at least one of the BSD indicators were shown in cases of Indonesia, Korea, Malaysia, Thailand, and Turkey. The bidirectional causal relationship between the BSD and EG, that running from at least one of the BSD indicator towards *GDP* and vice versa, is confirmed in both Mexico and South Africa.

Table 4.6. Summary of Toda-Yamamoto causality analysis.

Panel A: the causal relationship between *R*, *VR*, and the *BSD* indicators.

Country	*R* ↓↓ *Index*	*R* ↓↓ *PC*	*R* ↓↓ *LL*	*R* ↓↓ *BM*	*VR* ↓↓ *Index*	*VR* ↓↓ *PC*	*VR* ↓↓ *LL*	*VR* ↓↓ *BM*
Algeria						√		
Indonesia		√				√		
Korea		√						√
Malaysia								
Mexico	√		√	√	√		√	√
Philippines								
South Africa						√		

Table 4.6 (continued)

Country	*R* ↓↓ *Index*	*R* ↓↓ *PC*	*R* ↓↓ *LL*	*R* ↓↓ *BM*	*VR* ↓↓ *Index*	*VR* ↓↓ *PC*	*VR* ↓↓ *LL*	*VR* ↓↓ *BM*
Thailand	√			√				
Turkey			√			√		

Panel B: the causal relationship between *FDR* and *R*, *VR*, *GDP*, *BD*, and BSD indicators.

Country	*FDR* ↓↓	*FDR* ↓↓	*FDR* ↓↓	*FDR* ↓↓	*FDR* ↓↓	*FDR* ↓↓	*FDR* ↓↓	*FDR* ↓↓

	Index	*PC*	*LL*	*BM*	*R*	*VR*	*GDP*	*BD*
Algeria					√		√	
Indonesia			√	√		√	√	√
Korea	√	√		√				
Malaysia		√				√		
Mexico		√		√	√			√
Philippines	√					√		√
South Africa	√	√		√	√		√	
Thailand		√			√			
Turkey			√					√

Panel C: the causal relationship between economic growth and BSD indicators.

Country	*GDP* ↓↓ *Index*	*GDP* ↓↓ *PC*	*GDP* ↓↓ *LL*	*GDP* ↓↓ *BM*	*Index* ↓↓ *GDP*	*PC* ↓↓ *GDP*	*LL* ↓↓ *GDP*	*BM* ↓↓ *GDP*
Algeria							√	
Indonesia		√						
Korea				√				
Malaysia	√	√						
Mexico	√					√		
Philippines								√
South Africa	√		√	√			√	
Thailand	√	√						
Turkey		√						

4.6 Diagnostics Tests

The diagnostic tests are highly recommended to test for the adequacy of the estimated models. Table 4.7 represents the test statistics of the selected diagnostic tests. The majority of the test statistics indicate that the residuals of the estimated models are not serially correlated and have a normal distribution. In addition, the Ramsey Regression Equation Specification Error Test (RESET) statistics indicated that the estimated models were well-specified and did not suffer from any misspecification.

Table 4.7: Diagnostics tests for the estimated ARDL models.

	F-stat	R^2	r^2	DW	JB	LM	White	RESET
ALGERIA								
Index	173.351*** (0.000)	0.979	0.973	2.195	1.217 (0.544)	2.260 (0.130)	0.980 (0.492)	0.382 (0.687)
PC	15.667*** (0.000)	0.808	0.757	1.878	0.322 (0.850)	0.065 (0.936)	1.148 (0.376)	1.115 (0.348)
LL	18.274*** (0.000)	0.859	0.812	2.371	0.807 (0.667)	2.256 (0.137)	1.379 (0.257)	2.307 (0.131)
BM	22.895*** (0.000)	0.884	0.846	1.804	0.691 (0.707)	0.524 (0.601)	0.673 (0.757)	0.431 (0.656)
INDONESIA								
Index	73.306*** (0.000)	0.952	0.939	2.049	0.927 (0.628)	1.706 (0.205)	0.851 (0.587)	0.320 (0.729)
PC	40.552*** (0.000)	0.931	0.908	2.070	0.428 (0.807)	1.477 (0.253)	0.614 (0.797)	0.190 (0.667)
LL	64.688*** (0.000)	0.962	0.947	1.508	4.485 (0.106)	1.585 (0.230)	2.097* (0.069)	0.969 (0.336)
BM	50.831*** (0.000)	0.944	0.926	2.505	1.116 (0.572)	0.898 (0.423)	0.492 (0.877)	1.388 (0.251)
KOREA								
Index	17.207*** (0.000)	0.822	0.775	1.783	17.547*** (0.000)	0.886 (0.427)	0.745 (0.677)	0.434 (0.517)
LL	194.467*** (0.000)	0.987	0.982	1.886	0.482 (0.785)	1.131 (0.345)	0.573 (0.846)	0.017 (0.896)
MALAYSIA								
Index	59.395*** (0.000)	0.959	0.943	2.388	0.405 (0.816)	1.455 (0.258)	1.334 (0.273)	0.125 (0.727)
PC	18.215*** (0.000)	0.877	0.829	1.959	0.665 (0.716)	0.300 (0.744)	0.770 (0.673)	0.159 (0.693)
LL	36.147*** (0.000)	0.998	0.997	1.962	0.884 (0.642)	1.113 (0.350)	1.756 (0.128)	1.931 (0.173)
BM	61.457*** (0.000)	0.943	0.928	1.904	1.973 (0.372)	0.823 (0.452)	3.043** (0.014)	6.046** (0.021)
MEXICO								
Index	44.175*** (0.000)	0.922	0.902	2.308	1.278 (0.527)	1.695 (0.207)	1.214 (0.333)	2.428* (0.095)
LL	40.000*** (0.000)	0.994	0.991	2.457	0.073 (0.963)	1.745 (0.205)	1.142 (0.393)	0.037 (0.849)
BM	10.668*** (0.000)	0.781	0.707	2.367	0.453 (0.797)	0.289 (0.752)	1.771 (0.125)	8.005*** (0.003)
PHILIPPINES								
Index	28.361*** (0.000)	0.884	0.853	1.962	2.288 (0.318)	0.328 (0.723)	1.857 (0.116)	1.857 (0.184)
PC	16.468*** (0.000)	0.816	0.766	2.036	1.615 (0.445)	1.075 (0.357)	0.710 (0.680)	0.054 (0.818)
LL	20.520*** (0.000)	0.985	0.980	2.002	1.143 (0.564)	4.860** (0.019)	4.336*** (0.001)	0.936 (0.344)
BM	17.151*** (0.000)	0.822	0.774	2.198	0.588 (0.745)	0.724 (0.495)	0.573 (0.789)	1.559 (0.231)
SOUTH AFRICA								
LL	29.773*** (0.000)	0.985	0.980	2.004	1.516 (0.468)	0.017 (0.898)	3.479*** (0.007)	1.104 (0.305)
THAILAND								
Index	58.153*** (0.000)	0.951	0.935	1.915	1.410 (0.493)	0.311 (0.736)	0.900 (0.562)	2.314 (0.144)

PC	31.650*** (0.000)	0.895	0.867	2.160	1.053 (0.590)	0.515 (0.605)	0.913 (0.544)	0.122 (0.729)
LL	22.560*** (0.000)	0.987	0.984	1.831	2.458 (0.292)	0.407 (0.671)	1.248 (0.316)	2.256 (0.123)
TURKEY								
Index	56.602*** (0.000)	0.950	0.933	2.403	1.531 (0.464)	1.307 (0.267)	0.694 (0.739)	1.499 (0.235)
PC	19.830*** (0.000)	0.869	0.825	2.713	0.858 (0.651)	2.613 (0.122)	1.916* (0.095)	3.006* (0.050)
LL	47.974*** (0.000)	0.995	0.993	2.129	0.541 (0.762)	0.211 (0.812)	1.479 (0.214)	2.535 (0.129)
BM	48.530*** (0.000)	0.942	0.922	2.237	1.042 (0.593)	0.669 (0.423)	0.712 (0.723)	0.221 (0.643)

Notes: The "*Index*", *PC*, *LL*, and *BM* are as defined in Table 3.1. *F-stat* is the *F*-test statistics which are used to assessing the joint significance of the variables in the estimated model (or measures the goodness-of-fit). R^2 and r^2 are the coefficient of determination and the adjusted coefficient of determination, respectively (or *R*-squared and adjusted *R*-squared). The coefficient of determination provides information about the proportion of the variance in the regressand that is explained by the explanatory variable(s). DW is the Durbin-Watson statistic which used to detect the autocorrelation in the residuals. As a rule of thumb if the DW value around 2 that indicates no autocorrelation in the residuals series. JB is Jarque-Bera to test for the normality of the residuals. The null hypothesis of JB test is the residuals are normally distributed. LM is Breusch-Godfrey to test for the serial correlation in the residuals series. White is the test if heteroscedasticity in the residuals of the regression analysis. RESET is Ramsey regression estimation specification error test. The purpose of this test to testing whether there exist some significant nonlinear combinations among the explanatory variables when you have used linear models. *P*-values are presented between parentheses. ***, **, and * denote the levels of significance at 0.01, 0.05, and 0.10, respectively**.**

4.7 Stability Checking

The stability tests of the estimated long-term parameters are required, especially in case of possible structural breaks due to the crisis. Pesaran et al. (2001) suggest checking for the stability of the estimated ARDL model by employing the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) tests of Brown et al. (1975). These tests are presented in Figures 1 and 2, respectively. As shown clearly in Figure 1, the plot of the CUSUM tests does not cross the 5% critical bound in the majority of the estimated models except model C in case of Algeria, model A in case of Malaysia, and model D for Mexico. While the CUSUMSQ tests of Figure 2 have crossed the critical bounds only in model C in cases of Indonesia, Korea, and Thailand. These results can be considered as an evidence of the stability of most of the long-term coefficients in the estimated ARDL models. Thus, the ARDL models do not suffer from any systematic or structural instability over the sample period of the study.

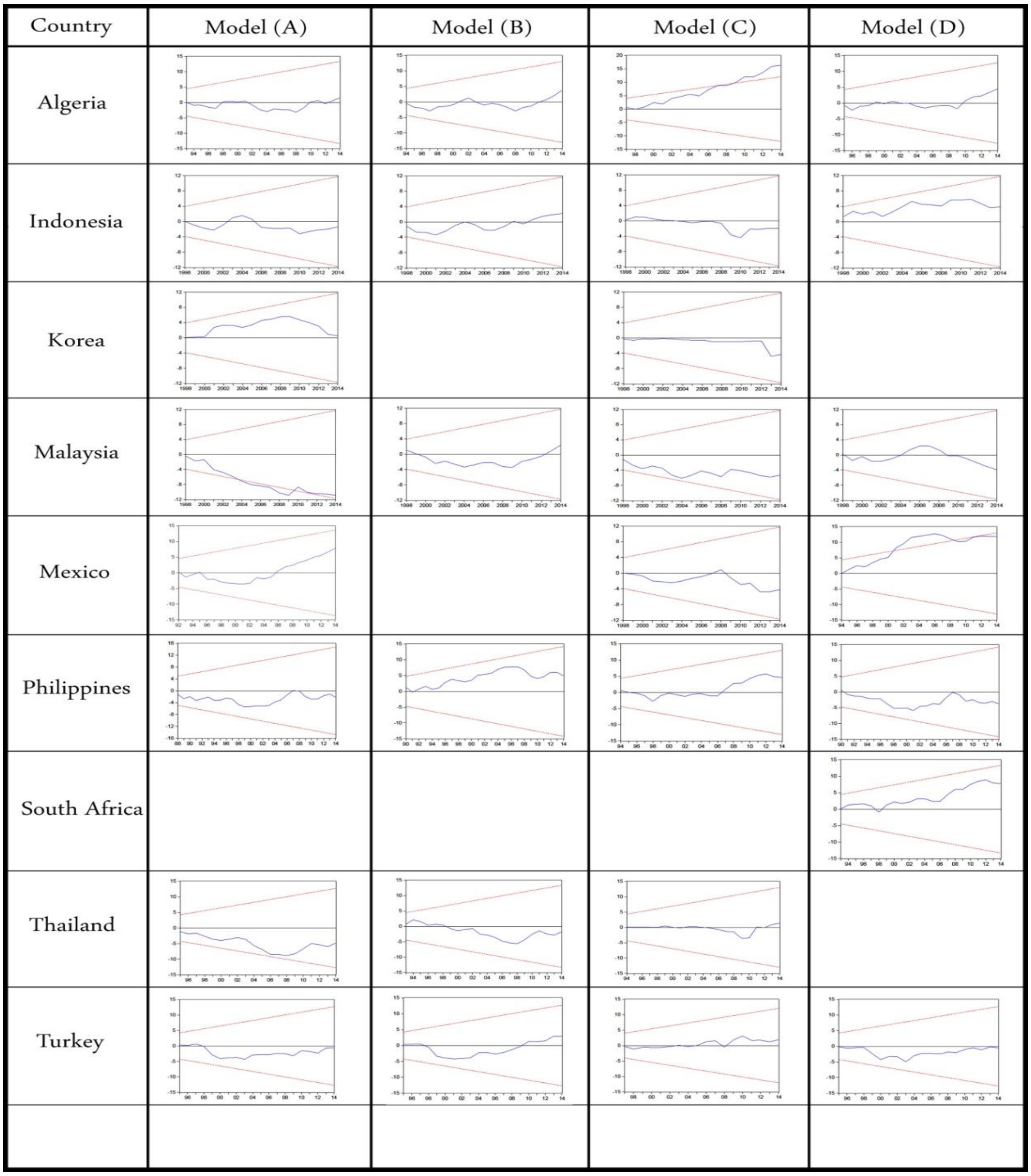

Figure 4.1. The CUSUMS test plots for the estimated ARDL models

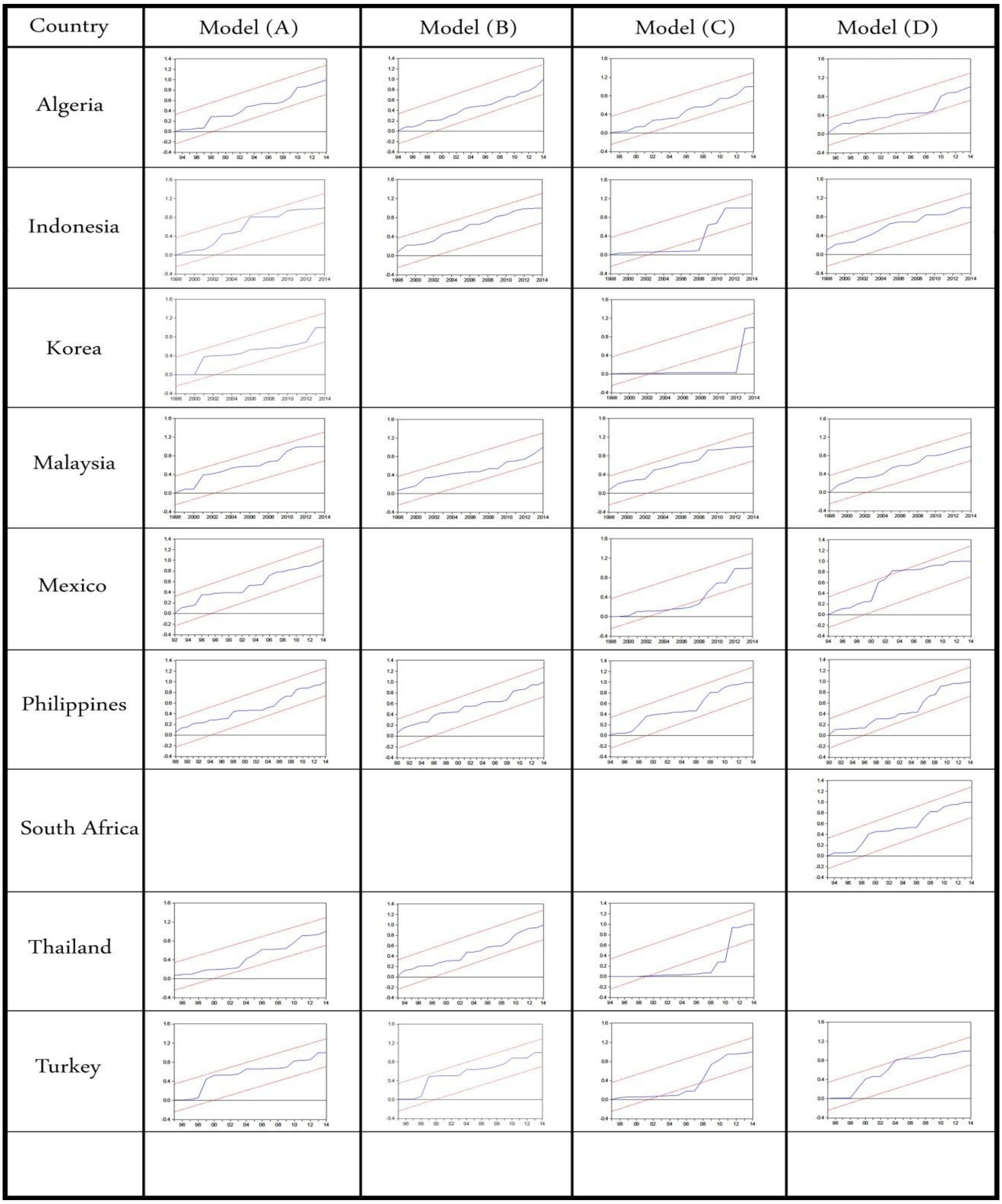

Figure 4.2. The CUSUMSEQ test plots for the estimated ARDL models

Chapter 5

CONCLUDING REMARKS

The major purpose of the thesis is to investigate the dynamic impact of local interest rate volatility and the U.S. policy rate on the BSD of emerging markets. The sample involves nine emerging countries, namely Algeria, Indonesia, Korea, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey during the period of 1980-2014. The bounds testing within the ARDL approach of Pesaran et al. (2001) and the causality analysis technique of Toda and Yamamoto (1995) are applied to answer the main questions of the study.

The empirical outcomes of bounds tests application revealed that for each country there are one or more of the BSD indicators (*Index*, *PC*, *LL*, and *BM*) that have a level relationship with the explanatory variables (*R*, *VR*, *FDR*, *GDP*, and *BD*). In other words, the null hypothesis of no level relationship has been rejected at least one time for each country. This result considered as permission to estimate the ARDL long-term relationship model for each variable that affirmed the existence of a level relationship with the determinants.

In the context of the relationship between real-time deposit interest rate and BSD indicators, the outcomes of the estimated ARDL models showed varying results about the sign of the impact. Indeed, the nature of this relationship strongly depends on the particular measure of the BSD that has been used in the analysis. For example, the negative and significant relationships between the local real-time deposit rate and

BSD have been observed in Malaysia when the *BM* was the BSD indicator and in Turkey when the "*Index*", *PC,* and *BM* were the BSD indicators. This result is in line with some previous work in the literature that found negative impact of real interest rate on the financial development (among others Williamson, 1987; Warman and Thirwal, 1994; Fry, 1997; Levine, 1997; Demirgüç-Kunt and Detragiache, 1998; Hellmann et al., 2000). However, for Algeria and Turkey, the estimated coefficients of *R* when the *LL* was the dependent variable are observed to be positive and significant, but negligibly small. For Indonesia, the relationship is also positive when the *PC* was used as an indicator of BSD, but it was marginally significant. In general, the positive relationship can be described by the theoretical suggestions of McKinnon (1973) and Shaw (1973). For the rest of the cases, the majority of the estimated models indicate the impact of real interest rate to be statistically insignificant; these results are consistent with some of the previous empirical findings (for instance, Jalil et al., 2009). In sum, the long-term relationship between real deposit rate and BSD are observed to be ambiguous in the majority of the sampled countries.

Regarding the impact of local interest rate volatility on the BSD, the empirical findings provide evidence for a negative significant relationship between at least one of the BSD measures for Indonesia, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey. In other words, the BSD of emerging markets observed to be vulnerable to local interest rate risk in all of the sampled countries except Algeria and Korea. Relatively high negative impacts of local interest rate volatility are observed in Indonesia, Thailand, and Malaysia, respectively. It is worth mentioning that in the study of Hajilee et al. (2015) the impacts of interest rate volatility on the BSD in these counties were insignificant. The contradicting results between this study and Hajilee et al. (2015) could be attributed to an insufficient indicator of BSD that has been used in their study. As explained in the literature the concept of BSD cannot be captured by a single measure, while the authors have used only the ratio of liquid liabilities as a measure of BSD. As a conclusion, the findings of the thesis support the presence of undesirable impacts of interest rate fluctuations on the BSD in the long-run, which in turn affect the economic growth in the same direction as well.

In terms of spillover impacts of the U.S. monetary policy on the BSD of emerging markets, the empirical outcomes support the existence of negative spillover effects of the U.S. monetary policy in two-thirds of the sampled countries that include Algeria, Indonesia, Korea, Thailand, Malaysia, and Turkey. The high negative spillover impacts were observed in cases of Turkey and Thailand. The results of the thesis are consistent with the theoretical arguments of Mundell (1963), at the same time with many other empirical findings in the literature (among them Anderson et al. 2007; Maćkowiak, 2007; Chang and Fernández, 2013; Kawai, 2015). In contrast, the BSD indicators of Mexico, Philippines, and South Africa are evidenced to be insensitive to the U.S. monetary policy changes, which are in line with previous work of (Edward and Susmel, 2000; Miniane and Rogers, 2007). Based on the empirical results that indicate negative spillover effects of the U.S. policy rate on the majority of sampled countries, this thesis supports the arguments that suggest the U.S. policy rate has played a dominant role in emerging markets.

In context of the relationship between BSD and EG which is widely debated in the financial development literature, the empirical results of the thesis indicate clearly positive and statistically significant connection between them for the majority of the sampled countries, namely Algeria, Indonesia, Korea, Malaysia, Mexico, Philippines, Thailand, and Turkey. Moreover, most of the estimated coefficients of EG measure are observed to be relatively high indicating that the BSD of developing markets are highly sensitive to the EG rates. This implies that the degree of the BSD is elastic and very responsive to the changes in the level of EG in the emerging economies. These results are in line with the financial development literature that asserts the positive relationship between BSD and EG.

About the role of banking deposits ratio which has been entered into the empirical model as a control variable, the empirical analysis showed that 23 out of 29 estimated models indicate positive and highly significant coefficients of banking deposits ratios, indicating the importance of this variable in the empirical analysis. The implication of this outcome may be that as the banking system attracts more deposits, the capacity of banks expands in providing credits to investment projects with positive repercussions on growth rates of emerging countries.

Regarding the short-term dynamic impacts of the real-deposit rate, interest rate volatility, and spillover effect of the U.S. policy rate on the BSD, the application of the ECM evidences these impacts as follow: the relationship between real deposit rate and BSD are observed to vary across the models and countries. The estimated coefficients of real-time deposits rate are recorded to be negative in Indonesia and Malaysia when the "*index*" and *BM* were the dependent variables. For Turkey, the negative coefficient is recorded when the *PC* was used as an indicator of the BSD. Some other positive coefficients have appeared, but the values were negligibly very small. These results are in line with the long-term estimations that revealed unclear role of the real-deposit interest rate in the BSD processes. In the context of the local interest rate volatility, the empirical results provide strong evidence for a negative impact from local interest rate movements towards BSD proxies for all sampled countries except Korea. These results reassert the undesirable impacts of local interest rate volatility on the BSD of emerging countries. Moreover, the negative spillovers effects of the U.S. policy rate on the BSD indicators were observed only in four countries, namely Algeria, Korea, Malaysia, and Thailand. In general, most of the estimated coefficients of the ECM are noticeably recorded to be small which can be attributed to the use of annual data that is more suitable for an analysis of long-term relationships rather than short-term.

The estimated coefficients of the ECTs provide important information related to the long-term convergence process of the model (or speed of adjustment). The results of ECM application showed the estimated coefficients of ECT were negative and statistically highly significant in all the estimated models. The negative and statistically significant ECT coefficients provided, even more, evidence of long-term feedback amongst the variables. The estimated values of ECT were recorded to be between -1 and -2 in four cases. These are for Indonesia when the *BM* was the BSD indicator, in Korea when the *LL* is the BSD indicator and in Malaysia when the "*Index*" and the *BM* were the dependent variables. It is interesting to provide an interpretation of those values which means the ECT produces dampened movements in the equilibrium path of the banking development. In other words, instead of the directly monotonically converging to the equilibrium path of the banking sector development, the error correction process fluctuates around the long-run equilibrium in a dampening way, or it suggests oscillatory convergence (see Loayza and Ranciere, 2005; Narayan and Smyth, 2006). On the other hand, the majority of the remaining ECT coefficients, 15 out of 25 estimations, have relatively small negative values (less than 0.50 in absolute value). The small magnitudes of the estimated coefficients indicate sluggishness in the converging system; the BSD needs a longer period to reach steady status. In contrast, some of the estimated ECT coefficients are observed to be relatively high (more than 0.50 in absolute value) which indicate that the BSD process converges to its long-term equilibrium path by a relatively high speed of adjustment through the channels of determinants variables (see, Katircioglu, 2010; Katircioglu et al., 2014). It is noticeable that high values of estimated ECT (more than 0.50 in absolute value) have been recorded, mostly, in those cases when the impacts of local interest rate volatility and/or spillover effects were insignificant. The variation in the estimated values of ECT could be attributed to the dissimilarity in the direction of the impact of the explanatory variables. More clearly, there are negative impacts for both local and international interest rate changes, but the impacts of economic growth and bank deposits are positive, which could be the reason of the observed variation in estimated values of ECTs. In sum, the empirical findings of ECM application evidenced the damaging role of both local interest rate volatility and spillover effects of the U.S. monetary policy on the BSD process in developing markets.

The application of Toda and Yamamoto (1995) tests provide comprehensive picture regarding the causality connections among the variables. Many of unidirectional and bidirectional causal effects have been observed, which will be summarized as follow: In terms of causal connections between local interest rate and BSD indicators, the results showed that there is a causal effect from local real rate towards, at least, one of the BSD indicators in cases of Indonesia, Korea, Mexico, Thailand, and Turkey. While the causal impact from *VR* running to at least one of the BSD indicators have been observed in Algeria, Indonesia, Korea, Mexico, South Africa, and Turkey.

These results indicate the important role of the local monetary policy, represented by *R* and *VR*, in the BSD processes of emerging countries.

The spillover impacts of the U.S. monetary policy on BSD of emerging markets have been affirmed in all of the sampled countries except Algeria. In other words, there are causal relationships running from the U.S. policy rate towards at least one of the BSD indicators in cases of Indonesia, Korea, Malaysia, Mexico, Philippines, South Africa, Thailand, and Turkey. In addition, some of the causal associations connect the *FDR* with the *R* and *VR* in a majority of the sampled countries during the period of the study. These results asserted that the spillover effect of the U.S. monetary policy could affect the BSD in emerging markets through the local interest rate channel. From another point of view, these findings could be considered as an evidence of dependency of their monetary policies on the US monetary policy. Also, the empirical outcomes showed some significant causal relationship running from *FDR* towards *GDP* and *BD*. Thus, the spillover of the U.S. monetary policy could affect the BSD process in emerging markets through the local *GDP* and *BD* channels as well.

Regarding the linkage between the BSD and EG, which have been debated in the literature over time, the unidirectional causality running from one of the BSD indicators towards EG measure have been observed in Algeria and Philippines. These outcomes confirmed the *supply-leading hypothesis* only for this couple of countries. In contrast, the unidirectional causality that runs from economic growth, measured by GDP, towards at least one of the BSD indicators were shown in cases of Indonesia, Korea, Malaysia, Thailand, and Turkey. These results are in support of the *demand-following hypothesis*. The bidirectional causal relationship between BSD and EG, that run from at least one of the BSD indicator towards GDP and vice versa, is confirmed in both Mexico and South Africa. These results are considered as an evidence of the validity of the *feedback hypothesis* in these countries. The outcomes of the causality analysis do not provide any supporting evidence for the *irrelevant hypothesis* at all. The previous empirical results revealed that the nature of causality analysis seemed to be different from country to country which also supported by the empirical results of this thesis. The variations could be attributed to the specific economic conditions in each particular country.

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APPENDICES

Appendix A: Principal Component Analysis Outcomes.

1.ALGERIA

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.681342	2.380539	0.8938	2.681342	0.8938
2	0.300802	0.282946	0.1003	2.982144	0.9940
3	0.017856	---	0.0060	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.544612	0.824071	0.155898
LNLL	0.601560	-0.254298	-0.757270
LNBM	0.584400	-0.506201	0.634222

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.813309	1.000000	
LNBM	0.729682	0.972775	1.000000

2.INDONESIA

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.533746	2.074405	0.8446	2.533746	0.8446
2	0.459340	0.452427	0.1531	2.993086	0.9977
3	0.006914	---	0.0023	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.511732	0.855839	0.075296
LNLL	0.601272	-0.419358	0.680154
LNBM	0.613679	-0.302784	-0.729192

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.615105	1.000000	
LNBM	0.676285	0.989818	1.000000

3.KOREA

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.915350	2.834410	0.9718	2.915350	0.9718

2	0.080940	0.077229	0.0270	2.996290	0.9988
3	0.003710	---	0.0012	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.579994	-0.466864	0.667566
LNLL	0.569574	0.818287	0.077414
LNBM	0.582402	-0.335329	-0.740515

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.932355	1.000000	
LNBM	0.995613	0.944661	1.000000

4.MALAYSIA

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.574626	2.233798	0.8582	2.574626	0.8582
2	0.340828	0.256282	0.1136	2.915454	0.9718
3	0.084546	---	0.0282	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.543271	0.839283	0.021469
LNLL	0.592501	-0.401395	0.698444
LNBM	0.594810	-0.366724	-0.715342

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.715191	1.000000	
LNBM	0.725772	0.915293	1.000000

5.MEXICO

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	1.788657	0.953621	0.5962	1.788657	0.5962
2	0.835036	0.458729	0.2783	2.623693	0.8746
3	0.376307	---	0.1254	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.464064	0.834607	0.296777
LNLL	0.661879	-0.104049	-0.742355
LNBM	0.588695	-0.540931	0.600693

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.393973	1.000000	
LNBM	0.178743	0.576133	1.000000

6.PHILIPPINES

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.482239	1.975431	0.8274	2.482239	0.8274
2	0.506808	0.495856	0.1689	2.989047	0.9963
3	0.010953	---	0.0037	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.499786	0.865865	0.022181
LNLL	0.610492	-0.370317	0.700118
LNBM	0.614421	-0.336368	-0.713682

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.595034	1.000000	
LNBM	0.614463	0.988743	1.000000

7.SOUTH AFRICA

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.230907	1.690349	0.7436	2.230907	0.7436
2	0.540559	0.312025	0.1802	2.771466	0.9238
3	0.228534	---	0.0762	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.568870	0.629054	-0.529790
LNLL	-0.540872	0.771428	0.335197
LNBM	0.619551	0.095865	0.779080

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	-0.464686	1.000000	
LNBM	0.724542	-0.647916	1.000000

8.THAILAND

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion

1	2.719994	2.466383	0.9067	2.719994	0.9067
2	0.253610	0.227214	0.0845	2.973604	0.9912
3	0.026396	---	0.0088	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.550121	0.835036	0.009096
LNLL	0.590081	-0.396407	0.703325
LNBM	0.590907	-0.381546	-0.710810

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.799174	1.000000	
LNBM	0.803217	0.973578	1.000000

9.TURKEY

Eigenvalues: (Sum = 3, Average = 1)

Number	Value	Difference	Proportion	Cumulative Value	Cumulative Proportion
1	2.708090	2.442555	0.9027	2.708090	0.9027
2	0.265535	0.239160	0.0885	2.973625	0.9912
3	0.026375	---	0.0088	3.000000	1.0000

Eigenvectors (loadings):

Variable	PC 1	PC 2	PC 3
LNPC	0.548470	0.835410	0.035635
LNLL	0.589562	-0.416583	0.692008
LNBM	0.592956	-0.358537	-0.721010

Ordinary correlations:

	LNPC	LNLL	LNBM
LNPC	1.000000		
LNLL	0.783921	1.000000	
LNBM	0.800509	0.973207	1.000000

Appendix B: Estimations of Crisis Dummy Variables.

Estimated coefficients of the crises dummy variables

Country	Crisis Period	Model A	Model B	Model C	Model D
Algeria	1990-1994	-0.270***	-0.297*	0.026	0.030
Indonesia	1997-2001	-0.083	-0.031	0.005	-0.026*
Korea	1997-1998	0.105		-0.001	
Malaysia	1997-1999	0.411**	0.058	0.001	0.020
Mexico	1981-1985, 1994-1996	0.179		0.003	-0.188**
Philippines	1983-1986, 1997-2001	0.036	-0.061	0.006	0.068**
South Africa					
Thailand	1983, 1997-1999	0.221***	0.059***	0.009***	
Turkey	1982-1984, 2000-2001	0.385***	0.219***	-0.003	0.032

Appendix C: Orders of the Estimated ARDL Models.

Order of the estimated ARDL models

Country	Model A	Model B	Model C	Model D
Algeria	(1, 1, 0, 0, 1, 1)	(1, 0, 0, 1, 0, 1)	(2, 0, 2, 2, 0, 2)	(1, 0, 0, 0, 0, 2)
Indonesia	(1, 1, 0, 0, 0, 1)	(1, 1, 2, 0, 0, 0)	(2, 0, 0, 0, 0, 2)	(0, 1, 0, 0, 0, 2)
Korea	(1, 0, 0, 1, 0, 1)		(1, 0, 1, 0, 2, 2)	
Malaysia	(2, 2, 0, 0, 0, 0)	(2, 0, 1, 0, 0, 2)	(1, 0, 1, 0, 2, 1)	(1, 0, 0, 0, 1, 0)
Mexico	(1, 0, 1, 0, 0, 1)		(2, 2, 0, 0, 2, 2)	(1, 0, 0, 0, 2, 1)
Philippines	(0, 0, 0, 0, 0, 0)	(1, 0, 0, 0, 0, 0)	(1, 0, 2, 0, 0, 1)	(0, 0, 0, 0, 0, 1)
South Africa			(1, 0, 2, 0, 0, 1)	
Thailand	(1, 2, 1, 0, 0, 1)	(1, 1, 1, 0, 0, 1)	(1, 1, 1, 1, 0, 1)	
Turkey	(1, 1, 0, 1, 0, 2)	(1, 1, 0, 0, 1, 2)	(2, 0, 2, 1, 0, 2)	(2, 1, 1, 0, 0, 1)

Appendix D: Unit Root Tests with a Breakpoint.

The Modified ADF test statistics for unit root testing with a breakpoint.

	Level	First diff		Level	First diff
	t-stat	*t*-stat		*t*-stat	*t*-stat
Algeria			**Philippines**		
Index	-4.24	-5.99***	*Index*	-2.71	-5.82***
PC	-2.20	11.41***	*PC*	-3.36	-5.95***
LL	-3.39	-6.43***	*LL*	-3.90	-4.76*
BM	-2.71	-5.50**	*BM*	-3.93	-7.35***
R	-4.35	-6.17***	*R*	-5.02**	-6.05***
VR	-5.38***	-6.36***	*VR*	-6.32***	-11.70***
FDR	-5.88***	-5.23**	*FDR*	-5.88***	-5.23**
GDP	-4.58	-5.39***	*GDP*	-1.90	-8.28***
BD	-4.23	-6. 63***	*BD*	-4.55	-6.16***
Indonesia			**South Africa**		
Index	-4.08	-4.99**	*Index*	-3.93	-6.72***
PC	-3.23	-9.70***	*PC*	-4.37	-8.28***
LL	-3.96	-4.86**	*LL*	-3.82	-5.20**
BM	-3.03	-4.96**	*BM*	-3.33	-5.38***
R	-5.19**	-8.85***	*R*	-5.75***	-10.20***
VR	-6. 31***	-8.18***	*VR*	-5.84***	-6.03***
FDR	-5.88***	-5.72***	*FDR*	-5.97***	-5.23**
GDP	-3.65	-13.61***	*GDP*	-3.43	-5.91***
BD	-4.40	-5.30**	*BD*	-3.96	-4.79*
Korea			**Thailand**		
Index	-4.04	-5.37***	*Index*	-3.89	-4.95**
PC	-3.60	-6. 45***	*PC*	-4.22	-8.18***
LL	-3.67	-4.87**	*LL*	-3.25	-4.97**
BM	-3.02	-7.03***	*BM*	-3.44	-5.77***
R	-4.24	-5.97***	*R*	-6.96***	-5.71***
VR	-5.54***	-9.79***	*VR*	-4.94**	-7.94***
FDR	-5.88***	-5.23**	*FDR*	-5.88***	-5.23**
GDP	-4.37	-5.81***	*GDP*	-2.02	-8.12***
BD	-3.10	-4.89**	*BD*	-4.02	-5.36***
Malaysia			**Turkey**		
Index	-2.74	-5.37**	*Index*	-4.33	-5.29**
PC	-3.60	-6.30***	*PC*	-2.35	-6.24***
LL	-2.67	-4.84**	*LL*	-3.66	-6.01***
BM	-3.02	-7.03***	*BM*	-3.08	-9.10***
R	-4.24	-5.97***	*R*	-11.48***	-8.75***
VR	-5.54***	-6.66***	*VR*	-4.20	-5.44***
FDR	-5.88***	-5.23**	*FDR*	-5.88***	-5.23**
GDP	-3.30	-5.81***	*GDP*	-3.87	-6.94***
BD	-3.10	-4.89**	*BD*	-3.48	-5.63***
Mexico					
Index	-3.66	-9.07***			
PC	-4.12	-7.40***			
LL	-3.58	-11.05***			
BM	-2.45	-5.21**			
R	-21.89***	-15.19***			
VR	-13.60***	-30.50***			
FDR	-5.97***	-5.72***			
GDP	-3.84	-5.86***			
BD	-4.17	-4.84*			

Notes:
(1) The variables are as defined in Table 3.1. (2) ***, ** and * denote the rejection of the null hypothesis at the 1%, 5%, and 10% levels respectively. (3) Trend specification: (a) basic: trend and intercept; (b) breaking: intercept. (4) Break type: innovation outlier. (5) Breakpoint selection: Dickey-Fuller min-t. (6) Lag length method: Akaike criterion. First diff is first difference.

Appendix E: Correlation Matrices of the Explanatory Variables.

Algeria

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000 ----- -----				
VR	-0.347090 -2.126056 0.0411	1.000000 ----- -----			
US	-0.171130 -0.997784 0.3256	0.211640 1.243961 0.2223	1.000000 ----- -----		
LNGDP	0.268185 1.599186 0.1193	-0.548900 -3.772259 0.0006	-0.471423 -3.070756 0.0043	1.000000 ----- -----	
LNBD	0.056735 0.326443 0.7462	-0.532978 -3.618513 0.0010	-0.086900 -0.501101 0.6196	0.626477 4.617205 0.0001	1.000000 ----- -----

Indonesia

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000 ----- -----				
VR	-0.335505 -2.045914 0.0488	1.000000 ----- -----			
US	-0.118151 -0.683511 0.4991	0.122095 0.706668 0.4847	1.000000 ----- -----		
LNGDP	-0.012742 -0.073204 0.9421	-0.109966 -0.635564 0.5294	-0.880865 -10.68976 0.0000	1.000000 ----- -----	
LNBD	0.205800	0.187516	-0.720908	0.734035	1.000000

	1.208091	1.096649	-5.975640	6.209158	-----
	0.2356	0.2807	0.0000	0.0000	-----

Korea

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000				

VR	0.399404	1.000000			
	2.502684	-----			
	0.0175	-----			
US	0.394134	0.535281	1.000000		
	2.463541	3.640406	-----		
	0.0191	0.0009	-----		
LNGDP	-0.420987	-0.425433	-0.897927	1.000000	
	-2.666158	-2.700498	-11.71935	-----	
	0.0118	0.0108	0.0000	-----	
LNBD	-0.398179	-0.318671	-0.786819	0.881956	1.000000
	-2.493559	-1.931314	-7.323472	10.74924	-----
	0.0178	0.0621	0.0000	0.0000	-----

Malaysia

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000				

VR	0.096033	1.000000			
	0.554231	-----			
	0.5832	-----			
US	0.282753	0.139267	1.000000		
	1.693394	0.807902	-----		
	0.0998	0.4249	-----		
LNGDP	-0.511186	-0.208743	-0.855070	1.000000	
	-3.416686	-1.226148	-9.473254	-----	
	0.0017	0.2288	0.0000	-----	
LNBD	-0.120047	0.092015	-0.605169	0.587521	1.000000
	-0.694639	0.530835	-4.366844	4.170801	-----

	0.4921	0.5991	0.0001	0.0002	-----

Mexico

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000				

VR	-0.252892	1.000000			
	-1.501564	-----			
	0.1427	-----			
US	-0.229103	0.446007	1.000000		
	-1.352058	2.862603	-----		
	0.1856	0.0072	-----		
LNGDP	0.369711	-0.606084	-0.640823	1.000000	
	2.285783	-4.377271	-4.795241	-----	
	0.0288	0.0001	0.0000	-----	
LNBD	0.311209	-0.738407	-0.305678	0.575546	1.000000
	1.881177	-6.290186	-1.844261	4.043019	-----
	0.0688	0.0000	0.0741	0.0003	-----

Philippines

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000				

VR	-0.619487	1.000000			
	-4.533309	-----			
	0.0001	-----			
US	-0.126985	0.379394	1.000000		
	-0.735427	2.355567	-----		
	0.4673	0.0246	-----		
LNGDP	-0.154359	-0.396283	-0.523319	1.000000	
	-0.897481	-2.479469	-3.527885	-----	
	0.3760	0.0184	0.0013	-----	
LNBD	0.092474	-0.507252	-0.827148	0.605263	1.000000
	0.533507	-3.381232	-8.455047	4.367918	-----
	0.5973	0.0019	0.0000	0.0001	-----

South Africa

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000				

VR	-0.047390	1.000000			
	-0.272538	-----			
	0.7869	-----			
US	-0.296732	0.342915	1.000000		
	-1.784989	2.097050	-----		
	0.0835	0.0437	-----		
LNGDP	-0.372884	-0.212635	-0.169343	1.000000	
	-2.308554	-1.250085	-0.987057	-----	
	0.0274	0.2201	0.3308	-----	
LNBD	0.031404	-0.322413	-0.578708	0.788754	1.000000
	0.180492	-1.956609	-4.076378	7.371038	-----
	0.8579	0.0589	0.0003	0.0000	-----

Thailand

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000				

VR	-0.122547	1.000000			
	-0.709327	-----			
	0.4831	-----			
US	0.340255	0.540450	1.000000		
	2.078642	3.689963	-----		
	0.0455	0.0008	-----		
LNGDP	-0.532070	-0.436441	-0.883845	1.000000	
	-3.609911	-2.786563	-10.85405	-----	
	0.0010	0.0088	0.0000	-----	
LNBD	-0.390688	-0.573162	-0.884063	0.923985	1.000000
	-2.438103	-4.018057	-10.86629	13.87943	-----
	0.0203	0.0003	0.0000	0.0000	-----

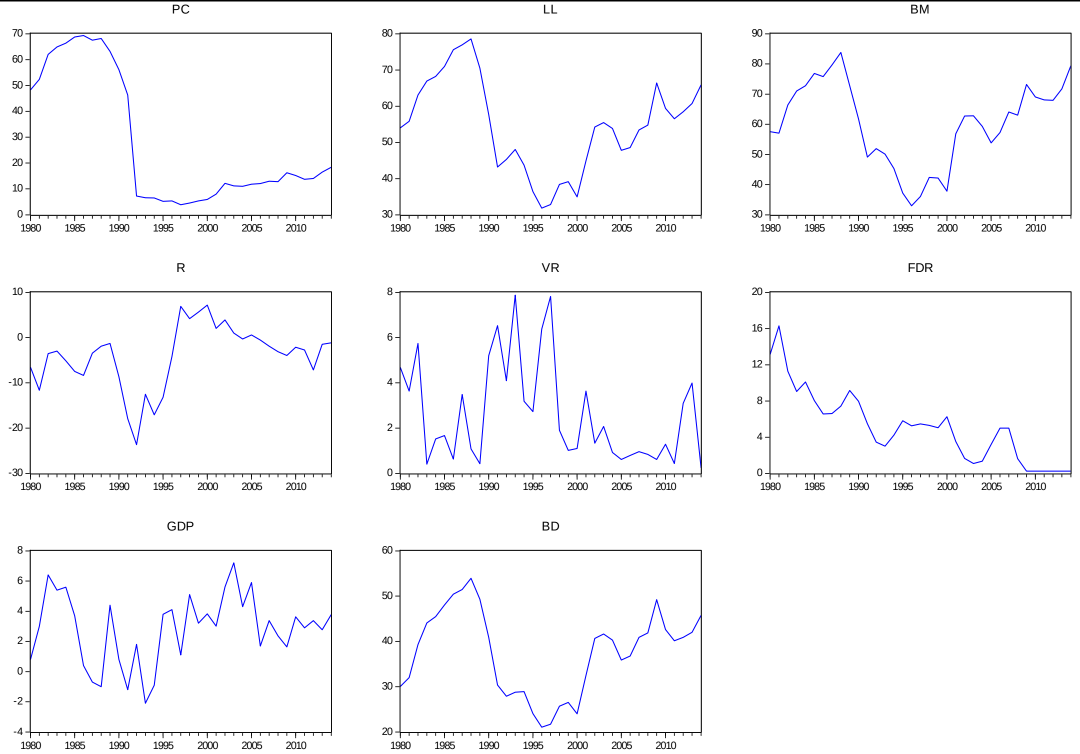
Turkey

Correlation t-Statistic Probability	R	VR	US	LNGDP	LNBD
R	1.000000				

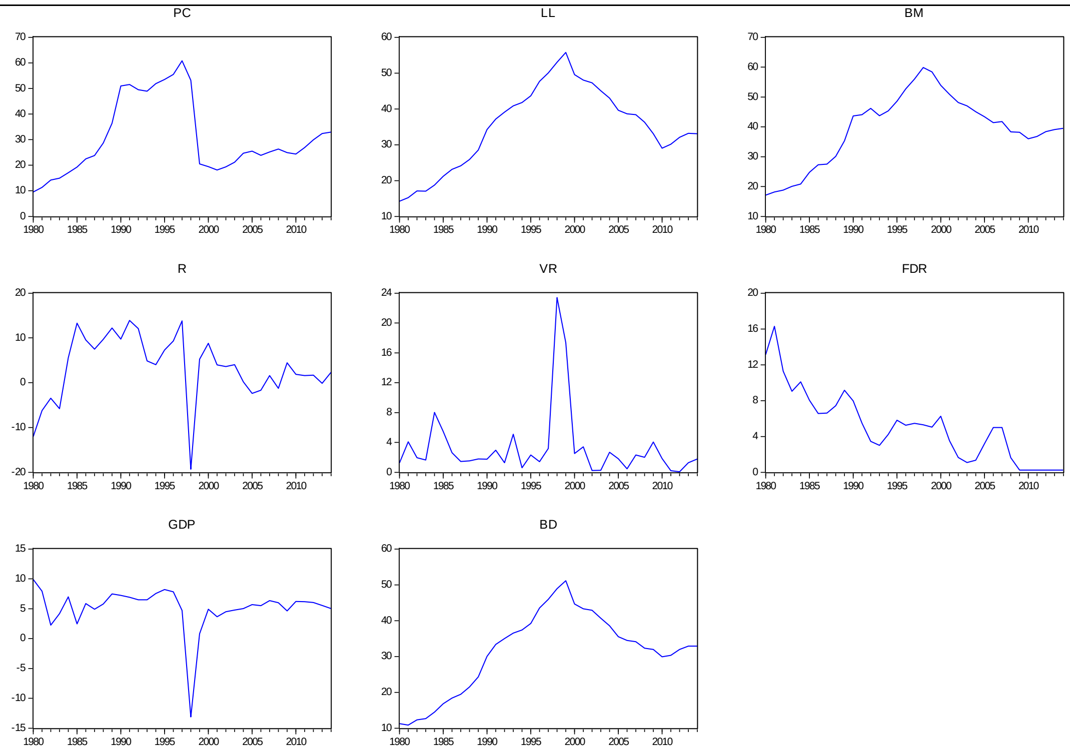
VR	-0.466362	1.000000			
	-3.028559	-----			
	0.0047	-----			
US	-0.491112	0.686800	1.000000		
	-3.238706	5.428058	-----		
	0.0027	0.0000	-----		
LNGDP	0.438764	-0.511043	-0.857062	1.000000	
	2.804924	-3.415392	-9.556143	-----	
	0.0084	0.0017	0.0000	-----	
LNBD	0.541657	-0.470895	-0.843697	0.937811	1.000000
	3.701623	-3.066332	-9.028489	15.51892	-----
	0.0008	0.0043	0.0000	0.0000	-----

Appendix F: Graphs of the Variables Used.

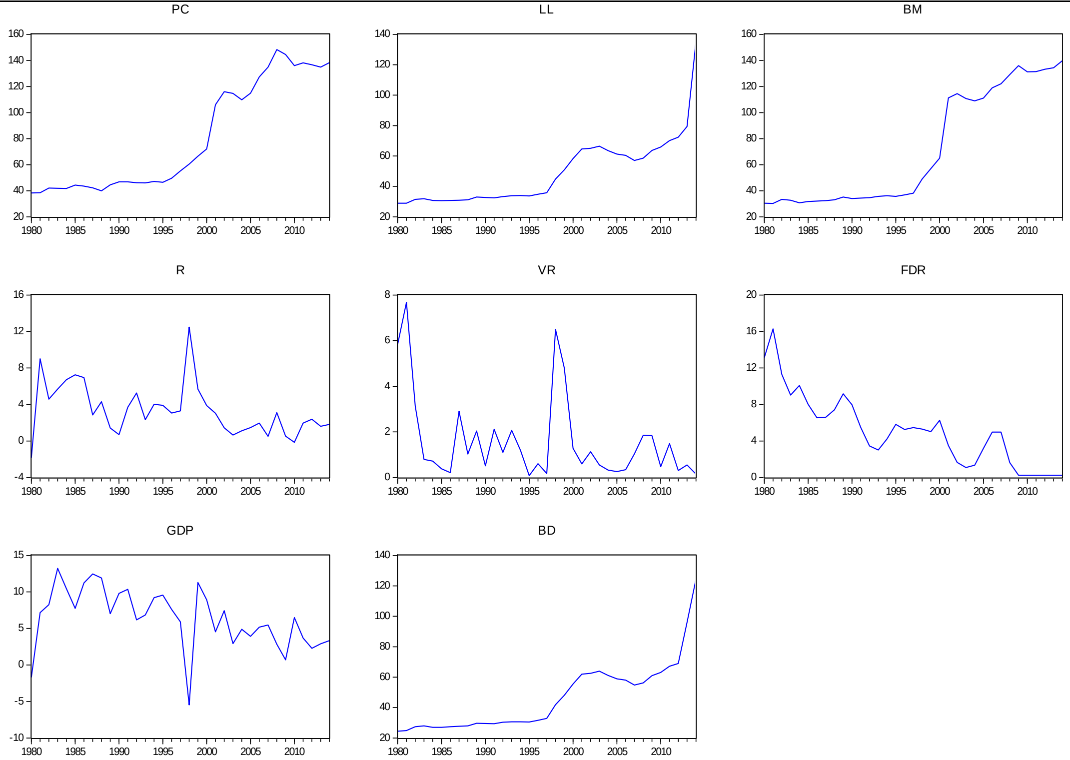
1.



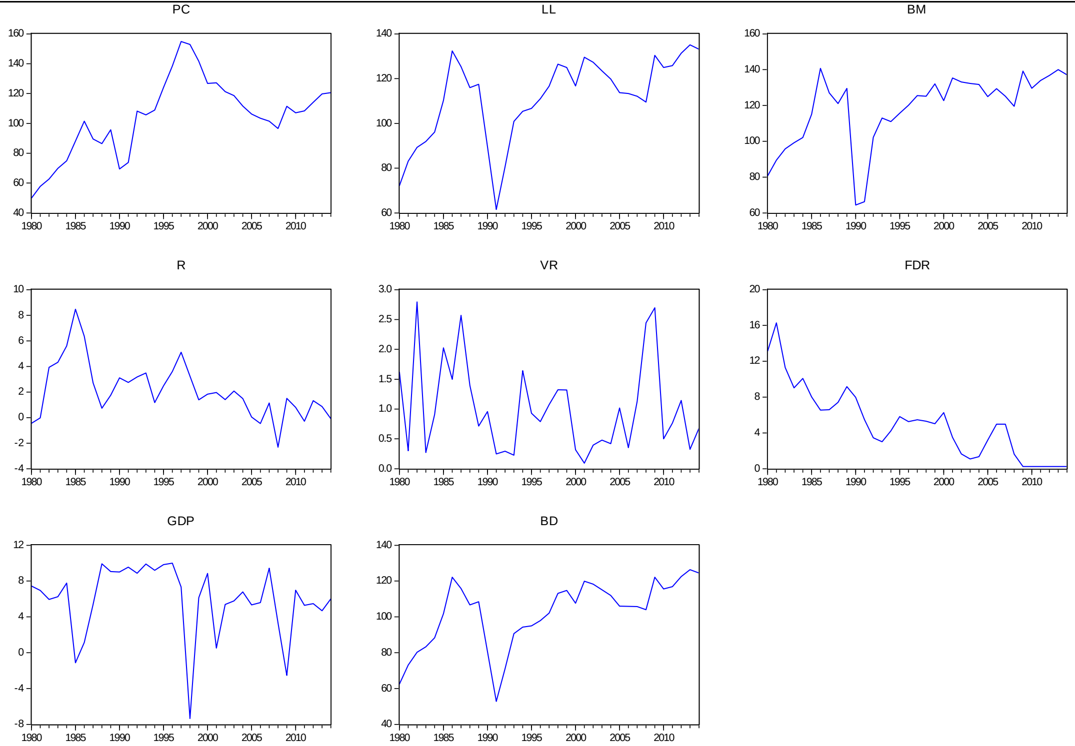
2.



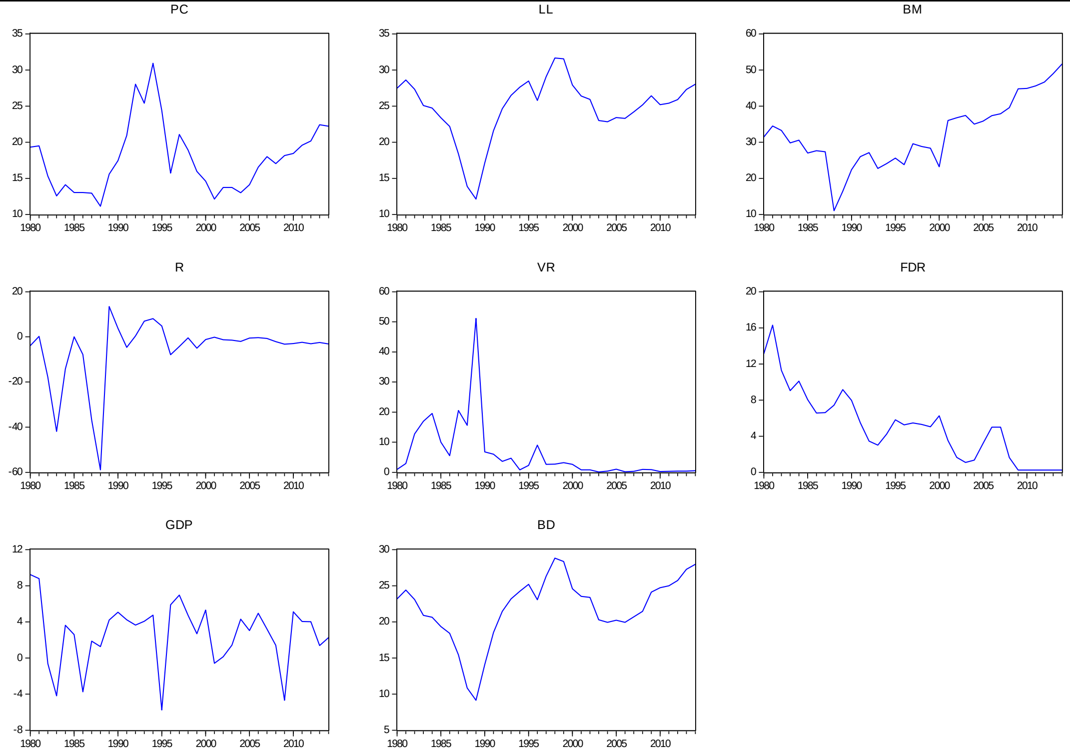
3.



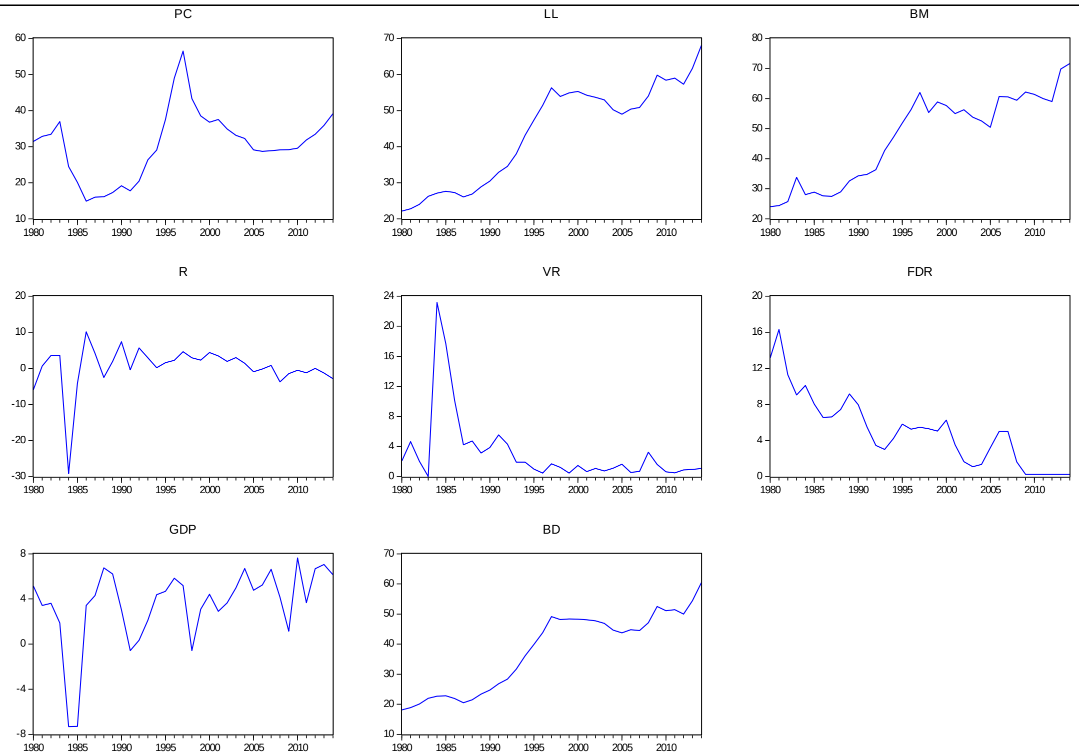
4.



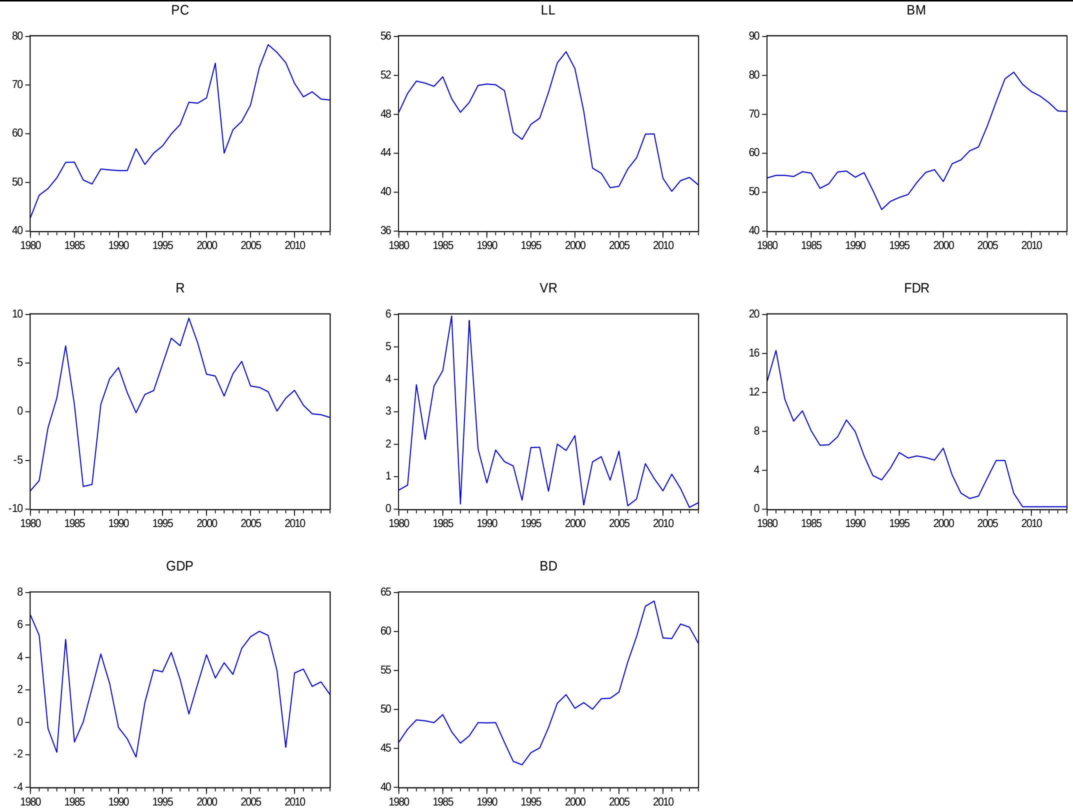
5.



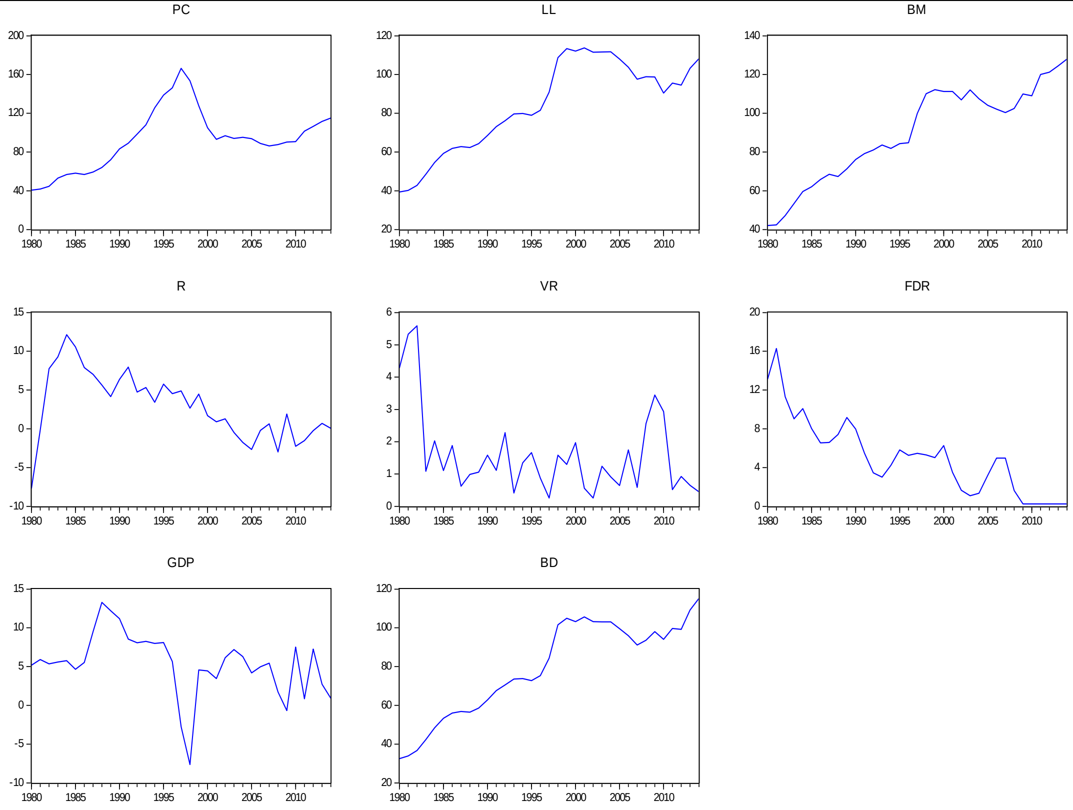
6.



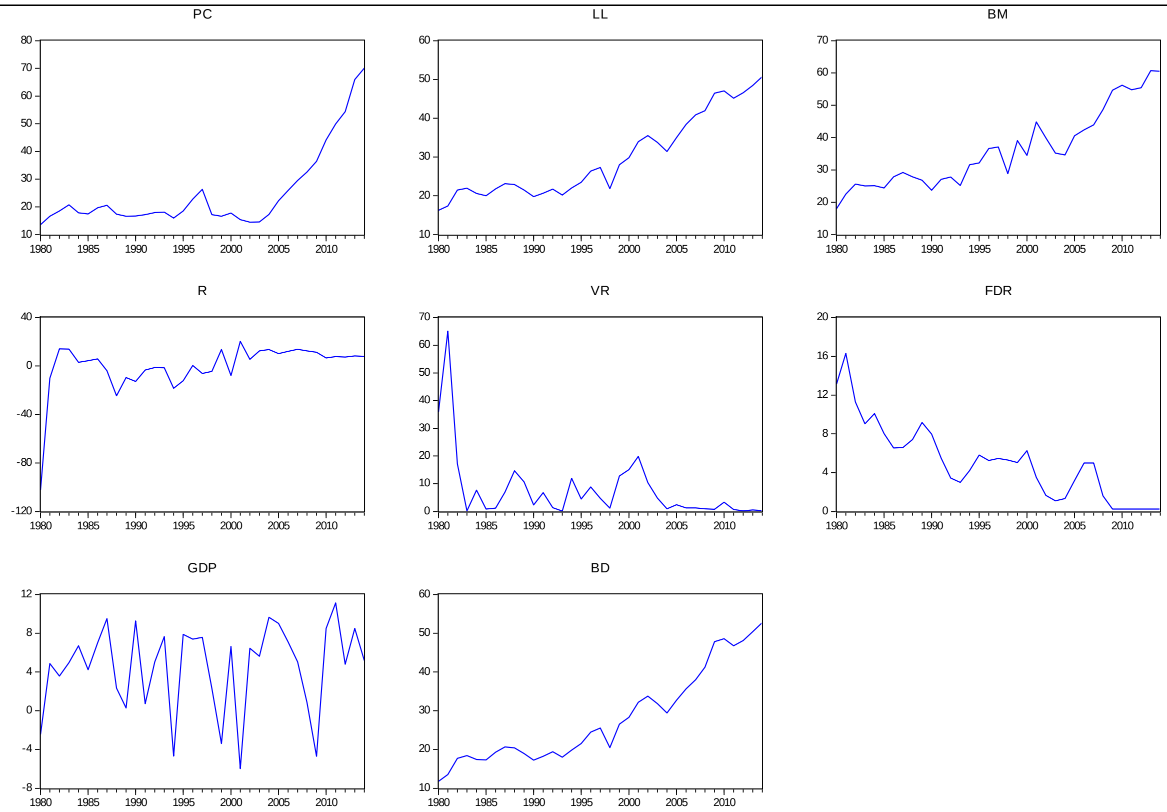
7.


PC
80 70 60 50 40
LL
56 52 48 44 40 36
BM
90 80 70 60 50 40
R
10 5 0 -5 -10
VR
6 5 4 3 2 1 0
FDR
20 16 12 8 4 0
GDP
8 6 4 2 0 -2 -4
BD
65 60 55 50 45 40
1980 1985 1990 1995 2000 2005 2010

8.


PC
200 160 120 80 40 0
LL
120 100 80 60 40 20
BM
140 120 100 80 60 40
R
15 10 5 0 -5 -10
VR
6 5 4 3 2 1 0
FDR
20 16 12 8 4 0
GDP
15 10 5 0 -5 -10
BD
120 100 80 60 40 20
1980 1985 1990 1995 2000 2005 2010

9.



The countries are listed as: (1) Algeria; (2) Indonesia; (3) Korea; (4) Malaysia; (5) Mexico; (6) Philippines, (7) South Africa; (8) Thailand; (9) Turkey.