THE EVOLUTION OF CENTRAL BANKING PRACTICES IN DEVELOPING COUNTRIES: AN EFFECTIVENESS ANALYSIS ON THE POST-CRISIS POLICY MIXES OF SELECTED COUNTRIES

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_____

Prof. Dr. Meliha Altunışık
Director

I certify that this thesis satisfies all the requirements as a thesis for the degree of Master of Science.

_____

Prof. Dr. Nadir Öcal
Head of Department

This is to certify that we have read this thesis and that in our opinion it is fully adequate, in scope and quality, as a thesis for the degree of Master of Science.

_____

Assist. Prof. Dr. Hasan Cömert
Supervisor

Examining Committee Members

Assoc. Prof. Dr. Şirin Saraçoğlu (METU,ECON) _____

Assist. Prof. Dr. Hasan Cömert (METU,ECON) _____

Assoc. Prof. Dr. Gökçer Özgür (Hacettepe, ECON) _____

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Name, Last name: Zeynep Bozkurt

Signature :

ABSTRACT

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Bozkurt, Zeynep
MSc, Department of Economics
Supervisor: Assist. Prof. Dr. Hasan Cömert

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Implying an expansion in the central bank mandates and policy tools, the post-crisis understanding of central banking brought a challenging task for policymakers, particularly for those of developing countries. The main purpose of this study is to assess the effectiveness of some selected post-crisis policy mixes. To this end, two methodologies are used: event analysis and index analysis. The former reveals that the overall design of the policy mix requires more attention than the selection of certain tools – a fact that has been ignored by the literature until this date. The study later digs deeper by introducing the latter method. The *Central Banking Effectiveness Index* is developed in order to obtain information where event analysis and empirical analysis fall short to explain. Besides being one of the first attempts in the literature with such purpose, the main contribution of this approach is the incorporation of the interactions within the policy toolkit. The results from both analyses match. In this respect, this study intends to fill an important gap in the literature and open a way for prospective studies. The study also presents some important implications upon the use of capital flow management tools and the patterns in the selected developing countries – South Korea, Turkey and Brazil.

Keywords: Central Banking, Macroprudential Policy, Developing Countries

ÖZ

GELİŞMEKTE OLAN ÜLKELERDE MERKEZ BANKACILIĞININ EVRİMİ: SEÇİLEN ÜLKELERİN KRİZ SONRASI POLİTİKA ÇERÇEVELERİ ÜZERİNE BİR ETKİLİLİK ANALİZİ

Bozkurt, Zeynep
Yüksek Lisans, İktisat Bölümü
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Kriz sonrası merkez bankacılığı anlayışı merkez bankası hedefleri ve politika araçlarında bir genişlemeye yol açmıştır. Böylelikle, başta gelişmekte olan ülkelerde olmak üzere, merkez bankacılarının görevini daha zor hale getirmiştir. Bu çalışmanın temel amacı kriz sonrasında oluşturulan bazı politika çerçevelerinin etkililiğini değerlendirmektir. Bu amaç doğrultusunda iki yöntem kullanılmıştır. Bunlar vaka analizi ve indeks analizidir. İlk yöntem, belirli araçların seçiminden ziyade politika çerçevesinin genel tasarımına daha fazla önem atfetmek gerektiğini ortaya koymaktadır. Günümüze kadar uzanan ilgili yazın bu noktayı göz ardı etmiştir. Çalışma bir sonraki aşamada daha derinlemesine bir değerlendirme yapmak amacıyla ikinci yöntemle devam etmektedir. *Merkez Bankacılığı Etkililik Endeksi*, vaka analizi ve ampirik çalışmaların yetersiz kaldığı koşullarda bilgi edinmek amacıyla oluşturulmuştur. Bu amaç için geliştirilmiş öncü bir yöntem olmasının dışında, politika araçları arasındaki etkileşimleri dikkate alması da bu yöntemin ilgili yazına önemli katkılarındandır. Yürütülen iki analizin sonuçları birbiriyle örtüşmektedir. Bu bağlamda, bu çalışma yazındaki önemli bir eksikliği giderme ve gelecek çalışmaların yolunu açma niyetindedir. Çalışma ayrıca sermaye akımları yönetim araçlarının kullanımı ve seçili ülkeler olan Güney Kore, Türkiye ve Brezilya'da görülen trendler hakkında da önemli sonuçlar ortaya koymaktadır.

Anahtar Kelimeler: Merkez Bankacılığı, Makroihtiyati Politikalar, Gelişmekte Olan Ülkeler

To My Parents

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CHAPTER 1

INTRODUCTION

After the global financial crisis hit the world economy, central banking took a giant step forward in its evolutionary history. The implications of the crisis and the circumstances of post-crisis environment forced policymakers to change their previous perspective towards central banking practices.

The pre-crisis dominant view over the understanding of central banking, which is known in the literature as the 'New Consensus', supported the idea that managing solely price stability through short-term interest rates was sufficient to promote both macroeconomic and financial stability. This simple way of conducting monetary policy worked out fairly well during the 'Great Moderation' years, which led the support for the 'New Consensus' to gain strength and its opponents to be neglected. By the same token, the stronger the 'New Consensus' got, the more favorable conditions for the 'Great Moderation' took place. By encouraging the neglect of financial stability and reluctance to react against asset bubbles, this feedback loop set the stage for the global financial crisis.

When the global financial crisis proved that this simple way of conducting monetary policy was not sufficient to promote overall stability, policymakers had to rethink their understanding of central banking. First, it was understood that financial stability could not be considered as a second-order issue. Second, indicators such as asset prices could not be neglected. Promoting a stable inflation does not guarantee a well-functioning financial system. Counting on the efficient market hypothesis lead policymakers lose time before intervening in any disruptive trend within the financial markets. In line with these important

changes, an emerging consensus on central banking practices was born. Among its multiple implications, this study focuses on three crucial ones. Firstly, financial stability was included in the central banking mandates. Secondly, this new mandate required some additional economic and financial indicators in the control panels of central bankers. The pre-crisis set of targeted indicators – inflation and GDP – widened significantly. Thirdly, the expansion of the set of monitored indicators brought the need for additional tools in the policy toolkits of central banks. Macroprudential policies were introduced or bolstered by the central bankers worldwide with the aim of affecting a wide set of indicators which are deemed to represent the circumstances in macroeconomic and financial systems. These three major highlights of the post-crisis understanding of central banking brought a difficult joint optimization problem for central bankers in pursuit of overall stability. While transforming from the 'New Consensus' to the emerging one, the understanding of central banking practices led a challenging task for the policymakers worldwide.

Another implication of the global financial crisis is the need for advanced countries to conduct non-conventional monetary policies. The post-crisis environment in the wake of the crisis led central bankers of advanced countries to develop exit strategies that were based on quantitative easing policies. These policies formed an excess global liquidity. Similar to the case during the Great Moderation, the excess liquidity ended up as capital flows into developing countries. However, unlike the pre-crisis period, the excess liquidity entered into the developing countries through capital inflows with a fluctuating global uncertainty. Having already witnessed the bitter consequences of reliance on global factors during the global financial crisis, the post-crisis economic environment and the associated vulnerabilities had to be carefully dealt with. Therefore, central bankers of developing countries were faced with even a more challenging joint optimization problem which also had to take external conditions into account. Considering the little experience with these tools and almost no knowledge upon the interactions among them, the post-crisis era formed an 'uncharted territory' for central bankers.

The focus of this study is the challenging task of central bankers of developing countries. The following Chapters assess this new era of central banking in

developing countries starting from mapping the risks for developing countries in two integrated cycles: domestic and global. The first step is to determine the reasons why developing countries needed differentiated policy mixes. It further elaborates on the transmission channels that macroprudential tools are supposed to overcome these problems. The assessment puts forward that each tool has primary and secondary effects over the steps of the integrated cycles that represents how risks are transmitted throughout the economy.

Another implication of this mapping is that central bankers may either suffer or benefit from these secondary effects. A well-designed policy mix can achieve efficacy and effectiveness by benefiting from the interactions within the toolkit.
Taking this crucial implication as a point of departure, Chapter 3 assesses the post-crisis monetary policy frameworks of three selected developing countries: Brazil, South Korea (S.Korea) and Turkey. These economies are both in the G20 and the "Fragile Five", sharing some distinguishing features. Moreover, central banks of all these three countries adopted and announced their adoption of new policy mixes after the global financial crisis. Chapter 3 first aims to identify the policy mixes adopted by each country and then to conduct a cross-country analysis over the effectiveness of these policy mixes. The method for assessment is event analysis. Although event analysis is a very conventional way to conduct such an assessment, it still contributes to the literature in certain ways. First, the analysis attempts to assess the effectiveness of post-crisis policy mixes in a cross-country perspective. Related studies in the literature lack a cross-country based perspective and rather focus on the case of a single country in general. Secondly, none of the studies in the literature intends to take policy interactions into account. The analysis provides some important findings. First, the choice over the implementation of capital flow management tools appear to be essential in countries with such economic and financial characteristics. Second, in line with the implication from Chapter 3, the analysis in Chapter 4 also concludes that the design of the policy mix is more important than the choice of individual tools. Some tools are found to be in interaction with others that may have weakened the effectiveness of the toolkit in Turkey and Brazil whereas S.Korean authorities enjoy more effectiveness and efficacy due to the use of complementary tools. The findings also reveal that S.Korean economy has significantly diverged from the trend observed in Brazil and Turkey, mainly after

2012. In terms of financial soundness, this can be considered as a divergence in the positive direction. However, S.Korean policymakers seem to have neglected the primary indicators – inflation and GDP – while having committed to promote financial soundness.

Although Chapter 3 utilizes event analysis approach, the concluding remarks over the trade-off within the policy mixes have some intuitive components. In order to conduct an analysis that would enable us to quantitatively compute the effectiveness that takes policy interactions[1] into account, Chapter 3 develops a new method. Taking the reasoning of Taylor rule as a point of departure, two new indices to the literature are developed: A *Central Banking Responsiveness Index* and *Central Banking Effectiveness Index*. The former assesses the extent which central banks manage to cover the risks arisen in the monitored indicators. In this sense, it puts forward the intuitive analysis in the previous chapter that was conducted upon the mapping of macroprudential tools over the integrated cycles. The latter, on the other hand, investigates the effectiveness of the policy mixes, in other words, the numerical measure of the effectiveness of the adjustments in the policy tools in addressing the movements in the monitored indicators. The uniqueness of this approach is that this is the only instrument in the literature that is developed to measure the effectiveness of central banking practices. Moreover, it also takes the targets set by central banks into account, which enables a realistic cross-country assessment with customized indices. Regarding that the post-crisis conditions form an 'uncharted territory' for central banking practices, the indices developed in this Chapter carry an intention to be a 'compass' for policymakers in this 'uncharted territory'.

Since Chapter 3 reveals that S.Korea has been following a significantly differentiated trend mainly after 2012, the analysis in the last Chapter focuses on the other two countries: Turkey and Brazil. These countries form an appropriate base for comparative analysis regarding the risks faced by these economies in the exchange rate, credit and capital flows fronts. The main difference appears to be their use of tools in the capital flow management front. While Brazilian authorities use capital flow management tools that were

[1] The interactions cover both those within the macroprudential tools and conventional monetary policy.

previously known as capital controls, Turkish policymakers prefer more market-friendly measures. The findings reveal that Brazilian policy choices resulted in more effectiveness, mainly by reducing the reliance on global factors. Moreover, Chapter 4 also complements the results in Chapter 3 that the undesired policy interactions between Turkish ROM, ended up with ineffectiveness of the tool. In addition, further elaboration on the comparative analysis provided some other findings upon the timely-implementation, commitment to targets and the emphasis put on financial soundness.

In brief, the study is structured as follows: the first chapter is based on the intention to point out the relevance of the Great Moderation and the New Consensus with the global financial crisis. Focusing mainly on the case of developing countries, the aim is to make clear how the pre-crisis conditions led the emergence of need for macroprudential policy. Then the Chapter intends to identify the steps of the risk cycle in developing countries and place macroprudential tools in accordance with the transmission channels which they are designed to block within the given cycle. Chapter 3 continues with the cross-comparison of the policy mixes adopted by three selected developing countries: Brazil, Turkey and S.Korea. The event analysis covers the indicators that stand out to be the most common ones monitored by central banks according to central bank reports and the related literature. The indicators are expected to represent the conditions in both price and financial stability fronts. While trying to assess the effectiveness of macroprudential tools individually, the Chapter also makes an attempt to reach some insights upon the interactions of certain tools. Finally, the last Chapter attempts to dig deeper by developing a *Central Banking Responsiveness Index* and a *Central Banking Effectiveness Index* to assess the extent of the coverage of risks and the effectiveness of the post-crisis policy mixes in selected two countries: Turkey and Brazil. The aim is to conduct a comprehensive quantitative assessment on the new policy mixes, while taking policy interactions also into account.

CHAPTER 2

THE EVOLUTION OF CENTRAL BANKING PRACTICES IN DEVELOPING COUNTRIES: THE EMERGENCE OF THE NEED FOR MACROPRUDENTIAL POLICIES

2.1 OVERVIEW

Central banking has recently entered into a new era worldwide. This substantial change occurred mainly due to the evolution in the understanding of central banking. Driven by a rapid and giant step in the understanding, this change also had massive impacts on the composition of central bank mandates, the policy toolkit and the institutional framework. The importance of international cooperation is highlighted. More importantly, unlike before, central banks adopted new policy mixes that are designed to address the risks that are specific to their economies, especially in developing countries. The particular focus of this Chapter is the policy toolkit in developing countries that has been enhanced in line with the extension of central bank mandates.

The Chapter first focuses on the pre-crisis period known as the 'Great Moderation', which set the stage for the new era in central banking. A few years ago, when central bankers used to control price stability only through short-term interest rates, the common view implied that this was the best way to implement monetary policy. Pleasant trends in the main indicators of the time also helped this view which is known as the 'New Consensus' to gain strength. On the other hand, as the New Consensus became more widespread, fewer concerns were raised about the execution of monetary policy. A feedback loop between these two concepts eventually brought the most drastic punctuation in the equilibrium – the global financial crisis. In this respect, one of the main attempts of this

study is to shed light on the Great Moderation which prepared the conditions for the global financial crisis and led a drastic change in central banking. Having already been studied extensively in the literature, the points mentioned above still require emphasis since they form a basis for the rest of the study to elaborate further on the case of developing countries.

With the global financial crisis taking place, the most commonly accepted views on the execution of monetary policy were proven to be wrong, or insufficient at least. Following the collapse of the New Consensus, a new one emerged. The understanding of central banking practices of the post-crisis period differs from that of the pre-crisis in several ways. Nevertheless, this Chapter focuses on two main ones that came along with the collapse of the pre-crisis consensus. First, the importance of financial stability was highlighted. It was understood that financial stability could not be considered as a second-order issue while pursuing an overall stability. Although central banks have always had a microeconomic function in addition to their macroeconomic duty, financial stability took its place near price stability in the list of central bank mandates for the first time in the history of central banking. Second, the need to monitor and manage the movements in the asset prices was underlined as a lesson from the global financial crisis. Along with the inclusion of financial stability in the central bank mandates, adding asset prices in the control panel of central bankers brought the need for additional tools to deal with multiple goals. The use of macroprudential policies have become much more widespread, being introduced or bolstered by the central banks of almost every country as well as some measures that are taken at the international level. Therefore, another attempt of this Chapter is to elaborate on these massive changes with a particular focus on the extended use of macroprudential policies.

While central banks worldwide are in the course of adapting to this new understanding and its implications, the task of the central bankers in developing countries is even more challenging. The global financial crisis drew attention back to a well-known struggle for developing countries – minimizing the dependence on external conditions. The magnitude and composition of capital flows into developing countries have crucial impacts on the domestic macroeconomic and financial systems. Moreover, the transmission of volatility

between the domestic and global conditions has been a major source of problem for central bankers in pursuing their policies. These challenges were highlighted both during and after the global financial crisis with frequent fluctuations in the global uncertainty. Therefore, policymakers of developing countries have been working on, or already introduced a set of macroprudential tools to deal with the specified issues. To fully understand these integrated cycles and the tools that are designed to mitigate the risks arising from them, the last attempt of this Chapter is to develop a new classification method for macroprudential policies. Unlike other classification models in the literature, the one presented in this Chapter lists the tools according to the step in the cycle that they are designed to address, instead of listing them only by their types. This way of classification is more beneficial while studying the impacts of the tools on the monitored indicators. It allows us to observe the multiple steps of the cycle that a tool is capable to affect through indirect impacts as well as the step that a tool is designed to address in a direct manner. This way, the Chapter can draw a detailed picture on the way which macroprudential tools are expected to help policymakers to deal both with macroeconomic and financial systems.

Having these three main attempts to explain in its focus, this Chapter is structured as follows: The first section explains the main characteristics of the Great Moderation. Its main components and neglects which gave birth to the crisis are presented. Section three focuses on the post-crisis period, particularly on the main changes occurred in the understanding of central banking and the reasons that brought the rise of macroprudential policy. The fourth section elaborates further on the case of developing countries, investigating the standing of macroprudential tools in the policy toolkits. The integrated external and domestic cycles for developing countries are presented. Macroprudential tools are mapped within the cycle, according to their main purposes. Lastly, the challenges for the implementation of macroprudential policies are underlined and a conclusion is given to resume the highlights of the Chapter.

2.2 GREAT MODERATION: THE PATH TO THE GLOBAL FINANCIAL CRISIS

In the mid-2000s, almost the whole world was experiencing a period called the "Great Moderation" which implied low volatility, controlled inflation and growing economies. This bright atmosphere led the view that managing inflation by simply manipulating the overnight interest rates was sufficient to promote overall macroeconomic stability. This dominant view is referred as the 'New Consensus'. The credit for the favorable conditions of Great Moderation was given to successful monetary policy by the supporters of the New Consensus. In Bernanke's (2004) words, "the improvements in the execution on monetary policy can plausibly account for a significant part of the Great Moderation". Another similar view resumed that "the worldwide progress in monetary policy is a great achievement that, especially when viewed from the perspective of 30 years ago, is a remarkable story" (Goodfriend 2007:65).

Although the 'New Consensus' was the dominant view, there were some debates over its main assumptions. There were some cautious approaches upon the effectiveness of the monetary policy and studies asserting that this picture might be illusive. However, the favorable conditions of mid 2000s caused central bankers to stick with their existing policies and therefore led some crucial neglects.

To explain the main characteristics and the debates over them, first of all the time span of Great Moderation should be determined. It is possible to consider Great Moderation in two separate phases: the first phase of 1990s and the second phase of 2000s. As the date of its end, this study takes the first quarter of 2007, following the study of Aizenman et al. (2010)[2].

The first phase of 1990s has two main implications. First, world economies entered into a new era of more open capital accounts and deep financial integration. These developments set the stage for availability for higher yields. The second implication is the crises that took place in developing countries.

[2] They set the last quarter of the Great Moderation based on the movements in the CBOE S&P 500 VIX, LIBOR-IO Spread, EMBI.

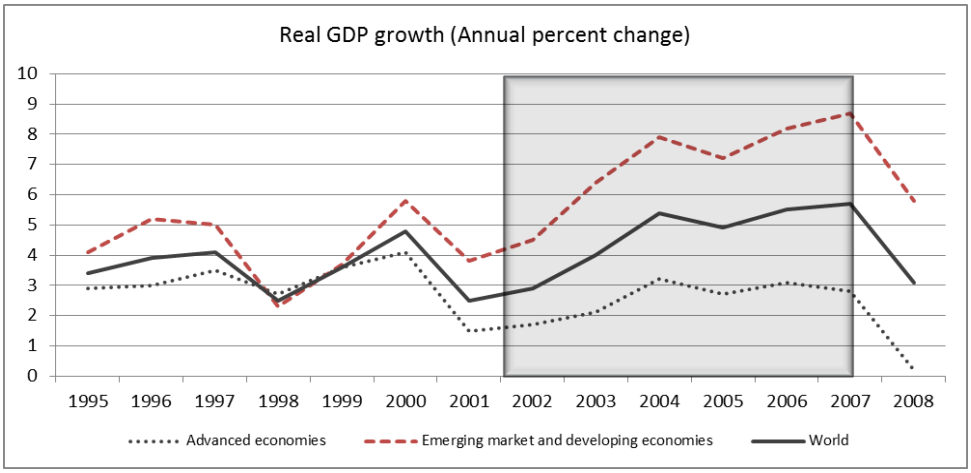
Crises such as the Mexican in 1994-95 and East Asian in 1997 led policymakers to promote stronger economic and financial fundamentals. During the first phase, advanced countries have already entered into an era of lowered volatility and pleasant macroeconomic indicators.

In the second phase, with the promotion of stronger economic and financial fundamentals in developing countries, low volatility and pleasant trends in macroeconomic indicators became widespread worldwide. Moreover, the central banking practices have almost harmonized in both developing and advanced countries. This harmonization was due to some widely accepted views – " New Consensus" – over the understanding of central banking practices. It is possible to summarize the main characteristics of the New Consensus under three main headings, that the major neglects of the era can be discussed: the dichotomy between price stability and financial stability; the 'Lean vs. Clean' debate; and inflation targeting frameworks with floating exchange rate regimes. To better understand how these characteristics gave rise to the global financial crisis, the links between these main points and the components of Great Moderation should be investigated.

The macroeconomic view during the Great Moderation regarded price stability and financial stability as two separate matters. In fact, most of the central banks were aware of the problems arisen from financial frictions and a large number of them were already publishing Financial Stability Reports. However, the Tinbergen rule –which implied the need for the use of separate tools for different objectives - was highly accepted as a principle for central banking practices among policymakers. The Tinbergen rule required monetary policy to address price stability and prudent regulation and supervision -especially microeconomic policy which aims to mitigate risks at an individual institution level- to address financial stability. The general equilibrium modelling frameworks of most central banks did not consider financial frictions as a major source of business cycle fluctuations. An inflation-targeting central bank could assert that it coped with credit market excesses automatically insofar since higher asset prices boost aggregate demand and create inflationary pressures (Eichengreen et al., 2011). Therefore, price stability was deemed to be sufficient in the promotion of financial stability and macroeconomic stability.

Other economists and central bankers, who do not share the perspective of the New Consensus, were concerned that financial markets, being more integrated, competitive and innovative, were reducing the effectiveness of the monetary policies of the central banks. The influence of central banks on long-term interest rates seemed to be weakening (Cömert, 2012; Rudebush et al., 2006) The main drawback of this rapid integration was the central banks' weakness on controlling financial markets.

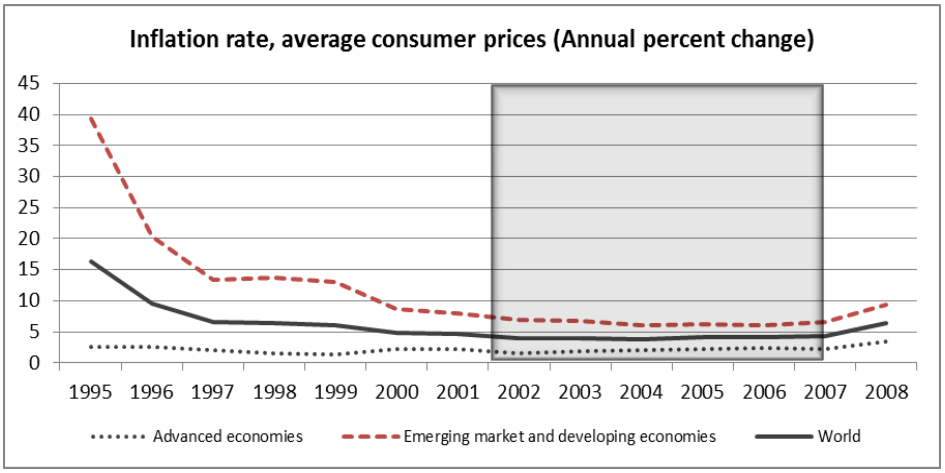
The following figures demonstrate the main macroeconomic variables that were closely monitored during Great Moderation. Figure 2.1 shows that during the period from early 2002 to mid-2007 the real GDP growth in emerging and developing economies rose by nearly 122%. Similarly, advanced countries enjoyed an almost doubled GDP growth rate through the end of the given period.



Source: IMF World Economic Outlook Database

Figure 2.1: Real GDP Growth During Great Moderation

Furthermore, Figure 2.2 clearly demonstrates that during the same time span inflation was remarkably controlled worldwide. The average inflation rate worldwide remained below 5% during the years under investigation. Within the same time span, the rate was around 6% in developing and 2-3% in advanced countries.



Source: IMF World Economic Outlook Database

Figure 2.2: Inflation Rates During Great Moderation

Another component of the consensus of "Great Moderation" is the Greenspan doctrine. During the Great Moderation years, there had been a heated debate over whether and how central banks should respond to asset price bubbles. Greenspan (2002) was a strong opponent of such response by central banks, stating that monetary policy should clean up after an asset price bubble bursts, rather than leaning against them. This view has been supported by several arguments in the literature.

The first and the most common argument against leaning a bubble is that an asset price bubble is hard to detect. The assumption that central banks have such an informational advantage over private markets to identify a bubble in progress is highly dubious (Hahm et al.,2012). Secondly, bubbles are defined as deviations from fundamentals, which make them unlikely to respond to usual tools of monetary policy. Asset prices bubbles may not respond to moderate changes in interest rates whereas drastic changes may cause more harm than good by depressing economic growth and increasing output volatility (Eichengreen et al., 2011). Moreover, leaning against a specific type of asset price bubble would also have unintended effects on other types of asset prices. Lastly, as Giavazzi and Mishkin(2006) put it, addressing asset prices may lead confusion of central bank objectives in public and cause a weakening of confidence.

Although the Greenspan doctrine was widely adopted by central bankers in pursuit of monetary policy decisions, there is a wide literature in favor of leaning against asset price bubbles. Cecchetti et al.(2000), Borio and Lowe(2002) and White (2004) are some of the studies which argue that central banks should raise interest rates to slow down accelerating asset prices and thus save the economy from getting damaged at least up to some extent.

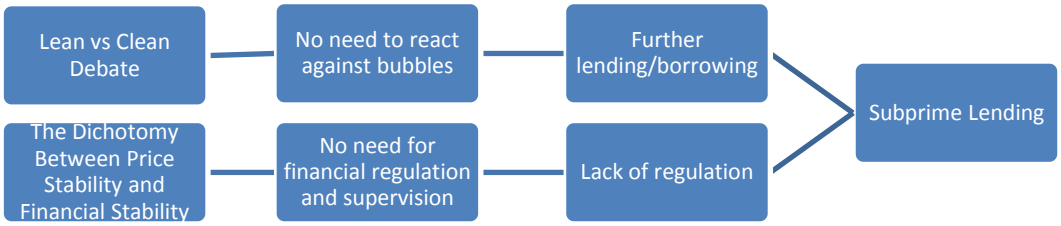
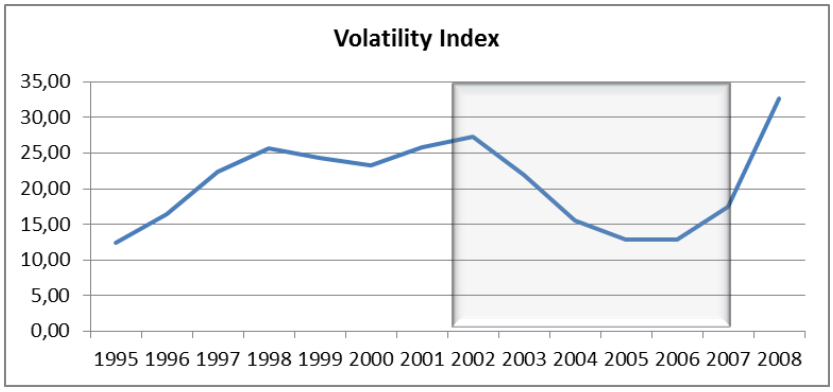


Figure 2.3: The Relevance of New Consensus with the Global Financial Crisis

The chain of events given Figure 2.3 above summarizes how the impacts of the two main components of the New Consensus turned out to be the background for the global financial crisis. As an implication of the New Consensus, central bankers remained reluctant to react against the extreme movements in credit growth and asset prices. This led an expansion in the balance sheets of financial institutions and encouraged lending and borrowing behavior further. While the circumstances for a housing bubble were being set, the fact that central bankers also neglected the need for sufficient financial regulation and supervision speeded the process up. Apart from these two points of departure, there were also some other factors contributing the uncontrolled subprime lending.

The favorable conditions of Great Moderation also led a gradual decline in the global uncertainty. By the same token, the fall in the VIX encouraged agents in the economy to take broader risks. Policymakers allowed credit growth to run free, promoting the appetite for further risk for yield. The volatility in the world markets had reached the lowest values just before the global financial crisis, in 2005 and 2006 (Figure 2.4). Furthermore, the central bank of the most advanced financial market in the world, Fed, was providing low interest rates,

self-confidently during the Great Moderation. Agents were enjoying the more and more yields obtained from the advancing financial markets. Low interest rates and global uncertainty led credit to grow rapidly.



Source: Chicago Board Options Exchange

Figure 2.4: Volatility Index (VIX)[3]

Another factor on the path to the global financial crisis is inflation targeting. Although inflation targeting itself cannot be considered as a direct source, its implications did not provide any buffer for the upcoming crisis.

An inflation targeting framework stands for a tight and credible commitment to stabilize inflation, often aiming to reach an explicit numerical inflation objective, while also pursuing policies to stabilize output around its natural level. By 2008, 14 central banks out of 30 OECD countries have adopted inflation targeting regimes. Many economists, who studied empirically, state various benefits of inflation targeting in advanced countries, such as lowered expected inflation (Johnson, 2002), less frequent sudden stops of capital flows and lowered exchange rate volatility (Rose, 2007). On the developing world side, the results were quite similar, only resumed to be performing "not as good as" the developed ones (Mishkin and Schmidt-Hebbel, 2007).

[3] CBOE Volatility Index measures the volatility implied by S&P 500. It refers to the volatility expected in the stock market for the next 30-day time frame.

Inflation targeting regime contributed to the set-up of the global financial crisis in the sense that it required only the monitoring of inflation and real GDP growth. Central banks were deemed to be successful depending on whether they hit their pre-announced targets. As stated before, central bankers were responsible from the extreme movements of the asset prices only if they had significant effects on the inflation rate. To this end, the limited control panel required by an inflation targeting regime of the time led crucial neglects.

The conditions that facilitated the subprime lending were further promoted by the developments in the financial instruments. US, having the most advanced but also complex financial market continued improving with financial innovations, particularly with the integration of derivatives to this leading market. However, as indicated before, this complex market lacked sufficient regulations. The tools available fell short in measuring the risk arising from those financial instruments properly. Brokers who were providing credits had no responsibility afterwards, which gave rise to the possibility of uninformed homeowners misunderstanding some crucial terms and proceeding problems in payments. Furthermore, mortgages were repacking over and over to other banks. Eventually, these collateralized debt obligations have formed the grounds of the global financial crisis.

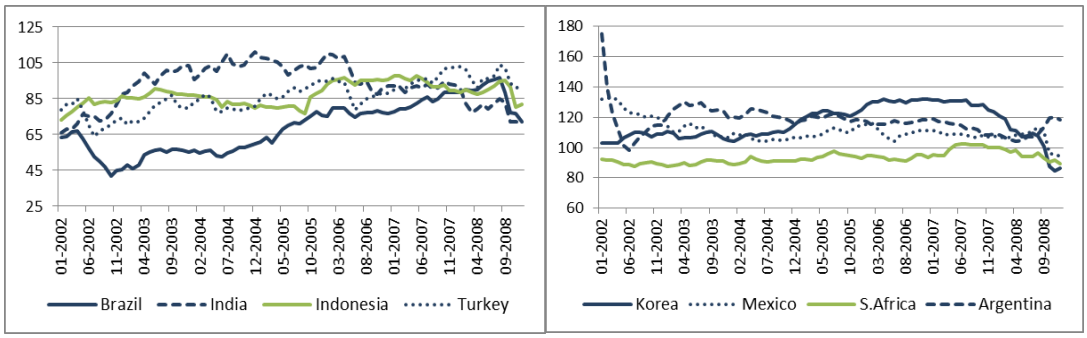
As in advanced countries, central bankers of developing countries were also celebrating since they were able to hit their inflation targets, promote high growth rates and low volatility. By 2008, nearly 20 developing countries adopted inflation targeting regimes. As clearly seen from the two main indicators to monitor at that time (Figure 2.1&2.2 earlier), they assumed that they were doing well. However, several studies reveal that their success may not have been achieved only by effective control of short-term interest rates and promoting price stability does not mean that they reached an overall macroeconomic stability.

In a study upon the success of South African inflation targeting, Comert and Epstein (2011) argue that the South African experience with inflation targeting was not successful when considered in terms of achieving low employment and higher economic growth. In other words, even though they were able to hit the

targets, the main macroeconomic variables were not doing well. Furthermore, Heintz and Ndikumana (2011), questioning the performance of developing countries on the inflation targets, state that during the period in which inflation targets were met, the real exchange rate was persistently appreciating.

In the same vein, the success of another developing country, Turkey, in inflation targeting is also being questioned. Benlialper and Comert (2013) argue that tolerating Turkish lira when it appreciated and intervening when it depreciated, which they call "implicit asymmetric exchange rate peg" under the inflation targeting regime, is the main reason that inflation targets were hit at that time. In other words, the Turkish central bank has benefited from the appreciation in Turkish lira as an implicit tool, to hit their inflation targets.

The findings of these studies are also supported by the study of Aizenman et al. (2008). In their study conducted on 17 emerging market countries, they find strong evidence that inflation targeting emerging economies have been following a mixed inflation targeting strategy whereby central banks respond to both inflation and real exchange rates in setting policy interest rates.

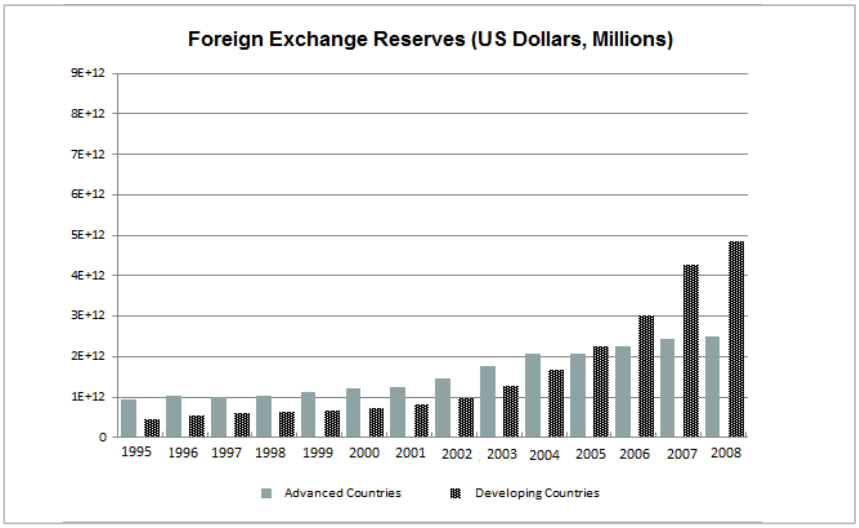


Source: BIS

Figure 2.5: Real Effective Exchange Rates in Some Developing Countries

Figure 2.5 verifies the fact that developing countries, some significantly and some moderately experienced an appreciation trend during Great Moderation. Considering the evidence from the literature and the appreciation trend which lasted until around the last quarter of 2008, it is likely that the well performance

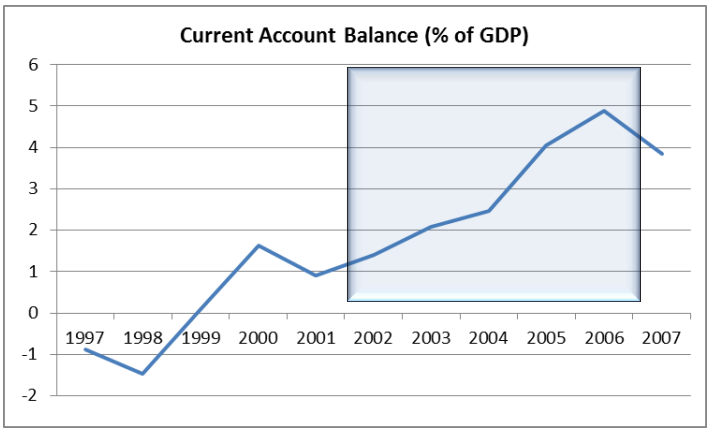
of central banks with their inflation targets might have been provided by the appreciation of domestic currency. The appreciation trend is likely to be associated with international capital flows led by expanding balance sheets in advanced countries. Moreover, Figure 2.6 below demonstrates that the foreign exchange reserve accumulation followed a significant upward trend, which strengthens the given argument. Figure 2.7 also supports the findings that the current account surplus in developing countries was rising for the given time frame. If developing countries used exchange rates as an implicit tool, it is very likely again, that most of them have ignored the undesired consequences of over-appreciation in developing countries (Benlialper, Comert, 2013).



Source: IMF

Figure 2.6: FX Reserves in Advanced and Developing Countries

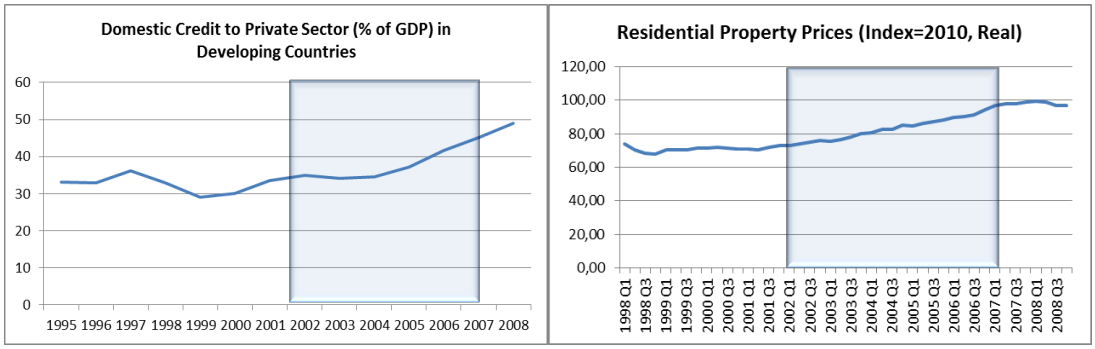
In this respect, an implication of the Great Moderation for developing countries was their standing in the middle ground of the challenging 'impossible trinity'. The large accumulation of reserves provided them to enjoy some degree of monetary autonomy and open capital accounts. At the same time, the underlying factors that enable this large reserve accumulation as well as the availability of open capital accounts led the currency appreaciation and therefore a successful record of inflation targeting.



Source: IMF

Figure 2.7: Current Account Balance in Developing Countries

The excess global liquidity driven by the expanding balance sheets in advanced countries had significant impacts also on the domestic credit cycles of developing countries as well. Within the same time framework, the credit provided to private sector increased by 48% and residential property prices rose by 34% (Figure 2.8).



Source: WorldBank, BIS

Figure 2.8: Credit and Residential Property Prices in Developing Countries

Since increasing short-term interest rates as a measure would lead further fueling of the cycle, developing economies experienced a serious policy dilemma and had to let procyclicality persist. Only some East Asian countries adopted

some measures in order to curb the mortgage lending and addressed the housing sector explicitly.

As stated in the beginning of this section, developing countries strengthened their main macroeconomic and financial fundamentals after their own financial crises in 1990s. This amelioration made these countries more investable for international investors. With more open capital accounts and more levered system, developing countries attracted large capital inflows during the second phase of the Great Moderation. This allowed their domestic currencies to appreciate and facilitated the task of policymakers to hit the preannounced inflation targets. Moreover, with the acceleration in credit growth and asset price inflation to some degree, the real GDP growth was fueled. Nevertheless, these favorable conditions made emerging economies dependent on the global conditions. Becoming dependent on international capital inflows in order to promote domestic macroeconomic stability brings the risk for developing countries to be extremely sensitive to a sudden stop or reversal. Counting only on the surge of capital inflows and the accumulation of international reserves proved to be insufficient with the onset of the global financial crisis.

2.3 AFTER THE GLOBAL FINANCIAL CRISIS: THE RISE OF MACROPRUDENTIAL POLICY

The global financial crisis has been a dramatic challenge to central banks, shaking the foundations of the pre-crisis consensus (Goodhart, 2010). Economists and central bankers have realized that financial stability should have counted more than a second-order issue, a fact that they have been ignoring in the course of Great Moderation. Central banks thought that financial instability could endogenously be managed due to the efficient market hypothesis and its effects on the real economy could be handled the by monetary policies implemented mainly for the price stability (Carré, 2013). These were proven to be wrong. The crisis clearly underlined the importance of financial stability and the need to more pay attention to it. In this vein, central banks started to seek appropriate ways to manage both price stability and financial stability.

Besides these massive changes in the understanding of central banking practices after the global financial crisis, there have also been some views that haven't changed. First, a majority of central bankers and economists share the idea that price stability should still serve as the primary objective (IMF 2010, De Gregorio, 2010). Secondly, the policy framework with flexible inflation targeting is still seen as valid since the goal of maintaining low inflation is inescapable and the pre-announced target establishes a benchmark for accountability (Mminele, 2010). However, although the basic central banking paradigm of flexible inflation targeting is still valid, the form of its flexibility requires substantial rethinking (Mishkin, 2012).

Due to some reasons driven by this massive change, the policy toolkit of central bankers required an expansion. First, since monetary policy failed to meet the policy needs of central banks in dealing with the global shock after the crisis, central bankers used unconventional monetary policy tools as an exit strategy. Many advanced economies cut policy rates at historical low levels for prolonged periods and expanded systemic liquidity. They also adopted the role in the resolution of systemically important institutions. On the other hand, facing with the bitter consequences of financial imbalances and procyclicality, they realized the importance of monitoring financial stability and countercyclical policies. The challenge faced by central banks was the fact that monetary policy was not sufficient in pursuing both price stability and financial stability. Monetary policy can be constrained by the exchange rate regime, the prevalence of foreign currency lending or an inefficient policy transmission mechanism (Lim et al., 2013). Furthermore, using simply short-term interest rates prevents central banks from addressing specific sectors such as housing market. In addition, solely regulating individual institutions by microprudential policies also did not guarantee financial stability. To this end, central banks found the solution in an alternative policy to prevent the build-up of systemic financial risks, which is the macroprudential policy.
Therefore, in brief, the post-crisis central banking is associated with the following highlights: financial stability complements price stability as a central bank mandate whereas price stability continues to be the primary objective; inflation targeting regimes remain in use as before, but with more flexibility; the control

panel of central banks no longer consists only of inflation and output but also include some other crucial macroeconomic and financial indicators; pursuing both mandates and monitoring a wider set of indicators bring the need for additional policy tools in the toolkit of central bankers.

In the light of these recent developments, financial regulators of the developed world, such as Bank for International Settlement (BIS), International Monetary Fund (IMF), European Central Bank and the Bank of England started to discuss the macroprudential framework after the global financial crisis. G20, announced their adoption of financial stability as one of its priorities and the use of macroprudential policy, at the London Summit of April 2009. Moreover, Financial Stability Oversight Council was established in 2010, to identify and moderate excessive financial risks. In U.K., Financial Policy Committee established as a new body of the Bank of England in 2010. Similarly, the European Union established The European Systemic Risk Board, to detect financial risks and provide appropriate tools, in January 2011. A more active step has been the establishment of international Basel requirements, which are recommended globally.

In spite of the fact that the ESRB functions both for the entire Union and country level, each country have featured financial structures. For example, in France, banks play a greater role in financing of the economy whereas in U.K. disintermediation is more developed (Banque de France, 2013). While some countries like New Zealand announced their use of macroprudential policy to the public, others like Australia remain reluctant to the public announcement, with the concern that this would lead the central banks to feel obliged to carry on with the policy. Thus, although there is a consensus between the developed countries on the use of macroprudential policy, the tools they use and the strategy they follow may differ depending on the structural circumstances in a country or the choice of a central bank.

The macroprudential tools discussed by institutions such as International Monetary Fund, Bank for International Settlement, Financial Stability Board, G20 and G30 are mostly concerned with the financial problems of the developed world. However, the financial characteristics of the developed and developing world differ significantly. The Basel requirements, for example, are designed

regarding the needs of the advanced economies. The financial systems in the developing world are still far behind their developed counterparts and their vulnerabilities against global uncertainties are significantly higher.

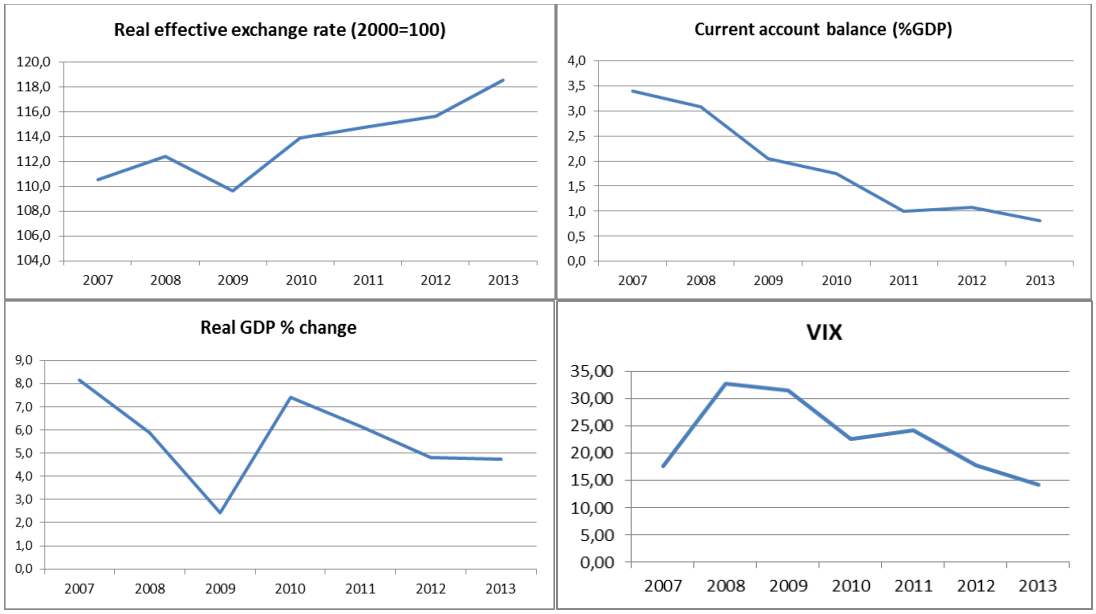
Thus, the developing world needs to go further than the recommendations of international settlements and follow their own macroprudential frameworks, regarding the individual risks in their financial systems (Akyüz, 2013). Having realized the outcomes of the cycle, many developing countries took macroprudential measures in order to counter the procyclicality or "to lean against the wind". While some of them transformed their existing tools, others came up with a whole new set-up of macroprudential frameworks, each adding the financial stability as a new mandate to complement their main objective, the price stability.

Despite demonstrating a considerable resilience against the global financial crisis (Ceballos et al., 2012, Colak and Comert, 2013, Kenc et al., 2012, De Gregorio, 2010), developing countries have faced a new problem due to the exit strategy of the developed world. As stated before, the global financial crisis brought non-conventional monetary policies in use. Developed countries have followed quantitative-easing strategies and zero interest-rate policies to deal with the liquidity shortage and credit crunch that took place after the global financial crisis. The leading central banks in the world, such as Fed, European Central Bank, Bank of Japan and Bank of England performed large asset purchases in line with their expansionary policies. Regarding the excess global liquidity that these policies created, capital flows to developing countries increased, arising multiple vulnerabilities in their financial systems. These inflows typically lead excess credit/leverage growth and asset price bubbles, accelerating the procyclicality in the system as already partially faced in the pre-crisis period. However, unlike in the pre-crisis period, the capital flows into developing countries were subject to fluctuate in line with the movements in the global uncertainty. To track these dynamics, the movements in the main indicators in the wake of the crisis should be analyzed.

Figure 2.9 shows some main macroeconomic indicators for developing countries. In the wake of the crisis, the rise in the real GDP and the appreciation in

domestic currencies remind the conditions in the Great Moderation. However, unlike before, there is a significant worsening in the current account balances. Moreover, the real growth rate falls immediately after 2010. Figure 2.9 also demonstrates that although the global uncertainty seemed to follow a downward trend in the wake of the crisis, a more volatile trend is observed with respect to the Great Moderation era afterwards.

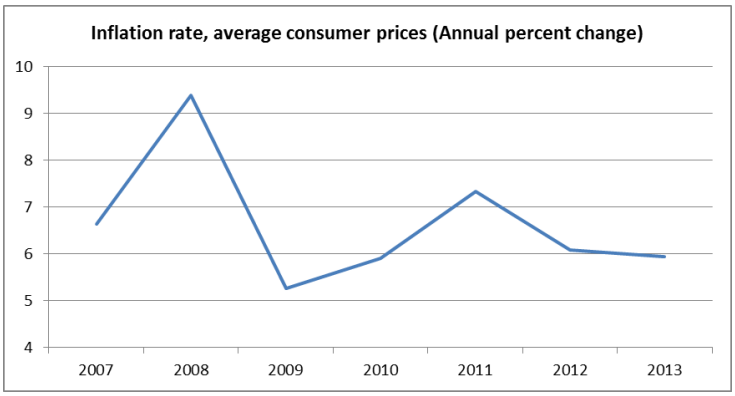
Another significant factor which leads central bankers to take additional measures is the movements in the inflation rate. After the crisis, the average inflation rate in developing countries was no longer stable. Following a significant fall in 2009, the rate then exceeded the stable path of the average 6% rate which was the trend during Great Moderation years (Figure 2.10).



Source: IIF

Note: IIF EM10 = BRICS, Turkey, Mexico, Chile, Poland and Indonesia

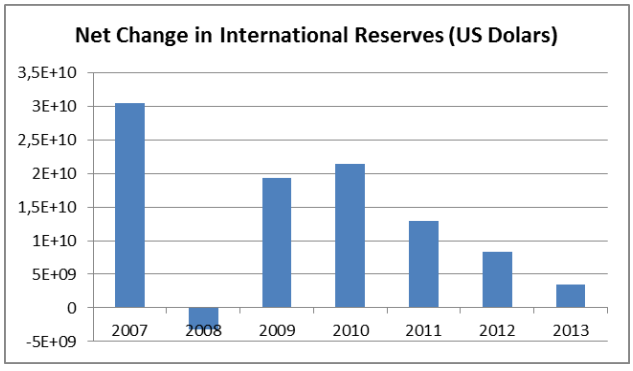
Figure 2.9: Main Macroeconomic Indicators in Developing Countries (EM10)



Source: IMF World Economic Outlook Database

Figure 2.10: Inflation Rate in Developing Countries[4]

Based on the literature we have focused on previously, developing countries may have been benefiting from the appreciation trend in the world and used their foreign exchange reserves as a buffer in a case of depreciation. The end of the appreciation trend has left them with the only first-aid tool, buffering reserves. Figure 2.11 below shows the net fall in the international reserves of developing countries during the crisis. Standing on the middle ground provided them a space within the trilemma for flexibility which was crucial in challenging



Source: IMF World Economic Outlook Database

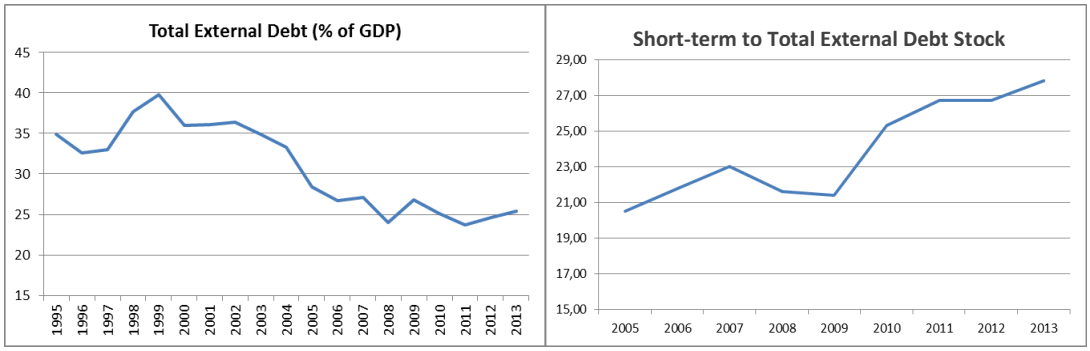
Figure 2.11: International Reserves in Developing Countries

[4] The 'developing countries' classification implied in the graphs is based on the categorization of IMF whenever the source is stated accordingly. For the rest of the sources throughout this Chapter, 'developing countries' refer to the developing countries within G20 and based on the compilations of the author, unless otherwise stated.

circumstances, but unfortunately insufficient. The risk of depletion has eventually caused them to let depreciation which proved that buffering reserves solely is not a sustainable way to fight against cross-border shocks. The need for new methods to control the pressures over the exchange rate became obvious.

The cruciality of promoting a stable currency is more obvious when the composition of external debt is taken into account. Figure 2.12 shows some important information upon the external debt of developing countries. Figure on the left shows that the total external debt had been falling since the beginning of the Great Moderation. When co-assessed with the figure on the right, it is clearly seen that there has been a significant shift towards short-term maturity in the composition of external debt as of the global financial crisis.

Moreover, as seen earlier, the current account balances significantly worsened too. This indicates that some countries might have been financing their current account deficits with short-term external debt, which implies serious possible maturity mismatch problems. The maturity mismatch related risks are likely to lead vulnerabilities for these economies against sharp reversals in the global conditions.

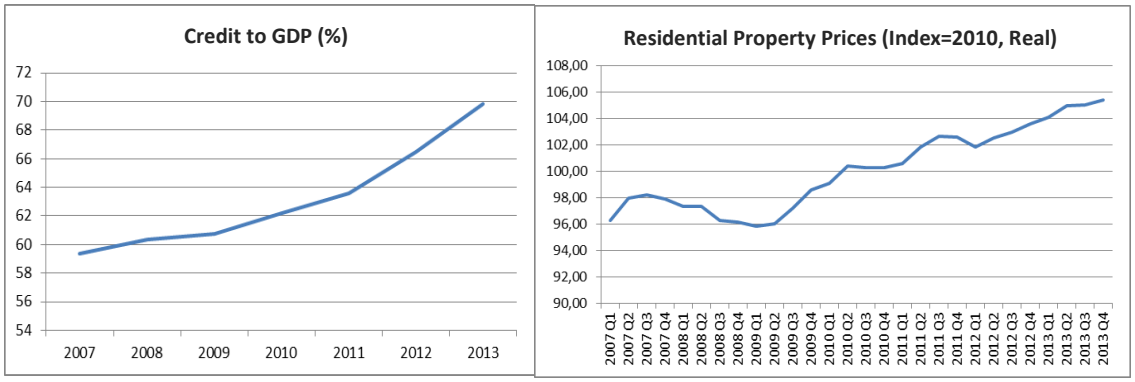


Source: WorldBank, IMF World Economic Outlook Database

Figure 2.12: External Debt Indicators in Developing Countries

Another worrisome front for the policymakers of developing countries is the developments in credit and asset markets. Although credit and asset price movements were managed to be held under control to some degree during the

Great Moderation, the post-crisis global conditions required closer attention to the developments in these fronts regarding the other additional risk factors. With the other vulnerabilities given earlier, a sudden reversal in global conditions became more likely to hit the domestic dynamics of a developing country. Figure 2.13 shows the persistent rise in credit to GDP level and real residential property prices in developing countries, which accelerated after the global financial crisis.



Source: Worldbank, BIS

Figure 2.13: Credit and Asset Prices in Developing Countries

The given indicators throughout this section represent the general trend observed in developing countries during and after the global financial crisis. However, developing countries are heterogeneous among themselves. While some countries suffered more from the unpleasant trends in inflation, other had more worrisome record in GDP or credit fronts. Appendix A presents some of the indicators given in this Chapter in a form that is decomposed for some sub-groups within developing countries. Figure A.1 asserts that except the European sub-group, inflation exceeded the pre-crisis trend of 6% in the wake of the crisis. The rate remained 6% in Latin America and the Caribbean whereas it persistently rose to a level exceeding 6% after the sharp decrease in 2009 to 3% in the Asian group. The reversal has been less sharp in the sub-group of Asia, the ASEAN Five[5]. However, the Asian Five appear to have been more negatively affected in the GDP growth front with respect to the other Asian countries (Figure A.2, Appendix A). The growth rate fluctuated sharply. Nevertheless, the

[5] ASEAN Five is composed of Indonesia, Malaysia, Thailand, Brunei Darussalam, Cambodia, Lao PDR, Myanmar, Philippines, Singapore and Vietnam.

most disruptive impacts of the global financial crisis in the real GDP growth front stand to have experienced by Europe as well as Latin America and the Caribbean. Unlike the Asian countries, those in the two given sub-sample groups had negative growth rates in 2009. This is likely to imply that the GDP growth in the given countries is more dependent on global factors.

The general analysis earlier implies that the broad set of developing countries have been experiencing a notable worsening of current account balances since the onset of the global financial crisis. Figure A.3 in Appendix A demonstrates that this case is not valid for the European sub-set. On the other hand, the current account balance of the Asian sub-group recorded a significant worsening. An average current account surplus of 6,5% in 2007 fell to 1% in 2011. The ASEAN Five reflects a similar case. The sub-group of Latin America and Caribbean stands to be the most negatively affected one among developing countries. An average current account surplus in 2007 turned into an unsustainable current account deficit at around 2,5-3% following the years after the global financial crisis.

In the credit front, the decomposition of the aggregated group reveals again that the findings for countries are heterogeneous. Since the related data in Figure A.4 of Appendix A is country-based instead of country groups, it is possible to observe that the differentiation in the trend is not constrained within country sub-groups. In Asia, while India and S.Korea have not experienced an upward trend in the credit to GDP ratio, Indonesian ratio has been increasing persistently since the global financial crisis. Nevertheless, in Latin America, three sample countries of Argentina, Brazil and Mexico all experienced upward trends. The evidence shows that each country has its own major risks together with the common trend observed in developing countries.

In brief, the post-crisis macroeconomic and financial environment implied acceleration in the credit growth rate and asset prices, high inflation, fluctuating real GDP growth rates, worsening current account balances, as well as shortening maturities in the composition of external debt stocks. If central bankers of developing countries would have remained with their pre-crisis toolkit consisted of short-term interest rates, they would have faced numerous policy

dilemmas that would eventually lead serious damage to their economies. An interest rate hike to limit the credit growth and asset prices could lead a further attraction of short-term capital flows and vulnerabilities to external factors. On the other hand, a cut in the policy rate to prevent capital inflows could lead a possible credit boom or a housing bubble. To promote overall macroeconomic and financial stability, central bankers had to develop a toolkit that is able to curb credit growth and asset price inflation, reach a sustainable current account balance, ameliorate the composition of short-term debt and weaken the pressures on the exchange rate. While doing so, they were also supposed to monitor their main variables of inflation and GDP growth. Given the previous discussion on the heterogeneity between developing countries, central bankers of each country should also work on toolkits that are specifically designed to put more emphasis on certain macroeconomic and financial risks.

The emerging consensus on central banking practices that was shaped due to the lessons from the global financial crisis already required an expansion in the policy toolkits of central bankers worldwide. In the light of all discussed above, the need for a macroprudential framework for developing countries was underlined once more with the post-crisis conditions that were heavily driven by the global factors. As globalization, which empowers the financial integration and capital flows -that causes the undesired volatility in emerging economies- is increasing in an accelerated manner, the urgency of a reform in the central bank policies becomes apparent.

2.4 CLASSIFYING THE TOOLKIT: WHERE DO THEY STAND IN THE CYCLE?

The previous section underlines the emergence of the need to adopt or bolster the use of macroprudential policies. They are expected to solve some policy challenges that were faced by central bankers earlier and promote the soundness of the financial system. However, to better understand how these tools are supposed to serve for these needs, the transmission channels of their impacts should be carefully investigated. In this section, this study attempts to

identify these transmission channels by determining their first and second-order effects on different indicators. This method allow the following chapters to define the new policy mixes of selected countries and is to be utilized to demonstrate the extent that a central bank manage to cover the risks in the macroeconomic and financial system. In this respect, this section first presents the classifications methods in the literature that are most related to the purpose of this study. Then, a new classification method is presented which takes transmission channels into account.

The macroprudential tools are classified in various ways in the literature, depending on their effects on the financial system or the side of the balance sheet that they target as well as the systemic risk that they aim to mitigate. Among these methods, this section presents the most relevant ones for the aim of emphasizing the importance and necessity of developing a new method that would serve best for the purposes of this study.

As stated before, there are numerous methods to classify macroprudential tools, mainly conducted with simple categorization purposes. The IMF report (2011) on capital flow management is particularly appropriate for the specific features of developing countries. The three part taxonomy consists of prudential tools, currency-based tools and, residency-based tools. Prudential tools are related to domestic conditions rather than capital flow distortions, including loan-to-value (LTV), loan-to-deposit (LTD) and leverage caps. The currency-based tools are concerned with the vulnerabilities due to global factors, such as levy on short-term foreign exchange denominated liabilities. Lastly, the residency-based tools are designed to deal with capital flows, such as, taxes on portfolio flows.

Another widespread classification is the summary of the IMF survey (2010) reported by Lim et al. (2011) dividing tools under three main categories: credit-related, liquidity-related, and capital-related. The most common credit-related tools are caps on loan-to-value (LTV) ratio, caps on debt-to-income(DTI) ratio, caps on foreign currency lending and ceilings on credit and/or credit growth. Liquidity-related tools are limits on net open currency positions or currency mismatch, limits on maturity mismatch and reserve requirements. Lastly, the most commonly used capital-related tools consist of countercyclical capital

requirements, dynamic provisioning and restrictions on capital distribution. There are also other well-known categorizations of macroprudential tools in the literature such as 'rule vs discretion' based tools and 'price vs quantity' based tools, utilized by Borio and Shin (2007) and Perotti and Suarez (2010) respectively.

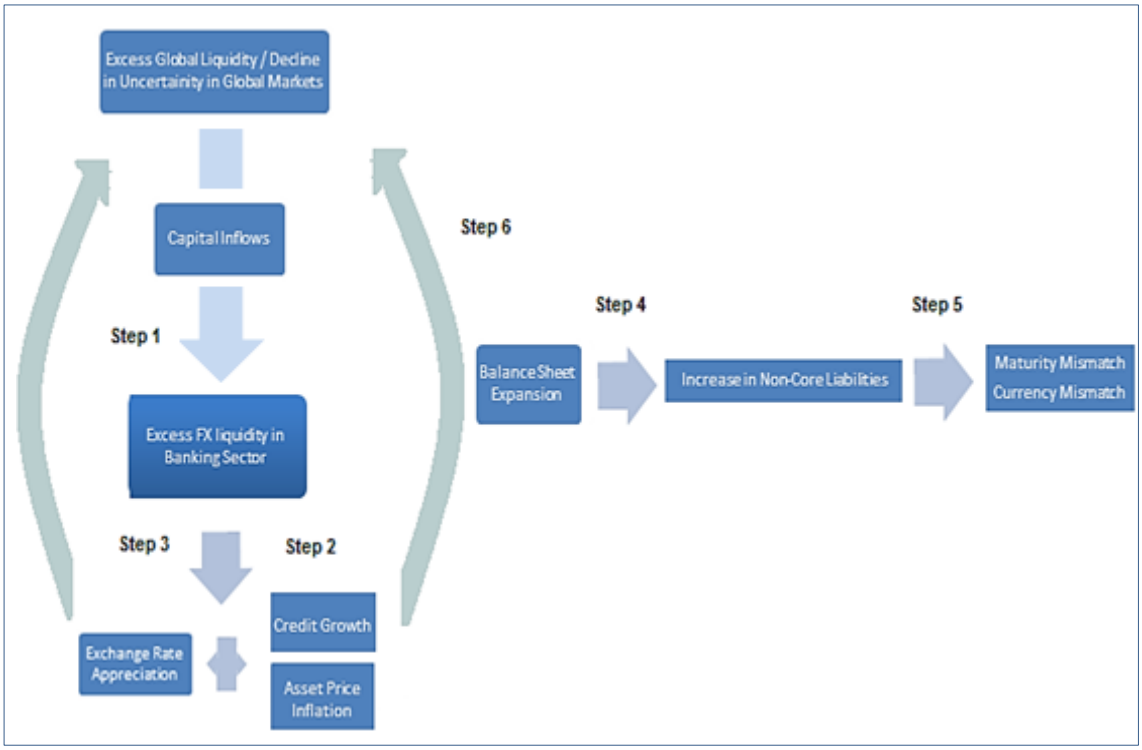
There are also a few studies which explain macroprudential tools by classifying them according to their purposes. The Financial Stability Board (FSB), who is the orientor of the macroprudential policy recommendations worldwide, evaluates macroprudential policies according to the type of risks that they aim to mitigate. These risks covers two dimensions: the time dimension (procyclicality) and the cross-sectional dimension (systemic risk). While the tools related to the latter category were already in use prior to the crisis, tools related to the former category have become more widespread in the post-crisis period. For example, unlike Basel II, which was later blamed for fueling procyclicality, the Basel III framework covers both dimensions.

Another approach by Lim et al. (2011), also classify macroprudential tools according to the risk that is addressed. This more detailed approach covers tools that aim to mitigate risks arising from: credit growth/asset price inflation; capital flows/currency fluctuation; excessive leverage and systemic liquidity. These risks are highly connected and in most cases initiated by credit inflows which are mostly driven by global factors on which developing countries have no control (Glosh et al., 2014). In the wake of the crisis, the quantitative easing exit strategies of advanced countries ended up with an acceleration in the credit growth that is more than desired in many developing countries. Without proper measures, the currency and maturity mismatch problems arisen from the foreign funding of the rising credit growth would lead vulnerabilities of financial systems. Therefore, taking capital inflows as a point of departure may provide a useful illustration of the chain of events in developing countries.

A more detailed approach is the one developed by BIS (2008). The tools are classified under five main headings. Tools that are concerned with: credit markets; balance sheet composition and expansion; capital flow volatility; risk assessment; and macroprudential assessment. The first three categories are

particularly important for investigating the macroprudential toolkit in developing countries. However, it is possible to expand the number of categories to fully reflect the challenges for developing countries.

Hence, although all approaches are beneficial in some terms, a new method is developed in this chapter. Rather than using a classification based on the qualifications of the tools, mapping them according to their impact on the monitored indicators of central banks is quite convenient for the aim of this study. This method offer a clear view over the transmission channels of risk in developing countries and the steps that macroprudential tools are designed to block these channels. The next chapters benefit from this approach while attempting to assess the central banking effectiveness in various countries.



Source: Compiled by the author

Figure 2.14: The Effects of Capital Inflows in Developing Countries[6]

[6] There may be channels which may transmit the FX liquidity other than the banking sector. However, developing countries compose mainly of banking-based financial systems. Although the study acknowledges that there may be other significant channels, it focuses on the banking sector for simplicity.

The figure given above demonstrates the path of the impacts of capital inflows focusing on developing countries. In fact, this path represents two inner cycles: domestic and global. These two strictly integrated cycles are mainly linked by the impacts of capital flows and any volatility arisen within each cycle. Each phase of the capital flows within the cycle is represented by different steps in the figure. Accordingly, macroprudential tools are designed to address one or more steps represented in the cycle.

Step one indicates the capital flow attraction of developing countries from the world. This attraction may also be caused by high domestic interest rates, low foreign interest rates, expected appreciation of foreign currency or a low VIX index which implies low investment risk. These factors contributed and have been contributing to the carry trade problem of developing countries both before and after the global financial crisis. When one or a combination of several of these occur and lead attraction of capital flows into a developing country, it is important for the authorities to control the magnitude and composition of these flows. Developing countries have been following different capital flow management strategies since the wake of the crisis. In Thailand, withholding taxes for nonresident investors were imposed whereas Indonesian policymakers put minimum holding periods in effect. Central Bank of Chile, that used to deal with capital inflows by imposing taxes on short-term flows, intervened in the FX market after the crisis. In Peru, some new regulations on the currency holdings of residents and nonresidents became in effect. There are also some countries that introduced some new tools into the macroprudential toolkit. Central Bank of Turkey adopted interest rate corridor as a tool to manage capital flows. Interest rate corridor refers to the wedge between the lending and borrowing rates. When the lower bound of the corridor is lowered, foreign investors become relatively uncertain for the yield of their investments and therefore be discouraged. On the other hand, when policymakers want to attract more capital flows they may encourage foreign investors by increasing the upper bound of the interest rate corridor. In S.Korea and Brazil the new tools that are introduced compose of taxes as capital flow management tools, known as capital controls. A useful tool at this step of the path is a tax that can be imposed to foreign investments. A financial transactions tax (IOF) was introduced in Brazil, which acts as a capital flow management measure by raising the cost of foreign

purchases of domestic bonds. Korean authorities also adopted new measures to address capital flows, mainly with the introduction of the Macroprudential Stability Levy (MSL). This way, Korean authorities aimed to manage the growing non-core liabilities problem of Korea. While the trend after the crisis seems to have been tightening the capital controls, South African Reserve Bank eliminated the controls on the outflow of capital and intervened in the FX market like Chile. Instead of coping with the volume of gross inflows, South African policymakers chose to reduce net inflows by encouraging gross outflows.

Although the tools explained above are specifically designed to manage capital flows, they are also supposed to have positive impacts on the other steps of the system, particularly related to exchange rates and financial soundness. By the same token, other tools to be implemented throughout the mechanism are also expected to have effects on this initial step of the path. Table 2.1 summarizes the expected effects of some selected tools on different steps. Each tool has first-order, second-order and some has third-order impacts over the stages in the given cycle.

Table 2.1: The Expected Impacts of Some Selected Tools on The Steps of the Cycle

	Interest Rate Corridor	**Taxes on Capital Flows**	**MSL**	**Minimum Holding Periods**	**Caps on LTV/DTI**	**ROM**	**Reserve Req.**	**FX Reserve Req.**	**Leverage Caps**
Step 1									
Step 2									
Step 3									
Step 4									
Step 5									
Step 6									

Source: Compiled by the Author

Note: The darker colors on the Table imply the first-order impacts. The lighter the color gets, the weaker impact is expected.

Moving along the given cycle, the need to effectively control each step becomes apparent. In developing countries, financial intermediation is relatively weak. Not

having deep and complex financial markets, the economies of these countries are mainly bank-based. Therefore, unless appropriate measures are taken, the surge of capital inflows eventually results in an excess liquidity in the banking sector.

At step two, banks with excess liquidity start providing loans to the agents in the economy. In the wake of the crisis, the main challenge for developing countries was to curb accelerating credit growth caused by quantitative easing strategies of advanced countries. In each country, a different sector had been the driving force of the overall accelerating credit growth. For example, the source of acceleration had mainly been housing sector in S.Korea whereas it was consumer loans in Turkey. At this point, choice of tools depends on the specific features of an economy. If loans are provided mainly as mortgages, policymakers tighten caps on loan-to-value (LTV) and caps on debt-to-income (DTI), whereas if consumer loans are the driving force of an accelerating credit growth they may impose restrictions on consumer loans. Caps on LTV and DTI are two tools that complement each other. Since LTV caps address the wealth aspect, its implementation alone dampens the procyclicality of credit growth. If asset prices grow rapidly, caps on LTV will be ineffective as a countercyclical tool. However, caps on DTI address the income aspect and complements the countercyclical behavior. The joint use of these two measures acts as a brake on both mortgage lending and housing price appreciation. As mentioned above, depending on the requirements of the system, restrictions on consumer loans may also be used for curbing credit growth. They may address specific type of loan such as personal credits, payroll-deducted loans or vehicle financing. Higher capital requirements on certain types of loans are also examples of the tools in this category.

While these tools to curb credit growth in specific sectors are not very widespread, reserve requirements – which address aggregate credit growth acceleration- are widely adopted by developing countries' central banks (Table 2.2). More recently, several central banks such as Banco Central do Brasil, Bank Indonesia and Central Bank of Republic of Turkey introduced foreign exchange reserve requirements too. Similar to domestic currency reserve requirements on

Table 2.2: Frequently Used Macro-prudential Tools in Some Developing Countries

	Time Dimension (Procyclicality)						*Cross-Sectional Dimension (Systemic Risk)*			
	Caps on LTV	Caps on DTI	Reserve Req.	Countercyclical capital requirement	Dynamic Provisioning	Limits on interbank exposures	Limits on net open positions	Limits on maturity mismatch	Caps on foreign currency lending	Levy on non-core lending
Brazil			+	+	+		+	+	+	
Mexico				+	+	+	+	+		
Argentina			+				+	+	+	
India	+		+	+	+					
S.Africa							+	+		
Turkey	+		+				+		+	
S.Korea	+	+	+				+		+	+
Indonesia	+		+				+			
Malaysia	+		+				+			
Colombia	+	+	+		+	+	+			

Source: Compiled by the author, based on Lim et al. (2011) and recent policy papers by the central banks of the given countries.

demand and term deposits, FX reserve requirements also promote curbing excessive credit growth. Moreover, foreign exchange reserve requirements also limits domestic banks' funding from abroad and supports the tools at the initial stages of the mechanism. Together with these secondary effects, the main target of foreign exchange reserve requirements is to control the volatility and the pressures on the exchange rates.

Apart from the credit and asset markets another implication of financial inflows is step three, the movements of the exchange rates. When there is an excess level of financial inflows to a country, appreciation pressures on the exchange rate tend to rise. In the opposite scenario, the exchange rate faces depreciation pressures. These pressures generally have significant side-effects over the real economy, particularly on the current account balance, inflation and real GDP growth. Rather than buffering reserves, these pressures are aimed to be weakened by the use of macroprudential tools. As indicated above, foreign exchange reserve requirements are the more widespread tool to manage the pressures. Moreover, Turkey introduced a tool called the Reserve Option Mechanism (ROM) that is designed to control the pressures on the exchange rate. While foreign exchange reserve requirements are compulsory, the ROM mechanism is based on voluntarily terms.

Another implication of this step is its connection with the initial step of the path. There is a strong link between the volatility of capital flows and exchange rates. The clockwise transmission mechanism can clearly be seen on the cycle. The volatility in the exchange rate that is mainly due to domestic factors may also affect the investment decision of foreigners. Tools such as foreign exchange reserve requirements and ROM are useful in this front also, by blocking the direct transmission from step 3 to step 1 and vice versa. On one hand, the volatility in the domestic currency is buffered while, on the other hand, the volatility of capital inflows is controlled. In both ways, the domestic currency is supposed to be stabilized and the pressures over the exchange rate are expected to be lowered. Furthermore, as with the tools in the previous steps, these tools also have impacts on the rest of the cycle, particularly on financial soundness.

Moving along step four, exchange rates and credit/asset markets may fuel each other in a feedback loop which may at last lead to a further expansion of bank balance sheets. When there is a significant asset price inflation in an economy, the demand for credit rises. To provide credit, banks' reliance for wholesale funding increases. This cycle leads stretching in banks' balance sheet and results in several vulnerability problems in the banking sector. First, since banks often provide the funding that they seek from outside in foreign exchange, the non-core liabilities of the banking system tend to increase. A levy on non-core liabilities aims to curb excessive increases in banks' non-core liabilities by reducing arbitrage margin and raising FX funding costs. Moreover, caps on loan-to-deposit (LTD) ratios are also useful for reducing reliance on wholesale funding. Secondly, if there is no levy imposed and no appropriate or adequate measures are taken throughout the mechanism, the financial system most likely ends up with currency mismatch and maturity mismatch problems, which may lead bitter results following any shock to the system at any point of the mechanism. Limits on currency and maturity mismatch may help moderating these risks. However, these are not time-varying tools and should be backed up with other ones in the earlier steps of the cycle.

Short-term capital flows are well-known to be subject to sudden stops or reversals. A volatility of capital flows can be caused by shocks or the mechanism itself. A change in the global liquidity, global uncertainty or a severe shock in commodity prices, as well as political instability in the recipient country may cause volatility in capital flows. Furthermore, an exchange rate misalignment which proceeds surge of capital inflows may eventually cause volatility of currency and increase risks for foreign investors. An excess amount of short-term external debt may also have adverse effects on the foreign investors' investment decision and cause capital flows to become more volatile.

Instead of limits on maturity and currency mismatches, the tendency of developing economies after the global financial crisis have been adopting measures that aim to mitigate the related risks at the initial stages of the path. To this end, many central banks introduced FX reserve requirements or leverage caps to limit the excessive leverage to be used for credit funding. Moreover, minimum holding periods and the tools that can be differentiated according to

the maturity such taxes or levies on non-core liabilities aim to mitigate the maturity related risks at various steps of the mechanism.

The tools explained above mainly address risks during a boom period. However, there are other countercyclical tools that are defined as 'automatic stabilizers', 'shock absorbers' or 'buffers' that prepares the banks for a downturn and enhances the resilience of the banking system. Countercyclical capital buffers and dynamic provisioning are the most widespread ones among those tools. The former promote banks to raise their capital in the run-up to a boom and lower it after the bust. Similarly, the latter is the adjustment of banks provisions which are to be increased during an upswing and decreased in the case of a downturn.

It is important to consider these tools at different stages of the mechanism as a joint optimization problem. Macroprudential tools may address more than one risk in the system and the tools may complement each other in mitigating risks. For example, limits on maturity mismatch addresses credit growth/asset price inflation, excessive leverage and also have slight effects on capital flows/currency fluctuation. This emphasizes the importance of forming a well-functioning policy framework since a simultaneous use of both macroprudential tools itself and their use along interest rates will be required.

2.5 CHALLENGES FOR IMPLEMENTATION AND THE WAY AHEAD

Despite the consensus on the possible benefits of the use of macroprudential policy, there are also various concerns upon the challenges of its implementation. First, the experience with macroprudential policy and literature on its effectiveness are still limited. Secondly, the joint optimization problem requires central bankers to develop a well-balanced policy mix which is a hard and meticulous task. Thirdly, there are still some moral problems upon the implementation of such tools and there is no consensus on the institutional framework.

Since empirical analysis requires a longer time span, measuring effectiveness of macroprudential tools have only been possible by assessing the tools that were adopted by developing countries prior to the crisis. After the financial crisis in the 1990s, developing countries took some macroprudential measures, mainly to promote the stability of their banking system and to enhance their resilience against cross-border spillovers. However, in several developing countries macroprudential measures did not prevent rapid credit growth in the lead-up to the crisis (Agénor, Pereira da Silva, 2011). In Latin America, for example, credit growth was accelerating, reaching alarming rates before the crisis (IMF, 2011). Regarding the post-crisis central banking practices, this can be considered as "a call for using macroprudential tools more aggressively or for adding new tools to the arsenal of policymakers" (Agénor, Pereira da Silva, 2011). However, without solid knowledge on the effects of tools, their selection by central bankers seems to remain challenging.

As the information and foresight is limited about the effectiveness of macroprudential policies, it is also a hard task for policymakers to choose the right combination of instruments. Since interest rates can affect financial stability and macroprudential tools may have indirect impacts on price stability, the macro-stabilization exercise must be thought carefully (Eichengreen et al., 2011). The side effects of each tool must be identified carefully and minimized to avoid unintended consequences. Macroprudential toolkit must be designed so that tools would complement each other and therefore the efficacy of the toolkits would be promoted.

Besides the uncertainty on its effectiveness, there are also some concerns that extended use of macroprudential policy will lead becoming more subject to lobbying and political pressure (Agénor, Pereira da Silva, 2011). Higher capital requirements can bother the agents who had been providing high yields in the financial sector. Furthermore, adoption of financial stability objective may adversely affect central bank credibility (Agénor, Pereira da Silva, 2011). Since there is no consensus yet on how to measure financial stability, there can be new challenges for the central banks in terms of transparency and communication of its policy decisions.

Lastly, although beyond the scope of this paper, one of the biggest challenges appears to be institutional arrangements. From the lender of last resort, to the guardian of price stability, and now having undertaken a mandate to promote financial stability, much is expected from central banks. At this point, it may be useful to remember the famous words of Walter Bagehot (1915): "'putting new wine to old bottles' is safe only when you watch the condition of the bottle, and adapt its structure most carefully". According to the study of Carré (2013) although the need for the macropudential policy have been accepted by both central bankers and economists, central bankers' answers reflect their reluctance on changing the remaining system. There seems to be no consensus on the structure, whether there should be two units in the central bank to pursue macroeconomic and financial stability, or central bank can pursue both at the same time. Some countries formed complementary bodies for monitoring financial stability, whereas others gave additional responsibilities to central banks in pursuing this complementary objective. The most common institutional forms consist of single integrated regulator and twin-peaks model. Nevertheless, the institutional transformation in many countries still continues.

2.6 CONCLUSION

The global financial crisis led central banking to take a giant step forward in its evolutionary history. Following the lessons from the crisis, financial stability is considered as an additional mandate and policy toolkits of central bankers are expanded with the inclusion of macroprudential policies. These developments also brought the need to monitor a wider set of indicators. With an expansion both in the monitored indicators and in the policy tools, the task of central bankers have turned into a joint optimization problem. For the policymakers of developing countries, the problem becomes more challenging regarding the vulnerabilities of these economies against global conditions.

As a first step to overcome this meticulous task, the risks that are faced and the features of policy tools should be pointed out. In this vein, this Chapter contributes to the existing literature by identifying risks and introducing a more

detailed approach to classify the macroprudential toolkit, while placing developing countries in its focus. With this method, it is possible to observe how effective central bankers are in covering the specified risks for a developing country.

The rest of this study elaborates on some other aspects of this joint optimization problem. Although there are multiple challenges related to the transformation process, this study focuses on the first two challenges given earlier: the limited experience with some macroprudential tools and the meticulous task of central bankers in developing a well-balanced policy mix. The aim of the two following chapters is based on the intention to shed light on two issues: the effectiveness of macroprudential tools and the interaction among the toolkit. While doing so, the cycle presented in this chapter is used to distinguish the policy mixes in some selected countries. The next Chapter is designed to assess the effectiveness of the new policy mixes adopted by some selected developing countries. The cross-country analysis is beneficial in terms of demonstrating the effectiveness of certain tools in different economies. Moreover, the common characteristics of selected countries are also helpful when comparing the tools. The last Chapter, on the other hand, digs deeper to investigate the tradeoff within the toolkit. Unlike the previous approaches in the literature, it develops a new method to measure the effectiveness of the new policy mixes by taking the interactions of the impact of selected tools into account.

CHAPTER 3

POST-CRISIS MONETARY POLICY FRAMEWORKS IN DEVELOPING COUNTRIES: A CROSS-COUNTRY ANALYSIS ON THE NEW POLICY MIXES

3.1 OVERVIEW

The previous chapter explains the changes occurring in the understanding of central banking from the early 2000s to today. The chapter particularly focuses on the recent developments in central banking after 2008, when the global financial crisis caused the most drastic punctuation in the equilibrium that had been observed since the Great Depression. The need for the inclusion of financial stability in central bank mandates is highlighted. Moreover, special attention is paid to the emerging consensus on the monetary policy framework that was shaped upon the lessons from the global financial crisis. This post-crisis framework came along with multiple implications and challenges: the introduction or bolstering of macroprudential tools; the interaction of financial stability and price stability; and the optimal policy choice regarding the joint use of monetary and macroprudential policy.

The urgency of a new monetary policy framework was emphasized by international bodies such as the IMF and G20. The adoption of international regulations such as the Basel requirements was promoted by these bodies. Despite the international initiatives and co-operations for the promotion of sound financial systems, there is much more work to do for the central banks of developing countries. Developing countries, facing a broader set of challenges regarding their vulnerabilities arising from unsustainable current account deficits,

highly volatile exchange rates and capital flows need further measures and regulations.

In this respect, central banks of many developing countries adopted new policy mixes that incorporate macroprudential policies in line with the specific risks to their economies. However, regarding our very little experience with these tools, we do not yet know where we stand in this "uncharted territory". The extent of effectiveness of macroprudential tools, interaction among the tools in the toolkit as well as the distance taken so far with this new architecture of monetary policy are almost unknown. Despite an explosion of studies upon the lessons from the crisis, little attention has been paid to these issues. In line with this need, this chapter now intends to dig deeper by attempting to assess the effectiveness of the post-crisis monetary policy frameworks of some important developing countries.

Three developing countries are selected for this purpose. These are: S.Korea[7], Turkey and Brazil. The selection of countries depends on three important factors. First, this set of countries can be considered as a fair representation of developing countries. The GDPs of these three countries form 46% of the total GDP of the developing countries within G20 (World Economic Outlook, 2014). Regarding their great potential for future growth and increasing interconnectedness with the rest of the world, the developments in these economies should be monitored closely. Secondly, the central banks of these countries announced their adoption of financial stability as an additional mandate and explicitly introduced new policy mixes following the global financial crisis. In this respect, the toolkits and the risks that are addressed are clear. Lastly, their post-crisis policy mixes form a useful set for a cross-country analysis since they address similar risks with different macroprudential tools. This enables us to observe the impacts on different tools on the same objectives.

With such an assessment, this study contributes to the existing literature by seeking answers to some crucial questions: How do the new policy mixes differ in the selected countries? Do these differences lead more or less effectiveness?

[7] Even though S. Korea has recently started to be considered as a developed country by several sources, this study takes UN Country Classification Report (2014) into account, where it is classified as a developing country.

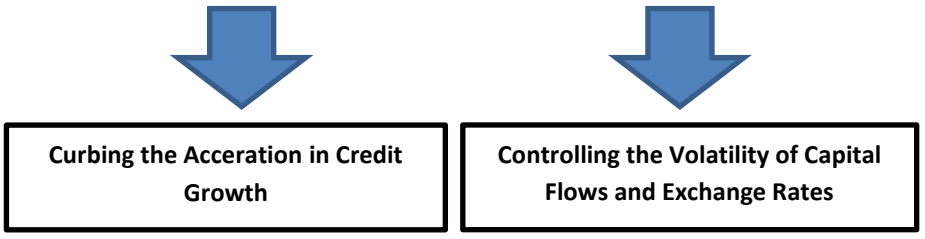
If they do, depending on the use of which tools? To this date, there has not been such an attempt in the literature that focuses on a set of countries for the assessment of post-crisis monetary policy frameworks.

The findings imply that different choice of tools led different outcomes in selected countries. The case of S.Korea, in particular, significantly diverges from the two other cases in several aspects. S.Korean policy mix appear to have formed a sounder financial system with respect to the other two. Digging deeper, the cases of Turkey and Brazil also tend to diverge due to different choice of tools in the capital flow front. The capital flow management tools which were previously known as capital controls seem to have increased the effectiveness of the policy mixes in Brazil and S.Korea. However, the most important implication of the findings is that rather than the choice of certain tools, the design of the overall policy mix requires more attention. A successfully designed policy mix should take the interactions among the tools into account.

To provide accurate conclusions upon the effectiveness of the post-crisis policy mixes, this chapter is structured as follows: The following part presents the new policy mixes of the three selected developing countries. Their aims and transmission channels are highlighted. Then, the chapter moves on with the examination of the literature on measuring the effectiveness of macroprudential tools. Their scopes, aims and methodologies are presented. In the next part, the chapter focuses on the assessment of the effectiveness of the post-crisis monetary policy frameworks of the selected developing countries. The assessment is conducted by an event analysis, regarding the top variables that stand out in the literature for indicating overall macroeconomic stability - financial stability as well as price stability - in conformity with the recent emerging consensus on central banking. After completing the event analysis and shaping broad view upon the new monetary policy frameworks' effectiveness, the chapter concludes with an overall discussion upon the success of these frameworks as well as addressing some prospective adjustments.

3.2 NEW POLICY MIXES

Figure 3.1 summarizes the details of the new policy mixes utilized by three selected countries. In Brazil and Turkey, the new policy mixes were introduced in late 2010, whereas S.Korean policy mix was adopted only a few months before, in mid-2010. All three policy frameworks consist of tools that cover both credit and exchange rate related risks. Although the risks that they aim to mitigate are similar, their toolkits differ significantly.

<table>
<tr><td></td><td colspan="3">New Policy Mixes</td></tr>
<tr><td></td><td>Adoption</td><td>Credit Front</td><td>Exchange Rate/Capital Flows Front</td></tr>
<tr><td rowspan="2">Brazil</td><td rowspan="2">Late 2010</td><td>-Reserve Requirements (RR)
-Restrictions on Consumer Loans
-IOF on Consumer Loans</td><td>-IOF on Portfolio Investments by Non-residents
-IOF on FX Derivatives
-IOF on External Credit Flows</td></tr>
<tr><td colspan="2">-FX RR</td></tr>
<tr><td rowspan="2">S.Korea</td><td rowspan="2">Mid 2010</td><td>-Loan-to-Value (LTV) Caps
-Debt-to-Income (DTI) Caps</td><td>-Leverage Caps (LC)
-Macroprudential Stability Levy (MSL)
-Taxation of Foreign Bond Investment</td></tr>
<tr><td colspan="2">-Loan-to-Deposit (LTD) Caps</td></tr>
<tr><td rowspan="2">Turkey</td><td rowspan="2">Late 2010</td><td>-RR
-BRSA measures</td><td>-Interest Rate Corridor
-Reserve Option Mechanism (ROM)</td></tr>
<tr><td colspan="2">-FX RR</td></tr>
<tr><td colspan="4"> 
Curbing the Acceration in Credit Growth | Controlling the Volatility of Capital Flows and Exchange Rates</td></tr>
</table>

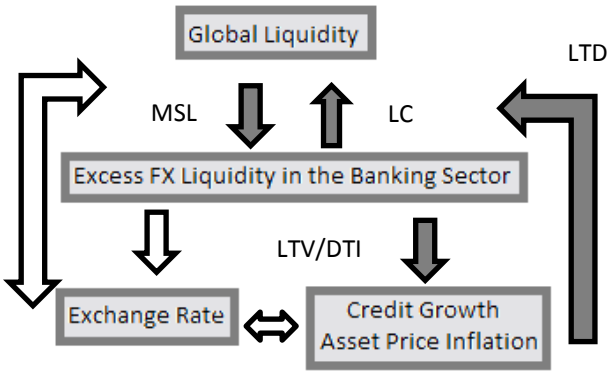
Source: Compiled by the Author, based on Central Bank statements, reports, technical notes, etc.

Figure 3.1: Detailed Presentation of the New Policy Mixes of Selected Countries

Chapter 2 explains the path of capital inflows in developing countries in detail. Figure 3.2 demonstrates a simplified version of this cycle for each country under investigation. The outer cycle can be interpreted as the vulnerability of an economy to global factors, whereas the inner cycle represents the domestic conditions, particularly the credit cycle. These two cycles have a tendency to fuel each other or transfer the volatility arisen in a single step to the entire system. To this end, effective control of each aspect within the cycle is crucial for a central bank to promote the soundness of the macroeconomic system.

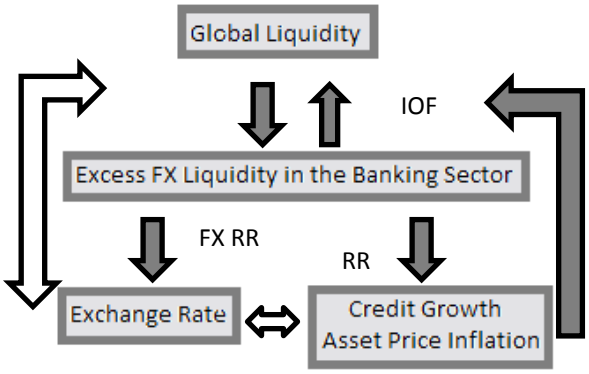
Regarding the excess global liquidity due to the quantitative easing strategies of advanced countries after the global financial crisis, the primary concern of the new policy mixes was to limit and/or control the capital inflows. For this purpose, each central bank adopted measures that address the supply and/or demand-side factors. Taking the supply-side factors as a point of departure, the list of measures that are taken are macroprudential stability levy (MSL) in S.Korea, financial transactions tax (IOF) in Brazil and interest rate corridor in Turkey. Although discussed to some extent in the previous chapter, it may be useful to focus more closely on these tools since they can be considered as the cornerstones of the new policy mixes. While IOF and MSL are measures that aim to control capital flows by increasing the cost of investment, interest rate corridor functions by controlling the uncertainty for foreign investors. Furthermore, IOF and MSL allow authorities to control the maturity of flows by associating higher rates of charges to short-term flows. Interest rate corridor, on the other hand, is expected to discourage short-term flows by creating uncertainty about short-term yields (Aysan et al., 2014). Nevertheless, interest rate corridor does not necessarily regulate the maturity of capital inflows. Central Bank of Turkey (CBRT) aims to undertake this task mainly with foreign exchange reserve requirements (FX RR). FX RR can be differentiated according to maturity and they may be useful for preventing short-term flows to pass through the domestic credit cycle. In this respect, effective use of FX RR is supposed to both save the banking system from maturity mismatch problems and reduce pressures on the exchange rate. Banco Central do Brazil (BCB), aiming to mitigate these risks, also introduced FX RR in its new policy mix.

Figure 3.2.a: S.Korea



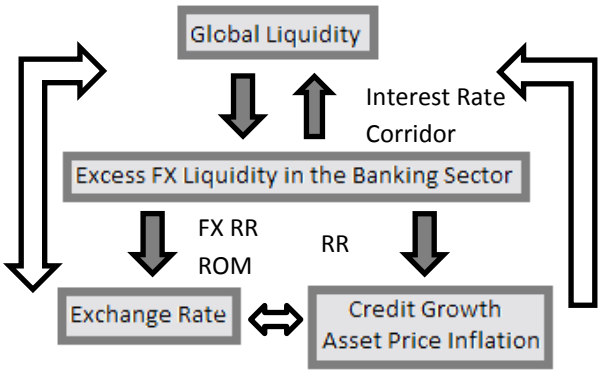
	Currency Mismatch	Maturity Mismatch
MSL	√	√
LC	√	
LTD	√	

Figure 3.2.b: Brazil



	Currency Mismatch	Maturity Mismatch
IOF	√	√
FX RR	√	√

Figure 3.2.c: Turkey



	Currency Mismatch	Maturity Mismatch
Int R.C.	√	√
ROM	√	
FX RR	√	√

Source: Compiled by the Author

Note: The arrows filled in grey represent the addressed channels by the macroprudential policy indicated nearby.

Figure 3.2: Macroprudential Tools in Selected Developing Countries

Moreover, regarding the tight two-way relationship between exchange rate and capital flow volatility, CBRT introduced a new tool – Reserve Option Mechanism (ROM) – as a part of its new policy mix. As explained in the previous chapter, this 'automatic stabilizer' allows banks to hold a certain fraction of their reserves in terms of foreign currency. This fraction is called the Reserve Option Coefficient and can be adjusted by CBRT.

The reserves of banks held within the ROM facility can be released during stressful times to meet the foreign currency needs of banks. By giving flexibility to banks in liquidity management, ROM aims to reduce the pressures on the exchange rate. By doing so, it also aims to contain the transmission of volatility between exchange rates and capital flows. Another benefit of the ROM mechanism is further stated by Alper et al. (2012) that with the presence of ROM accounts, CBRT relies less on direct FX interventions. To this end, the effective use of ROM is supposed to reduces the need for direct FX purchases and interventions which in turn minimizes possible undesired communicational issues.

Another implication of excess capital inflows is the fueling of the domestic credit cycles. The tools regarding the credit front are listed in Figure 3.1. In Brazil and Turkey, the primary tool to curb the acceleration of credit growth is reserve requirements. Additional measures consist of capital requirements and IOF on consumer loans in Brazil. In Turkey, the Banking Regulation and Supervision Agency (BRSA) took some tightening measures regarding the credit card purchases and LTV ratios of vehicle loans, as well as the repayment periods of several types of consumer loans. S.Korean authorities, on the other hand, focus on housing price appreciation since early 2000s. Caps on loan-to-value (LTV) and debt-to-income (DTI) ratios address residential loan growth on wealth and income aspect respectively.

In a boom phase, banks tend to borrow from abroad. The reliance on wholesale funding fuels the cycle with currency and maturity mismatch related risks. In this respect, policy mixes are supposed to cover the demand-side factors too. For this purpose, BOK adopted caps on loan-to-deposit (LTD) ratio and leverage caps. The former tool is designed to limit loans to deposits. This way, the tool

both promotes financial soundness by improving banks' liquidity conditions and reduces the reliance on wholesale funding by preventing undesired expansion in assets. Leverage caps, on the other hand, are a tool that limits asset growth to bank equity. It directly affects FX balance sheets and limit banks' FX borrowings. Similarly, BCB also addresses the demand channel. An IOF on external credit flows aims to reduce the reliance on external funding of the Brazilian banking system. On the other hand, CBRT has not adopted a tool specific to this aspect of the cycle. CBRT relies on the indirect effects of interest rate corridor, FX RR and ROM. It is assumed that when domestic banks require further funding, their reserves held in the ROM facility will enable them to rely less on non-core funding (Alper et al., 2012).

To fully explain the design of the new policy mixes, the interactions among the selected tools should be well understood. Each mix has similar aims to be pursued by different tools. The choice of different tools forms different interactions that lead benefits or drawbacks for policymakers. To design an effective policy mix the interactions should be computed carefully. For example, both ROM and MSL address vulnerabilities that may arise from the banking sector, from very different aspects. MSL specifically addresses banks' non-core liabilities[8] and therefore aims to reduce the procyclicality in the banking sector. Moreover, unlike the examples in other countries such as UK, the proceeds of the levy are held in a special segregated account of foreign exchange reserves, called 'Foreign Exchange Stabilization Fund' (Bruno and Shin, 2013). In this respect, MSL may also act as FX RR with regard to its stabilizing effect on the exchange rate. Since S.Korean policymakers uses leverage caps to control the FX liquidity that enters into the domestic economy, the interactions seem to cover the benefits of FX RR without having it included in the toolkit. ROM, on the other hand, is designed mainly as an automatic stabilizer. Since banks are not obliged to but voluntarily hold a fraction of their reserves in FX, it significantly differs from MSL and FX RR. With the use of this tool, CBRT aims to complement the other tools in the mix - FX RR and interest rate corridor-. When CBRT changes the FX RR, every bank in the system is obliged to adjust its FX liquidity accordingly. Therefore, banks with limited access to FX may face difficulties. In this respect, ROM helps to improve the soundness of the banking system and

[8] Foreign exhange denominated liabilities of banks.

eliminate possible negative outcomes of the use the FX RR. While doing so, ROM may also have stabilizing effects on the exchange rate.

However, rather than being a substitute, it stands to be a complement to the interest rate corridor since their transmission channels differ significantly (Alper et al., 2012). It is clear that ROM is designed to lower pressures on the exchange rate through adjusting the use of capital flows received. Unlike ROM, interest rate corridor aims to stabilize the exchange rate through controlling investment decisions. To this end, ROM is expected to ease the reliance on the interest rate corridor to some extent. Moreover, the interest rate corridor has notable effects on the credit growth front. The credit conditions rely heavily on the upper bound of the interest rate corridor (Alper et al., 2012). Although all of the policies mentioned above – FX RR, MSL, leverage caps- have positive effects in curbing credit growth, these are less direct than the impacts of interest rate corridor since their transmission mechanism is through the limitation of FX liquidity. Therefore it is possible to consider the interest rate corridor as an additional tool for the Turkish toolkit in dealing with the credit cycle. However, since it is designed to have a transmission channel mainly through managing investment decisions, the joint optimization should be carefully computed in order not to suffer from the side effects of certain tools.

IOF, on the other hand, is closer to leverage caps regarding its main transmission channel. However, unlike leverage caps – which are quantity based- IOF taxes are priced-based capital flow management tools. In a sense, FX RR can also be regarded as price-based tools. The opportunity cost of the part of inflow that is deposited in unremunerated accounts has similar effects with a tax (Ostry, 2011). In the literature, quantity-based tools are considered to be more effective than price-based tools. In this respect, the three policy mixes can also be compared with regard to these features. S.Korean policymakers seem to have designed a policy mix where quantity-based tools are associated with a larger weight whereas more importance is attached to price-based tools in Turkish and Brazilian policy mixes. In Brazil, there appears to be a joint use of the price-based tools: the FX RR and IOF. As in the Turkish case, Brazilian policymakers should also take policy interactions into consideration. FX RR is designed to reduce the pressure on the exchange rate by the deposited amount in the FX

reserves. IOF, on the other hand, mainly aims to control the size and maturity composition of capital flows. Unlike MSL the taxes obtained from the IOF are not held in a special account. Instead, IOF taxes are converted into local currency. This may lead pressures on the exchange rate. Hence, these two tools should be adjusted carefully so that the undesired effects of IOF tax would not offset the benefits of FX RR on the exchange rate.

When the three policy mixes are evaluated in a broader sense, the capital flow management measures of BCB and BOK can be interpreted as capital controls whereas Turkish toolkit seeks to control the cycle in a more market-friendly manner. Moreover, the Turkish toolkit is narrower in terms of the number of tools that CBRT relies on. This efficiency may be beneficial for market communication which is in line with the market-friendly policy choices of CBRT. Therefore, the effectiveness analysis in the following parts may provide crucial implications upon these choices. While assessing the effectiveness of the new framework, the findings can indicate whether the use of tools that are traditionally known as capital controls is inevitable or it is possible to manage the cycle without them.

3.3 LITERATURE REVIEW ON EFFECTIVENESS ANALYSIS

There are many studies in the literature assessing the effectiveness of macroprudential tools, some focusing on certain ones and some on the aggregate level. These studies also differ among the financial stability indicators that are investigated and the methodology that they carry out. The most common methodology is assessing the effectiveness with empirical analysis. Since the experience of many developing countries with macroprudential tools date back to early 2000s, the data usually extents to an 8-12 years period of time. These studies are generally based on a cross-country dataset and focus on a certain macroprudential tool. Some studies are carried out solely by empirical analysis whereas some support their empirical work by event analysis. There are also some studies in the literature that are conducted by event analysis only.

Lim et al. (2011), in their cross-country study with a data set of 49 countries for the period of 2000-2010, use both event analysis and dynamic panel regression to measure the effectiveness of eight macroprudential policies in limiting the procyclicality of credit and leverage, and two other macroprudential policies in reducing systemic risk. They conclude that caps on LTV and DTI, dynamic provisioning and reserve requirements have been successful in curbing credit growth. On the other hand, other tools such as caps on FX lending seem to have had less obvious impacts. Another study conducted by Claessens, Glosh and Mihet (2012) uses the same panel data set to analyze the effects of macroprudential policies on banking system vulnerabilities. Both studies explore the effects of the most commonly used macroprudential policies, but on different aspects of financial stability and conclude that the policies are effective, at least under some circumstances. The broad data set consists of developed and developing countries, both the ones that have adopted macroprudential policy and the ones that have not, with different policy frameworks and capital account openness status. The diversity of the data enables them to carry out an extensive comparison.

On the other hand, the IMF (2012) conducts a study to investigate the interaction of monetary and macroprudential policies. In this study, they also assess the effects of macroprudential tools on financial variables such as credits and asset prices by using cross-country data on the use of macroprudential tools from 2000 to 2011 in 36 countries. The macroprudential tools that are focused on are capital requirements, limits on loan-to-value ratios, caps on debt-to-income and reserve requirements, whereas monetary policy refers to the policy interest rate. The results from their regression indicate that there is no significant evidence upon the interaction between monetary and macroprudential policies, a result verifying the study of Dell'Ariccia et al. (2012). The findings also reveal that the effectiveness of a macroprudential policy does not depend on the monetary or FX regime of the country under investigation, in line with the study of Lim and others (2011). Furthermore, the results from the empirical study emphasize that reserve requirements are successful in slowing down the credit growth whereas caps on loan-to-value limits house price appreciation, and capital requirements are successful in managing both.

There are also some country-, and region-specific studies sharing similar aims with the ones mentioned above. For example, Tovar et al. (2012) analyze the effectiveness of reserve requirements and other macroprudential policies on credit growth in Latin America. The event analysis observes the data covering the period of four months before and after the policy implementation. They particularly focus on the data on annual credit growth provided to private sector, policy rates, lending rates and exchange rates. Finding the results of the event analysis inadequate in terms of not allowing extrication the shocks and the effectiveness of policies, they complement their analysis with a dynamic panel data vector auto-regression. The empirical analysis is based on a system reached by using Generalized Method of Moments. They run the regression over a vector of a macroprudential policy dummy[9], policy interest-rate, level of economic activity and private bank credit growth; and lags of this vector. Concluding on the effectiveness of reserve requirements on the slowdown of credit growth, they underline that "other tools are no less important, but their role is examined here only tangentially".

Furthermore, the study of Glocker and Towbin (2012b) explores the Brazilian experience with reserve requirements by using a bayesian vector auto-regression model. The model is constructed with a vector of endogenous variables (unemployment, CPI inflation, current account, Selic rate, reserve requirements, interest rate spread, loan and central bank reserves) and a vector of exogenous variables (constant term, trend, dummy for time period, US federal funds rate, commodity price index). According to the results of the regression, they find out that reserve requirements complement monetary policy in promoting financial stability.

In one of the case studies on Korea, Igan and Kang (2012) indicate that caps on loan-to-value (LTV) and debt-to-income (DTI) limit mortgage credit growth in Korea. To draw this conclusion, they use data from 2002 to 2010 where they use an independent variable of interest in housing and mortgage markets, and two independent variables: a control variable reflecting the general economic

[9]The macroprudential policy dummy is a cumulative dummy which consists of marginal reserve requirements, average reserve requirements and private bank credit growth.

activity, monetary policy stance and measures of tightness and expectations in housing markets; and a dummy that reflects the time of any rule change.

The literature puts forward the fact that the studies on measuring the effectiveness of macroprudential tools generally focus on the tools such as caps on LTV and DTI, dynamic provisioning and reserve requirements. These tools stand out to be the ones that were generally adopted by developing and a few developed countries before the global financial crisis. Thus, the sufficient data which allows empirical work, is almost only upon these policies.

However, as implied in the previous chapter, together with the changing nature of central banking, the new monetary policy frameworks have been adopted in the world after the crisis, mostly in 2010 and 2011. Therefore, the available data on the new monetary policy frameworks is inadequate for most empirical approaches and thus the literature on the evaluation of the new monetary policy frameworks generally relies on event analysis. Empirical studies are generally conducted in a before-after manner in evaluating the effects of the new frameworks.

Furthermore, the main implication of the emerging consensus, i.e. macroprudential policy complementing monetary policy in pursuit of both price and financial stability, suggests that this new era in central banking needs to be evaluated differently from the past. Rather than focusing on the success of certain tools and policies, the new monetary policy frameworks require a broader assessment of the overall framework since the success of a single tool may have reversed effects on other indicators due to the interaction between the policies and objectives.

One example for the assessment of new policy frameworks has been conducted for Turkey. Kenc et al. (2011) seek evidence from yield curves to show that the reserve requirements hikes have led a tighter policy stance in Turkey. They also benefit from event analysis to observe the impacts of the policy framework on credit and loan growth. Another study (Kara, 2012), also carries out an event analysis in order to assess the new monetary policy framework of Turkey. This study, however, takes both financial stability and price stability into account.

Kara defines the transmission mechanism from policy tools to both stabilities as being through the exchange rate and the credits. The study particularly examines these two variables in assessing the effectiveness of the policies of the CBRT. The results of the event analysis reveal that, in the financial stability side, there was a slowdown in credit growth and an amelioration in the exchange rate volatility relative to other developing economies at the end of 2011, after a year that the new policy framework was adopted. On the other hand, pointing at the significant deviation from the official inflation target at the last quarter of 2011, Kara (2012) concludes that the CBRT policies haven't been that successful in the price stability front.

Similar to the study of Kara, Pereira da Silva and Harris (2012) assess the effectiveness of the new policy mix in Brazil by observing the changes in related data. They also evaluate the toolkit based on the two transmission channels: exchange rate channel and credit channel. Their analysis reveals that IOF and other complementary tools have been effective in reducing the rate of carry trade and lengthening the maturity composition of external loans. Moreover, the study asserts that credit-related measures have also been successful by curbing the growth of credit to a more sustainable pace.

Studies on Brazil focus more on the tools related to capital flow management. Chamon and Garcia (2014) conduct an empirical analysis on the post-crisis measures in Brazil. They conclude that capital flow management measures in Brazil, particularly IOF have been effective in increasing the cost of domestic assets for foreign investors. The effectiveness of Brazilian measures is also pointed out in other studies. Baumann and Gallagher (2012) find evidence of an amelioration in the maturity composition of capital inflows and reduced exchange rate volatility after the introduction of the new policy mix. Furthermore, Forbes et al. (2011) conclude that portfolio flows have been reduced. Jinjarak et al. (2013), on the other hand, find out that the IOF measures do not have any significant impact on the magnitude of capital inflows, instead there have been a moderation in the magnitude of outflows during stressful times. Earlier studies on the effectiveness of capital controls also drive some similar results. Binici et al. (2009) put forward that debt and equity controls are successful in reducing outflows whereas limited impact is observed on the volume of capital inflows.

Similarly, the studies of both Magud et al. (2011) and Ostry et al. (2010) reveal that capital controls have positive impacts on the composition of flows, but limited effects on the volume of flows.

Regarding its huge reliance on the external factors before and during the global financial crisis, studies on Korean economy generally evaluate the performance of the new policy mix in terms of its resilience on global risk factors. Ree et al. (2012) conduct such a study focusing on the two well-known vulnerabilities of the Korean financial system: currency mismatch and exchange rate volatility. Their findings reveal that a significant reduction of Korean short-term external debt weakened the link between exchange rate volatility and global risk factors (proxied by VIX). Therefore, they assert that the resilience of Korean financial system to external shocks have remarkably been reduced after the global financial crisis. The empirical study of Bruno and Shin (2013), also reach similar findings. They deal with 48 countries including Korea, and find out that after 2010 -the year which Korean authorities announced the adoption of new macroprudential tools- Korea's sensitivity to global factors decreased, whereas the findings draw an image in the opposite direction for other East Asian countries, particularly the Big Five[10]. Furthermore, other studies focused on Korea indicate that the new monetary policy framework of Korea has been successful. The macroprudential levy, caps on loan-to-deposit and ceilings on banks FX derivative positions are "effective in curbing banks' reliance on short term FX funding and in reducing vulnerabilities from FX mismatches and exchange rate volatility" (Bruno and Shin, 2012). A recent study of Baumann and Gallagher (2013), however, finds limited evidence on the effectiveness of the S.Korean capital flow management measures on exchange rate appreciation and volatility.

Aysan et al. (2014) follow a similar strategy to Bruno and Shin (2013) in order to assess the sensitivity of Turkish financial system to global factors. They use a panel regression specification with a dependent variable of banking sector capital inflows and an independent variable of the growth of interoffice assets of foreign banks in US. The independent variable stands as a proxy for the rate at which global banks are engaged in wholesale funding to the rest of the world. They

[10]Indonesia, Malaysia, Philippines, Thailand and Vietnam.

also include the VIX variable that reflects the leverage of global banks and a control variable as independent variables. The results reflect that capital flows to Turkey has become less sensitive to cross-border global banking activities after the implementation of the new monetary policy framework with macroprudential policies.

3.4 ASSESSING THE EFFECTIVENESS OF THE POST-CRISIS MONETARY POLICY FRAMEWORKS IN THE SELECTED DEVELOPING COUNTRIES

The literature review shows that a vast majority of relevant studies are only concerned with the effectiveness of certain macroprudential tools. They do not possess the intention of assessing the effects of an overall monetary policy framework. Furthermore, a limited number of studies being carried out with this intention, focus only on a single country. The importance of this study is that this section investigates the post-crisis monetary policy frameworks of a set of developing countries, trying to figure out how effective they have been so far. The similarities and differences of the three toolkits may enable us to draw some conclusions on the characteristics of a correct policy toolkit for developing countries. As far as the literature review indicates, the related literature does not elaborate on an assessment with such a concern.

In order to provide such conclusions, this section assesses the effectiveness of the post-crisis monetary policy frameworks of selected developing countries by examining the trend of the available data on the countries' macroeconomic and financial systems. Indicators are examined regarding the time of the adoption and adjustments of macroprudential measures. While conducting this analysis, the study benefits from the indicators used both in the literature for similar aims and in the financial stability or economic activity reports of central banks. Even though the event analysis approach does not provide a deep examination in terms of indicating comprehensive conclusions or extrication of the effects of policies from shocks, it may still serve as a useful way to shape a broad view

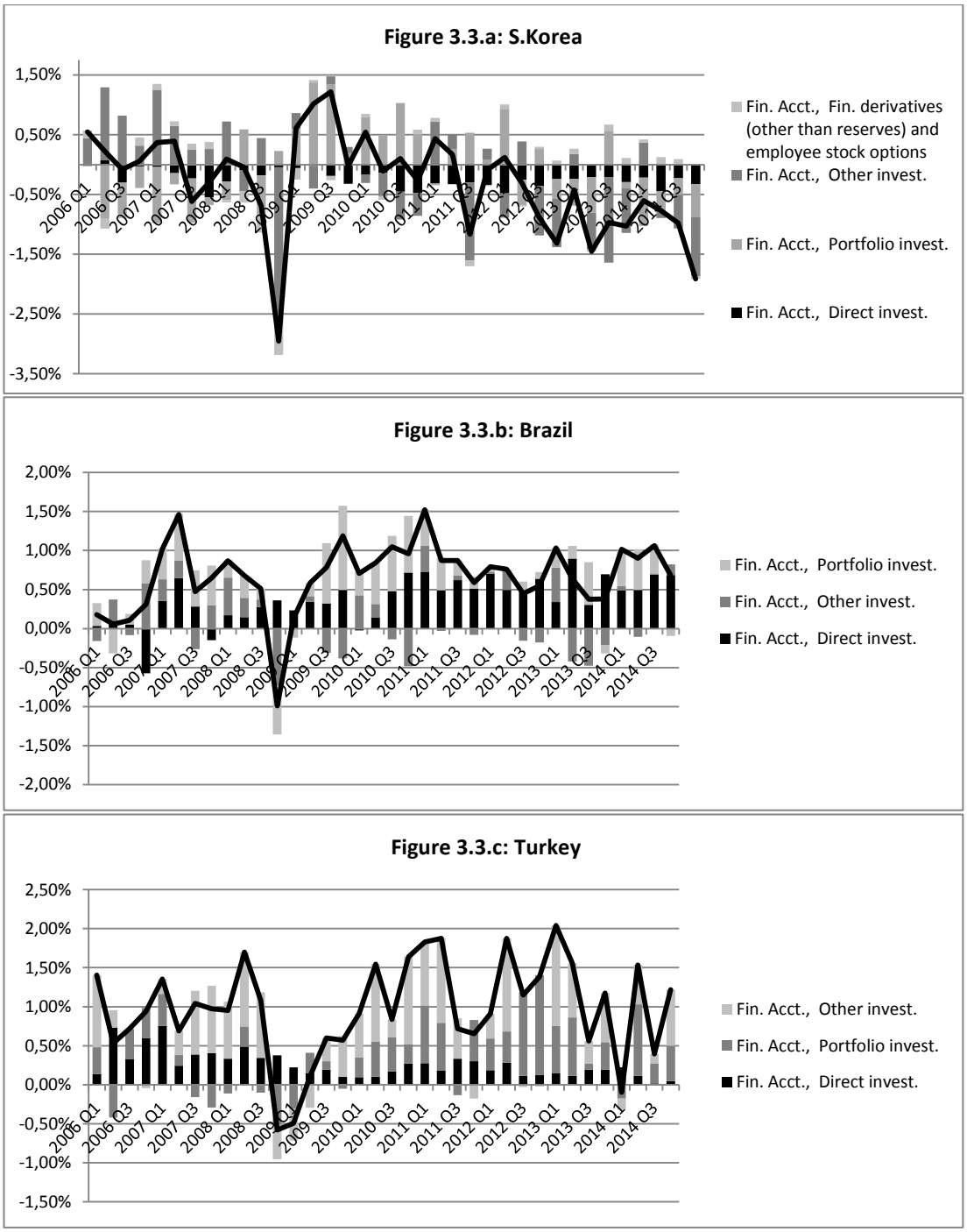
over the effects of policies. Since the new policy frameworks address both financial stability and price stability, the examination will concern both fronts.

It was already mentioned in the previous chapter that there is no absolute consensus on which indicators should financial stability can be observed. However, there are two main transmission channels addressed in the design of the new policy mixes: capital flows /exchange rate and credit channels. Therefore this section is structured to focus on these two transmission channels closely. Lastly, the overall effects on the macroeconomic system and financial soundness are examined.

3.4.1 Volatility of Capital Flows and Exchange Rate

After the global financial crisis, the primary concern of the central bankers of developing economies has been to limit and regulate the surge of capital inflows in order to prevent procyclicality. The procyclical behavior generally starts with large surges of capital flows and causes vulnerabilities in financial and macroeconomic stability. Excess capital inflows lead appreciation pressures on domestic currency and worsen current account balance on one hand, while on the other hand they fuel the domestic credit cycle by providing excess liquidity to banks. Stretching bank balance sheets may encourage non-core funding[11] and cause further vulnerabilities. To this end, controlling maturity composition and magnitude of capital inflows is crucial for developing economies.

[11] Funding through FX denominated liabilities.



Source: IMF BOPS Statistics

Figure 3.3: Net Capital Inflows over GDP in Selected Developing Countries[12]

[12] Financial derivatives and employee stock options form a significant part of flows only in S.Korea. In Brazil and Turkey the share of the given category is negligible. Thus, the figures for Turkey and Brazil do not include financial derivatives.

Figure 3.3 shows the vulnerability of capital inflows to global factors. All of the three countries experienced large capital reversals during the peak of the global financial crisis. There are several factors that may make an economy to be more subject to such volatility of capital flows. These factors generally include large external debts and unsustainable current account deficits for most of the developing countries. The countries under investigation in this section suffer from one or both of these factors which required them to adopt appropriate measures after the global financial crisis.

Table 3.1: Coefficient of Variations for Gross Financial Inflows

	From 2006 to late 2010	From late 2010 until 2015	All Period
Brazil	71%	25%	51%
S.Korea	139%	91%	136%
Turkey	85%	43%	66%

Table 3.1 shows the volatility of gross financial inflows for selected developing countries. The coefficient of variation values indicate that the volatility of financial inflows was higher before the new policy mixes were in effect. The coefficient of variation values have been significantly reduced for all of the countries, at varying rates. The different levels of amelioration in the volatility of financial flows address the impacts of different policies that were put in effect. Hence, a separate analysis for each policy mix is required.

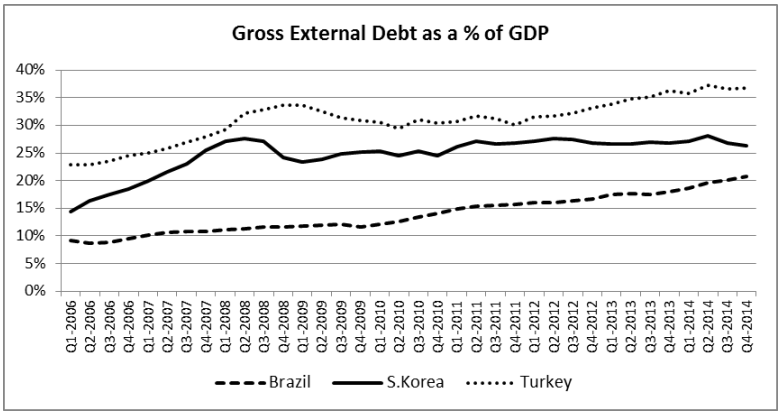
In late 2010, Central Bank of Republic of Turkey (CBRT) introduced interest rate corridor to manage the volatility of capital flows. Regarding the excess surge of capital flows at the time of its introduction, the lower bound was cut and the corridor was widened. The uncertainty promoted by the corridor discouraged foreign flows. In late 2011 and early 2012, the Eurozone debt crisis intensified and the rise of the global uncertainty implied volatility of capital flows. In response, CBRT increased the upper bound to attract capital inflows. In the late 2012 and early 2013, the global uncertainty declined and CBRT again responded

with a decrease of the upper bound. Figure 3.3.c shows that the active use of the interest rate corridor may have helped the volatility of capital inflows to decline with respect to the pre-crisis period. However, in mid-2013, following the US Fed announcement of tapering policy, capital inflows declined. Although CBRT increased the upper bound and cut the lower bound in late 2013, Turkish economy could not avoid a gradual decline in capital inflows.

Despite being successful in managing the capital flows during a period of volatility, interest rate corridor became no longer effective after the economy faced a larger shock in 2013. Furthermore, although interest rate corridor aims to prevent excessive short-term flows by its nature, it does not necessarily regulate the composition of flows. Figure 3.5 shows the share of short-term foreign debt within gross external debt in three countries. While the Turkish measures only incorporate foreign exchange reserve requirements, the tools that are used for this purpose are numerous in other countries. CBRT's first response to the accelerating rate of short-term foreign debt was to increase foreign exchange reserve requirements. In November 2010, the foreign exchange reserve requirements were increased from 9 to 11. A few months later, CBRT made an adjustment in foreign exchange reserve requirements according to maturities so that short-term deposits were associated with the highest ratio. Figure 3.5.c shows that following the implementation of these measures, the rise in the short-term debt ratio slowed down until the end of 2011. However, a gradual rise followed, from the beginning of 2012. Although CBRT cut the upper bound and pulled the lower bound to discourage capital inflows, surges persisted until the second half of 2013. Both gross external debt and the share of short-term debt rose steadily (Figure 3.4, Figure 3.5.c). There appears to be a two-way causality. When evaluated with the decline of short-term financial flows shown in Figure 3.3.c, the slowdown in the rise of short-term foreign debt is more likely to be associated with global factors rather than being under control of CBRT.

Furthermore, the failure of interest rate corridor may have been caused by the large accumulation of short-term foreign debt until 2013. Figure 3.4 shows that Turkey had the largest external debt to GDP ratio among three selected countries in 2013. Furthermore, Figure 3.5.c demonstrates that almost 35% of

this debt was with short-term maturity. Together with the uncertainty due to Fed's tapering policy, this large ratio may have discouraged international flows to a larger extent than in the other selected countries.



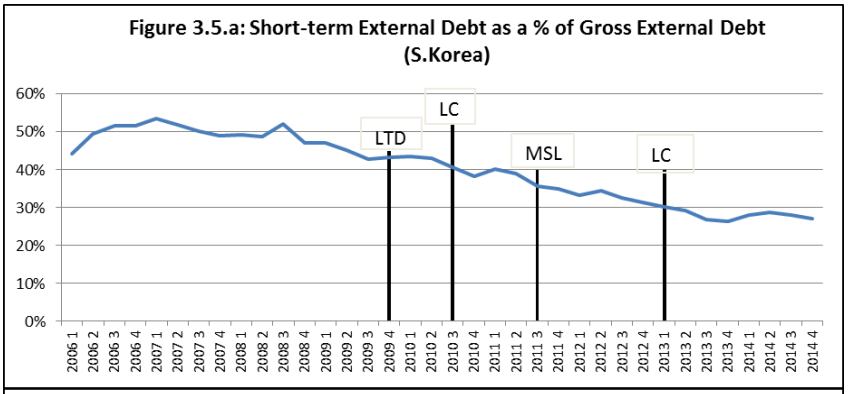
Source: WorldBank, UNStats

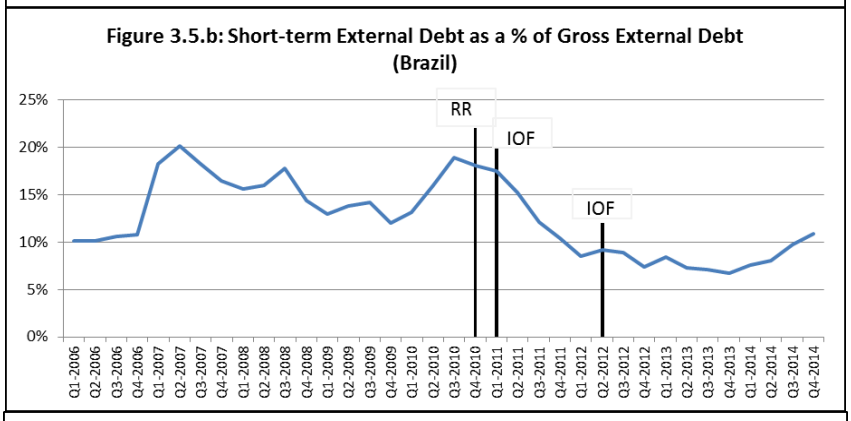
Figure 3.4: Gross External Debt in Selected Countries

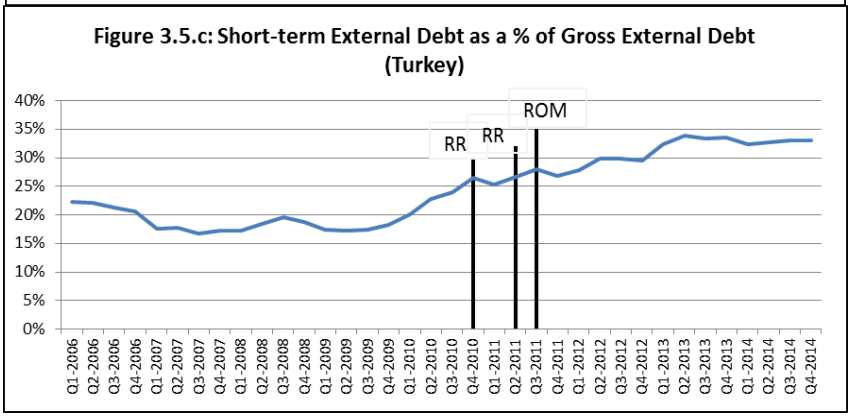
In fact, before the crisis hit developing countries, the short-term to total external debt ratios of Turkey and Brazil were almost at the same level, around 17%. However, after the introduction of new policy mixes, the ratios of the two economies diverged significantly. In this respect, it may be useful to compare the macroprudential tools implemented by CBRT and Banco Central do Brasil (BCB).

BCB also responded its rising short-term external debt by increasing foreign exchange reserve requirements. Introduced in January 2011 at a rate of 60%, this tool particularly addressed short-term deposits. It remained in effect until the second half of 2013. Unlike CBRT who only relied on the interest rate corridor, BCB complemented its measures with several types of the financial transactions tax- IOF- within this time frame. The first type of IOF is on portfolio investments by non-residents, aiming to discourage carry trades in spot and future markets. In March 2011, BCB introduced a second IOF measure on external credit inflows. Moreover, a third type of IOF was introduced in July 2011 on FX derivatives. These set of measures seem to have helped Brazilian short-term debt to decrease from 17% of GDP in late 2010 to 8% in late 2012.

When the Turkish and Brazilian cases are compared, it is clear that foreign exchange reserve requirements are a useful tool to control the magnitude and maturity of FX denominated debt and therefore the FX liquidity in the market. However, the experiences under investigation reflect that this tool should be complemented with more direct tools such as taxes or caps. The Korean example reinforces this argument.







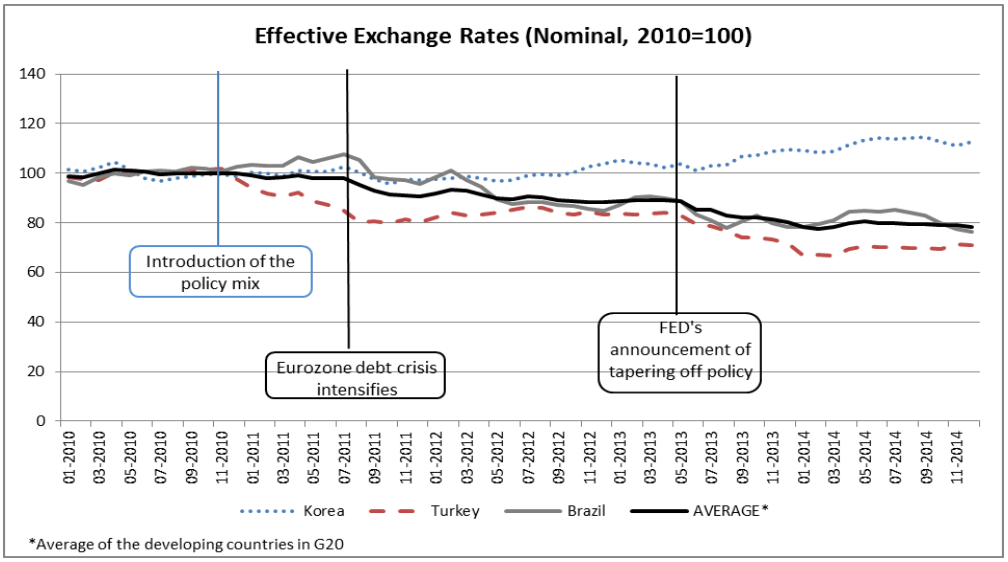
Source: CBRT, BCB, BOK

Figure 3.5: Short-term Foreign Debt in Selected Developing Countries

Before the global financial crisis, when Brazilian and Turkish short-term to total external debt ratios were approximately around 17%, the data on Korean economy reflected a ratio over 50%. In line with the possible vulnerabilities that such ratio may cause, S.Korean economy faced the sharpest capital flow reversal among the three selected economies during the peak of the crisis (Figure 3.3.a). Accordingly, Table 3.1 clearly shows that the volatility of financial flows to S.Korea have been the highest among three selected countries. Moreover, Figure 3.3.a also demonstrates that unlike in Brazil and Turkey, S.Korean financial outflows offset financial inflows. This case is particularly persistent since the beginning of 2012. There are several reasons for these distinguishing features of the Korean financial system. First, Korean capital account openness is the highest among the selected countries. As Ree et al. (2012) also indicate in their study, the Korean capital account openness is placed at the top end of emerging market economies by the Investment Freedom Index (Wall Street Journal, Heritage Foundation) and even at the top end of the world by the Capital Access Index (Milken Institute). Furthermore, during Great Moderation years, when the S.Korean economy was receiving large capital inflow surges, authorities took several measures to promote outflows (Kim, 2012). These measures succeeded in making residents' investments overseas to offset foreign capital inflows (Figure 3.3.a). Lastly, S.Korean external borrowing was mainly driven by the demand of exporters- particularly shipbuilders- for FX hedging. The expectations of further appreciation of the Korean Won formed a cyclical lending behavior and contributed the build-up of a large external debt, which is mainly composed of non-core liabilities of banks. In this respect, before the introduction of its new policy mix in mid-2010, the immediate response of Bank of Korea (BOK) after the crisis was to introduce loan-to-deposit (LTD) caps. Introduced in December 2009, LTD caps aim to reduce the procyclicality of bank lending behavior by limiting banks' reliance on wholesale funding.

The BOK then announced its adoption of a set of measures in mid-2010. In October 2010, when financial flows to developing countries had been increasing in a worrisome manner, Korean authorities introduced caps on FX derivative positions and leverage caps in order to curb banks' short-term external debt. These measures were actively used by tightening for several times. The new policy mix also addressed the bond market with the reintroduction of the tax on

foreign investors' bond investment. In August 2011, BOK adopted macroprudential stability levy on non-core liabilities of the banks. The levy implies a charge on foreign currency denominated liabilities of banks up to 12 months of maturity whereas maturities of over one year are associated with lower rates (Bruno and Shin, 2013). In this respect, the macroprudential stability levy aims to mitigate the risks arising from both maturity and mismatch problems (effects on related indicators are given later). The levy has further stabilizing effects since the charge from banks are held as foreign exchange reserves in order to be released at stressful times. After the implementation of these tools the short-term external debt ratio declined to a range of 30% of GDP in 2013 and 2014. While gross external debt to GDP remained almost constant as of late 2010, short-term over total external debt declined steadily. This asserts that the maturity composition of Korean debt have been significantly ameliorated proceeding the introduction of the new policy mix.



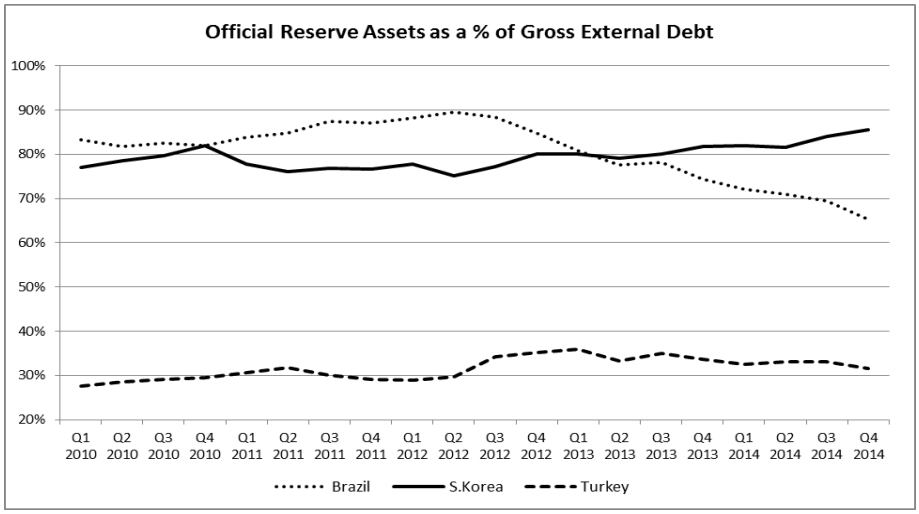
Source: BIS

Figure 3.6: Effective Exchange Rates in Developing Countries

The tools listed above also aim to control the volatility of exchange rates. Controlling the risks that are associated with capital flows automatically provides central banks to reduce the pressures on domestic currencies. The large capital surges after crisis led appreciation pressures on the domestic currencies of

developing countries after the global financial crisis. Figure 3.6 shows the exchange rate movements in the three selected countries with respect to the average of developing countries.

After the introduction of the new policy mix in November 2010, Turkish lira recorded a significant depreciation of 20% in less than a year (Figure 3.6). The policy mix proves to have helped reducing the appreciation pressures on domestic currency during a period of large capital flow surges. In September 2011, CBRT complemented its toolkit with an additional tool. As indicated previously, Reserve Option Mechanism (ROM) was announced as an automatic stabilizer and a market-friendly tool. It allows banks to hold a certain fraction (determined by the reserve option coefficient) of their required reserves in foreign currency or gold. This way, banks accumulate foreign exchange reserves during large capital flow surges which are to be released in a case of capital outflow. Therefore, the pressures on domestic currency can be lowered. Although introduced in the second half of 2011, Alper et al. (2012) note that it was in June 2012 when the tool became fully in effect. Accordingly, Figure 3.8 demonstrates that the official reserve assets recorded a noticeable increase proceeding this date.

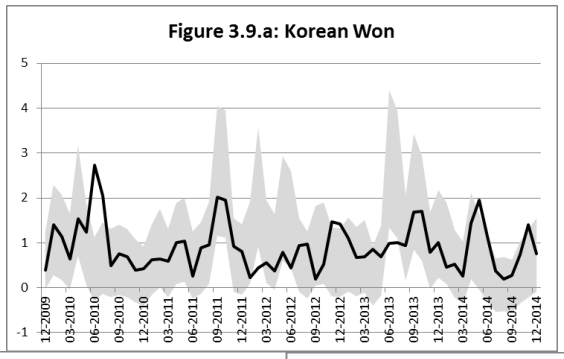


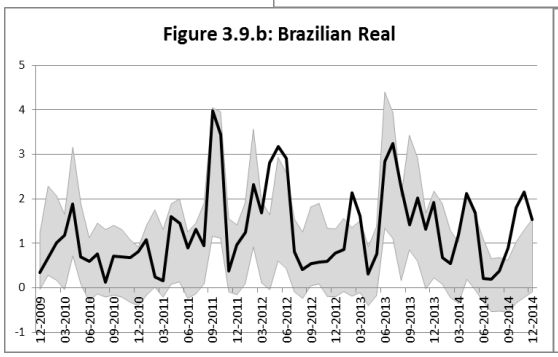
Source: IMF, WorldBank

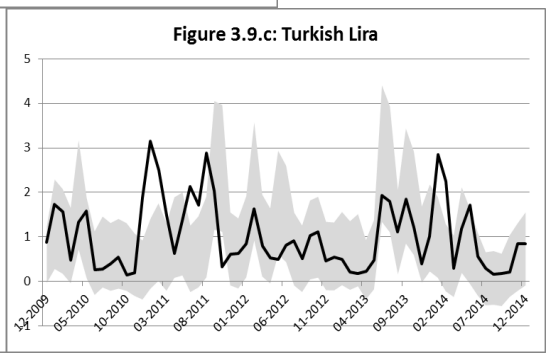
Figure 3.7: International Reserves as % of Gross External Debt

The overall policy mix seems to have successfully reduced the risk of volatility of Turkish lira during a period of global uncertainty due to the European debt crisis. Turkish lira stands to be relatively more stable among others from late 2011 to mid-2013 (Figure 3.8). This fact is highlighted in the studies of Aysan et al. (2014) and Alper et al. (2013). The latter put forward that although CBRT did not engage in direct FX interventions since the beginning of 2012, Turkish lira remained stable throughout the year. However, with the Fed announcement of tapering policy, the bright picture upon Turkish lira diminished. Figure 3.6 shows that TL faced a notable depreciation of 20% while the developing countries' average was approximately 10%. While Turkish lira was experiencing this gradual depreciation, Brazilian real depreciated at a rate closer to the developing countries average. Starting from May 2013- when Fed announced its possible tapering policy- Turkish lira depreciated by 17% within a year. Brazilian Real, on the other hand, depreciated much moderately by 6%. Within the same time frame, Korean Won significantly diverged from other developing country currencies with a 9% appreciation.

Although Brazilian exchange rate appears to have had responded to this shock more moderately, the story underneath reveals some different implications on the success of BCB. The framework of BCB indicated that IOF is supposed to stabilize the currency by regulating the capital flows. Simple reasoning asserts that when the maturity composition of capital flows is fixed, the pressures on the exchange rate should be lowered. However, IOF may have other side effects on the exchange rates as indicated in the earlier section where the policy mixes are presented. IOF measures were introduced in period when no further appreciation in the exchange rate was desired. By limiting capital inflows, IOF should have helped a fair depreciation in the exchange rate. However, Figure 3.6 shows that a significant appreciation occurred after the introduction of the new policy mix. Although FX RR at a rate of 60% was introduced in 2011, the depreciation only took place in late 2011 when the Eurozone debt crisis intensified. Moreover, in early 2012 another IOF regulation took place mainly aiming to regulate the maturity composition of capital inflows. However, through mid-2012, both capital inflows shrank and exchange rate depreciated. Together with inflationary concerns and low output levels in 2012, as well as the increasing current account





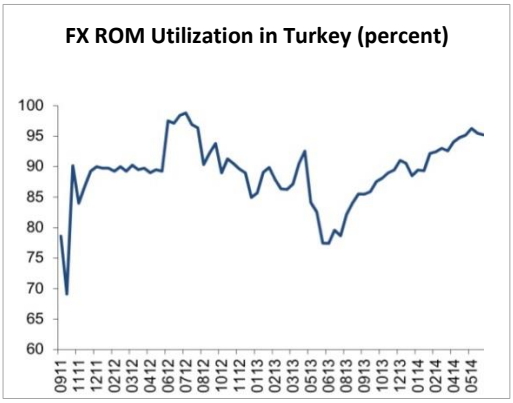


Source: BIS Exchange Rate Data

Note: The range in grey represents the volatility interval (+/- 2 st. deviations of the median) for developing countries within G20. The mean for the interval calculation is based on 3 months moving average standard deviation.

Figure 3.8: Volatilities of Selected Domestic Currencies

deficit and a large reduction in the Selic rate, further depreciation became undesirable. Therefore, an initial response of BCB was to attract more capital inflows by loosening of its IOF measures by the end of 2012. In 2013, IOF taxes on fixed income and derivatives were eliminated. Starting from late 2013, Brazil managed to attract more capital inflows. However, a joint observation of Figure 3.7 and 3.8 reveals that these policy adjustments were not effective in the exchange rate front, since the relatively more stable trend in Brazilian Real in the second half of 2012 was managed along with a large reduction in the reserves. With the elimination of some of the IOF measures by early 2013, even the relatively stable path of Real – controlled with interventions – no longer existed.



Source: Alper et al. (2013)

Figure 3.9: ROM Utilization Rate

Focusing on the Turkish case, indicators demonstrate that CBRT started to lose its control over capital inflows starting from 2012. Although the effects of this loss of control were not clear in the exchange rate front during 2012, it became obvious on various aspects of the financial and macroeconomic system after the Fed announcement of tapering policy in 2013. It was already stated with the ROM facility becoming in effect, the international reserves of CBRT increased remarkably due to the rise of reserve holdings in the ROM accounts. However, Figure 3.9 indicates that this facility hasn't been used in a large scale during periods of capital outflows. Therefore, the ROM may not have been used by banks in the way that CBRT expects. Aslaner et al. (2014) explain this ineffectiveness by the side effects of the use of the interest rate corridor on the ROM facility. They assert that when there is an increase in the interest rates to attract capital inflows, the cost of Turkish lira funding increases and it becomes more profitable for banks to use ROM. To this end, the automatic stabilizer feature of ROM becomes weakened. Accordingly, the volatility of Turkish Lira, which was significantly dampened during 2012, worsened after mid-2013 with a sharp depreciation.

While Turkish and Brazilian policymakers are trying to lessen the depreciation pressures on their exchange rates in the past couple of years, the challenge of S.Korea have been remarkably different. The Korean Won adopted a divergent trend from the rest of the developing countries since mid-2012 and diverged in a broader sense since the announcement of US tapering policy. The starting date

of this divergent trend is in conformity with the Figure 3.3.c earlier, which addresses the same date for S.Korean investments abroad significantly offsetting the foreign capital inflows. The same date can also be distinguished from Figure 3.8 as the start of an increase in the reserve accumulation. Moreover, Figure 3.6 shows that in line with the gradual decline in the short-term external debt, the resilience of Korean Won to external factors has risen. From the introduction of the policy mix in mid-2010 to the date of Fed announcement of tapering policy in mid-2013, Korean Won remained in a +/- 5% range of appreciation or depreciation whereas the Turkish and Brazilian currencies experienced a depreciation up to 20%. It is also clearly seen from Figure 3.8 that the Korean Won remains as the most stable currency among the selected currencies.

While the Won remains relatively stable, after mid-2013, it started to appreciate at a rate which is more than desired. During the Great Moderation years, BOK saw such upswings as a threat to the export sector since the appreciation may undermine the sector by weakening profitability. In 2013, the governor of Bank of Korea, Kim Cehoong-soo said that the exchange rate should be left in the market fundamentals, implying that they let the currency to appreciate. He also added that the appreciation of Won would have moderate impacts on exports since the export industry is now driven by goods based on advance technology. From mid-2013 to mid-2014, the Won recorded an appreciation of 15% with a significant risk for the Korean economy. In mid-2014 another interview was given by the Governer Lee-Ju-yeol implying that the large current account surplus leads some worries that the currency is bound to appreciate, along with the increase in the current account surplus. A current account surplus may have been a source of buffer against the global causes of domestic volatility. However, a further reliance on this buffer may have led some concerns since the export-oriented manufacturing industry remains as the cornerstone of the economic growth in S.Korea. Therefore, a stable, but also a competitive exchange rate is the essential policy goal of the authorities to maintain economic growth (Leiteritz, 2014).

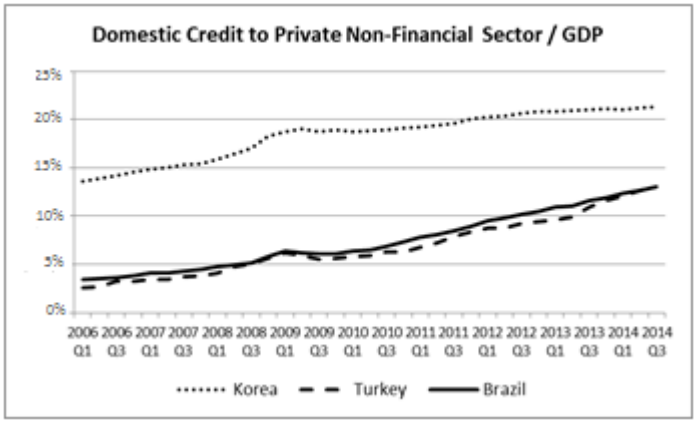
Another implication from the moderate volatility of Won is that BOK managed to control the feedback loop between the volatility of capital flows and exchange rate. The volatility of financial flows did not pass through the exchange rate

front. This successful barrier forms a supporting example for the discussion in the previous section. The MSL may have acted as FX RR in restraining the FX liquidity entering into the market by holding the excess FX in the Foreign Exchange Stabilization Fund. Moreover, the rise in the current account surplus (to be discussed further later in the Chapter) and large international reserves (Figure 3.8 earlier) also should have contributed to the fall of volatility in the exchange rate front.

3.4.2 Acceleration of Credit Growth and Asset Price Inflation

As discussed before, advanced countries followed quantitative easing strategies after the crisis, which led an excess global liquidity. Unless appropriate measures are taken, this global liquidity ends up in an acceleration of credit growth in developing countries through surges of capital inflows. The control over credit growth is important for the financial system as a whole, since banks tend to seek foreign funding during the upswings, which may fuel foreign debt as well as causing currency and/or maturity mismatch problems. If not managed properly, episodes of excessive credit growth may lead to growing imbalances and tend to end abruptly (Elekdag and Wu, 2011).

Figure 3.10 show that the selected countries experienced significant increases in their credit to GDP ratios both before and after the global financial crisis. Although the acceleration of credit was widespread among developing countries, each economy has different driving forces behind its credit growth. In this respect, central banks of developing countries adopted measures to curb the credit growth both on the aggregate level and by addressing specific types of loans.

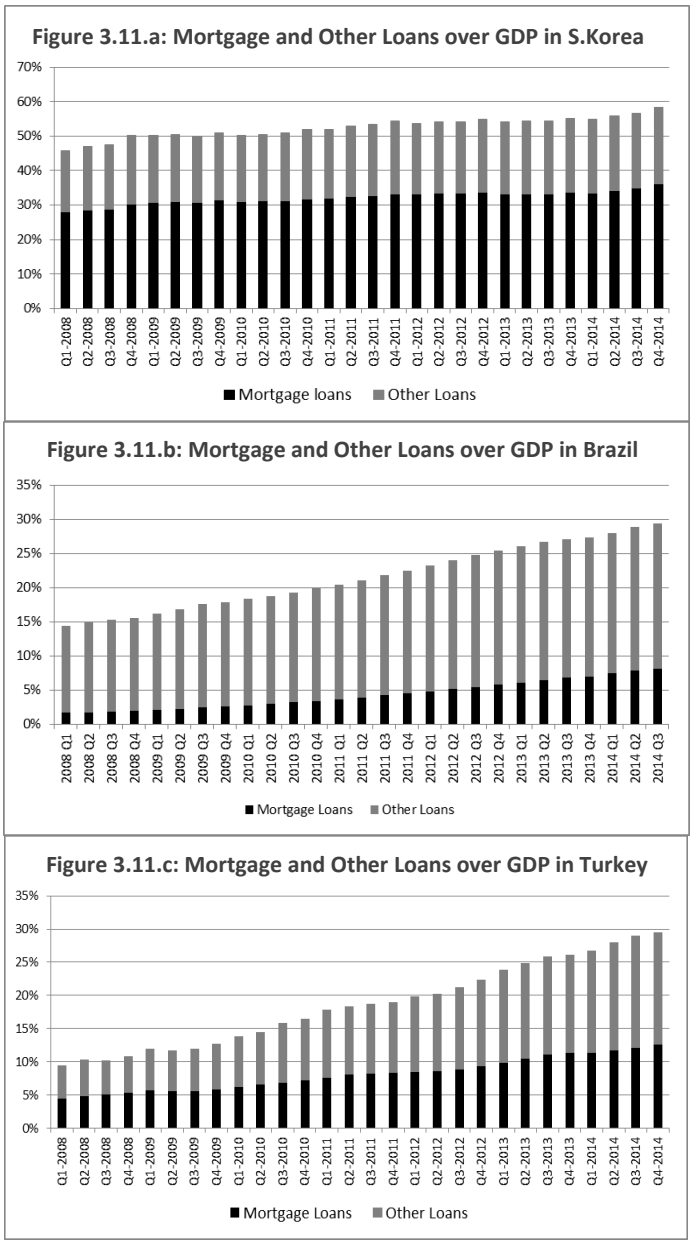


Source: BIS

Figure 3.10: Credit in Selected Developing Countries

Figure 3.11 shows that the composition of household loans in S.Korea, Brazil and Turkey. The mortgage loans forms around 61% of total loans on average in S.Korea whereas their share among Turkish household loan form 42% of total loans. The different composition of loans brings different challenges for economies. While Korean credit related measures mostly cover the housing sector, Turkish measures focus on other loans, particularly consumer loans.

While the share of mortgage loans among total loans remained almost stable in Turkey and S.Korea for the period under investigation, Figure 3.11.c shows that the ratio in Brazil followed an upward trend. Mortgage loans that formed 13% of total loans in early 2008, reached 22% in early 2011 and 36% in early 2014. Unlike S.Korea, the policy mix of Brazil have not specifically addressed the housing sector, but aimed to curb the credit growth in an aggregate level. As will be discussed later, the lack of policies addressing the housing sector is due to the fact that the expansion of mortgage loans in Brazil does not only depend on cyclical factors but also structural changes occurred towards the housing sector.



Source: BOK, IMF FSI Database, CBRT

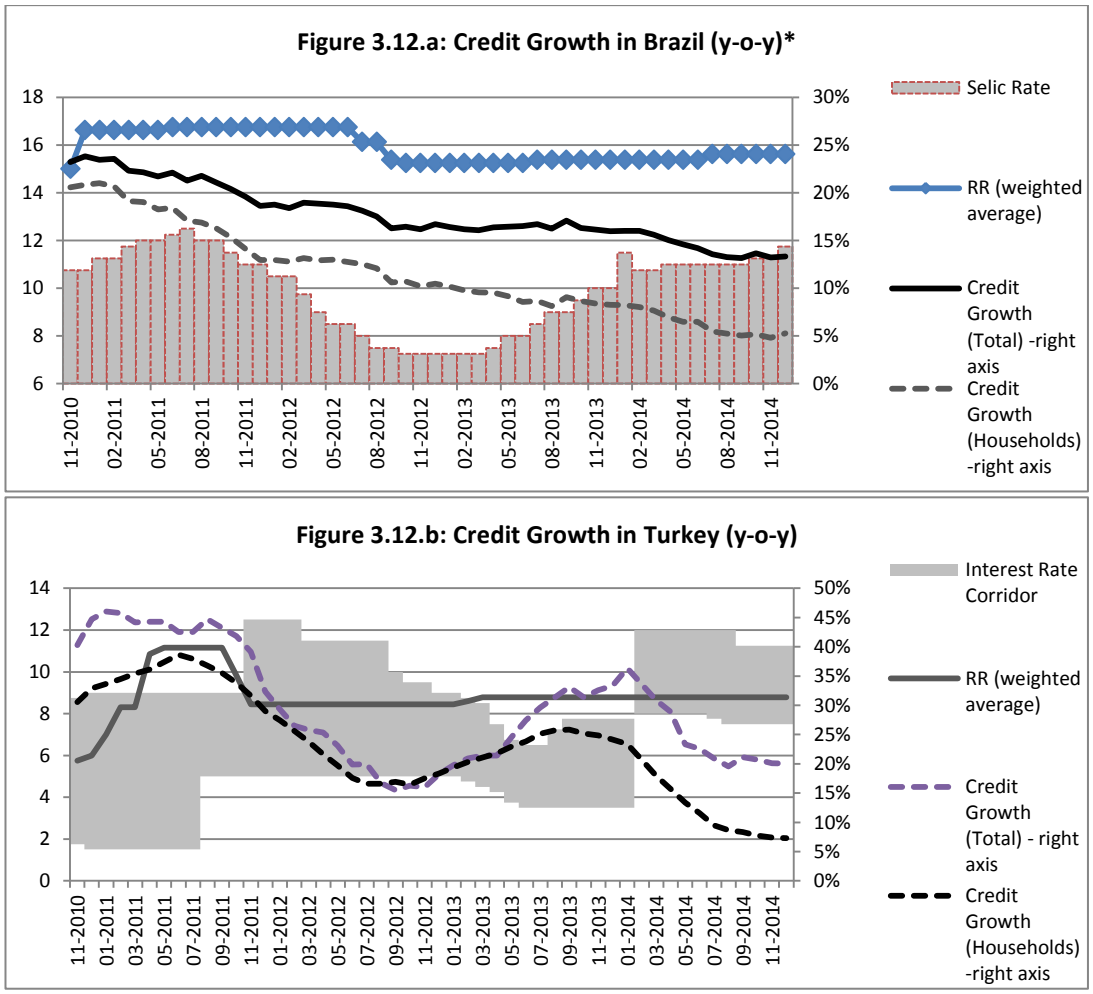
Figure 3.11: Loan Composition in S.Korean and Turkish Banking Systems

In Turkey and Brazil, the primary tools to curb the accelerating credit growth have been reserve requirements. BCB and CBRT also took additional measures regarding the specific features of their loan compositions. Figure 3.12 demonstrates the movement of credit growth along with the measures taken.

After BCB adopted its new policy mix in late 2010, credit growth started to follow a downward trend. BCB promoted this downward trend with the simultaneous rise of reserve requirements and Selic rate until the second half of 2011. These measures were also complemented with the increase of capital requirements on consumer loans in December 2010. The Risk Weight Factor was increased for consumer loans mainly for vehicle financing (which accounted for 25% of outstanding household loans in December 2010) and consumer credit. This measure did not include mortgage loans (Pereira da Silva and Harris, 2012). Moreover, an IOF tax on consumer credit was introduced in April 2011. This set of measures helped BCB to curb the credit growth from a rate of 24% in January 2011 to 18% in January 2012. In November 2011, when the credit growth first reached the rate of 18%, Luiz Pereira from BCB stated that the credit growth had slowed down to a sustainable pace. After that point, to avoid any further slowdown in the growth rate The Risk Weight Factor and Selic Rate were lowered in the second half of 2011 while reserve requirements were held constant.

However, the growth rate slowed down further to almost 15% in late 2012. Another statement from BCB followed, declaring that "there is still room for credit to expand further and that would be desirable". Despite a notable cut in the RRs and elimination of some IOF measures, credit growth continued to slow down towards rates below 15% throughout 2013, simultaneously with the rise in the Selic rate which was in fact adjusted to attract capital flows after the Fed tapering talk. In this respect, although the Brazilian policy mix was successful in curbing the credit growth, it fell short when policymakers started to seek further expansion in credit.

CBRT also took several measures to address the acceleration of credit growth. CBRT increased the reserve requirements substantially at several steps from November 2010 to April 2011 and tightened the interest rate corridor by cutting the lower bound in August 2011. Another measure followed the set of tools to curb the accelerating credit growth in mid-2011. Regarding the large share of consumer loans in this acceleration, Banking Regulation and Supervision Agency (BRSA) took several measures. These included several types of limitations to the monthly spending with credit cards. Furthermore, capital requirements for consumer loans were raised. Figure 3.12.b clearly indicates that these measures



Source: BCB, CBRT

* Year-over-year.

Figure 3.12: Credit Growth in Selected Developing Countries

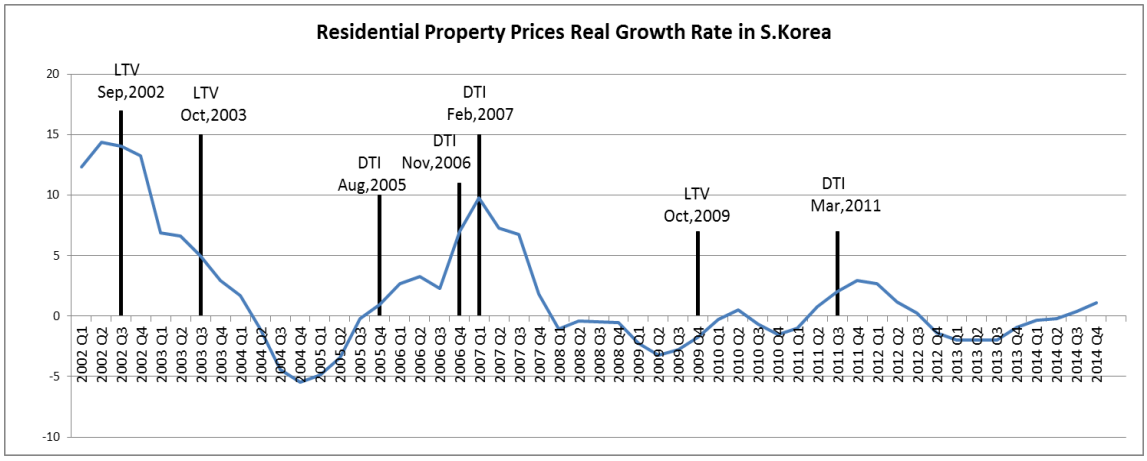
had been notably successful in curbing the credit growth after August 2011. In conformity with the adjustments in the interest rate corridor, the decline in the credit growth rate continued until late 2012. After 2012, CBRT remained reluctant to use reserve requirements actively. The movements of credit growth rate in 2013 and 2014 have been mainly associated with another episode of BRSA measures and the interest rate corridor. In November 2013, BRSA announced a new set of limitations to credit card purchases and the introduction of LTV caps on vehicle loans. Furthermore, the repayment periods for vehicle and housing loans were limited to 48 and 36 months respectively. Around the same date, the interest rate corridor was also aggressively adjusted upwards in

order to encourage capital flows, after the Fed tapering talk. As a result of these policies the credit growth rate approached to more desired levels recently. The set of BRSA measures can be seen as an exceptional attempt to promote financial stability with regard to the "market-friendly" toolkit of CBRT. The policy coordination between these two bodies appears to be successful in curbing the undesired acceleration in the consumer credit front.

The credit growth performances of the countries under investigation reveal that both central banks face different policy dilemmas. In Turkey, credit growth seems to be in a negatively correlated co-movement with the upper bound of the interest rate corridor. A significant decrease in the upper bound triggers an undesired credit growth for CBRT. On the other hand, in Brazil, while a rise in the Selic rate leads contraction in the credit growth, a cut does not seem to be able to help fuel the growth rate through desired levels. Evidence from the above analysis assert that a more active use of macroprudential tools that are not directly related with interest rates may help central banks avoid such policy dilemmas arising from the multilateral impacts of interest rates. When interest rate related policies are implemented for attraction or limitation of capital flows, the credit growth rates are affected too. Therefore, when the impact of the interest rate related tool is negative with regard to the targets of central banks, the use of other tools should be expanded. This is clearly seen from the Turkish example in Figure 3.12.b that if Turkish authorities could have used reserve requirements more aggressively in early 2013, credit growth might not have risen back at a rate of 35% and could be curbed before the actions of BRSA and an increase in the interest rate corridor.

A greater credit supply is associated with asset price inflation (Brunnermeier et al., 2012; Borio and Disyatat, 2011). Regarding the acceleration of credit growth, another concern of developing countries is the risk of a housing bubble with residential price appreciation and high mortgage loan growth. Garber (2000) defines a housing bubble as the part of the housing price movement that cannot be explained by the fundamentals. On the other hand Shiller and Case (2003) suggest that this term refers to a situation which excessive public expectations for future price increases cause prices to be temporarily elevated. More specifically, according to Mayer (2011) when housing prices rise rapidly,

growing over 20% for a few years and then falling just as rapidly in the following few years, we can consider this price movement as a housing bubble[13]. Tools such as caps on loan-to-value or debt-to-income ratios have been adopted by some countries regarding this concern, in addition to the ones related with the aggregate credit growth such as reserve requirements.



Source: BIS

Figure 3.13: Residential Property Prices[14] in S.Korea

East Asian countries have been the first economies to implement these tools starting from the early 2000s. BOK introduced caps on LTV and caps on DTI in September 2002 and August 2005 respectively. Later in the second half of 2000s these ratios were adjusted to be tighter particularly for the Seoul metropolitan area which stands to have the highest residential property prices growth rate. Figure 3.13 shows that these measures have been remarkably successful in controlling the residential property prices. With the joint use of these tools, the growth rate only moderately accelerated in late 2011 after the surge of excessive capital inflows. Figure 3.14.a also highlights BOK's success by demonstrating that Korean housing prices followed an almost horizontal path

[13] There are various methods developed in the literature to detect a housing bubble. For details, see: Shiller (1981); West (1987); Campbell and Shiller (1987); Diba and Grossman (1988); Phillips et al. (2011).

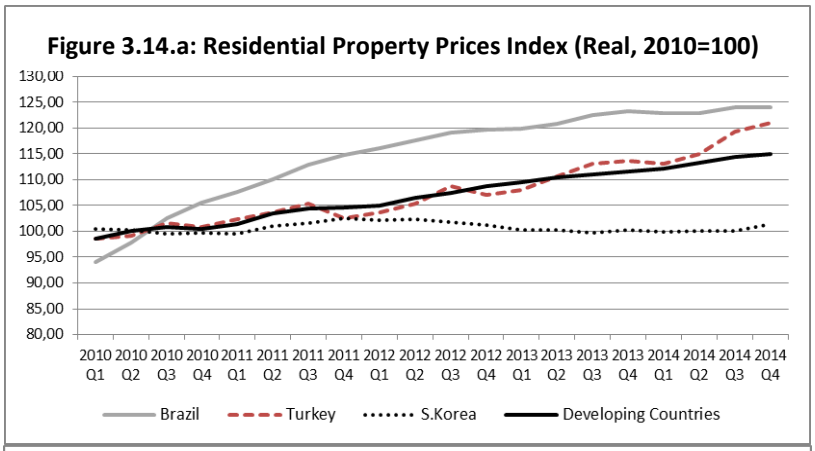
[14] Percent per year, all types of new and existing dwellings in the whole country.

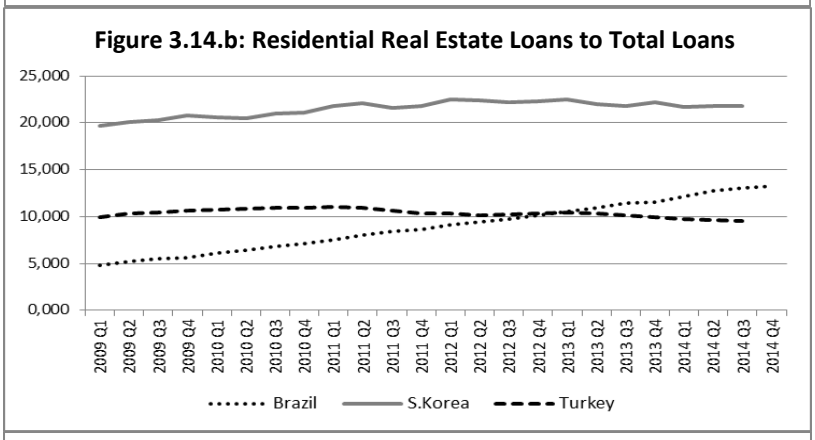
after the crisis. Considering the upward trend in developing countries' average, BOK has been remarkably successful in controlling the housing prices.

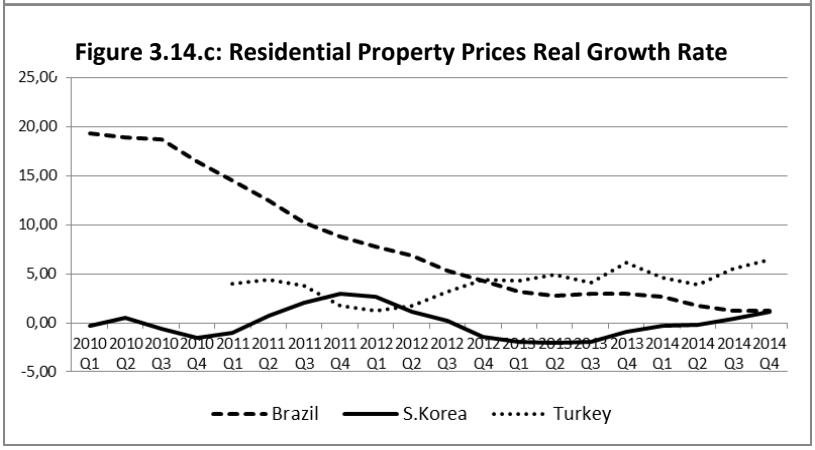
On the other hand, in Brazil, where the signs of a "housing bubble" appeared through early 2010, the residential property prices recorded the sharpest upswing. Residential property prices increased by over 20% in real terms, from early 2010 to mid-2012. The average appreciation rate in developing countries was less than 10% for the same period (Figure 3.3.14.a). However, as implied earlier, the fact that BCB have not adopted any measures regarding the persistent upswing in the housing sector is due to the structural changes aiming to expand the housing market rather than an ignorance. As Figure 3.11.b shows, the share of mortgage loans among total loans provided to households was around 13%, which is remarkably low with respect to other emerging market economies. After various legal and structural changes[15], Brazilians who had stayed away from the housing market for decades, have started accessing the housing market (Pereira da Silva and Harris, 2012). In line with these encouragements for access, BCB also addressed in a statement given in late 2012 that the desired driving force for credit growth expansion is the housing sector. After mid-2012, the appreciation of Brazilian residential property prices almost stopped while the developing country average continued an appreciating trend. Figure 3.14.c also demonstrates the diminishing rate of growth in residential property prices in Brazil. The stable prices may have occurred due to the measures of BCB on both capital inflows and credit growth front as well as a slowdown in the demand after the first reaction to the structural and legal changes.

However, as also indicated in this section earlier, the share of residential real estate loan in total loans is still rising persistently (Figure 3.14.b). This may lead further appreciation in the housing prices and increase in credit growth in the near future as desired by BCB.

[15] Some of the changes are a new mechanism called "alienação fiduciária" and the Law 109331/04 that amended the Civil Code. For details, see Pereira da Silva and Harris (2012).







Source: BIS, IMF (Financial Soundness Indicators)

Figure 3.14: Residential Property Prices[16] Indicators of Selected Developing Countries

[16] Developing countries average refers to the average in the developing countries within G20. Growth rate is in terms of per cent per year. All types of new and existing dwellings for Brazil; new houses in big cities for Indonesia; all types of new and existing dwellings in big cities for India; and all types of new and existing dwellings in the whole country for the rest of the countries.

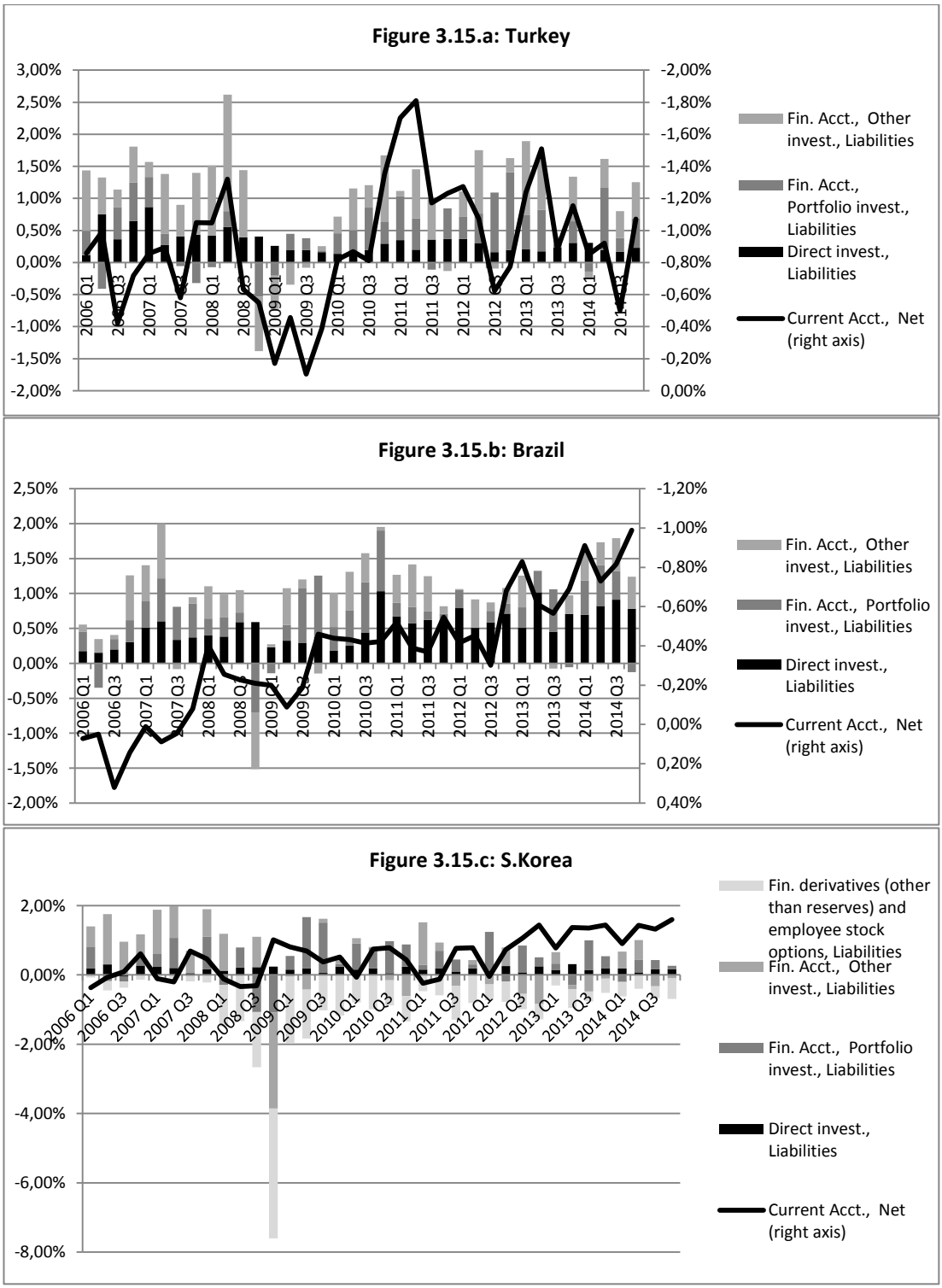
In Turkey, although the share of residential property loans in total loans remain almost constant (Figure 3.14.b), residential property prices index show a persistent upswing (Figure 3.14.a). Mainly after early 2013, the rise in the prices is above the average in developing countries. Figure 3.14.c also demonstrates that the movements in the growth rate highly match with the developments in the capital flows. The growth rate declines following the times when capital flows wane –in late 2011 when Eurozone debt crisis intensify and in the second half of 2013 after the tapering talk – and rises during surges of capital inflows. Given this volatility which addresses a sensitivity of domestic conditions to external factors, the developments in the Turkish housing sector may require closer attention.

In this light of the above discussions, the analysis on the housing sector implies that both Brazilian and Turkish indicators seem to be under control for the time being. However, if the upswing in the indicators persist and reach levels more than desired, additional measures such as the ones in East Asia may be required to be adopted.

3.4.3 Overall Effects of the Policy Mixes on Financial Stability and Price Stability

Figure 3.15 shows financial flows and current account deficits in Brazil and Turkey. Although the Brazilian current account deficit widened from 2% of GDP in 2010 to 3.38% in 2013 (IMF, 2014), FDI flows have also followed an upward trend. This indicates that the measures of BCB to regulate the financial flow composition have been successful. The maturity of flows has lengthened and the current account deficit is almost entirely financed by long-term flows. This implies a narrowing of risks in the Brazilian financial system and less exposure to the impacts of global factors.

On the other hand, in Turkey, the majority of capital flows to finance the current account deficit are short-term flows. Although there had been a moderate amelioration in the magnitude of FDI flows after the introduction of new policy



Source: IMF BOPS, UN Stats

Note: Net deficits for Turkey and Brazil.

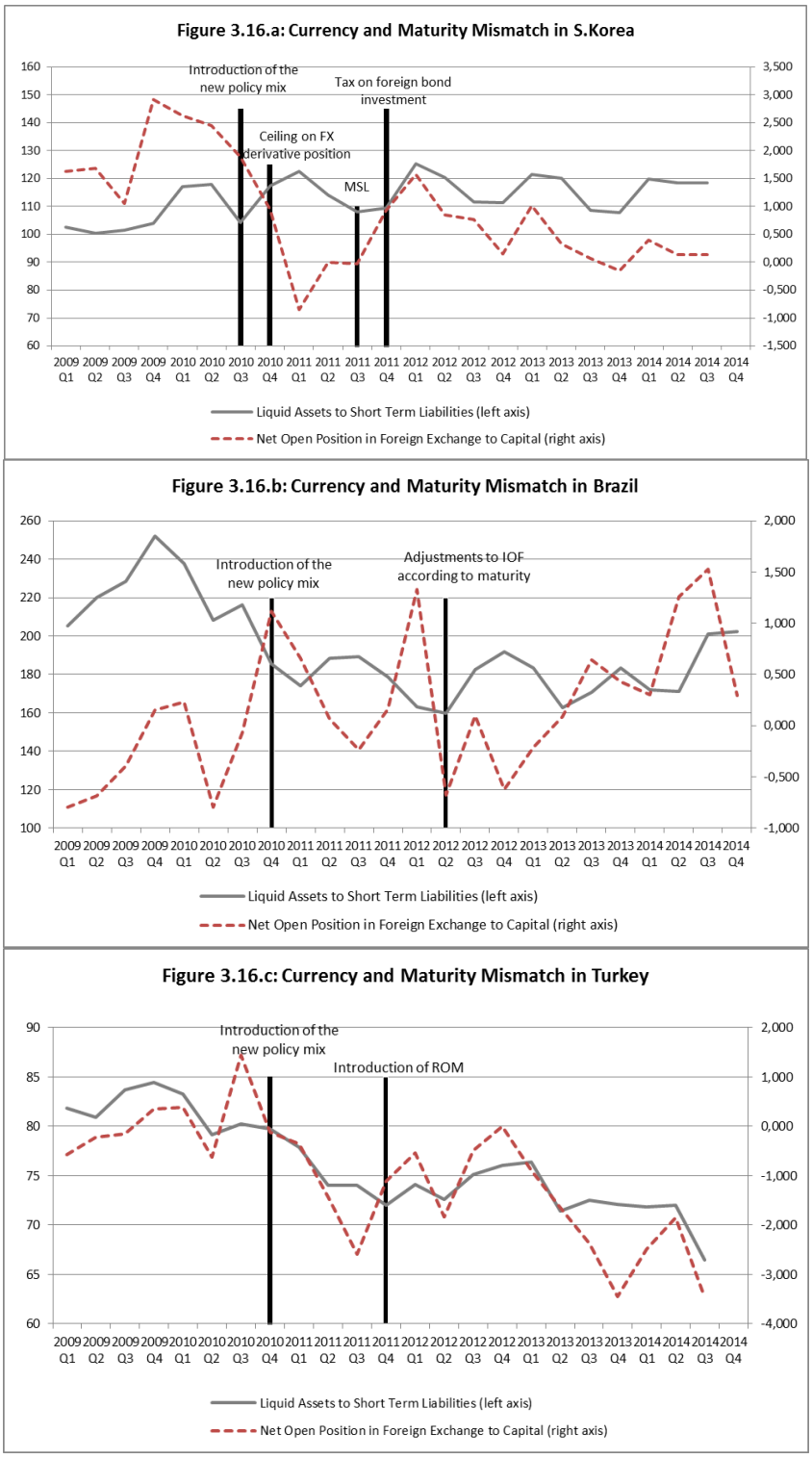
Figure 3.15: The Gross Capital Inflows and Current Account Balances over GDP

mix, this trend did not last long. The share of FDI flows among other financial flows to finance the current account deficit worsened after mid-2012. Moreover, the composition of flows has also been deteriorated with respect to the pre-crisis period. Relying on short-term financial flows to finance its current account deficit, Turkish financial system and macro-economy possess a higher dependence on global factors than the Brazilian example.

Proceeding the worsening of the financial flow composition in Turkey, the indicators of currency and maturity mismatch have also been at alarming rates for the past couple of years (Figure 3.16.c). The rate of net open position in foreign exchange and the ratio of liquid assets to short-term liabilities of the Turkish banking system worsened rapidly after 2012. Regarding the analysis in the previous parts, this deterioration is likely to be picturing the unintended results of the increase of short-term external debt in 2012 and the loss of control of CBRT on the management of capital flows in after 2012.

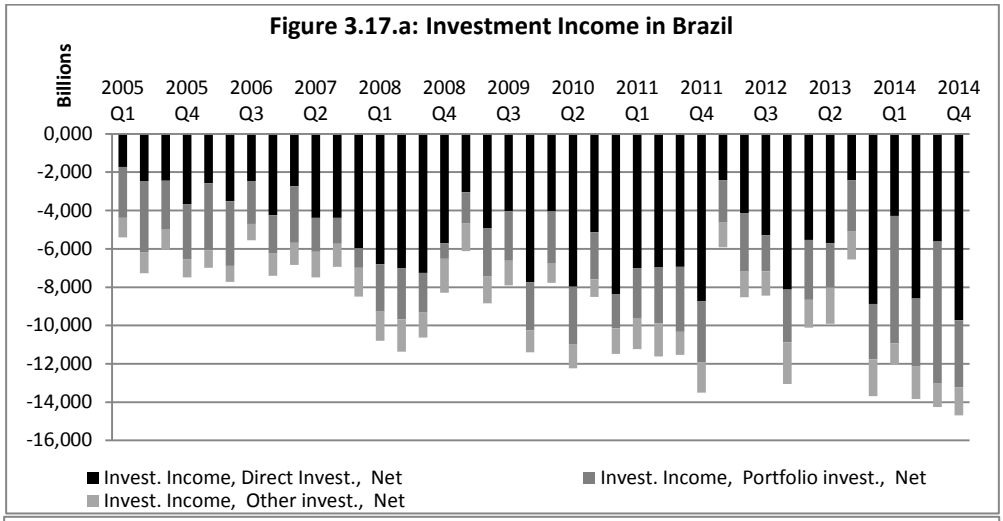
Brazil, on the other hand, seems to have fixed the maturity and currency mismatch problems of its financial system significantly. As discussed in the previous sections, IOF measures have helped the decline of short-term external debt and have reduced the vulnerabilities of Brazilian economy to external factors. These developments are reflected in the balance sheets of banks with a lag.

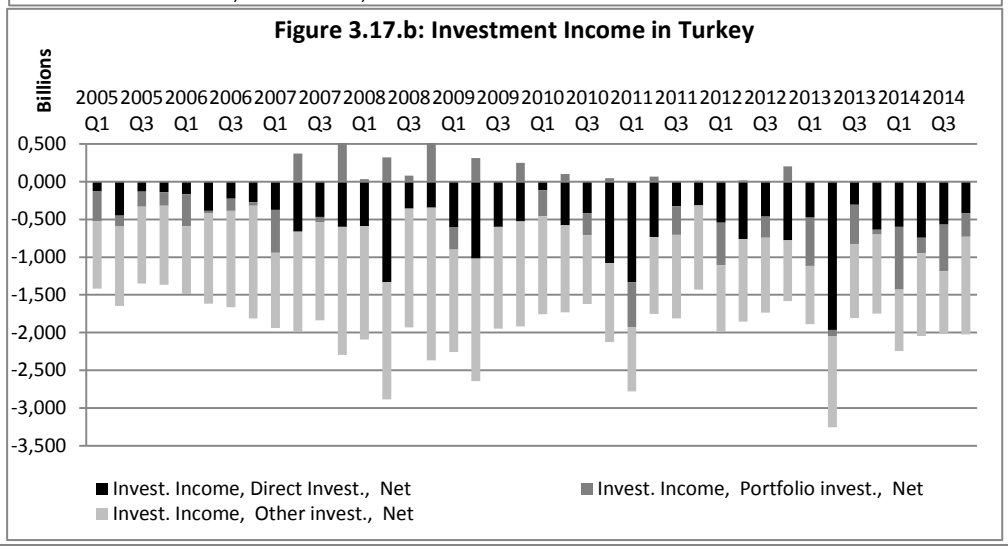
S.Korean indicators also show similar results to those of Brazil. Figure 3.16.a demonstrates that the measures of BOK have especially been successful in lengthening the maturities of bank liabilities. Since the primary concern of policymakers in S.Korea has been the rate of non-core liabilities, these indicators reflect the success of the policy mix of BOK.

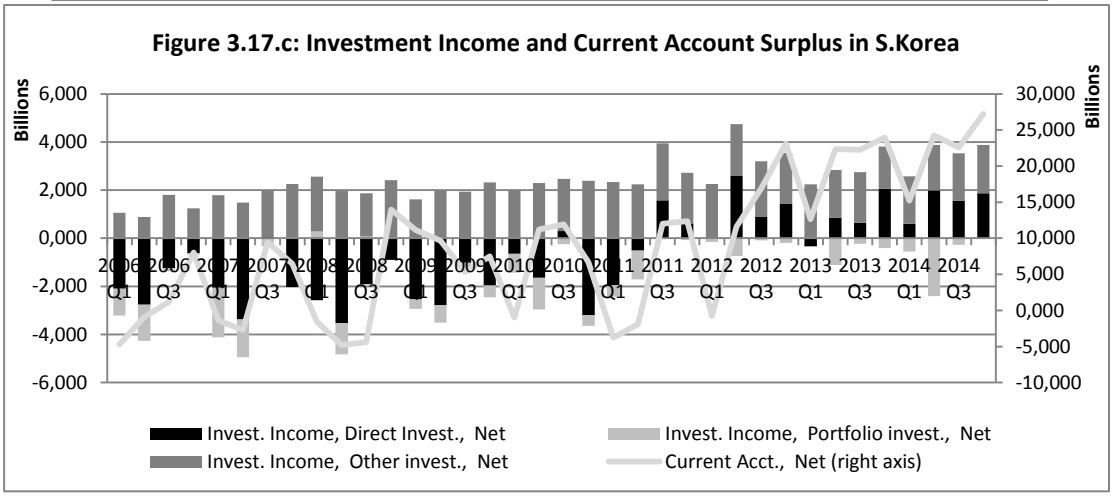


Source: Financial Soundness Indicators, IMF

Figure 3.16: Indicators for Currency and Maturity Mismatch in Selected Developing Countries



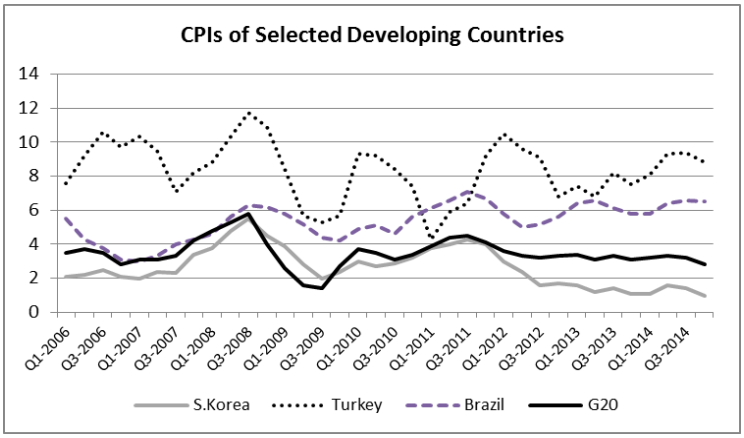




Source: IMF BOPS Database

Figure 3.17: Investment Income in Selected Countries

Although S.Korean indicators reveal positive implications upon its financial fundamentals, there is an underlying problem for the future performance of the economy. Figure 3.16 earlier shows that there is a persistent increase in the current account surplus of the country. It is already stated in the earlier sections that S.Korean authorities are not pleased with this rise. Although the S.Korean economy have been experiencing net financial outflows recently, the level of the surplus continues to rise, which implies that there should be other factors underneath. Figure 3.17 shows the net investment income levels in the countries under investigation. While the net investment income levels are negative in Turkey and Brazil, Figure 3.17.c indicates that S.Korea has been receiving a significant investment income since late 2011. It is clearly observable that the persistent rise in the current account surplus follows the switch of the net investment income to positive. Taking this into account one can conclude that the income of residents from their investments abroad has significantly contributed the rise in the current account surplus. Therefore, although some positive impacts of these developments are observed in terms of lowering the volatility of some indicators in response to global factors, the policies of S.Korean authorities in mid-2000s to promote capital outflows might have caused a new chain of problems for the Korean economy.



Source: UNStats

Note: HCPI for Turkey, CPI for the rest of the countries

Figure 3.18: CPIs of Selected Developing Countries

Figure 3.18 show that developing countries have not shown a good performance on the price stability front, as of the date of introduction of the new policy mixes. Similar to financial stability, price stability have also been affected by global factors. The quantitative easing strategies of US FED in late 2008 caused inflationary pressures in 2009 and 2010. In late 2011 and early 2012, the European debt crisis intensified and caused a contraction in the world economy. World economic growth declined to 3,2% in 2012 from a rate of 3,9% in 2011. The decline of global demand also caused subdued inflationary pressures on developing countries by reducing export levels. To this end, 2012 was a year of lower growth and reduced inflationary pressures for developing countries. In 2013, although the effects of Eurozone crisis lessened, the announcement of US FED tapering policy in May 2013, put depreciation pressures on domestic currencies and stimulated inflationary pressures on economies. On the growth side, advanced countries performed better than developing countries, causing further capital outflows. Moreover, declining commodity prices caused additional challenges for commodity exporters.

Turkey, after introducing new monetary policy framework in late 2010, recorded an inflation rate of 10,5% in 2011, which is dramatically above the official target of 5,5%. Despite attaining a rate within the uncertainty band in 2012, the rates in 2013 and 2014 exceeded the upper band. Although the depreciation pressures of 2013 and 2014 caused the Brazilian inflation rate also to rise, the inflation rates in Brazil remained within the tolerance intervals. However, since the tolerance interval of +/-2pp provide a notably wide range to target for the authorities, these realized rates do not necessarily imply a very successful performance of BCB on the price stability front.

S.Korea, on the other hand, maintaining the lowest point target of 3%, achieved to realize inflation rates that fall within the tolerance interval of +/-1pp in 2011 and 2012. However, S.Korean economy faced dramatically low inflation rates around 1,3% in 2013 and 2014, falling far behind the lower bound of the tolerance interval.

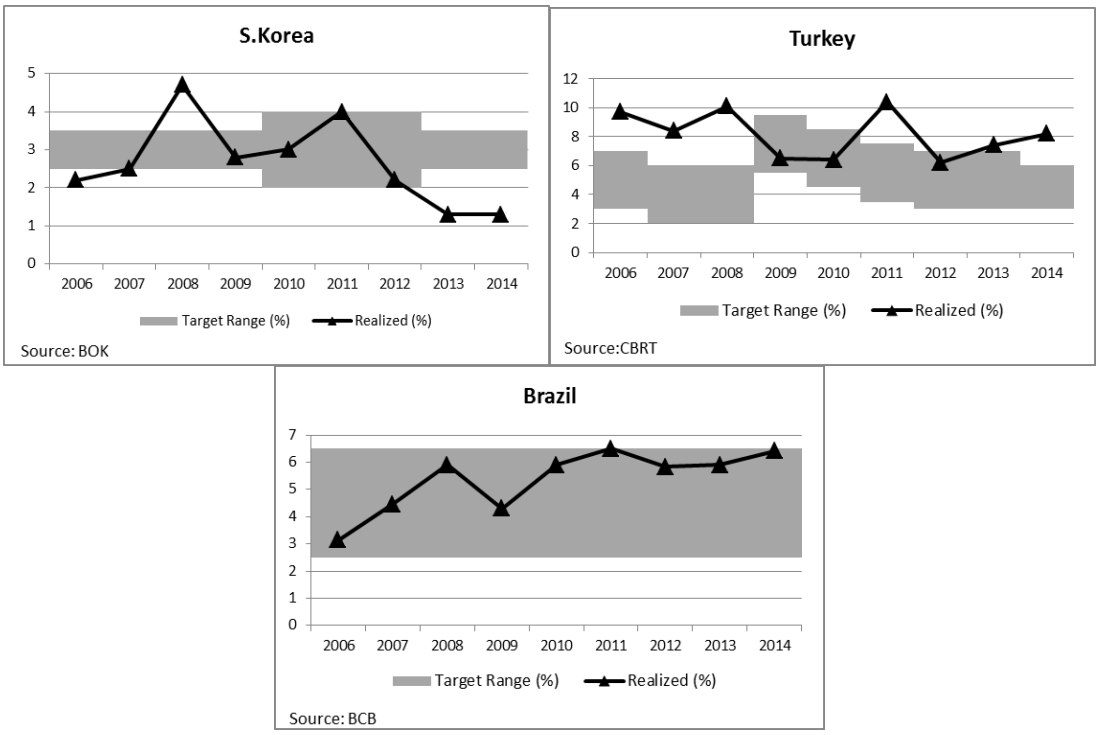
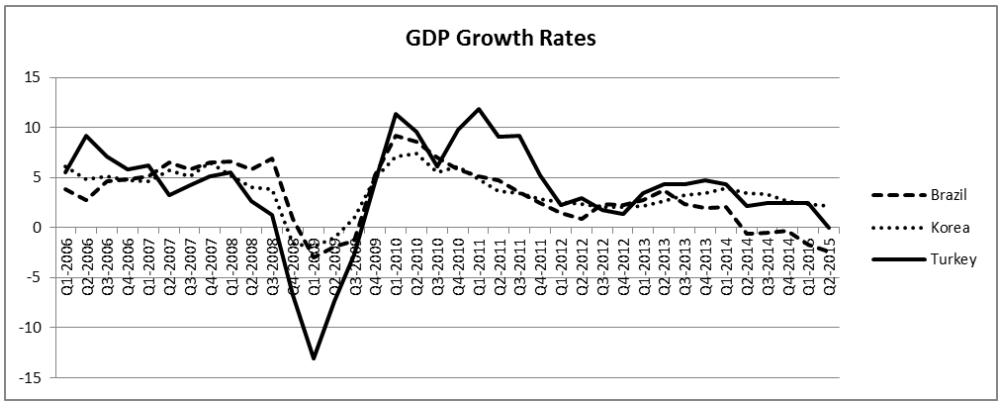


Figure 3.19: Inflation Targets and Realized Inflation in Selected Developing Countries

While Brazil and Turkey faced increasing inflation rates during 2013 and 2014, the Korean rates followed an opposite trend. These opposite movement are in conformity with the appreciation trend of Korean Won, which accelerated especially after mid-2013. Furthermore, the residents' investments abroad offsetting the foreign capital inflows, the divergence of the Won with respect to other developing countries' currencies and the first significant fall in the inflation rate address 2012 as a turning point for the Korean economy. In this respect, it is possible to conclude that even though the rise in the current account surplus and the accumulation of large international reserves act as a buffer against global shocks, the impacts of these measures in the macroeconomic front started to become worrisome. The policy mix of S.Korea seems to have achieved its goal in terms of promoting a sounder financial system. Nevertheless, the slow-down in the real GDP growth and inflation rates requires more attention of the policymakers in these fronts.



Source: OECD Statistics

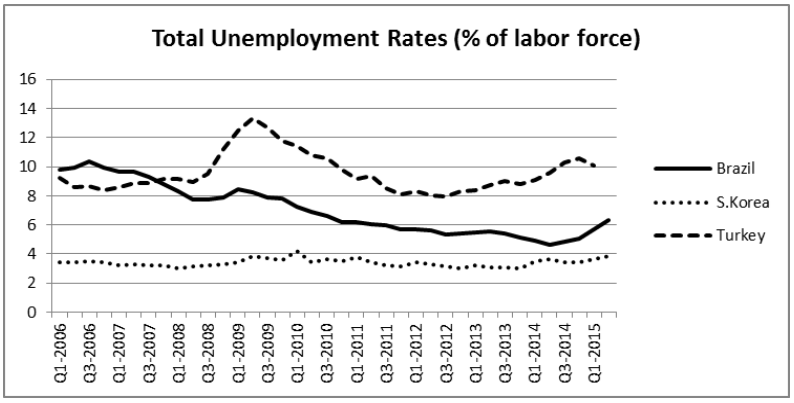
Note: Growth rate compared to the same quarter of previous year, seasonally adjusted

Figure 3.20: GDP Growth Rates in Selected Developing Countries

Figure 3.20 shows that S.Korean GDP growth rate fell behind of those of Brazil and Turkey. The relatively similar patterns among three cases started to differentiate for the case of S.Korea, mainly after 2013. Before that date, the Turkish GDP growth rate appears to be fluctuating sharply and revealing a remarkably higher rate during 2011, with respect to the other countries. This performance may have occurred due to the market-friendly strategies as well as the sharp decline of the given rate in response to the global financial crisis. Starting from 2012, Turkish growth rate moves along with the Brazilian growth rate, remaining behind 5%. In this respect, although Turkish policymakers enjoyed relatively better GDP growth rates on average after the global financial crisis, the rate started to follow the same trend as in the other two cases after 2012. In S.Korea, the notable decline after the given year may have occurred due to the sharp appreciation trend as indicated before.

As in the case with GDP growth rates, Turkish indicators followed a fluctuating trend in the case of another ultimate target, unemployment rates. Turkish unemployment rate have been by far the highest among the three selected countries after the crisis (Figure 3.21). The rate recorded the sharpest upswing during 2009 that it also experienced the most remarkable decline during 2010 and 2011. S.Korean unemployment rate remained almost stable while a downward trend is observed in Brazil. The downward trend in the Brazilian unemployment rate continued until 2014, whereas the Turkish rate switched to

an upward trend after the tapering talk. When considered altogether, one might conclude that the Turkish economy have been hit by the impacts of the tapering talk more significantly than the Brazilian economy. The results in the ultimate targets front support the previous findings in terms of indicating that the Brazilian economy has become less dependent on global factors after the global financial crisis.



Source: OECD Statistics

Figure 3.21: Total Unemployment Rates in Selected Developing Countries

3.5 CONCLUSION

The analysis conducted in this chapter reveals important results on both the effectiveness of certain macroprudential tools and the new policy mixes of the selected developing countries. In line with the general view in the literature, reserve requirements stand to be effective in curbing the credit growth. Moreover, the analysis also demonstrates that caps on LTV and DTI are successful tools in dealing with accelerating mortgage loans and housing prices appreciation. Other policies such as capital requirements in Brazil and BRSA measures in Turkey also appear to be effective in controlling the acceleration in the credit growth.

While the tools in the credit front provide more straightforward conclusions, the tools in the exchange rate/capital flows front are harder to draw conclusions on.

For example, while FX RR in Turkey have been initially effective at the time of its introduction, its effects are less obvious in the proceeding periods. Brazilian FX RR, on the other hand, has ambiguous effects on the Brazilian exchange rate and the analysis particularly asserts that the impacts of this tool on the exchange rate front could have been offset by the side effects of IOF measures. Therefore, unlike some studies given in the literature review, the event analysis reveal no significant findings of positive impacts of the new policy mix on the exchange rate volatility front.

Nevertheless, in terms of dealing with the maturity composition of capital flows, IOF measures reflect a successful record. The new policy mix seem to have had a significant positive impact on the composition of the flows and very limited or no impact on the magnitude of inflows. In this respect, the findings of the event analysis are consistent with the conclusions of Jinjarak et al. (2013) and the earlier literature on the effectiveness of the capital controls.

Examined together with S.Korean capital flow management measures, the attempt to place capital flows management measures have helped both Brazil and S.Korea to ameliorate their currency and maturity mismatch problems. Their short-term external debt declined remarkably after the introduction of their new policy mixes. Although the volatility of financial inflows to S.Korea remains relatively high, the BOK has been significantly successful in controlling the volatility of Won. This success may be due to the indirect stabilizing effects of its capital flow management measures, particularly MSL. Despite the fact that S.Korean authorities do not incorporate tools such as FX RR or ROM that directly address the exchange rate front, it seems as a successful policy design brought the most stable currency among the ones under investigation. The large current account surplus and international reserves are other significant factors contributing to the success of BOK in controlling the volatility of the domestic currency. Taking these points into consideration, the analysis shows that S.Korean indicators seem to be less dependent on global factors, in line with the relevant literature.

In Turkey, where market-friendly policy choices are in place, the short-term external debt has been steadily increasing. The effects of the new policy mix

were only initially observable. Moreover, the ROM facility seems to have helped a significant reserve accumulation to take place after becoming fully in effect at the first half of 2012. However, there are no significant findings which show that banks benefited from their reserves held within the ROM facility in the periods when capital inflows wane. This supports the findings of Aslaner et al. (2014) that the use of interest rate corridor to attract more flows during stressful times, may have lead banks to consider the high interest rates as an opportunity rather than benefiting from their reserves in the ROM accounts.

The analysis in this chapter also provides implications for the selected countries in terms of some possible adjustments or prospective tools to be included in their policy mixes. For the case of Turkey, interest rate corridor almost proves to fall short in regulating the maturity of capital inflows, leaving the risks ongoing throughout the system. The fact that it may also have negatively affected the functioning of ROM reinforces the case against the implementation of interest rate corridor in the current manner. Since the undesired interaction of these two tools is more likely to take place when there is a reversal in portfolio flows, a measure which would specifically regulate these types of flows could both ease the pressures on the interest rate corridor and mitigate the side-effects arising from its joint use with ROM.

In the Brazilian policy mix, the major problem is the control of the pressures on the exchange rate. Since the maturity composition of capital inflows have successfully been managed, the case for the side effects of IOF taxes on exchange rate reinforces. A possible suggestion for the solution of this problem could be a more active use of the existing tools. From the time of their adoption to elimination, the FX RR and several types of IOF were not adjusted. Considering the large fall in the reserves after the Brazilian Real took a depreciation trend, another suggestion could be that the adoption of ROM facility. Such a policy could help BCB to intervene the FX market less frequently.

Moreover, although the Brazilian and Korean capital flow management frameworks stand to be more effective than the Turkish market-friendly policy mix, they also have had some costs. The Brazilian authorities could not manage to accelerate the credit growth to the levels that they had desired. Furthermore,

both Korean and Brazilian real GDP growth rates fall behind the Turkish rate[17]. The case of S.Korea has its own distinguishing features as stated throughout the Chapter. However, it seems likely that Brazilian credit and GDP indicators may have suffered from the distortionary effects of capital controls to some extent.

Another important finding is that mid-2012 has been the date for divergence of the three sample countries. The individual problems of each economy arose around this date. BCB lost its control over the exchange rate front. Its efforts to keep the currency stable along with a significant reduction in international reserves failed and the domestic currency depreciated sharply. The volatility of the Real could also not been managed. Around the same date, S.Korean authorities faced a problem of a persistently increasing current account surplus heavily due to the received investment income from abroad. The international reserves started to rise along with the sharp appreciation in Won. Inflation remained below the target and GDP growth fell behind the desired rates. Almost at the same date for the start of the chain of problems faced by BCB and BOK, the success of CBRT started to weaken too. CBRT started loose its control over the short-term external debt in mid-2012. This loss of control has many implications since it means the maintenance on the dependence of the economy on the external factors. Combined with a large current account deficit, the short-term external debt stock resulted in serious maturity and currency mismatch problems. The efforts to make the Turkish Lira stable failed which became apparent after the tapering talk. Moreover, in addition to these multiple vulnerabilities, inflation dampened remarkably. It should be noted that although the findings upon the Turkish case do not reveal a bright picture, they do not necessarily conflict with the relevant literature too. The time frame that is covered in earlier analyses does not extend to the time frame of this study. Considering the given chain of events in the countries under investigation, it is possible to see examples which verify the fueling cycle given at the beginning of this chapter.

It is also possible to detect some possible future challenges for the selected economies from this analysis. For the case of Korea, it is already stated earlier

[17] The rates are: 3,22 for Brazil; 3,74 for Korea and; 5,44 for Turkey on average for the years from 2010 to 2014 (based on data from WorldBank).

that the current picture in the current account surplus started to raise some concerns for the policymakers. The recent efforts of BOK have been large cuts in the policy rates to ameliorate the levels of GDP, inflation and other indicators that may cause concerns for the export based growth model of Korea. Although these efforts may moderate the current situation, a balanced policy is needed. It should be taken into account that the current approach to cut interest rates may fuel the historical problems of the Korean economy with household debt and housing sector, unless appropriate measures are taken. For Brazil, it seems as the distortionary effects of capital controls may further constrain credit growth and GDP. The recent rise in the Selic rate may also worsen this situation. The joint optimization should be managed meticulously so that BCB would not face a future policy dilemma. Unlike Brazil and Korea, the possible future issues for Turkey may arise from the currency and maturity mismatch problems, driven by its large short-term external debt. Neglecting financial soundness may lead undesired impacts on the entire financial and macroeconomic system.

In fact, besides the conclusions on the effectiveness of macroprudential tools, the main implication of this chapter has been the importance of the joint optimization problem that central bankers should deal with. The analysis shows that rather than the choice of certain tool, the choice of the framework requires more attention. The cases with MSL, IOF and ROM form examples for the situations where the indirect effects of tools can either facilitate the task of central banks by supporting each other or make it more difficult by limiting the effectiveness of another by showing some side-effects.

Although this chapter contributes to the existing literature by pointing out the problematic outcomes of the new policy mixes and suggesting some prospective solutions them, there is still much to do. With the event analysis approach, we can see the impacts of the tools on the primary indicators that they are designed to address. However, although this chapter makes moderate attempts, the indirect effects of each tool on different indicators should also be observable in order to conduct a comprehensive analysis on the effectiveness of the new policy mixes. The limited experience with the new policy mixes and the unknown indirect effects of newly developed tools make this era of central banking practices rather an "uncharted territory". To this end, the next chapter aims to

carry out such a comprehensive analysis by developing a new method. This new method should be able to demonstrate the extent of effectiveness of a policy mix while also taking the interactions into account.

CHAPTER 4

ASSESSING POST-CRISIS MONETARY POLICY FRAMEWORKS WITH A *CENTRAL BANKING EFFECTIVENESS INDEX*: A *COMPASS* FOR THE *UNCHARTED TERRITORY*

4.1 OVERVIEW

Lessons from the global financial crisis brought a remarkable change in the understanding of central banking. It was understood that financial stability should have counted more than a second-order issue and the overall macroeconomic stability could not be promoted without pursuing financial stability in addition to the price stability. Indeed, the inclusion of financial stability in central banking objectives led the requirement of additional tools for central bankers, who were operating almost only through controlling short-term interest rates a few years ago. Most developed and developing countries started or bolstered the use of macroprudential tools. Therefore, as well as their control panels the toolkits of central bankers were also expanded. Regarding the limited experience with such tools, these developments have caused new struggles for economists and central bankers in pursuit of conducting effective monetary policy and its monitoring. Despite an explosion of studies conducted recently on this area, this "uncharted territory" still requires further focus.

After this gradual change, the former ways of monitoring the effectiveness of monetary policy are also no longer valid. An additional objective and new policy tools, all in interaction with each other form a difficult task for central bankers and economists to conduct a comprehensive assessment. In other words, the

previous approaches for assessment require an "update" for this new era of central banking.

Nevertheless, unlike with price stability, the indicators over which the financial stability could be monitored are rather vague. Furthermore, a vast majority of the studies regarding this aim are conducted for developed countries. For developing countries, the studies are mostly country-specific. Regarding this need, this study seeks a way to assess and analyze the new path of central banking practices in selected developing countries.

The countries under investigation are Brazil and Turkey. They are both within G20 economies and the "Fragile Five". Moreover, the previous Chapter demonstrates that Turkish and Brazilian economies show remarkably similar patterns in their economies, in terms of the risks they face with and the measures that they adopt. They both face large current account deficits, inflationary pressures and risks arising from large capital flows. Although the macroprudential tools that were adopted to address their domestic credit cycles are similar, their measures against the undesired results of capital flows differ. Chapter 3 deeply examines the policies that are implemented in these countries and their effectiveness in terms of achieving desired rates and levels for the indicators that they monitor. However, the event analysis approach does not allow a comprehensive assessment and only provides partial information. Following such approach, monitoring the interactions between policies and indicators is only possible with the intuitive support. Therefore, event analysis mostly allows making conclusions upon the effectiveness of certain tools and a comparison between similar tools that are implemented to address the same indicators in the economy, rather than a comprehensive assessment of the overall effectiveness of the monetary policy frameworks.

This study aims to investigate the effectiveness of the pre- and post-crisis monetary policy frameworks by forming a *Central Banking Effectiveness Index* for selected developing countries. The uniqueness of this approach is that former studies with similar purposes were conducted mostly by empirical or event analysis. There are indices constructed with the aim of informing about the monetary stance. However, these take the previous consensus on monetary

policy into account. Moreover, information upon the monetary stance can only form one side of the effectiveness analysis. This study undertakes a harder task by not only being concerned with the monetary stance in the new era in central banking but also assessing the extent of its effectiveness. It was mentioned above that considering the limited experience with macroprudential tools and the scarcity of research about the effectiveness of post-crisis monetary policy frameworks, the new era in central banking practices is rather an "uncharted territory". In this respect, the *Central Banking Effectiveness Index* is designed to be an appropriate "compass" by providing crucial information about the success of the central banks of the countries under investigation, that have developed or in the course of developing policies to deal with this "uncharted territory".

The Chapter is organized as follows. Section II presents the frequently used indices in the literature and summarizes the relevant work for the purpose of this study. Special attention is paid to the financial stability indicators that should be incorporated when assessing for developing economies. While doing so, their scope, aim, methodology and contributions to the existing literature are discussed. Next, in the light of the literature review, section III moves on with the construction of the *Central Banking Responsiveness Index* step by step. Definitions of selected indicators, description of the data and methodology are presented. The *Central Banking Effectiveness Index* is formed following the same methodology. The last section demonstrates the findings of the analysis that is carried out with the indices that are developed in the previous section and draws conclusions upon the success of the pre- and post-crisis monetary frameworks both in a country-based and a cross-country-based manner.

4.2 LITERATURE REVIEW ON INDICES

Indices are frequently used tools in conducting quantitative analysis where empirical data and event analysis cannot provide sufficient information. In this study, since the post-crisis monetary policy frameworks do not provide us the required data time frame to conduct an accurate empirical assessment, the aim is to investigate the impacts of the emerging consensus on central banking

practices by constructing an index. In order to form a correct index and examine its possible implications, this section first explores the previous indices in the literature and provides a background for the formation of the *Central Banking Effectiveness Index.* The indices that shed light on the way of constructing the *central banking effectiveness index* are: the trilemma indices (monetary independence index, exchange rate stability index and capital account openness index), monetary conditions indices, financial conditions indices, aggregate financial stability indices and some other indices related to the stress of the financial or banking system. Moreover, the section also provides information on how central banks decide upon their policies and which variables are observed for this aim. Early warning indicators, financial stability indicators and their relevance for the index construction will also be examined throughout this section.

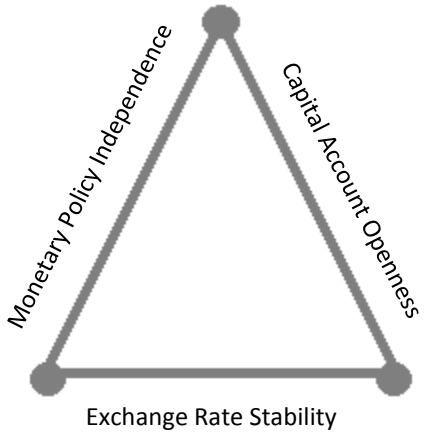


Figure 4.1: The Impossible Trinity

Trilemma measures are based on the three corners of the concept "the impossible trinity". The three corners are: exchange rate flexibility, monetary independence and capital account openness. The trilemma implies that these three macroeconomic policy goals cannot be reached at the same time. In other words, for example, a country with full financial integration and a floating exchange rate regime must give up its monetary independence (Figure 4.1). For each trilemma aspect, an index has been formed:

The monetary independence index (MI), which is developed by Aizenman, Ito and Chinn (2012), is the reciprocal of the annual correlation of the monthly

interest rates between the home country and the base country. The formula is constructed so that the values vary within the range of [0,1][18]:

$$\mathbf{MI} = 1 - \frac{corr(i_i, i_j)+1}{2}$$

where i_t and i_j represent the home country and base country interest rates respectively. A higher value indicates higher degree of monetary independence.

On the other hand, regarding the second policy goal of the trilemma concept, the exchange rate stability index (ERS) is constructed by Aizenman, Ito and Chinn (2012). It assesses the exchange rate stability by calculating the annual standard deviations of the monthly exchange rate between the home country and the base country. By construction, the values computed by the index range within [0,1] and the highest value indicates the greatest degree of exchange rate stability. The formula for ERS is as follows:

$$\mathbf{ERS} = \frac{0.01}{0.01+stdev(\Delta(\log(exch\_rate))}$$

To measure the extent of exchange rate flexibility, a majority of the rest of the literature addresses two indices based on the idea of exchange market pressure (EMP). The theoretical foundation for EMP stems for a basic monetary model incorporating the demand for money, its supply and relative PPP (Cavoli and Rajan, 2006)[19]. The usual equation for EMP is as follows:

[18] In the construction of the MI index, authors benefit from the following formula for transforming the values that are within [-1,1] to [1,0]: $C.\left[\frac{x-A}{B-A}\right] + D.\left[1 - \frac{x-A}{B-A}\right]$ where values of x within the range [A,B] are transformed to be within the range [C,D] .

[19] For details, see: Girton and Roper, 1977; Tanner, 2001; Pentecost et al. 2001, Guimaeres and Karacadag, 2004).

$$EMP^1 = \Delta e - \Delta f$$

With the use of this equation, the level of exchange rate flexibility is determined regarding the relationship between the change in exchange rates (Δe) and change in foreign reserves (Δf). There are also two alternate index forms to measure exhange rate flexibility.

$$EMP^2 = \sigma_{ER}/\sigma_{ER} + \sigma_{NFA}$$
$$EMP^3 = \sigma_{ER}/\sigma_{ER} + \sigma_{NFA} + \sigma_{IR}$$

where σ_{ER} is the annual standard deviation of monthly percentage difference in the exchange rate, σ_{NFA} is the annual standard deviation of monthly percentage difference in reserves and σ_{IR} is the annual standard deviation of monthly first differences in money market rates. EMP^2 only takes reserve interventions into account whereas EMP^3captures both reserve and interest rate interventions. By construction, values from both indices range from 0 to 1. For determining the associated weights, some studies use theory (Girton and Roper, 1977) whereas some others use empirical models (Pentecost et al, 2001).

On the other hand, there are many indices developed in the literature pursuing the aim of measuring financial openness. Quinn et al. (2011) classify these various measures into two categories: *de facto* and *de jure* indicators. *De facto* indicators can be quantity-based, price-based or hybrid measures.

A quantity based measure is the index developed by Lane and Milesi-Ferretti (2003). They use the following ratio to measure financial integration:

$$IFIGDP_{i,t} = \frac{(FA_{i,t} + FL_{i,t})}{GDP_{i,t}}$$

where, FA is the stock of external assets, FL is the stock of external liabilities of country *i* at time *t*. The extent of financial integration is computed by investigating the size of foreign assets and liabilities relative to GDP.

The hybrid measure of Edison and Warnock (2003), Foreign Ownership Restrictions Index (FOR) is a monthly measure of capital account liberalization. It is based on two indices of the International Finance Corporation (IFC). IFC computes a Global index (IFCG) and Investable index (IFCI) for each emerging market economy. IFCG is designed in order to represent the market whereas IFCI is designed to represent the portion of the market that is available to foreigners. The reasoning behind their index is that the ratio of the market capitalizations of a country's IFCI and IFCG indices gives the availability of a country's equities to foreigners. Therefore, one minus this ratio indicates the intensity of capital controls. The formula is presented below:

$$FOR_{i,t} = 1 - \frac{MC_{i,t}^{IFCI}}{MC_{i,t}^{IFCG}}$$

where MC is the market capitalization of country *i*'s IFCI or IFCG indices at time *t.* Values from the FOR index range from 0 to 1. A value of 0 indicates fully open market whereas a value of 1 represents a completely closed market.

One of the most widely used *de jure* measures is the third trilemma index that is developed by Chinn and Ito (2006,2008) to measure financial openness. The capital account openness index (KAOPEN) "is based on the binary dummy variables that codify the tabulation of restrictions on cross-border financial transactions reported in the IMF's Annual Report on Exchange Rate Arrangements and Exchange Restrictions (AREAER)". The dummy variables consist of the variables indicating: the presence of multiple exchange rates, restrictions on current account transactions, restrictions on capital account transactions and the requirement of the surrender of exports proceeds. After forming a share of a five year window, KAOPEN is constructed as the first

standardized principal component of the above-mentioned variables and the share of a five year window.

All three trilemma indices have the maximum value of 1 and the minimum value of 0. Despite the first two indices are based on a simple reasoning, the aggregate assessment of all three indices reveal important information. Aizenman, Ito and Chinn (2012) show that the trilemma is "binding" by finding evidence that the three aspects of trilemma are in a trade-off. They attempt to show this by demonstrating that the weighted sum of the variables adds up to a constant:

$$\mathbf{1} = a_j MI_{i,t} + b_j ERS_{i,t} + c_j KAOPEN_{i,t} + \varepsilon_t$$

A high goodness of fit for the above regression indicates that the relationship is linear and there exists a tradeoff between the three policy dimensions. On the other hand, a low goodness of fit would suggest that there is no trilemma or the relationship is nonlinear. Reaching an adjusted R-squared of 94%, the authors conclude that the three policy dimensions are linearly related and that the trilemma exists.

Another important index in the literature is the monetary conditions index, which have been used frequently since the 1990s. The primary aim of this index is to provide information about the monetary stance. It is a combination of the short-term interest-rates and exchange rates, each with their assigned weights[20]. Freedman (1994) addresses two ways for the construction of the index. If the selected country's driving force for inflation is the exchange rate then the exchange rate should be associated with a greater weight in the index, whereas when the driving force is the output gap, the weights used in the index should be obtained from the AD equation. For instance, in the case of the monetary conditions index for Canada, Duguay (1994) indicates that the weights should be

[20] $\boldsymbol{MCI_t = w_e(e_t - e_0) + w_r(r_t - r_0)}$, e_t, e_0 being the real effective exchange rate at time t and at base period respectively; r_t, r_0 the real interest rate at time t and at base period respectively; w_e and w_r the weights assigned for each variable respectively.

obtained from the AD equation since the driving force for the inflation is the output gap in Canada. For the case of Turkey, on the other hand, Kesriyeli and Koçaker (1999) point out the exchange rates as the driving force for inflation and construct a monetary conditions index accordingly.

There are, however, some critics about the hazards in the implementation of the monetary conditions index. Eika et al (1996) put forward the fact that the underlying model for the weights of the index should be examined carefully in terms of dynamics, co-integration, exogeneity, parameter consistency and omitted variables. Criticizing the past monetary conditions indices in the sense that they do not satisfy these assumptions, Eika et al. also add that even if they were satisfied, there may be other factors affecting the variables other than the policy instruments which the index remains insufficient to explain. Furthermore, the study also underlines the fact that "the monetary conditions index, as a univariate measure, may be conceptually inappropriate if the policymakers are concerned with more than one objective".

In line with its aim regarding the emerging consensus on central banking, this study seeks ways to measure the effectiveness of central banking for both objectives of financial stability and the price stability. For the assessment on the central banking practices implemented towards the price stability side, monetary conditions index may continue to form a valid form of measurement, in terms of providing information about the monetary stance. However, as Eika et al. pointed out in 1996, monetary conditions indices are inappropriate when policymakers pursue more than one objective. Regarding today's emerging consensus with financial stability being an additional objective, there must be a more sophisticated measure to assess the effectiveness of central banks.

Monetary conditions indices are later criticized in terms of not considering other important transmission channels such as asset prices (Goodhart and Hoffman, 2001) and house prices (Mayes and Virén, 2001). A broader monetary conditions index, that includes a wider range of transmission channels, has become known as a financial conditions index. In this regard, a financial conditions index can be considered as a natural extension of the monetary conditions index (ECB, 2013). Depending on their construction, some financial conditions indices can be

interpreted as summarizing the impact of financial conditions on growth, whereas others can infer whether financial conditions have tightened or loosened (Hatzius et al., 2010).

In constructing financial conditions indices, two methodologies stand out to be the most common ones in the literature. These are the weighted-sum approach and the principal component approach. In the former, the weights of each variable in the index are determined upon their estimated impact on real GDP growth. The estimation may be based on simulations with large-scale macroeconomic models, unrestricted VAR models or reduced-form demand equations. On the other hand, in the principal components approach, the principal common factor is extracted from a set of indicators which captures the common variation among variables.

Most of the financial conditions indices are used for the aim of forecasting economic act, inflation investment or financial stress whereas others assess their relevance for monetary policy in the context of augmented Taylor rules (ECB, 2013). Rather than informing about the monetary stance or forecasting, Taylor principle is based on the idea that in each period the actual interest rate set by the central bank should adjust towards the target value. Montagnoli and Napolitano (2004) analyze the interactions between financial conditions indices and monetary policy in USA, Canada and EU. They use the Taylor rule (standard and augmented for financial stability index) to define the optimal monetary policy and evaluate central bank reactions. Their FCI includes four asset price indicators: short-term interest rate, the real effective exchange rate, real house prices and real share prices. Their associated weights are determined by using Kalman Filter algorithm. The findings of the study reveal that in all three cases the inclusion of financial conditions index have a positive and significant value. It is further stated that: "…if we accept that Central Banks do not only have the objective of monetary stability but also of financial stability, then asset prices can play an important role in monetary policy.".

After the inclusion of financial stability into the central bank objectives, there has been the need to assess the stability of the entire financial system. Van den End (2010) points out that, unlike early warning indicators, financial conditions

indices do not incorporate the position of financial institutions. Therefore, financial conditions indices do not cover the entire financial system. On the other hand, aiming to forecast financial stress, early warning indicators are also far from indicating the stability of the entire financial system. In this vein, considering financial conditions indices as a useful point of departure for his study, Van den End (2010) constructs a financial stability conditions index which incorporates interest rates, effective exchange rate, real estate and stock prices, solvency of the financial institutions and the volatility of the stock index of financial institutions.

Aggregate financial stability indices are developed in order to monitor the stability of the financial system. After Van den End's financial stability conditions index for the Netherlands, many countries have adopted similar indices for their economies such as: the aggregate financial stability index for Jamaica (2010), the financial stress index for Greece (Louzis and Vouldis, 2013), the aggregate financial stability index for Bangladesh (Nayn and Siddiqui, 2012), the financial stability index for Israel (Cheang and Choy, 2011), financial conditions index for Turkey (Kara et al., 2015) and financial activity indices for Japan (Ito et al., 2014). The choice of variables for the formation of such indices is generally based on the literature in early warning indicators.

In constructing aggregate financial stability indices, the first step is to convert the values of selected variables into a common scale. There are two methods that are used in the literature to eliminate disparity in units of measurement. The first one is statistical normalization, which converts values into a common scale with an average of zero and standard deviation of one. The formula for statistical normalization is given below:

$$\mathbf{Z}_t = \frac{(\mathbf{X}_t - \boldsymbol{u})}{\boldsymbol{s}}$$

where X_t represents the value of indicator X in period t ; u and s are the mean and standard deviation respectively recorded by indicator X in the analyzed period; Z_t is the normalized value of the indicator. The zero average precludes

aggregation distortions caused by the differences among the means of the indicators. The scaling factor for normalization is the standard deviation of the indicator.

The second method for eliminating disparity in units of measurement is empirical normalization. Empirical normalization converts selected variables into an identical range of [0,1] with the formula presented below:

$$I_{it}^{n} = \frac{\mathrm{I}_{it} - \min(\mathrm{I}_{i})}{\max(\mathrm{I}_{i}) - \min(\mathrm{I}_{i})}$$

where I_{it} represents the value of the indicator at time *t* whereas *max(I_i)* and *min(I_i)* show the most favorable and unfavorable values of the indicator respectively. I_{it}^{n} denotes the normalized value of the indicator. Unlike statistical normalization, empirical normalization uses the range of min and max as the scaling factor instead of standard deviation. Moreover, although not frequently used in the relevant literature, a third scaling method is decimal scaling. This method transforms the data into a range between [-1,1] with the following formula:

$$d' = \frac{d}{10^{m}}$$

where, m is the smallest integer that max $(|d'|)<1$.

After the normalization process, the next step is to construct a composite index by aggregation. The aggregation may be executed by equal weighting of variables or different weights can be assigned in accordance with the specific features of the country under investigation.

While some composite indices are constructed by weighting the selected variables, some are divided into sub-indices. The aggregate financial stability

index of Albulescu (2009) for Romanian financial system is composed of four sub-indices. These sub-indices are concerned with development of the banking sector, financial soundness, financial vulnerability and the world economic climate. Twenty selected indicators are empirically normalized so that their values range from 0 to 1 and aggregated by equal-weighting approach. Another aggregate financial stability index, which is formed by Morris (2010) for Jamaican financial system, also consists of four sub-indices. These sub-indices are financial development index, financial vulnerability index, financial soundness index and world economic climate index. Equal weights are assigned to the indicators under sub-indices, whereas sub-indices are unevenly weighted in the aggregation procedure. Another similar study is conducted by Cheang and Choy (2011). Their aggregate financial stability index formed for Macao is composed of 3 sub-indices: the financial soundness index, financial vulnerability index and the regional economic climate index. Like the precedent index example by Morris (2010), the sub-indices are constructed by equal-weighting whereas the sub-indices are associated with different weights in the aggregation. Differentiated weights are assigned regarding the specific features of the financial system of Macao. Following the same methodology with Cheang and Choy (2011), Nayn and Siddiqui (2012) construct an aggregate financial stability index for Bangladesh. They use the same sub-indices in the formation of the aggregate index, with some modifications depending on data availability and some other practical considerations.

A majority of the studies mentioned in this review generally concern with the highly interconnected and advanced financial systems of developed countries. However, the choice of variables should regard the structure of the financial system of the country under investigation. In countries where bank intermediation is more significant that market financing, banking system indicators require more attention (ECB, 2007). Furthermore, Claeassens and Glosh (2012) indicate that:

> *For emerging markets, with still less developed financial systems with smaller, less systemic banks and fewer interconnections, the cyclical risks, often related to global financial cycles, are likely to be the most important to be concerned about from an overall risk point of view.*

In this regard, financial stability reports of the selected countries focus more intensively on financial indicators that inform about asset quality, market risk, sensitivity to global factor etc. These variables form a significant part of the set of financial soundness indicators that are developed by the IMF (2006).

In line with these, for aggregate financial stability indices, the review reveals that while studies that are carried out upon advanced countries are more concerned with asset prices such as housing and equity prices, studies that are conducted upon developing countries focus more on the banking sector indicators. Regarding the study of Montagnoli and Napolitano (2004), an FCI which would incorporate the indicators for developing countries would be very relevant with the aim of this study. If such study was conducted regarding the circumstances in developing countries, the indicators for financial system would most likely be concerned with banking system or vulnerability indicators. However, in a Taylor equation, where the policy instrument is only formed by short-term interest rates, a comparison of optimal and actual monetary policy would be misleading. Therefore, rather than a modified Taylor-type equation, the aim of this analysis is more compatible to be conducted with an index that brings the above-mentioned indicators together.

Moreover, there are some other studies in the literature that modify Taylor rule by directly incorporating other variables in addition to inflation and output gap. For example, there are many studies in the literature to examine whether central banks –especially in developing countries – respond to the changes in the exchange rates. Some studies include an index or a variable to represent external conditions (Aizenman, Hutchinson and Noy, 2008 for the former and Comert et al. (2010) for the latter) whereas some other incorporate real or nominal exchange rates (Filosa, 2001; Klau and Mohanty, 2004 for the former and Benlialper and Comert, 2013 for the latter). In many of the cases, studies concluded that central banks respond exchange rate changes either moderately or significantly.

Regarding the selected countries for this study, central bank reports and policy statements show that they also consider credit growth and current account deficits while implementing monetary policy. As explained in the previous

chapters in detail, when macroprudential policies were not in use as intensively as they are today, policymakers used to face some important challenges. Policies that addressed one variable may lead deterioration on the other variable. When, for example, policymakers tried to reduce the current account deficit by raising interest rates, this would lead attraction of capital flows. Similarly, when credit growth accelerated and policymakers increased interest rates, attraction of capital flows would increase foreign borrowing and more funds would be available. These problems, however, are thought to be more manageable with the inclusion of macroprudential policies and thus should have been at least partly overcome after the adoption of the new policy mixes.

There are also some studies in the literature that support the idea that monetary policy should address these additional variables to which central bankers attach importance. Berkelman (2005) asserts that central banks should respond to the changes in credit growth. Since rapid credit growth can be inflationary, it may elicit a higher interest rate response by the central bank. The study of Christiano, Ilut, Motto and Rostagno (2007) also examines the relevance of credit growth for monetary policy. They represent monetary policy in an empirically estimated Taylor rule and find out that "a policy which not only targets inflation, but also 'leans against the wind' by tightening monetary policy when credit growth is strong would reduce some costs associated with pure inflation targeting". Furthermore, an appreciating currency and a large current account deficit may represent higher demand and monetary policy may respond with a tighter policy stance. Ferrero, Gertler and Svensson (2010) seek the relevance of current account imbalances for monetary policy. They conclude that "the current account imbalance may have implications for the natural rate of interest rate that have to factor into central bank policy, one way or another".

In brief, as mentioned before, although the indices presented in this review may shed light on this study in terms of the selection of variables and a general construction of an index, they do not directly serve as a measure to assess the effectiveness of central banking by themselves. Monetary conditions indices and financial conditions indices are operational targets that fall short in summarizing the effects of central banking practices. Furthermore, aggregate financial stability indices have to be simplified in terms of the included variables,

considering the variables that are addressed by the macroprudential policy that central banks implement. More importantly, these measures, in general, inform about the economic or financial conditions in an economy. Taylor rule, on the other hand, provides information about the optimal policy. Therefore, in the next section, this study intends to develop a measure that is able to capture the deviations from the central bank targets, regarding the variables that inform about the economic and financial conditions in the economies of the countries under investigation. A co-examination of the deviation of monitored variables from their targets and the actual policy implemented may serve as a proper guide to assess the effectiveness of monetary policy frameworks in selected developing countries.

4.3 DATA AND METHODOLOGY

In order to assess the effectiveness of monetary policy frameworks, a co-assessment of two separate measures is needed. Firstly, a measure is required to inform about the deviations from targets which incorporates the main indicators currently monitored by the central banks of the selected developing countries. Central banks monitor these deviations and set their monetary and/or macroprudential policies accordingly. To this end, then this measure should be co-assessed with another measure that indicates the actual measures that are taken by the central banks of these countries. This assessment will therefore, be enlightening in terms of demonstrating the effectiveness of monetary policy framework that is under investigation, in both the price stability side and the financial system side.

To begin with the measure which provides information about the deviations in the targeted variables, the literature review addresses the Taylor-rule as an appropriate point of departure. A simple Taylor rule is formulated as follows:

$$i_t = \pi_t + r_t^* + a_\pi(\pi_t - \pi_t^*) + a_y(y_t - \bar{y}_t)$$

where i_t is the short-term nominal interest rate (policy rate), π_t is the realized rate of inflation, π_t^* is the desired inflation (inflation target), r_t^* is the assumed equilibrium real interest rate, y_t is the real GDP and $\bar{y}_t$ is the potential GDP. Taylor (1993) proposes setting a_π and a_y as 0.5. Although there are different approaches regarding the determination of these associated weights, it is certain that the signs of these weights should be positive. The more these variables deviate from the targets in the upward direction, the tighter the monetary policy should become. When GDP is above its potential and inflation is higher than the targeted level, a central bank would create a tighter policy environment whereas when GDP is underperforming and inflation is behind the targeted level, central bank would choose a more accommodative policy stance.

Considering Taylor's reasoning as a useful point of departure, this study intends to create a *Policy Target Index* which would incorporate the main variables that are targeted and closely monitored by the central banks of the selected countries. Regarding the changes occurred in the understanding of central banking, this index is at first formed be formed for the pre-crisis period (standard PTI) as an illustration of the reasoning and for the post-crisis period (augmented PTI) to conduct the main analysis of this study. Then an index to inform about the policy stance should be formed. This index should again be differentiated for the pre- and post-crisis periods as an illustration of the functioning of the indices and an instrument for the main analysis respectively. The last step is to co-assess these indices.

4.3.1 Standard CBRI

The third Chapter explains the understanding of central banking practices during the Great Moderation in detail. While constructing an instrument that intends to evaluate central banking practices of the given era, the circumstances of the time should be taken into account. The simplicity of the understanding of the pre-crisis central banking practices facilitates the construction of the index to be

developed. Benefiting from the simplicity of the era, this section aims to form the way of construction of the index approach which is to be used in the rest of the study. The scaling, weighting and general reasoning that are shaped in this section compose the basis for the analysis part in the following section. Regarding the pre-crisis consensus on the monetary policy framework, a Policy Target Index should then incorporate the following variables:

INF: This variable reflects the deviation of the realized inflation from the target inflation which a central bank announces explicitly or implicitly. To avoid the fallaciously pleasant results due to wide target ranges, all targets are set as a point target by calculating the average of the target boundaries. The deviation from the targeted inflation rate –either upward or downward- implies a need for appropriate adjustments in the short-term interest rates.

GDP: The GDP variable is the remainder when the potential GDP growth indicated by OECD (2012) is subtracted from the actual GDP growth recorded in a country. The remainder stands for the output gap. The higher the real GDP growth deviates away from its potential, the tighter measures are required to be taken by the central bank.

Rather than an augmented Taylor equation, the study seeks an aggregated index. This is because that the aim of this study is not the computation of the exact optimal policy but to assess whether the policies implemented in selected countries moves in conformity with the deviations of monitored indicators from their targeted values. Therefore, to do such an assessment, another aggregated index which indicates the overall policy stance is required. This index is the Monetary Policy Index (MPI).

The policy toolkit of the central banks has expanded after the global financial crisis. However, before the crisis, the characteristics of the Great Moderation implied the control of GDP gap and inflation only through short-term interest rates. Therefore, the standard MPI for the pre-crisis period should simply be short-term interest-rates.

As indicated in the literature review, there are various ways to put the values from different variables into the same scale. Throughout the rest of this section, this analysis seeks ways to co-assess the deviations from targets with the adjustments in the new policy mixes. Regarding this particular aim of this analysis, all scaling methods can apply, however, each possessing some specific benefits and drawbacks. The goal is to capture the method which applies the best for this analysis.

The empirical normalization method, which scales the values according to the min-max range functions well in terms of converting the recorded deviations from 0 to 1. However, the background research for this study reveals that the targets of central banks may not be adjusted so often (for example, while inflation targets are announced each year, credit growth or current account deficit targets are determined in line with the structure and fundamentals of the economy and may apply for more than a year). Therefore, simply subtracting the target from the realized value and the scaling the result (deviation from the target) invalidates the incorporation of targets in the analysis (in the case when targets are not adjusted frequently). The scaled values of the deviation values give the same results when values are scaled before a normalization process.

A solution to this problem may be using absolute deviations. When absolute deviations are applied to the analysis, the resulting values only imply the deviations from targets, excluding an indication of the sign of the deviations. In other words, this method allows us to only focus on the deviations regardless whether they are upward or downward. This way, the problem with the invalidation of the targets is fixed. However, fixing the target problem in this manner is against the reasoning of the indices since different signs do not offset each other. Therefore, the co-assessment with the adjustments in the policy mix becomes unreasonable. For example, when credit growth is accelerating far ahead of the target and real GDP growth is behind the potential, the deviations are added regardless the signs they have. However, the expected policy responses from a central bank would be cutting interest rates and increasing reserve requirements. In this respect, the index for the policy mix would be aggregated in a sense where different directions of policies offset each other whereas the index formed for targets would stand for absolute deviations.

The second scaling method that is listed in the literature review is statistical normalization (standardization). Standardized values are obtained by dividing the difference between the given value and the mean by the standard deviation of the data set. Similar to the case with empirical normalization, this method also invalidates the incorporation of the targets. When a constant value (unadjusted target in our case) is subtracted from each given value in the dataset, the standardized values from the subtraction are equal to the directly standardized original values. However, a simple modification fixes this problem. The formula of standardization implies that the standardized values stand for the distance of the original values from the mean in terms of standard deviation. Then, if the formula incorporates the target value instead of the mean, the obtained value is the distance from the original value from the target. Therefore, with the mentioned modification to the standardization formula, this approach is a simple way to measure the distance of a value from the target in terms of standard deviations. This method, however, can no longer be defined as standardization as known in the literature. It can rather be considered as a transformation method to serve for the goal of this study. The formula is shown below:

$$Transformed\ Values\ (X_{t,i}) = \frac{\left(x_{t,i} - x^*_{t,i}\right)}{s}$$

Where x is the value of the variable i at time t, x* is the target value of variable i at time t and s is the standard deviation of the x values. Since its reasoning relies on a centralization of the deviations around the target, it is referred as the 'Centralization Around Target' method in the rest of the study.

After transforming the values of the selected indicators, a composite index is formed by equal-weighting approach. There are several methods for determining weights in the literature as indicated in this chapter earlier. However, a vast majority of similar studies have applied equal weighting approach while constructing their indices. Furthermore, in his study of a financial stability

conditions index, Van den End (2006) showed that there is a modest discrepancy between equal weighting and weighting based on econometric validation. Illing and Liu (2006) also put forward that equal weighting performs as well as weighting that is predicated on economic fundamentals. Therefore the formulations of standard and augmented PTI are given as follows:

$$PTI^{st} = 0{,}5\left(X_{t,1}\right) + 0{,}5\ (X_{t,2})$$

where X_1 is the transformed values of INF and X_2 is the transformed values for GDP.

For the construction of the standard MPI, the problem with the targets no longer apply. Therefore, the values can be standardized with the given standardization formula in the literature:

$$Standardized\ Values\ (X_{t,i}) = \frac{\left(x_{t,i} - \bar{x_i}\right)}{s}$$

Having formed two measures that inform about the targets and the actual monetary policy stance, the next step is the co-assessment. At this point, the Monetary Independence (MI) index of Aizenman (2008) serves as a useful guide. As indicated in the literature review, this is a measure which is developed to provide information based on the extent of the relationship of two supposedly interrelated variables. The correlation between the home and base country interest rates are incorporated in a correlation analysis which reveals information upon the degree of monetary independence.

In this sense, the correlation between PTI and MPI can be used to inform about the strenght of the relationship between the aggregate deviations and the aggregate policy stance. Following the Taylor reasoning, the closer the movement of the actual policy to the deviations from the targets, the better the

central banks are responding. Rather than the effectiveness of the tools, this relationship informs about the extent of success of the central banks in responding the deviations in the monitored variables from their targeted values. Therefore, a *Central Bank Responsiveness Index* (CBRI) should measure the simple correlation between PTI and MPI. Since correlation analysis is invariant to linear scaling methods, there is no need to rescale the aggregated values from the indices.

For the formulation of the CBRI, the reasoning on the construction of the Monetary Independence (MI) Index is followed. As stated earlier, the monetary independence index examines the correlation between home country and base country interest rates. The correlation that ranges between [-1,1] moves from the lowest monetary independence to the highest. Aizenman (2008) converts the simple correlation values that are within the range [-1,1] into the range [1,0] so that values closer to one (zero) represents higher (lower)monetary independence. The following formula is used for conversion:

$f(x) = C\left[1 - \frac{(x-A)}{(B-A)}\right] + D\left[\frac{(x-A)}{(B-A}\right]$, where the values within the range [A,B] is converted into the range [C,D]. In the CBRI, however, the simple correlation values within the range [-1,1] are converted to the range within [0,1], while lower (higher) values indicate lower (higher) responsiveness. In this respect, the formula for the standard CBRI is given below:

$$CBRI^{st} = \frac{corr\left(PTI_{t,i}^{st},\ MPI_{t+m,i}^{st}\right) + 1}{2}$$

The data for standard CBRI is in monthly terms and covers the period from 2002M1 to 2010M10. As indicated while describing the formulation process, the closer the values to 1, the better responding the monetary policy framework is.
For the values from the correlation analysis to be valid, the values from the two indices should be normally distributed. For the standard MPI, we already know that the values have a mean of zero and a standard deviation of one by construction. However, for the PTI, a modified standardization technique is

applied. Therefore, the values obtained from the PTI should be checked whether they are normally distributed. For this purpose, the bell-curves with skewness values can be examined. A significant skewness can violate the assumptions for the validity of the correlation analysis, and therefore the CBRI.

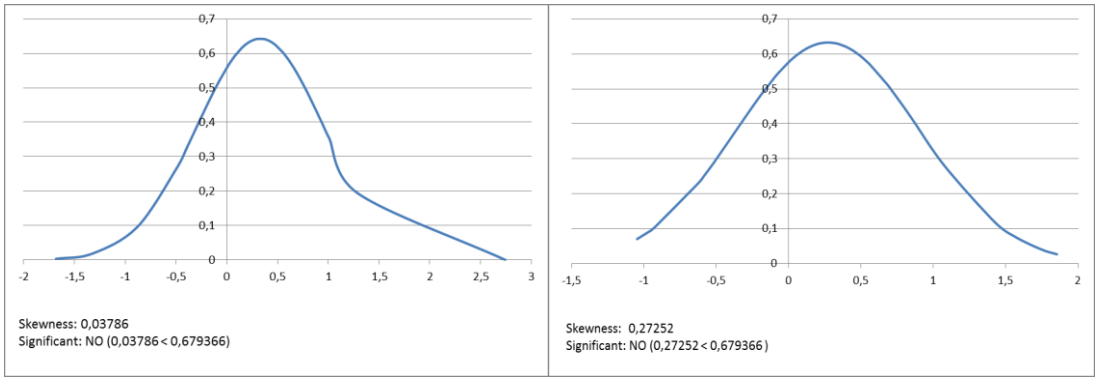
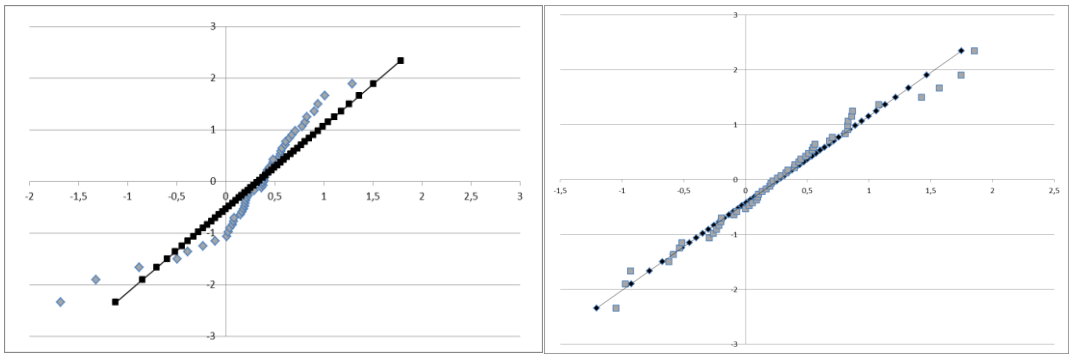


Figure 4.2: The Bell-Curves and Skewness Values for the Standard PTI's of Turkey (left) and Brazil (right)

Figure 4.2 shows the bell-curves for the standard MPI for Turkey and Brazil respectively. The skewness values are not significant, so the data can be assumed to be fairly symmetric. This can further be verified from Figure 4.3 which demonstrates the scatter plot diagrams obtained from the normality test. The original values fairly coincide with the line of expected values.



Note: The black dots are plotted for z-values versus expected values and the grey ones stand for z-values against the original sorted values.

Figure 4.3: Z-values for the Standard PTI's of Turkey (left) and Brazil (right)

The information given above asserts that the values from the two PTIs can be considered as normally distributed. Therefore, the correlation and the CBRI analyses are statistically valid. This section implies that an index can be formed for the purpose of this study. However, since the main focus of this study is the post-crisis period, the analysis should cover the implications of the new understanding of central banking practices. In this respect, benefiting from the approach developed in this section, the index requires further elaboration. In the following section, the augmented CBRI is also constructed by following the same steps. The same steps and sub-indices also open the path for the formulation of the *Central Banking Effectiveness Index* (CBEI) with some further elaboration in the reasoning.

4.3.2 Augmented CBRI and CBEI

Since the control panels of the central banks significantly expanded with the introduction of their new policy mixes, the PTI which is augmented for the post-crisis period should incorporate a wider range of variables. For the selected countries, economic reports from the central banks also indicate that the variables are broader than a small set formed only by the inflation level and output gap. These reports further put forward the fact that central banks were already monitoring other variables such as the current account deficit, credit growth, asset prices and exchange rate stability. However, after the global financial crisis, widening current account deficits, accelerating credit growth being triggered by the global financial cycle and increasing exchange rate volatility caused by inconsistent capital flows brought these variables greater importance in the control panels of the central banks. Therefore, in addition to the variables listed for standard its standard version, the augmented *Policy Target Index (PTI)* incorporates the following variables as well:

EXC: The EXC variable reflects the movements in exchange rate that exceed the targeted levels. CBRT stated that an appreciation or depreciation more than 1,5-2% cannot be disregarded. According to the Governor of CBRT, the given range of an appreciation or depreciation is in conformity with Balassa-Samuelson

effects. Since there is not any rate stated by the BCB, this study considers the same rate as the target rate for Brazil.

CRE: This variable shows the deviation of the realized credit growth rate from the target. The credit growth data is based on the total credit provided by domestic banks. CBRT focuses on the change in credit stock over GDP ratio – which is approximately 55% - in determining the desired rate of credit growth. Ranking countries according to their credit/GDP ratios, Alper et al.(2013) assert that the 25 and 75 percent quartiles correspond to a range of 6.7-10.6 percent. They further put forward that when Turkey's high level of current account deficit is also taken into account, the appropriate credit growth rate for Turkish economy should be around 7.5% in the given range, which implies an annual credit growth rate of 15%. In line with this reasoning, Turkish authorities address a rate of 15% as the desired credit growth rate. On the other hand, BCB stated the credit as growing at a sustainable pace at the level approximately 18%[21]. This rate is also consistent with the approach of CBRT in determining a desirable credit growth rate. Credit/GDP ratio in Brazil was around 64% (Worldbank, 2014) when the Turkish rate was at 55%. However, the Brazilian current account deficit has been significantly lower than Turkeys' with a rate around 2,5% and 7,5% of the GDP respectively. Therefore, one would expect a higher target for annual credit growth rate for Brazil which is in line with the statement of the Brazilian authorities addressing an 18% target rate.

CAB: The CAB variable is the difference between the realized current account deficit (surplus) and the targeted deficit (surplus) level. For both of the selected countries, the current account balance for the post-crisis period record deficits. The aim of both central banks in this front is to reduce their current account deficit to a sustainable level. For the case of Turkey, a sustainable current account deficit can be considered as the current account balance excluding energy. The share of energy in the Turkish current account deficit has been exclusively large with approximately 40% in 2011, 50% in 2012 and 30% in 2013 (CBRT). However, in Brazil, energy does not appear to be a driving force for the current account deficit and therefore the aim of the central bank can be

[21] The statements belong to Luiz Pereira, the Director of International Affairs of BCB (Bloomberg Business, 2011) and Carlos Hamilton Araujo, Economic Policy Director of BCB (Mninews, 2012).

interpreted as reaching a fully balanced current account i.e., the target can be set at zero.

All the variables are constructed upon the indicators which stand out to be the most common ones in order to evaluate the central bank performance and the most closely monitored ones by the central banks. The selection of indicators is based on central bank reports (annual reports, financial stability reports, etc.) and the literature review.

Augmented PTI possesses the same features with the standard PTI in terms of value range and implications of the values' numerical standing in this given range. Data frequency for the index is again monthly while, however, the sample period covers the post-crisis period with the new policy mixes which lies between 2010M11-2014M12.

$$PTI^{aug} = \frac{\sum_{i=1}^{5} X_{t,i}}{5}$$

where X_1 to X_i is the transformed values of variables listed above (INF, GDP, CAD, CRE, EXC) at time *t.*

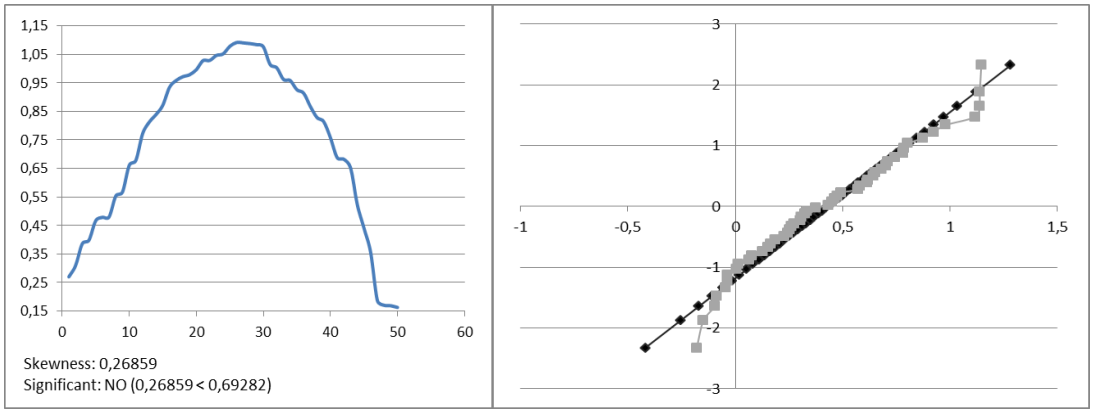


Figure 4.4: The Bell-Curve (left) and Z-values (right) for the Augmented PTI of Turkey

Figures 4.4 and 4.5 indicate that the values from augmented PTI's can also be considered as normally distributed. Bell-curves for both Brazilian and Turkish PTI imply skewness values that are not significant and original sorted values coincide with the expected values.

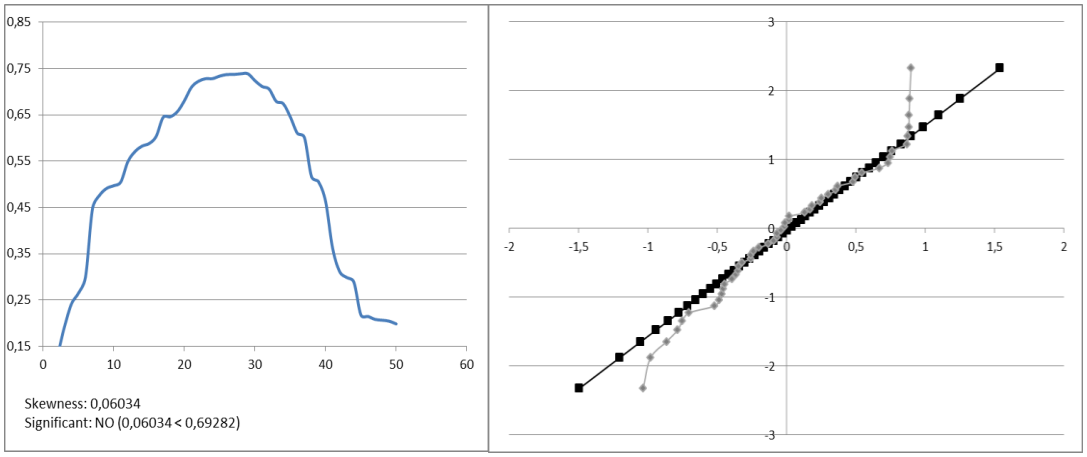


Figure 4.5: The Bell-Curve (left) and Z-values (right) for the Augmented PTI of Brazil

While the control panels of the central banks have expanded, their toolkits to control these variables have enhanced too. As with the standard analysis, another aggregated index which indicates the overall policy stance is required for the augmented analysis. The standard MPI for the pre-crisis period is simply composed of short-term interest-rates. In line with the enhanced toolkits of the central banks after the global financial crisis, the augmented MPI should incorporate the tools in the new policy mixes of two selected countries as summarized in Table 4.1 below.

For both countries, the policy rate and three macroprudential policy tools are included. Values from each tool are statistically normalized so that they have a mean of zero and a standard deviation of one. After the standardization process, each indicator is associated with equal weights. Since policy rate covers a larger part of a monetary policy framework and macroprudential policies are adjusted less frequently, the study also attempts to associate policy rates with a higher weight whereas macroprudential policies are assigned by a lower weight.

Table 4.1: Monetary Policy Tools included in the *Monetary Policy Index*

Country	Brazil	Turkey[22]
Important Tools in the Policy Toolkit	Selic Rate IOF* RR* FX RR	Repo Rate Interest Rate Corridor** RR* FX RR*

*Weighted average[23]
**The width of the corridor

However, as in the other studies in the literature summarized before, the two methods reveal very similar results. Therefore, this analysis moves on with the equal weighting approach. The final formulation of the MPI is given below:

$$MPI^{aug} = 0{,}25\ P + 0{,}25\ MAPP_1 + 0{,}25\ MAPP_2 + 0{,}25\ MAPP_3$$

Where P stands for short-term interest rates set by the central bank (policy rate) and $MAPP$ represents the three selected macroprudential policies being implemented in a certain country (see Table 4.1). Having constructed the augmented versions of PTI and MPI, the augmented CBRI is formed as the standard version.

A CBRI based on Taylor-rule reasoning indicates about the success of central banks in responding the deviations in the mainly monitored variables. However, the primary aim of this study is to inform about the effectiveness of the new policy mixes. This method allows us to conduct an effectiveness analysis too.

[22] Although ROM is stated as an important tool in the Turkish policy mix by CBRT, it is not included in the augmented MPI. Since ROM is a mechanism that its utilization is in voluntarily terms, the adjustments of the CBRT do not necessarily imply that these given changes are in effect. Therefore, rather than the adjustments of the CBRT, ROM functions depending on the utilization of banks. In this respect, ROM is not included in order to keep the analysis as simple as possible at this point. The case with ROM is discussed in the robustness checks section later.

[23] While computing the weighted average, the weights are set as the maturities (in terms of days) that the IOF ratios are designed to address. This method allows the overall values to both reflect the tax ratios and the maturities.

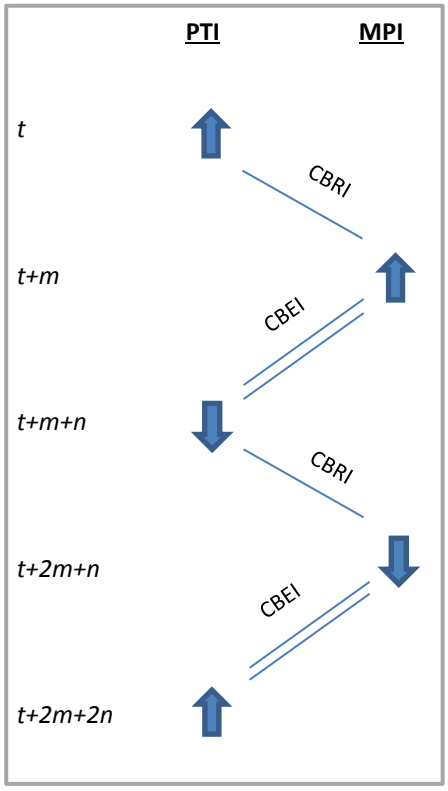


Figure 4.6: The reasoning of CBRI and CBEI

Figure 4.6 shows the reasoning of a responsiveness and effectiveness analysis. While CBRI computes the strength of the relationship between PTI and an 'm' period lagged MPI, the *Central Banking Effectiveness Index (CBEI)* should operate in the opposite direction. It measures the strength of the relationship between a MPI and an 'n' period of lagged PTI. This way, one would observe how the policies summarized in MPI affect the aggregated deviations of the variables in PTI. While the direction of the relationship is expected to be positive in CBRI, the relationship is supposed to be negative for the CBEI. Accordingly, their formulas are constructed as follows:

$$CBRI = \frac{[corr(PTI_t,\ MPI_{t+m}) + 1]}{2}$$

$$CBEI = 1 - \frac{[corr(PTI_{t+m+n},\ MPI_{t+m}) + 1]}{2}$$

Where m stands for central bank's response lag and n represents the lag for the response to show its impact on the addressed indicators. As indicated in Figure 4.6, a positive correlation is expected for CBRI and a negative correlation for CBEI. Ideally, since the analysis is conducted with monthly data, m is expected to be one or two and n is expected to be between one and three. Higher m's and n's are also possible, but not desired when seeking for timely-implemented policies.

The data for CBRI and CBEI is available for the post-crisis period starting from the date of adoption of new policy mixes, 2010M11-2014M12. The data sources are: IMF BOPS Database, UNStats, BIS Exchange Rate Database and the websites of BCB and CBRT for monthly series included in the PTI; policy reports and related speechs from central bank governors for targets settings; and again websites of BCB and CBRT for the time-series data upon monetary and macroprudential policies included in MPI.

There are several benefits of this approach. First of all, monetary policy cannot be considered to be composed of simply policy rates anymore. The lessons from the global financial crisis brought the introduction or bolstering of the macroprudential policy. The policy responses of central banks should be investigated at the aggregate level, covering both short-term policy interest rates and macroprudential tools. In this respect, MPI is the first measure in the literature with the intention of informing about the overall policy stance, covering both monetary and macroprudential tools.

Secondly, central banks do no longer aim only to promote price stability and control output gap. With the introduction of the financial stability into central bank objectives, financial system indicators, which were partially monitored before the global financial crisis, have also taken part in the control panels of the central banks. The control panels of the developing countries are now broader to include current account deficit, credit growth and exchange rate, especially for the selected countries. Therefore, the PTI stands out to be an index broad enough to cover almost all of the main indicators that are closely monitored by the central banks. In addition to the five selected indicators, more indicators can be included in the analysis when desired. In this vein, CBRI and CBEI are the first indices in the literature that are capable to assess the relationship between central bank reactions and the movements in an economy.

Thirdly, CBEI covers all interactions that occur within the sub-indices. When, for example, monitored indicators deviate from targets in the opposite directions, it is expected that this would be reflected as in an aggregate sign and size in the policy target index. In other words, when GDP is far behind the potential rate and credit growth is accelerating with a significant positive deviation from the

target, policy rates and reserve requirements are implemented in the opposite ways too. As a response to the deviations from the targets, central banks would supposedly cut interest rates and increase reserve requirements. The indicators that move in the opposite directions are represented in the indices with the final sign and magnitude of all indicators after the aggregation process. This enables an analysis that does not only measure the effectiveness of certain policies on certain indicators but also assesses the overall effectiveness which also takes interactions into account. Therefore, with this reasoning, a monetary policy framework which benefits from interactions in a correct way, are associated with a higher effectiveness by the CBEI.

Lastly, this method intends to overcome the simultaneity problem arisen from the correlation analysis. Correlation analyses typically do not inform about causality. They rather observe the simultaneous movements among the indicators. By incorporating lagged versions of PTI and MPI respectively, the method attempts to overcome the simultaneity problem in the results obtained from the CBRI and CBEI. This way, CBRI directly informs about the extent that central banks can respond to the deviations of variables in their control panel from their targets or trends. The ability of the central bank measures to capture the deviations from their targets increases the responsiveness. In this case, the values from the CBRI should approach through one. The same case applies for the effectiveness analysis with CBEI.

There are also some limitations of this approach. Central banks may tend to operate their policies in an asymmetric manner. A central bank, for example, may intervene in the foreign exchange market in the case of a domestic currency depreciation whereas it may tolerate a domestic currency appreciation (for the Turkish, S.African, Brazilian and Mexican cases: see Benlialper and Comert, 2013;Heintz and Ndikumana, 2010; Barbosa-Filho, 2006 and Galindo and Ros, 2008, respectively). Implementing such type of a policy, central banks use exchange rates as a tool to achieve their inflation targets rather than a monitored indicator. The CBRI simply considers such an asymmetric behavior towards any of the listed indicators as a lack of responsiveness and the values will diverge from 1. The lack of responsiveness should also decrease the values for CBEI.

Another shortcoming is that since MPI does not contain all central banking practices such as open market operations, the measures taken by other regulatory bodies (such as BRSA in Turkey) and the rest of the macroprudential tools that are being implemented, the indices are not expected to be very close to 1. Nevertheless, the measures that are included are the most frequently used ones among the toolkits and stand out to be the ones that central banks attach the most importance to. Therefore, even though the indices are not expected to be very close to 1, the results still indicate crucial information upon the effectiveness of pre- and post-crisis monetary policy frameworks. Other drawbacks still exist, but tried to have been minimized. These are given throughout the analysis and conclusion when relevant.

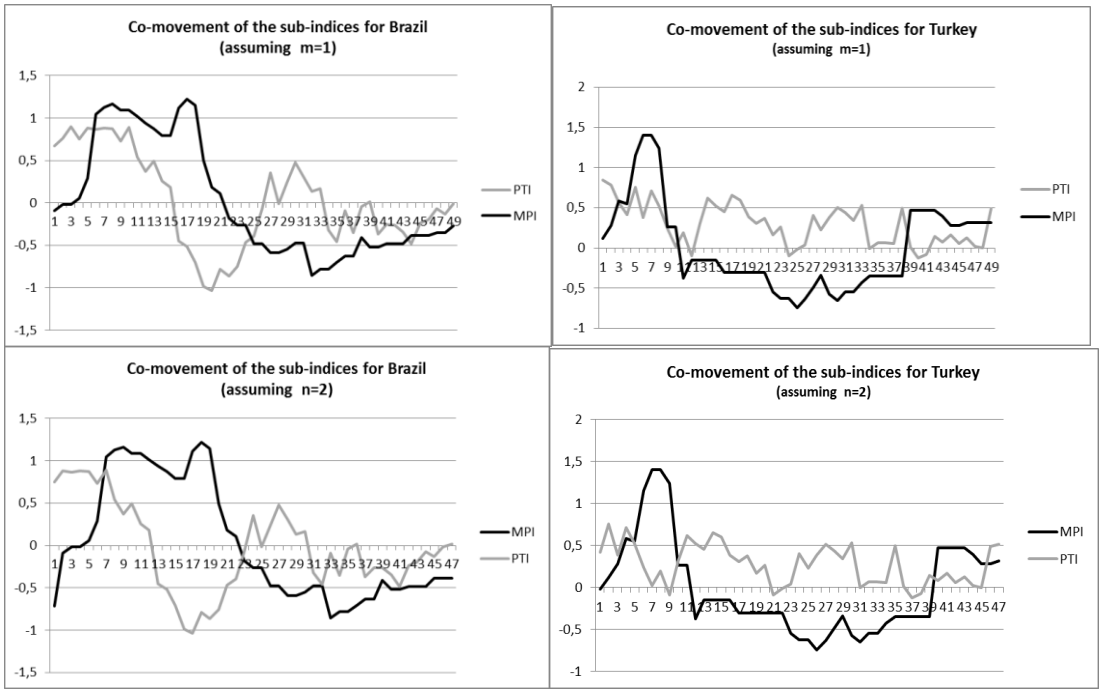
4.4 RESULTS

This approach allows us to make a detailed assessment. The results obtained from the indices are interpreted in four main aspects:

Simultaneous assessment of responsiveness and effectiveness: The two separate measures on the same data set allow us to easily investigate the standanding of a central bank in terms of effectiveness. When responsiveness is high, but effectiveness is not satisfactory, there might be an undesired interaction among the policies which limits the effectiveness of the policy mix. Furthermore, assessing effectiveness solely may be misleading. Other conditions may drive the desired results rather than the policies of the central bank. A central bank can take advantage of other conditions to reach their desired results. Co-assessment with the resposiveness is more informative in that sense.

Examination of the resistence of policies against global conditions : Data is divided into sub-periods. Two additional sub-sample periods are added to the entire sample period: 2010M11-2013M5, 2013M5-2014M12 where 2010M11 stands for the time of adoption of the new policy mixes and 2013M5 represents the time when US Fed announced the possible tapering of its QE policies in the

following months. Chapter 3 explains in detail how US tapering policy caused capital outflows and depreciation pressures for developing countries. Regarding the extent of the global shock, this date appears to be the first serious test for the post-crisis policy mixes of developing countries.



Note: The horizontal axis represent the lagged time. Then t=49 above and t=47 below refers to 2014M12.

Figure 4.7: Co-movement of the sub-indices for responsiveness (above) and effectiveness (below) analysis

Cross-country comparison: The central banks of both Brazil and Turkey announced their adoption of new policy mixes in late 2010. Moreover, as indicated in the previous Chapter in detail, their economies share similar risks. Therefore, a cross-country comparison should reveal important implications upon a successful policy mix. Moreover, the sub-sample periods mentioned in the points above are also subject to a cross-country comparison, since the inequally distributed length of data among periods may be misleading.

Figure 4.7 shows the co-movement of the PTI and MPI for both Turkish and Brazilian cases. In the figures above where m=1, the MPI follows PTI with a one month lag whereas the figures below where n=2, the PTI follows MPI with a three months lag (m+n=3). From the first relationship, a positively co-movement is observed. This is consistent with the reasoning of this study. The second relationship is also in conformity with the expectations, since a fairly negative co-movement is reflected.

Table 4.2: CBRI and CBEI results (monthly)[24]

	TURKEY				BRAZIL			
	CBRI				CBRI			
	m=1	*m=2*	*m=3*		*m=1*	*m=2*	*m=3*	
2010M11-2014M12	0,587303	0,617591	0,594821		0,653286	0,704824	0,755416	
2010M11-2013M5	0,727787	0,769589	0,746682		0,600929	0,701744	0,791247	
2013M5-2014M12	0,248748	0,307342	0,301206		0,457543	0,21883	0,249717	
	CBEI				CBEI			
(assuming m is 1)	*n=1*	*n=2*	*n=3*	*n=4*	*n=1*	*n=2*	*n=3*	*n=4*
2010M11-2014M12	0,494885	0,530978	0,527797	0,494626	0,516077	0,56027	0,599564	0,627783
2010M11-2013M5	0,511761	0,591321	0,611134	0,5612	0,647981	0,706616	0,772299	0,81704
2013M5-2014M12	0,464739	0,370626	0,400369	0,422383	0,345477	0,520959	0,455979	0,519498

Table 4.2 lists the results from the CBRI and CBEI. To begin with the responsiveness analysis, BCB seems to have been more successful than CBRT. Both of the central banks have better responsiveness values before the Fed tapering talk. As stated before, the MPI for both countries do not include all the measures implemented by their central banks. Therefore, these values only represent the responds of the central banks for the included policy tools. In this sense, the responsiveness values for the pre-tapering talk period are in conformity with the expectations of this study.

The analysis in the responsiveness front let us assume that a timely-response should take one month for a central bank after a non-negligible deviation takes place. Taking this into account, it is reasonable to expect that the impacts of the policies should become evident in the next two, three months or so on. Nevertheless, the values with any lag provide results in a similar direction, i.e.,

[24] Correlation values are given in Table B.1, Appendix B.

values computed with all lags decrease after the Fed tapering talk. This is consistent with the findings in the previous Chapter. In the setting of lags, any lag can be utilized regarding the circumstances of the specific economy and policy mix, as long as the main reasoning ($1 \leq m < m+n$) holds.

For Turkey, both the response and effectiveness lags appear to be shorter. This is consistent with the design of the Turkish policy mix. CBRT presents the interest rate corridor as a tool which allows timely-implemented adjustments.
On the other hand, the examination of the Brazilian policy mix carried out in Chapter 3 shows that the included tools are not easily adjustable or adjusted frequently by BCB. The IOF measures, as includes the imposition of different types of financial transactions taxes, are not easily adjustable. BCB imposes or eliminates these measures rather than adjusting them at different rates. Moreover, the FX RRs which can be easily adjusted as in the case of Turkey, are also imposed at a high rate and then eliminated without being adjusted by BCB within this time frame. Therefore, when these specific characteristics of the policy mixes are also taken into account, it is reasonable to reach the conclusion from the indices that CBRT obtains its desired results in a faster pace.

While the Turkish policy mix overperforms with respect to the Brazilian mix in terms of timing, the effectiveness front reveal opposite findings. The values from the CBEI demonstrate that the policies of BCB have been remarkably more effective than those of CBRT. Especially in the last sub-sample period where both effectiveness values are deteriorated significantly, BCB managed to maintain its control over the targeted variables. For CBRT, the effectiveness values are already unlikely to be meaningful since the responsiveness is almost vanished.

For an interaction analysis, the results do not directly assert any findings. However, some implications can be reached. In the Brazilian values from late 2010 to mid-2013, the CBEI value exceeds the CBRI value. However, Turkish CBEI falls way behind the CBRI for the same period. Although further investigation is needed, this may be an indicator of an undesired interaction within the Turkish policy mix.

4.5 ROBUSTNESS CHECKS

To check whether the results obtained from the CBRI and CBEI are accurate and consistent with the facts revealed in the previous chapter, some further investigation is required. First step is to conduct the same monthly analysis with absolute deviations instead of total deviations. Secondly, the analysis is focused on the Turkish case, particularly on the ROM. Furthermore, the relationship between central bank effectiveness and global conditions is investigated. Finally, the analysis further incorporates the financial soundness indicators into the PTI.

The first step is to conduct the same analysis with absolute deviations i.e., disregarding the signs of the deviations. The analyses until this point are conducted with the assumption that central banks adjust their policies by taking the aggregate sign and size of the deviations into account. This step is a useful way to check the validity of this assumption. Since the sign of the deviations are neglected, the original standardization formula is used for the calculation of PTI. The results are given in Table B.2 in the B section of the Appendices. The findings reveal significantly inconsistent results by giving same signs of correlation values for both CBRI and CBEI. Therefore, it can be concluded that absolute deviations are not taken into account by central banks and the main assumption of this study is valid.

The second step is to elaborate on the Turkish case with ROM. While conducting the analyses throughout this chapter, the Turkish policy mix has been simplified by excluding ROM from the MPI. The reason to take the case of ROM separately is because of the fact that its way of implementation and functioning may cause some problems. ROM has been in effect since late 2011. However, its introduction came in multiple steps and it became fully in effect after mid-2012. Moreover, as explained in detail in Chapter 3, ROM's utilization by banks is based on voluntariness. CBRT sets the ROC (Reserve Option Coefficient) in response to the developments in the economy whereas banks make their own decisions on the utilization of the ROM accounts. The findings in Chapter 3 reveal that mainly after the Fed tapering talk, banks have not been utilized the ROM facility in line

with the CBRT's expectations. Therefore, the results with ROM are not expected to have a positive impact on our indices after the tapering talk.

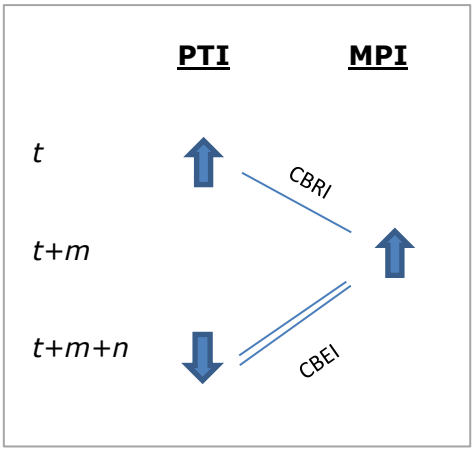


Figure 4.8: The Reasoning of the Main Indices

To include ROM in the MPI, its functioning should be consistent with the reasoning of the CBRT and CBEI. When there is a large surge of capital inflows and domestic currency is appreciating (Figure 4.8, time t), banks are expected to use the ROM facility by holding extra surges in ROM accounts. Central bank decides on the size of reserves that can be held in FX by adjusting ROC (reserve option coefficient).

This way, the appreciation pressures on the domestic exchange rate is supposed to be reduced (Figure 4.8, time t+m+n). Hence, the functioning of ROM is consistent with the reasoning of CBRI and CBEI. As already mentioned, its introduction came in multiple steps. Therefore, since the results from CBRI are not likely to yield any meaningful findings, the analysis is conducted solely with the CBEI.

Table 4.3: CBEI results for Turkey computed with and without ROM[25][26]

	2011M10-2013M5	2013M5-2014M12
WITHOUT ROM	0,412781754	0,37062551
WITH ROM	0,487399224	0,368791757

[25] Correlation values are given in Table B.3, Appendix B.

[26] It is already stated in earlier that all lag settings lead similar conclusions. For simplicity, the values represent the lag setting of three (m+n=3) for CBEI analysis after this point, unless otherwise stated.

The findings from CBEI that is computed with and without ROM are listed in Table 4.3. The findings are consistent with the expected results. Before the Fed tapering talk, when banks used the ROM facility as desired by the CBRT, the inclusion of ROM seems to have led an increase in the effectiveness. However, after May 2013, effectiveness decrease since banks used ROM in contrast to its aim of design. These findings support the conclusion in Chapter 3 that the benefits of ROM may have been weakened by its joint use with the interest rate corridor. Until mid-2013, when capital inflows persisted, the utilization of ROM facility helped the control of exchange rate volatility by reducing appreciation pressures. On the other hand, after mid-2013, when capital outflows took place, CBRT increased the upper bound of the interest rate corridor and thus made the utilization of ROM facility more profitable for banks. Although banks were expected to withdraw their FX reserves in ROM and decrease depreciation pressures on TL, this undesired behavior caused further depreciation of TL.

Another implication from Chapter 3 is that CBRT mainly lost its control on the targeted indicators after mid-2012. The Chapter also asserts that although the loss of control date back to mid-2012, the observable disruption on the main monitored indicators took place with the Fed tapering talk. To test whether this conclusion is consistent with the index approach, the data should be divided into further sub-sample periods.

Table 4.4: CBEI Values for Three Sub-Sample Periods[27]

	2010M11-2012M6	2012M6-2013M5	2013M5-2014M12
Turkey	0,758108054	0,700446607	0,37062551
Brazil	0,785975761	0,930415143	0,520958981

Figure 4.9 and Table 4.4 divide the data into three sub-sample periods. First period is from the introduction of the new policy mixes to mid-2012, where the Turkish policy mix is deemed to be most effective. Results from Table 4.4 verify that the first sub-sample period was the most effective period of the Turkish policy mix. Although the Brazilian value exceeds the Turkish CBEI result, it

[27] Correlation values are given in Table B.4, Appendix B.

should be noted that the BRSA measures which were very effective in this period[28] is excluded from this analysis.

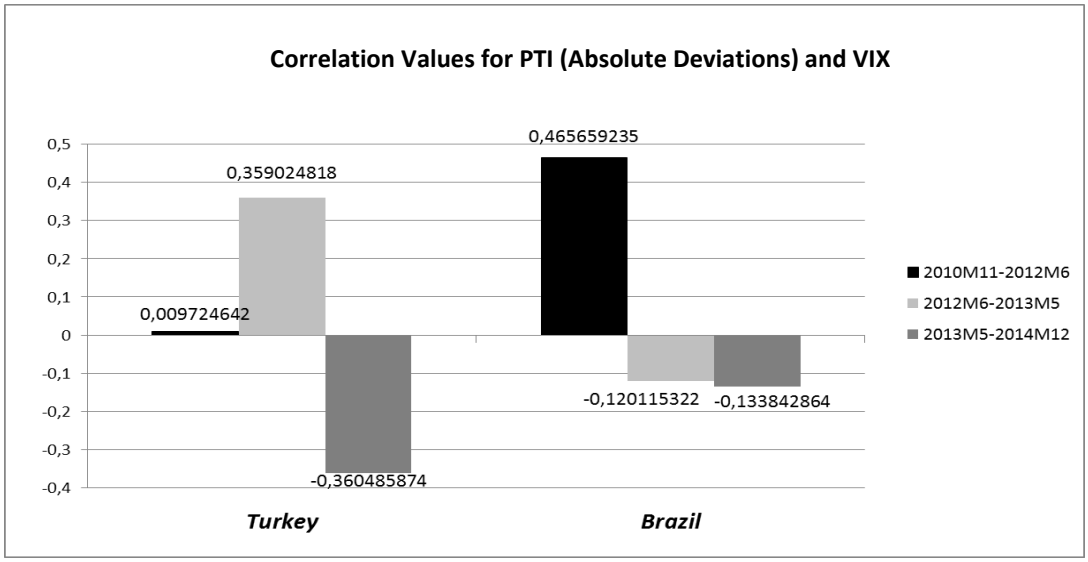


Figure 4.9: The Strength of the Relationship Between the Turkish (left) and Brazilian (right) PTI's with VIX

Furthermore, the co-analysis of Table 4.4 and Figure 4.9 also put forward the fact that this is a period where the deviations from Turkish targets were almost independent from global factors. This can be clearly seen from Figure 4.9 which demonstrates the strength of the relationship between PTI and VIX. In Brazil, on the other hand, the deviations were extremely dependent to the global factors in this period, which addresses the fact that the effectiveness of the BCB may have owed to global conditions to some extent.

For the second sub-sample period from mid-2012 to mid-2013, CBEI values assert that this period may have been the breaking point for the success of the two central banks. As indicated before, Turkish CBEI value is not deteriorated significantly. However, Figure 4.9 reflects interesting results for this period. The strength of the relationship between the Turkish PTI and VIX increased significantly whereas in Brazil, the relationship seems to have almost vanished.

[28] See Chapter 3.

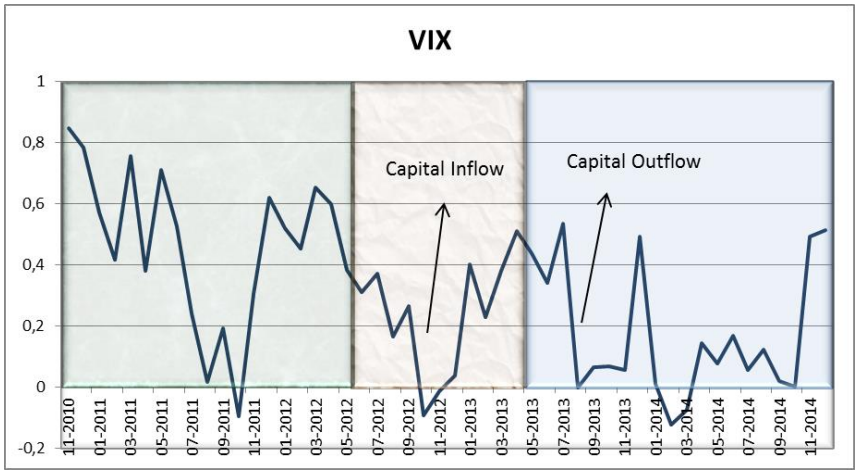
According to the facts that are put forward in Chapter 3, this opposite movement of the correlation in Turkey and Brazil may mostly be due to their levels of short-term external debt and the interrelated capital flow management strategies that they have been following.

Taking this implication into account, one can conclude that the fairly good effectiveness value of CBRT is mostly supported by the global factors. The capital inflows persisted in the sub-sample period under investigation, which led the effectiveness value to be fallaciously high. On the other hand, it would be fairly reasonable to put forward that BCB showed a remarkable success in this period, since PTI was not driven by the external factors.

Figure 4.9 draws an even more interesting picture for the last sub-sample period which is from mid-2013 to the end of 2014. For this period, looking back to the main analysis of this study with two sub-sample periods, we know that both central banks failed to be effective to some degree. This lack of effectiveness is also clearly seen in the current analysis. Figure enriches the analysis with more informative results. While the sign of correlation between the Turkish PTI and VIX was positive in the second sub-sample period, the sign becomes negative in the third sub-sample period. The change in the sign of the correlation has important implications when interpreting the effectiveness results for Turkey. After 2013, the decline in the global uncertainty implied the end of the easy money era, unlike the previous period. Figure 4.10 demonstrates the evolution of VIX. In the second sub-sample period, a fall (rise) in the global uncertainty would often imply more capital inflows (outflows) for a developing country. In Turkey, where the policy mix is designed to be more market-friendly and have less controls on the financial flows, the surges are more likely to cause deviations. However, this positive relationship may not hold in the last sub-sample period. After mid-2013, a decline in the global uncertainty does not necessarily lead capital inflow surges.

Therefore, while the global conditions helped the CBRT to reach its pre-determined targets from mid-2012 to mid-2013, the correlation having an opposite direction in the third sub-sample period made the task of CBRT harder.

As a result, the effectiveness value of CBRT falls remarkably and to a larger extent when compared with the Brazilian example.



Source: Chicago Board Options Exchange

Note: The dates associated with capital inflows and outflows can be found in Figure 3.3 in Chapter 3

Figure 4.10: Global Uncertainty in the Sub-Sample Periods Under Investigation

In Brazil, where the correlation of PTI and VIX is still at a very low level, the effectiveness has been reduced. Even though the credit growth level have fallen significantly below the target and Brazilian Real have been following a sharp depreciation trend, CBEI value decreases in a smaller extent. These findings are likely to assert that Brazilian authorities have formed a much resistant macroprudential framework with respect to their Turkish peers, verifying the results from Chapter 3. Brazil had already implemented aggressive capital control measures until 2012 so that the easy money of the date was not allowed to enter in the country at the levels received by the Turkish economy. Therefore, the end of the easy money era did not hit the effectiveness of BCB as experienced by CBRT.

As the last step of robustness checks, financial soundness indicators are included in the analysis. Since the data obtained from the IMF Financial Soundness Indicators Database are in quarterly frequency, the analysis has to be conducted with the quarterly version of the indices. A background analysis with quarterly

data reveals that the Brazilian case is more appropriate for such analysis[29]. Therefore, the analysis to observe the impacts of the inclusion of financial soundness indicators should be carried out on the Brazilian case.

There are a wide set of financial soundness indicators listed in the IMF database. Here, a sub-set is incorporated for the construction of a Financial Soundness Index (FSI). The FSI is based on six different financial soundness indicators namely: i) non-performing loans to gross total loans; ii) liquid assets to short-term liabilities; iii) net open position in foreign-exchange to capital; iv) foreign currency denominated liabilities to total liabilities; v) household debt to GDP and lastly; vi) residential real estate loans to total loans. These indicators allow us to track the asset quality, covering currency and maturity mismatch problems. Moreover, deposit takers' exposure to exchange rate related risks and the household indebtedness are also covered. A significant deviation in these variables may lead potential vulnerabilities in the financial system.

Since central banks do not announce any pre-determined targets for the indicators mentioned above, the deviations are computed with respect to the trend. Rather than a linear trend function, a logarithmic trend line is utilized to obtain the deviations, due to computational reasons. The remaining values are then converted into the same scale by simple standardization and aggregated by taking their arithmetic mean to form the FSI. The FSI is then included in the PTI as a sixth variable.

Results are given in C section of the Appendices part. The findings reveal that the Brazilian policy mix have been effective in controlling financial soundness. The effectiveness values from CBEI rise for each period with the introduction of FSI into the PTI. The most remarkable rise takes place in the last sub-sample period, asserting that even though the Brazilian authorities have not been able to handle the post-tapering talk period as successfully as before, they managed to control the financial soundness effectively. This is again likely to be due to the effectiveness of BCB curbing the short-term external debt in the previous period

[29] The Turkish quarterly data does not yield accurate results. This inaccuracy may arise from shorter response lags of the Turkish mix or simply the lack of sufficient sample periods due to quarterly frequency.

and therefore having managed to establish sound macroprudential fundamentals.

4.6 CONCLUSION

The analysis conducted in this Chapter fairly match with the implications in the earlier Chapters. Providing a numerical value upon the responsiveness and effectiveness, the findings are more precise and complement the intuitions throughout the study. Moreover, the method developed in this Chapter also leads a more detailed assessment by providing further implications on the extent of timely-implementation, commitment to targets and dependence on external conditions.

The CBEI show that the Brazilian policy mix has been more effective than the one developed by CBRT. Evidence asserts that this is most likely to be a result of the weakening of the dependence on external factors in Brazil. The earlier analysis on the policy mix implies that this success is due to the use of capital flow management tools that were previously known as capital controls. Yet, the effectiveness values do not exceed the Turkish values in a remarkable manner. Turning again back to the previous analysis in Chapter 3, it is possible to conclude that the effectiveness of the Brazilian policy mix may have been constrained by the distortionary effects of the capital controls. However, the comparison with the Turkish case asserts that the benefits of the capital controls have been more significant than their drawbacks. Even though the volatility of the exchange rate could also have not been managed, Brazilian effectiveness value is still higher than the Turkish.

The results obtained from the indices also assert that the Turkish policy mix have been implemented more timely that the Brazilian mix. This is in line with the intentions of the design of the Turkish policy mix. In this respect, CBRT have achieved one of its goals. The interest rate corridor and ROM are tools that are easy to respond to the changes in the monitored indicators in a timely-manner. Moreover, evidence from Chapter 3 shows that the Turkish credit growth has not

been subject to any distortionary effects. Instead, the acceleration was slowed-down by the policies of CBRT that addressed the domestic credit cycle. However, as stated above, the effectiveness values for the Turkish policy mix are found to be lower than the Brazilian case. This asserts that although the Turkish mix stands to be successful in the ways given earlier, the drawbacks of the market-friendly design exceed its benefits. The analysis which incorporates the VIX imply that the success of the Turkish policy mix have become highly dependent on external factors after mid-2012. The relationship was in positive terms from mid-2012 to mid-2013, i.e. regarding the high effectiveness value for this sub-period, Turkish policy mix may have been benefiting from the global conditions until Fed tapering talk in May, 2013. After the given date, the relationship appears to be negative, the exact same time that the effectiveness of the policy mix weakens. Furthermore, the weakening of the effectiveness of ROM after Fed tapering talk is verified by the CBEI where MPI also incorporates the ROM. Chapter 3 asserts that this weakening may have arisen from the undesired interactions among the Turkish policy toolkit.

This Chapter also verifies the argument presented throughout the study that the design of the policy mix requires more attention than the selection of certain tools. With this method, the interactions occurring in the policy mix are taken into account. This is the first methodology that is developed in the literature with such concern.

Although this method has important benefits, the indices can be developed further by elaborating on certain issues so that the functioning and explanation power of the indices can be enhanced. These issues are composed of several points.

Firstly, some tools are excluded from PTI and MPI for computational reasons and simplicity. PTI does not incorporate all the indicators monitored by central banks. The indicators are selected carefully from a large set so that they would not eliminate the significance of each other within the index. To avoid any undesired invalidation within the index, the indicators do not reflect the complete set of monitored indicators by central banks. For example, even though the ratio of short-term over total external debt is an important indicator to monitor, the

background analysis shows that its inclusion weakens the explanation power of the indices. This may most likely be a result of the interaction of the given ratio with another indicator within the index, particularly the current account deficit and/or the exchange rate. Furthermore, any indicator related to reserves is also not included regarding the close relationship of such indicator with exchange rates and current account balance. Moreover, FX interventions are also not included in the PTI. Such tools can be converted into a dummy structured variable to be incorporated by the index. In addition, the literature review earlier underlines the importance of the banking sector indicators for assessing the case of developing countries. In this respect, an FSI constructed with monthly data may be included for the coverage of the entire financial system.

Secondly, although this study checks for basic statistical properties, further investigation may be needed. This study only checks for normal distribution of the values obtained from the `centralization around target` method. Furthermore, the indices developed in this study may suffer from the criticisms of Eika et al. (1996) regarding the Monetary Conditions Indices. Although their first criticism that 'indices may be inappropriate when policymakers have more than one objective' is overcome in this study, their other criticisms may remain valid. These consist of the need for detailed examinations such as co-integration and omitted variables. Moreover, since the formation of the CBRI and CBEI is based on the reasoning of the Taylor rule and the construction of the Aizenman's Monetary Independence Index, criticisms on these studies may apply to the indices formulated in this study as well.

Thirdly, attempts to formulate the indices show that equal-weighting method provides more or less similar results to those when weights are differentiated for variables. However, weights can be calculated by different empirical methods that are used in the literature. These are simulations with macroeconomic models, VAR models, reduced-form demand equations or the principal components approach. This way of weight setting may be more reasonable since central banks tend to put more emphasis on certain tools and/or may monitor some indicators. Moreover, the associated weights can vary over time. In this case, the Kalman filter method which is used by Montagnoli and Napolitano (2004) in determining the associated weights for their FCI can be applied. Other

methods in the literature may also apply as long as they are appropriate to reflect the choices of central banks changing through time.

As a first attempt, this Chapter contributes to the existing literature by opening a way for the assessment of the post-crisis policy mixes. The methodology allows a comprehensive evaluation over the central bank performance. With further elaboration on the given issues above, the functioning of the indices can be enhanced and they can be developed to provide more information.

CHAPTER 5

CONCLUDING REMARKS

Throughout this study, the design and effectiveness of the new policy mixes in the post-crisis era of central banking are assessed. The first Chapter emphasizes the emergence of the need for customized policy mixes in developing countries. The last two Chapters attempt to evaluate the cases of some selected countries. While Chapter 3 forms a basis for Chapter 4, the event analysis in the former and the index analysis in the latter complement each other in reaching some important conclusions upon the effectiveness of the new policy mixes.

Firstly, a policy mix should be comprehensive. Neglecting one important step of the risk cycle may lead worsening in other steps. In the case of S.Korea the lack of efforts to control the rise of the current account surplus led an over-appreciating domestic currency. In turn, real GDP growth rate and inflation fell to undesired levels. Similar chains of events are also observable in the cases of other countries under investigation. The lack of efforts to fix the maturity composition of capital flows into Turkey led significant worsening of the maturity mismatch related risks which may lead abrupt results in a case of volatility in any step of the risk cycle. Secondly, the comparison between the use of capital controls and market-friendly policies reveals some implications. Both the event and the index analyses assert that the capital flow management tools, which were previously known as capital controls are more successful in controlling the maturity composition of capital inflows. In this sense, they are more effective in reducing the vulnerabilities of an economy against global conditions. However, there are also some findings that these tools may lead distortionary effects over credit and real GDP growth. Thirdly, the assessment put forward that efficacy does not necessarily guarantee effectiveness. Even though the Turkish policy toolkit benefits from efficacy, Brazilian policy mix appears to be more effective

than the Turkish policy toolkit. However, when the S.Korean policy mix is assessed in the financial stability front, it is possible to state that S.Korean policymakers achieved to develop a toolkit that is both efficient and effective. Fourthly, side effects of the included tools should be investigated carefully and complemented with additional tools where necessary. The Brazilian case related to the side effects of IOF over exchange rate form the basis for this conclusion. The side effects of IOF measures over the exchange rate could have been compensated with more active use of FX RRs or the introduction of Turkish ROM tool. The last but not the least, although complementary tools should be used where necessary, the interaction between tools should be carefully assessed so that no undesired interactions to take place. The implication from Chapter 3 is supported by the findings of Chapter 4, in the sense that the effectiveness of ROM is constrained by its interaction with another cornerstone of the Turkish policy mix, the interest rate corridor.

The findings explained above are crucial since they attempt to form a basis for the possible adjustments to the policy mixes of the selected developing countries. They also intend to form some possible guidelines for policymakers of countries where the design of the new policy mixes is yet in progress. With further elaboration on these issues, toolkits that are optimized to enhance macroeconomic and financial stability may become more likely to be promoted.
Nonetheless, the main contribution of this study to the existing literature is the new approach that is developed to assess the central bank responsiveness and effectiveness in the post-crisis era. The two indices –*Central Bank Responsiveness Index* and *Central Bank Effectiveness Index* – are constructed upon a wide review on the indices that are developed in the literature until this date. Yet, they are based on a simple reasoning. The findings from the indices imply similar or complementary findings to those from the event analysis. Moreover, they also provide some additional information where event analysis falls short to compute such as: the extent of timely-implementation of the policies or commitment of central bank to its pre-determined targets. Nevertheless, the most important feature stands out to be providing numerical values upon the effectiveness of overall policy frameworks. This feature facilitates to conduct a comprehensive assessment and also a cross-country or cross-period comparison.

Since this is a very first attempt to conduct such an analysis, the methodology can be subject to some adjustments in order to enhance the explanation power of the indices. First, the sub-indices may suffer from excluded variables. PTI can incorporate some additional indicators that central banks monitor. A more sophisticated MPI can also be developed by taking the excluded tools into account. Further elaboration on the sub-indices may help the main indices to better function and provide more precise results. Moreover, the determination of targets in this study is based on non-official statements in some cases. Availability of official central bank statements, policy reports or speeches from governors may optimize the target setting and lead healthier information to be provided by the indices upon the effectiveness of central banks. Lastly, a more detailed assessment on the statistical properties of the indices and further considerations on the setting of the weights for the variables that compose the sub-indices may be possible.

Taking the given possible adjustments to the indices into account, this first attempt opens a way for prospective studies that would benefit from the given approach. First, the simplicity of the approach makes them possible to be adjusted for any country. The indicators in PTI and the tools in MPI can be selected in accordance with the circumstances in a country. Second, the indices can be simplified, enhanced or modified in any sense as long as the alterations are in line with the reasoning behind the construction of the indices. The indices are incorporated to enlighten the post-crisis era of central banking in this study. However, they can also be adjusted for studies that would seek historical findings. In addition, they can also be enhanced or modified for any developments that would occur in central banking practices in the future. Third, in empirical studies where the time span of the data is sufficient, both the main and sub- indices can be incorporated so that they would yield aggregated information. MPI can be used as a representation of the overall policy stance which takes both monetary and macroprudential policies into account. Moreover, PTI can be used as a macroeconomic and financial stability index. The targets can be eliminated or kept in the formulation regarding the aim of the prospective studies. In addition, the 'centralization around target' method can be used in any study with any aim where information upon the deviations from a given target is

required without giving some vital statistical properties up. The last suggestion would be the use of the indices in assessing timely-implementation of the policies. Although this study hints that the indices may have such a function, it does not elaborate on the issue.

In brief, the most common implication from the findings of this study is that, policymakers of developing countries should develop comprehensive policy mixes that takes both the risks specific to their economies and the interactions between the tools that are included in the toolkit. Regarding the little experience of central bankers with the use of multiple tools and limited studies in the literature, this new era of central banking is rather an 'uncharted territory'. With the expansion of the set of monitored indicators and policy tools, policymakers are faced with a difficult task. In this respect, this study stands as a very first attempt to develop a 'compass' for central bankers in the post-crisis era of central banking practices. Although there are some findings which imply that the policy mixes have been evolving in the right direction, the conclusion from the overall analysis is that there is no perfect policy mix yet, at least in the countries under investigation. Nevertheless, the findings and the methodology of this study can be considered as a useful point of departure for prospective studies that would further elaborate on this area. An expansion of the literature conducted on this issue may help central bankers to overcome the challenging task of designing an optimized policy mix that is in line with the post-crisis understanding of central banking.

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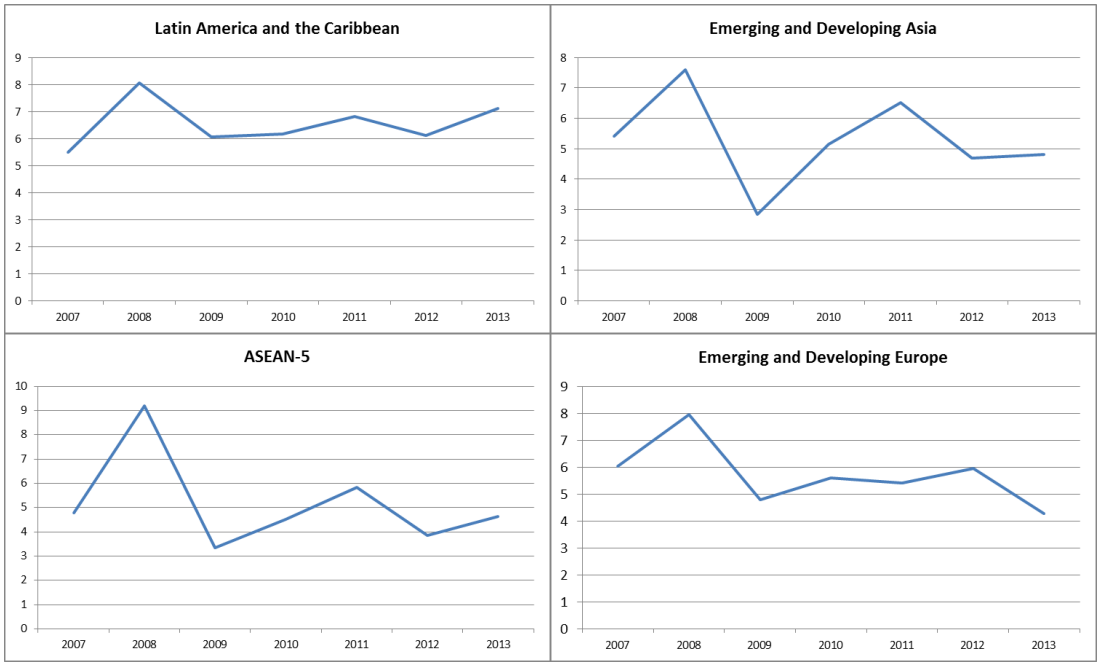
APPENDICES

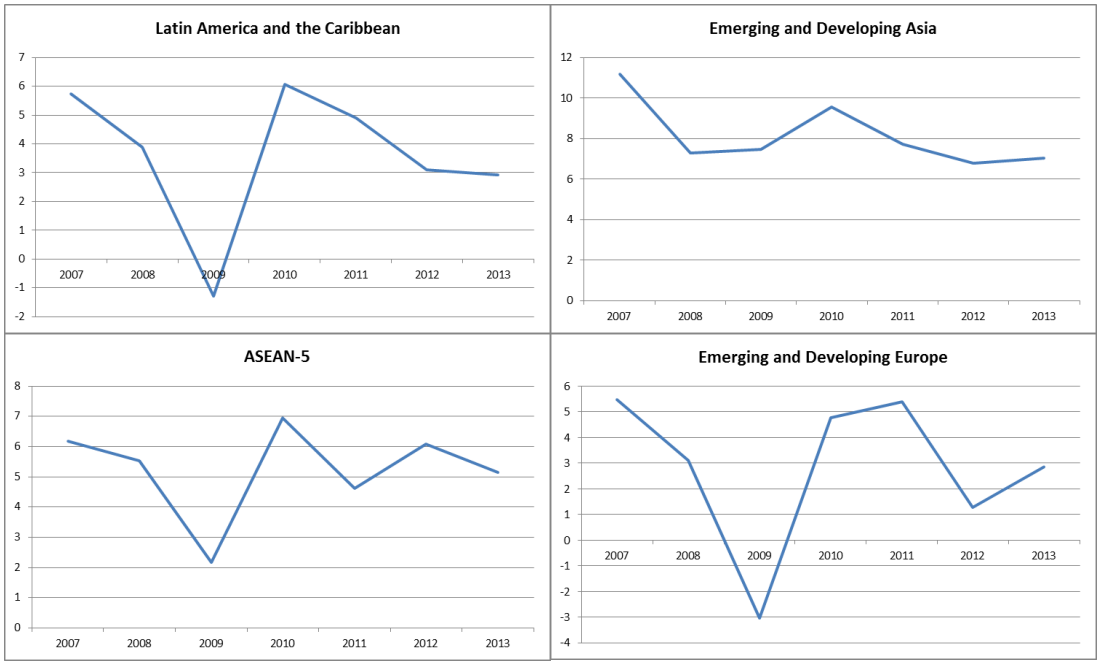
APPENDIX A: THE TRENDS IN THE MAIN INDICATORS AMONG DEVELOPING COUNTRIES

FIGURE A.1: Inflation Rates in Some Developing Country Sub-Groups



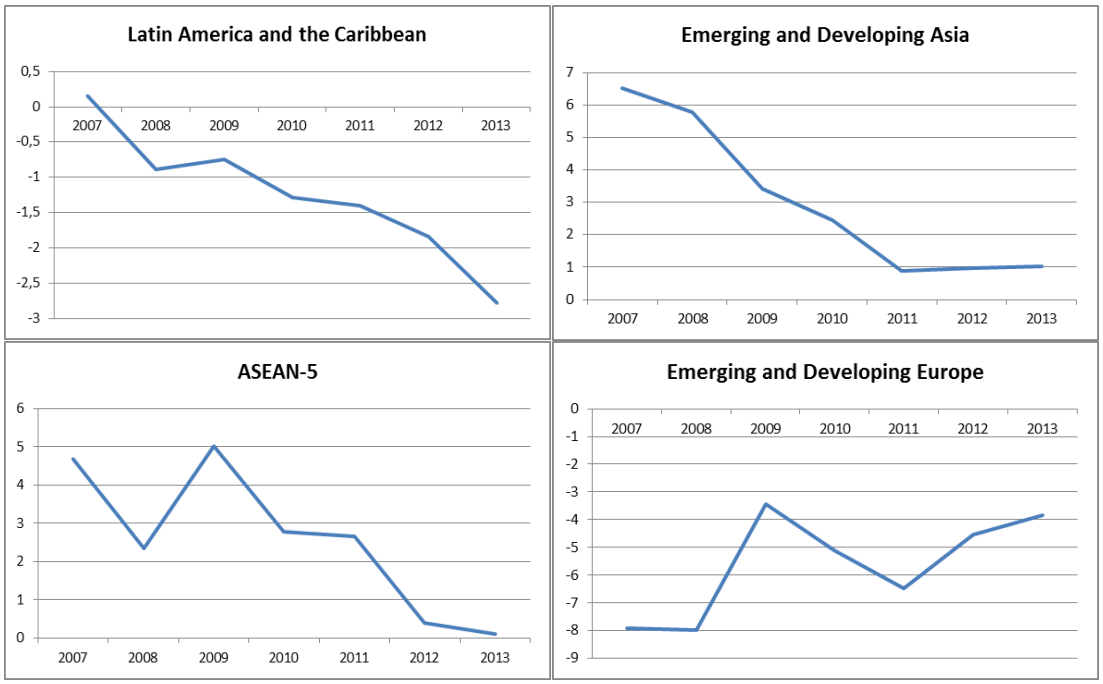
Source: IMF, World Economic Outlook Database

FIGURE A.2: Real GDP Growth Rates in Some Developing Country Sub-Groups



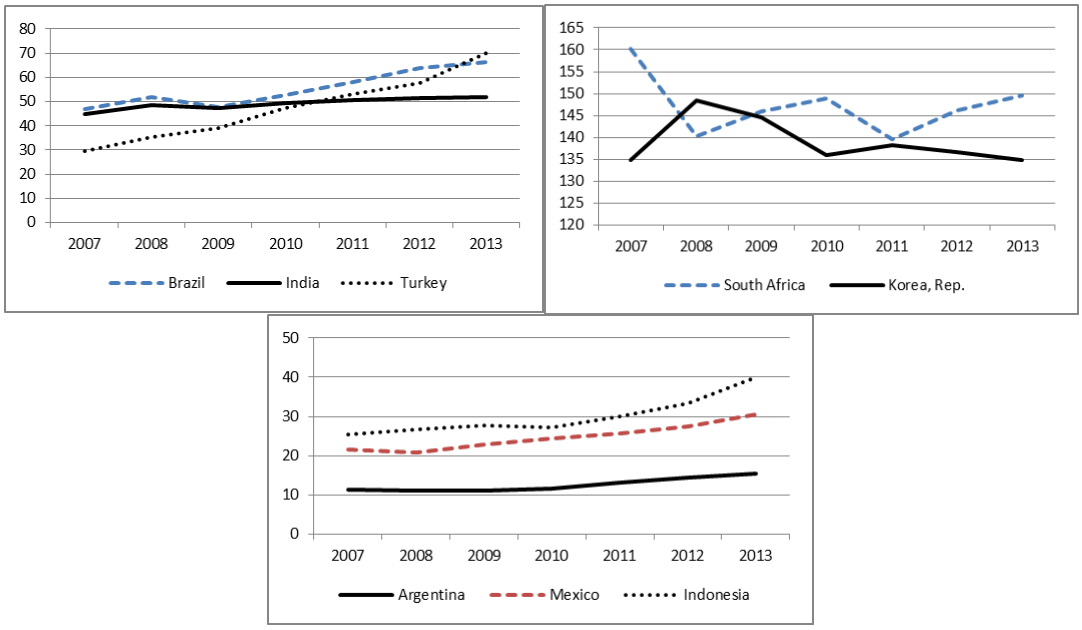
Source: IMF, World Economic Outlook Database

FIGURE A.3: Current Account Balance to GDP Ratios in Some Developing Country Sub-Groups



Source: IMF, World Economic Outlook Database

FIGURE A.4: Domestic Credit to Private Sector (% of GDP) in Selected Developing Countries



Source: Worldbank, World Development Indicators

APPENDIX B: CORRELATION VALUES

TABLE B.1: Correlation Values for the Monthly Analysis ('Centralization Around Target Method')

	TURKEY				BRAZIL			
	CBRI				CBRI			
	m=1	*m=2*	*m=3*		*m=1*	*m=2*	*m=3*	
2010M11-2014M12	0,174607	0,235182	0,189641		0,306572	0,409649	0,510831	
2010M11-2013M5	0,455575	0,539178	0,493364		0,201857	0,403488	0,582494	
2013M5-2014M12	-0,5025	-0,38532	-0,39759		-0,08491	-0,56234	-0,50057	
	CBEI				CBEI			
(assuming m is 1)	*n=1*	*n=2*	*n=3*	*n=4*	*n=1*	*n=2*	*n=3*	*n=4*
2010M11-2014M12	0,01023	-0,06196	-0,05559	0,010748	-0,03215	-0,12054	-0,19913	-0,25557
2010M11-2013M5	-0,02352	-0,18264	-0,22227	-0,1224	-0,29596	-0,41323	-0,5446	-0,63408
2013M5-2014M12	0,070522	0,258749	0,199261	0,155235	0,309045	-0,04192	0,088041	-0,039

TABLE B.2: Correlation Values for Absolute Deviations Method (Monthly)

	TURKEY			BRAZIL		
	CBRI			CBRI		
	m=1	*m=2*	*m=3*	m=1	m=2	m=3
2010M11-2014M12	0,581341	0,543633	0,478105	-0,57273	-0,6032	-0,58976
2010M11-2013M5	0,756591	0,709773	0,645968	-0,57432	-0,66007	-0,64539
2013M5-2014M12	0,471891	0,618772	0,600338	0,746515	0,67051	0,78004
	CBEI			CBEI		
(assuming m is 1)	*n=1*	*n=2*	*n=3*	*n=1*	n=2	n=3
2010M11-2014M12	0,666917	0,630913	0,630913	-0,48646	-0,50113	-0,50113
2010M11-2013M5	0,821483	0,779119	0,761592	-0,25055	-0,20996	-0,20785
2013M5-2014M12	0,15443	0,025448	-0,14687	0,830772	0,654553	0,447931

TABLE B.3: Correlation values for the monthly CBEI analyses conducted with and without ROM ('centralization around target method')

	2011M10-2013M5	2013M5-2014M12
WITHOUT ROM	0,174436491	0,25874898
WITH ROM	0,025201552	0,262416487

TABLE B.4: Correlation Values for 3 sub-sample period analysis

	2010M11-2012M6	2012M6-2013M5	2013M5-2014M12
Turkey	-0,516216107	-0,400893214	0,25874898
Brazil	-0,571951523	-0,860830287	-0,041917961

APPENDIX C: RESULTS FOR THE ANALYSIS WITH FSI

TABLE C.1: Results for the CBEI analysis with and without the Financial Soundness Index

WITHOUT FSI		
m+n=2	CORR.	CBEI
2010Q4-2015Q1	-0,31765	0,658823
2010Q4-2013Q2	-0,62217	0,811087
2013Q2-2015Q1	-0,14974	0,574868

WITH FSI		
m+n=2	CORR.	CBEI
2010Q4-2015Q1	-0,37018	0,685089
2010Q4-2013Q2	-0,67044	0,835218
2013Q2-2015Q1	-0,41351	0,706753

APPENDIX D: TURKISH SUMMARY

Bu çalışmanın amacı gelişmekte olan ülkelerdeki kriz sonrası merkez bankacılığı anlayışına ışık tutmaktır. Kriz sonrası oluşan riskler, alınan tedbirler, en önemlisi de bu tedbirlerin bahsi geçen riskler üzerindeki etkileri incelenmektedir. Bu çalışma, seçilen ülkelerde kriz sonrası uygulamaya giren para politikası çerçevelerini kıyaslayarak incelemesi bakımından ilgili yazına önemli bir katkı sunmaktadır. Bu inceleme iki yöntem kullanılarak yapılmıştır. İlki olan vaka analizi ilgili yazında sıkça başvurulan bir metottur. İkinci olan endeks analizi ise bu çalışmanın amacına özel olarak geliştirilmiş bir yeni bir yoldur. Bu iki analiz birbirini tamamlamakta ve kriz sonrası para politikalarının etkililiği konusunda birtakım önemli sonuçlara varmayı mümkün kılmaktadır.

Çalışmanın ilk bölümü olan giriş, bu çalışmanın gerekliliğini ve genel çerçevesini anlatmaktadır. İzlenecek yol ve bu yola başvurulmasının nedenleri açıklanmıştır. İkinci bölümde ise kriz öncesi ve kriz sonrası koşullar araştırılmaktadır. Krizle birlikte merkez bankacılığında iki önemli gelişme olmuştur. İlki finansal istikrarın öneminin kavranması ve finansal istikrarın merkez bankası hedefleri içinde yerini anlamasıdır. İkincisi ise merkez bankalarının varlık fiyatlarındaki gelişmeleri takip ve kontrol etmesinin gerekliliğinin anlaşılmasıdır. Söz konusu olan değişiklikler para politikası üzerinde de yeni etkiler doğurmuştur. Merkez bankalarının kontrol panelleri genişlemiş, kullandığı politika araçları artmıştır. Bu bağlamda, makro-ihtiyati politikalar tüm dünya merkez bankaları için önem kazanmıştır. Krizden çıkarılan derslerin yanı sıra gelişmiş ülkelerin kriz sonrası uyguladıkları parasal genişleme stratejileri ve küresel belirsizlikteki dalgalanma gibi sebepler bu yeni politika araçlarına atfedilen önemin gelişmekte olan ülkelerde daha geniş anlamda artmasında rol oynamıştır.

Gelişmekte olan ülkelerde risk, iç ve dış döngülerin birbirine bağlı oluşuyla tüm sisteme yayılabilir. Dış döngü genellikle sermaye akımlarıyla birlikte gelen yabancı paranın bankacılık sistemine doğrudan aktarımı ve bankaların sağladığı kredilerle bilançoların genişleme eğilime girmesiyle iç sisteme aktarılır. Bu likidite aynı zamanda kurda değer kazanma ve varlık fiyatlarında artışa da sebep olmaktadır. Önlem alınmadığı takdirde genişleme eğilimindeki bilançolar yabancı para ile borçlanmayı tetikleyebilir. Herhangi bir dış şok bu kanal üzerinden iç

döngüye yansıyacağı gibi, bir iç şok da yabancı yatırımcıların kararlarını etkileyerek şokun etkisini arttırabilir ve etki bahsi geçen döngü üzerindeki diğer adımlara sirayet edebilir. Makro-ihtiyati tedbirler bu döngüdeki basamaklar arasındaki bağlantıları engellemek, riskin veya istenmeyen eğilimlerin tüm sisteme yayılmasını önlemek amacıyla yeni politika çerçevelerine dahil edilmiştir. İlgili yazın bu araçları sınıflandırırken daha ziyade ayırt edici özelliklerinden yola çıkmış, aktarım mekanizmaları üzerinde durmamıştır. Bu bölümdeki anlatım, araçların birinci ve ikinci derece etkilerini tanımlayarak, araçları risk döngüsünde bloke etmeye çalıştıkları kanallara göre sınıflandırmıştır. Örneğin, ilk adımda küresel likidite arzının kontrolünü amaçlayan araçlar bulunurken, ileriki adımlarda kredi büyümesini amaçlayan araçlar yer almaktadır. Bu araçların farklı adımlar üzerinde de riski azaltıcı etkileri bulunsa da, sınıflandırma ana hedeflerine göre yapılmıştır. Araçların risk döngüsü üzerinde nerede konumlandığını görmek, ikincil etkilerinin muhtemel adreslerini görmeyi de kolaylaştırmaktadır. Bu yöntem araçların etkilerinin daha iyi anlaşılması ve etkileşimlerin daha kolay takip edilebilmesini sağlamayı amaçlamıştır. Çalışmanın daha sonraki bölümlerinde buradaki mantıktan sıkça faydalanılmıştır.

Üçüncü bölüm vaka analizine ayrılmıştır. Bu bölüm seçilen üç gelişmekte olan ülkenin kriz sonrası para politika çerçevelerini bir önceki bölümdeki bilgilerin ışığında detaylı ve karşılaştırmalı olarak incelemektedir. Seçili ülkeleri Güney Kore, Türkiye ve Brezilya oluşturmaktadır. Bu ülkelerin seçiminde birkaç önemli etken öne çıkmaktadır. Bu ülkeler Birleşmiş Milletler sınıflandırmasına göre (2014) G20 içerisinde bulunan gelişmekte olan ülkelerdendir. Ayrıca, "Kırılgan Beşli" olarak bilinen, küresel şoklara karşı daha savunmasız olarak tanımlanan beş ülkenin üçünü oluşturmaktadırlar. Dahası, bu ülkelerin merkez bankaları kriz sonrasında yeni para politika çerçeveleri geliştirmiş, benimsedikleri çerçeveyi kamuoyuyla paylaşmışlardır. Bahsi geçen politikaların uygulama konma tarihi Güney Kore'de 2010 ortasında, Brezilya ve Türkiye'de 2010 sonlarındadır.

Seçili ülkelerde uygulamaya konan para politikası çerçeveleri kredi ve döviz kuru/sermaye akımları kanallarını hedeflemektedir. Kredi kanalındaki araçları zorunlu karşılık oranları gibi kredi büyümesini genel anlamda yavaşlatmayı amaçlayan araçlar olduğu gibi, seçili ekonomide daha fazla risk yarattığı görülen kredi bileşenlerini hedefleyen araçlar oluşturmaktadır. Bunlar Türkiye ve Brezilya'da tüketici kredilerini hedefleyen araçlarken, Güney Kore'de konut

sektörünü hedefleyen araçlardır. Döviz kuru/sermaye akımları kanalındaki araçlar da ülkelerin kendine has risklerini hedefler. Ancak karşılaştırmalı olarak incelendiğinde burada bir tercihin söz konusu olduğu görülmektedir. Güney Kore ve Brezilya'da "sermaye akımı yönetimi araçları" (SAY) öne çıkarken, Türkiye'de daha "piyasa dostu" olarak bilinen bir çerçeve benimsenmiştir. Brezilya'da IOF olarak bilinen finansal işlemler vergisi, Güney Kore'de ise makro-ihtiyati istikrar vergisi uygulanmaktadır. Buna karşılık, Türkiye'de bu kanalın faiz koridoru ve rezerv opsiyon mekanizmasıyla kontrol altında tutulması hedeflenmektedir. Politika çerçevelerindeki bu farklar, ülkelerin maruz kaldığı risklerdeki farklılıklarla birleşerek, merkez bankalarının performanslarında değişik tablolar meydana getirmiştir.

Makro-ihtiyati araçların etkililik derecesi ilgili yazında çokça incelenmiştir. Ancak bu çalışmalar genellikle tek bir aracın ampirik olarak etkililik analizine tabi edilmesi şeklinde yürütülmüştür. Bazı çalışmalar ise birkaç araç üzerine yoğunlaşmış, uygulamaya girmelerinden öncesi ve sonrası arasında karşılaştırmalı bir değerlendirme yaparak bazı sonuçlara ulaşmışlardır. Bu çalışmalar daha ziyade sermaye kontrolleri üzerinde durmuş ve bu araçların özellikle sermaye akımı vadelerini düzenlemede başarılı olduğu sonucuna varmıştır. Kur ve sermaye akımı hacmine etkileri üzerindeki bulgular ise daha kısıtlıdır. Bu çalışmalar daha önce de belirtildiği gibi sınırlı araçlar üzerine yoğunlaşmış ve ampirik analizle incelenmiştir. Yazında tüm politika çerçevesini inceleyen çalışmalar da nadir olmakla birlikte bulunmaktadır. Bu çalışmalar, politika çerçeveleri kısa süredir uygulamada oldukları için ampirik analizden ziyade vaka analiziyle yürütülmüştür. Türkiye'de uygulanmakta olan politika çerçevesi bu yöntemle incelenmiş ve genel anlamda başarılı bulunmuştur. Ancak bu çalışmalar 2013'ten sonraki dönemi değerlendirmemektedir. Güney Kore ve Brezilya için ise çalışmalar genellikle SAY araçları üzerine yoğunlaşmış, sonuçlar ise daha önce sermaye kontrolü üzerine yürütülen çalışmalarla benzer bir tablo ortaya çıkartmıştır. Bu çalışmanın ilgili bölümünde yürütülen vaka analizi, yazında ulaşılan sonuçlarla büyük ölçüde örtüşmektedir. Ancak karşılaştırmalı bir çalışma olması ve daha geniş bir zaman dilimini incelemesi bakımından bazı ek bilgiler elde edilmiş, daha detaylı ve derinlemesine sonuçlara ulaşılmıştır.

Vaka analizi sonucunda elde edilen farklı tabloları ve nihai sonuçları birkaç başlık altında özetlemek mümkündür. Varılan birincil sonuç, en etkili aracın seçiminden

ziyade, politika çerçevesinin genel tasarımının daha büyük önem taşımasıdır. İkinci önemli nokta, ülkeler arasındaki trendlerde belli ayrışmalar gözlenmiş olmasıdır. Bu ayrışmaların özellikle 2012 ortasında meydana gelmiş olduğu görülmüştür. Ülkeler arasındaki farkları gözlemlerken 2012 ortası bu nedenle önemli bir tarih olarak göze çarpmıştır. Diğer bir önemli tarih ise Amerikan Merkez Bankası Fed'in mevcut parasal genişleme politikasını sonlandırabileceği açıklamasını yaptığı Mayıs 2013 tarihidir. Bu açıklamanın yarattığı şok, gelişmekte olan ülkelerin dış faktörlere karşı gösterdikleri kırılganlığın ne seviyede olduğunu belirlemede önemlidir.

Sermaye akımlarını kontrol etmeyi amaçlayan Güney Kore ve Brezilya merkez bankaları ekonomilerindeki kısa vadeli dış borcun toplam dış borca oranını kademeli olarak düşürmeyi başarmışlardır. Türkiye'de ise aynı oran, yeni politika çerçevesinin uygulamaya konmasından itibaren belirgin bir artış göstermiştir. Kriz öncesinde söz konusu olan oranın oldukça yakın seyrettiği Türkiye ve Brezilya'da sermaye akımları kıyaslandığında da önemli sonuçlar elde edilmektedir. Brezilya Merkez Bankası'nın (BCB) IOF politika aracı hem sermaye akımlarının hacmini hem de vadesini düzenlemeyi hedeflemektedir. Faiz koridoru ise yabancı yatırımcıların kısa vadeli yatırım kararlarını etkilemeyi amaçlar. Ancak özellikle vade düzenlemek gibi bir özelliği bulunmamaktadır. Bu doğrultuda, iki ekonominin 2010 sonrası aldığı net sermaye akımlarının vadeleri incelendiğinde Brezilya ekonomisinin daha uzun vadeli akımları çektiği gözlenmiştir. Türkiye ekonomisine yönelen finansal akımların vadesi 2010 sonrası bir derece düzelme gösterdiyse de 2012 ortasından itibaren vade tekrar kısalmıştır. TCMB'nin sermaye akımları üzerindeki kontrolünü yitirmesi 2013 ortasında FED'in mevcut parasal genişleme politikasını bitirebileceği yönündeki açıklamayla belirgin hale gelmiştir. Mayıs 2013'te meydana gelen bu şokla Brezilya ekonomisine gelen net finansal akımlar %6 düşüş gösterirken Türkiye'de bu oran %15 olmuştur. Bu örnekten yola çıkarak BCB'nin Brezilya ekonomisini dış şoklara karşı daha dayanıklı hale getirmeyi başardığı sonucuna varılabilir.

TCMB'nin sermaye akımları üzerindeki etkisini kaybetmesi 2012 yılı boyunca diğer önemli finansal göstergelere yansımamıştır. Bunun önemli sebeplerinden bir tanesi 2011'de kademeli 2012 ortasında ise tam olarak devreye giren Rezerv Opsiyon Mekanizması (ROM) olabilir. ROM'un devreye girmesiyle birlikte merkez bankası rezervlerinde kayda değer bir artış gözlenmiştir. Türk Lirası'nda da ciddi

bir oynaklık meydana gelmemiş ve kur üzerinde önemli bir baskı görülmemiştir. Ancak 2013 ortasında TCMB kur üzerindeki etkisini de yitirmiştir. Alper ve diğerleri (2013) ROM aracının 2013 ortasından itibaren faiz politikasıyla istenmeyen bir etkileşime girerek etkisini yitirdiği kanısı savunmaktadır. Vaka analizinin çizdiği tablo da bu kanıyı destekler niteliktedir.

Brezilya ekonomisindeki başlıca sorunlar da döviz kurundan kaynaklanmaktadır. IOF politika aracı her ne kadar sermaye akımları üzerinde etkili olmuşsa da, bu etkiyi döviz kuru alanında gösterememiştir. Brezilya Real'i ilk bakışta gelişmekte olan ülke kurlarıyla aynı trendi paylaşmaktadır. Ancak ülkenin döviz kuru oynaklık açısından incelenmekte olan ülkeler bazında en zayıf performansı göstermiştir. Dahası, rezervlerle birlikte incelendiğinde, BCB'nin döviz kurunu 2012 ortasından itibaren rezervlerde ciddi bir düşüşle kontrol edebildiği görülmektedir. Yani, BCB'nin para politikası çerçevesi 2012 ortasından itibaren döviz kuru alanındaki etkisini kaybetmiştir. Bunun sebeplerinden bir tanesi olarak IOF politika aracı ile elde edilen dövizin yerli para birimine dönüştürülmesi gösterilebilir. Güney Kore'de kullanılan makro-ihtiyati istikrar vergisinden elde edilen döviz "Exchange Rate Stabilization Fund" yani "Döviz Kuru İstikrar Fonu" olarak adlandırılan hesapta toplanmaktadır. Bu hesap döviz kuru için bir tampon etkisi görmekte, oynaklığı gidermede yardımcı görev görmektedir. Bu doğrultuda, Kore Won'u incelenen üç döviz kuru arasından en az oynaklık gösteren kur durumundadır.

Özetle SAY araçları piyasa dostu araçlardan daha başarılı bir performans çizse de bu araçlar da tüm riskleri kapsamamaktadır. Ayrıca vaka analizi çalışması bu araçların büyüme ve kredi üzerinde de olumsuz etkileri olabileceğini ortaya koymuştur. SAY araçlarının kullanılmadığı Türkiye'de büyüme oranları diğer ülke oranlarının belirgin düzeyde üzerindedir. Kredi büyümesinde de Türkiye büyümeyi yavaşlatmayı amaçlarken, 2012 sonrasında Brezilya'da kredi büyümesi arzu edilen oranların altında kalmıştır. Bu noktalar ışığında varılan sonuç, en etkili politika araçlarının seçiminden ziyade politika çerçevesinin genel tasarımı daha büyük önem teşkil etmesi gerektiğidir. Politika çerçevesini meydana getiren araçlar arasında etkileşimler görülmektedir. Bu etkileşimler araçların yan etkileri veya tamamlayıcı etkileri anlamına gelmektedir. Etkinin yan veya tamamlayıcı olması merkez bankacılarının işini güçleştirmekte veya kolaylaştırabilmektedir.

Bu bağlamda Türkiye ve Brezilya'da yan etkilerden bahsetmek mümkünken, Güney Kore örneğinde araçlar arası tamamlayıcı etkilerden söz edilebilir.

Daha önce de bahsedildiği gibi incelenmekte olan üç ülkede de 2012 ayrışma için önemli bir tarih olarak göze çarpmaktadır. Ancak en keskin ayrışma Güney Kore örneğinde görülmektedir. Ülkenin cari fazlası 2012 ortalarından itibaren büyük bir artış göstermiştir. Bunun altında yatan sebeplere bakıldığında, yatırım gelirleri kalemi göze çarpar. Net finansal akımların negatif seyrettiği bu ekonomi, net yatırım gelirlerinin ciddi bir artışa geçmesiyle diğer gelişmekte olan ülke ekonomilerinden ayrışmıştır. Cari fazladaki artışı takiben rezervler yükselmiş, Won değer kazanma eğilimine girmiştir. Bu durum her ne kadar Güney Kore ekonomisini dış şoklara karşı daha dayanıklı bir hale getirse de olumsuz etkileri de olmuştur. Ekonomide 2012 ortasından itibaren başlayan bu zincirleme etki enflasyona olumsuz yansımıştır. Sonraki yıllarda enflasyon oranları önceden belirlenen hedeflerin bariz bir biçimde gerisinde kalmıştır. Ayrıca, Won'un değer kazanması, ihracat odaklı bir büyüme modelini benimsemiş Güney Kore ekonomisi için bir tehdit haline gelme potansiyeli taşımaktadır.

Vaka analizi her ne kadar önemli sonuçlara ulaşmayı sağlasa da, bu sonuçların önemli kısmı yorumlarla desteklenmiştir. Bunun sebebi aynı anda takip edilecek çok fazla gösterge ve politika aracının söz konusu olmasıdır. Bu noktada, destekleyici bir yönteme ihtiyaç duyulmaktadır. Kullanılacak yöntem sayısal ve tüm politika çerçevesini kapsayıcı nitelikte olmalıdır. Günümüze kadar yapılmış ampirik çalışmalar kapsayıcı olmaktan uzaktır. Dahası, yeni politika çerçevelerinin yürürlükte olduğu süreler ampirik çalışmalarda kullanılacak yeterli örneklem sayısına ulaşmayı güçleştirmektedir. Dolayısıyla, bu çalışma yeni bir yöntem geliştirmeye çalışmaktadır.

İlgili yazın incelendiğinde, endeks analizinin bazı göstergeleri bir araya getirme veya göstergeler arası ilişkiyi basit şekilde göstermede sıkça başvurulan bir yöntem olduğu ortaya konmuştur. Üzerinde durulan ve oluşturulma yöntemleri incelenen endekslerin başında Parasal Koşulları Endeksleri, Finansal Koşullar Endeksleri ve Finansal İstikrar Endeksleri gelmektedir. Ayrıca imkansız üçleme ya da üçlü açmaz endeksleri de incelenmiştir. İncelenen endeksler oluşturulma yöntemleri açısından aydınlatıcı olduysa da mantık bakımından bu çalışmanın amacına en uygun örnek çalışmanın Taylor kuralı olduğu görülmektedir. Taylor kuralı, değişkenlerin hedeflenen değerlerden sapmaları ve politika araçlarının

yönleri arasında pozitif bir ilişki olduğunu ortaya koyar. Bu kural kriz öncesi merkez bankacılığı anlayışına uygun geliştirildiği için göstergeler ve politika araçları sınırlıdır.

Ancak Taylor kuralının işaret ettiği pozitif ilişki, günümüz merkez bankacılığı koşullarında test edilebilir. Bu ilişkiyi görmek için merkez bankalarının izlediği değişkenlerin önceden belirlenmiş hedeflerden sapmalarını ve politika araçlarını iki ayrı değişken haline getirmek gerekmektedir. İlgili yazın bu tip bir işlem için endeks analizini işaret etmektedir. Endeksler birden fazla değişkeni bir araya getirip tek bir gösterge olarak sunmayı mümkün kılar.

Çalışmanın üçüncü bölümü endeks analizine ayrılmıştır. Öncelikle merkez bankalarının kriz sonrasında izledikleri değişkenler belirlenmiştir. Daha sonra bu değişkenlerin merkez bankalarınca belirlenen hedeflerden sapmaları Politika Hedef Endeksi'inde bir araya getirilmiştir. Sapma değerleri, bu çalışma için özel olarak geliştirilen "Hedef Etrafında Ortalama" yöntemiyle ölçeklendirilmiştir. Bu yönteme istatistiksel normalleştirme (standardizasyon) yöntemindeki ortalama değerinin yerinin hedef değerle değiştirilmesiyle ulaşılmıştır. Dönüşümden geçen değerler eşit ağırlıklar atanarak Politika Hedef Endeksinde toplanmıştır.

Nihai sapma hakkında bilgi veren bu endeksle birlikte, merkez bankalarının politika duruşunu gösterecek bir diğer endekse daha gerek duyulmaktadır. Kriz öncesi merkez bankacılığı anlayışına göre bu endeks sadece kısa vadeli faiz oranlarından oluşacak iken kriz sonrasında politika araçlarına makro-ihtiyati araçlar eklenmiştir. İncelenmekte olan her ülke için dört adet politika aracı seçilmiştir. Bunlar Türkiye için repo faizi, faiz koridoru, TL zorunlu karşılık oranları ve YP zorunlu karşılık oranlarından; Brezilya için ise Selic oranı, Real zorunlu karşılık oranları, YP zorunlu karşılık oranları ve IOF'ten oluşmaktadır. Değerler standardize edildikten sonra eşit ağırlıklandırma yöntemiyle her bir ülke için ayrı oluşturulan Para Politikası Endeks'inde bir araya getirilmiştir.

Bir sonraki adım, elde edilen iki endeksin arasındaki ilişkinin yönünü ve kuvvetini ölçmektir. Bu noktada, ilgili literatürdeki Aizenman'ın MI endeksini oluştururken izlediği yol takip edilmiştir. İki endeksin arasındaki ilişki korelasyon yardımıyla ölçülebilmektedir. Ancak korelasyon bu iki endeksin incelenmesinde bir eşzamanlılık problemi ortaya çıkarmaktadır. Çalışma bu problemi zaman gecikmesi kullanarak aşmayı hedeflemektedir. Taylor kuralı mantığı kullanılarak

gecikme Politika Hedef Endeksine uygulandığında analiz bir cevap verebilirlik endeksine dönüşmektedir. Bu doğrultuda meydana getirilen endeks "Merkez Bankacılığı Cevap Verebilirlik Endeksi" adını almıştır. Gecikme tam tersi yöne, yani Para Politikası Endeksine uygulandığında ise elde edilen endeks etkililiği ortaya koymaktadır. Bu yöntemle oluşturulan endeks ise "Merkez Bankacılığı Etkililik Endeksi" adını almıştır. Oluşturulan her iki endeks de [0,1] aralığında değerler sağlamaktadır. Elde edilen değerler bire yaklaştıkça incelenmekte olan merkez bankasının daha iyi cevap verebildiği veya daha etkili olduğu anlaşılacaktır.

Kullanılan veri yeni politika çerçevelerinin uygulamaya giriş tarihi olan Kasım 2010 tarihinden 2014 sonuna kadar uzanmaktadır. Elde edilen verilere Uluslararası Para Fonu (IMF), Dünya Bankası (World Bank) gibi uluslararası kuruluşların yanı sıra ilgili merkez bankalarının kendi veri tabanlarından da faydalanılarak erişilmiştir.

Analiz sonuçları üç temel noktayı işaret etmektedir. Birincisi, genel olarak bakıldığında BCB'nin politika çerçevesinin TCMB'ninkinden daha etkili olduğu görülmüştür. İkincisi, 2013 ortasından sonra her iki merkez bankasının da cevap verebilirlik ve etkililik değerleri düşmüştür. Sonuncusu, 2013 sonrasında değerlerde gözlenen düşüş Brezilya örneğinde daha sınırlı olmuştur. Tüm bu sonuçlar, vaka analizinin çıkarımları ile örtüşmektedir. Ayrıca farklı periyodlara göre gecikme uygulandığında da aynı yönde sonuçlara ulaşılmış, tutarlılık gözlemlenmiştir.

Sağlamlık testleriyle 2012 ortasının ayrışmada önemli bir tarih olduğu doğrulanmış, Brezilya'da dış faktörlerin izlenen göstergeler üzerinde daha sınırlı etkide bulunduğu gösterilmiştir. Ayrıca ROM politika aracının 2013 ortasından itibaren etkili olmadığı yönündeki yorum endeks analiziyle doğrulanmıştır. Endekslerin mantığını sorgulamaya yönelik testler olumlu sonuçlar vermiştir. Brezilya analizi bir Finansal Sağlamlık Endeksi geliştirilerek zenginleştirilmiştir. Bu endeks IMF finansal sağlamlık indikatörleri veri tabanında listelenen göstergelerin bir araya getirilmesiyle oluşturulmuştur. Sonuçlara göre BCB politika çerçevesi kur ve vade uyuşmazlığı, konut kredilerinin toplam kredi stokuna oranı gibi finansal sistem göstergelerini de dikkate almaktadır. Bu sonuç vaka analizindeki yorumlarla örtüşmektedir.

Çalışmanın son bölümünde ise elde edilen sonuçlar özetlenmiş, çalışmanın zayıf ve güçlü noktalarının altı çizilmiş ve ilgili yazına sağladığı katkılar anlatılmıştır. Endeks analizi yöntemi sayısal sonuçlar sağlayarak kriz sonrası para politika çerçevelerinin başarısını incelemeyi kolaylaştırmıştır. Elde edilen sonuçların vaka analiziyle örtüşmesi, endekslerin arzu edilen sonuçlara daha kolay ulaşmayı mümkün kıldığını göstermiştir. Endeksler geniş bir yazın taramasına dayanarak oluşturulmuş olmalarına rağmen basit bir mantığa dayandırılmıştır. En önemlisi de, bu alanda yapılan ilk çalışma olması dolayısıyla yazındaki önemli bir eksikliği gidermektedir.

Ancak bu yöntemin bazı zayıflıkları veya açıklamada yetersiz olduğu noktalar da söz konusu olabilmektedir. Öncelikle ana endeksleri oluşturan alt endeksler bazı önemli değişkenleri içermeyebilir. Politika Hedef Endeksi rezervler, kısa vadeli dış borcun toplam dış borca oranı, kur oynaklığı gibi bazı önemli değişkenleri içermemektedir. Aynı zamanda Para Politikası Endeksi de döviz müdahaleleri ve politika çerçevesi içindeki ikincil önem taşıyan bazı araçları dikkate almamaktadır.

İkinci olarak merkez bankası hedeflerinin belirlenmesinde daha güvenilir kaynaklara erişim endekslerin güvenilirliğini arttırabilir. Bu çalışma hedeflerin belirlenmesinde resmi açıklamalardan faydalandığı kadar merkez bankası yetkililerinin medyaya verdikleri beyanatları da kullanmaktadır. Bu sebeple, resmi kaynaklardan alınacak kesin hedefler daha sağlıklı sonuçlara ulaşılmasını mümkün kılabilir.

Bir diğer nokta da istatistiksel testlerin çeşitlendirilmesi olabilir. Bu çalışma korelasyon analizi için gerekli olan normal dağılım testlerini gerçekleştirmiştir. Ancak gerekli görülebilecek diğer testler de uygulanabilir. Bunlar içsellik, eş bütünleşme ve dışlanan değişken analizleri olabilir.

Son olarak, ağırlıklandırma yönteminde değişikliğe gidilebilir. Bu çalışma endekslerin oluşturulmasında eşit ağırlıklandırma yöntemini benimsemiştir. Ancak merkez bankaları bazı ekonomik ve/veya finansal göstergelere daha çok önem verebilmektedirler. Bu durumda simülasyon modellemeleri katsayıların belirlenmesinde fayda sağlayabilir. Ayrıca, merkez bankalarının belli değişkenlere atfettiği önem zaman içerisinde değişebilmektedir. Böyle bir durumda ise Kalman filtresi yönteminin kullanımı uygun olabilecektir.

Yukarıda bahsi geçen zayıf noktaları veya geliştirebilecek noktalarına rağmen bu iki endeks ilgili yazında kriz sonrası merkez bankası pratiklerini değerlendirmeye imkan sağlamada ilk örnekler olması bakımından büyük önem taşımaktadır. Politika araçları arasındaki etkileşimleri ve merkez bankası hedeflerini dikkate alması bakımından da bu çalışma alana değerli katkılar sunmaktadır. Çalışmada kullanılan yöntem ve varılan sonuçlar sonraki çalışmalara da temel oluşturacak niteliktedir.

Gelecek çalışmalar için öneriler birkaç başlık altında açıklanabilir. Öncelikle bu çalışmanın endeks bölümünde bulunan sayısal sonuçlar farklı gecikme değerleriyle sunulmuştur. Farklı periyodlarda gecikme uygulanan değerler merkez bankalarının politikalarının zamanlaması hakkında önemli bilgiler içermektedir. Bu çalışmada böyle bir zamanlama analizi hakkında ipuçları verilmiş olsa da, konu derinlemesine incelenmemiştir. Gelecekteki çalışmalar bu değerler üzerinde daha derinlemesine bir inceleme yaparak merkez bankalarının ne kadar bir sürede sapmalara tepki verdiğini ve/veya bu tepkilerin ne kadar sürede değişkenler üzerinde etki gösterdiğini sorgulayabilirler. Böylelikle, merkez bankalarının ve onların politika çerçevelerinin zamanlama açısından ne derece başarılı oldukları saptanabilir.

Diğer bir öneri ise geliştirilen endekslerin ampirik çalışmalarda da kullanılabilecek olmasıdır. Endeksler birçok önemli bilgiyi tek bir gösterge halinde sunarak çalışmalara katkıda bulunabilirler. Veri zaman aralığı yeterli örneklem sayısını sağladığı takdirde ampirik çalışmalar ana ve alt endekslerden faydalanabilirler. Ayrıca alt endeksler ampirik çalışmalar dışında da önemli göstergeler olarak kullanılabilirler. *Politika Hedef Endeksi* hedeflerden arındırılarak kullanıldığında finansal koşullar veya finansal istikrar endeksi olarak geliştirilebilir. Para Politikası Endeksi ise makro-ihtiyati politikaları içeren ilk politika duruşu göstergesidir. Bu bilgi yazındaki kriz sonrası dönem araştırmalarını zenginleştirebilir.

Daha önce de bahsedildiği gibi, endeksler basit bir mantık üzerine kuruludur. Bu özellikleri sayesinde endekslerin istenilen zaman aralığı veya ülkeler için kullanımı da kolaylaşmaktadır. Basit adaptasyonlarla kriz öncesi süreç değerlendirilebilir. Dahası, daha geniş ülke grupları üzerine daha detaylı bir karşılaştırmalı analiz yürütülebilir. Yapılacak araştırmaların amacına göre bazı değişkenler çıkartılabilir veya eklenebilir.

Son olarak, *Politika Hedef Endeksi*'nin oluşturulmasında kullanılan ölçeklendirme yöntemi başka çalışmalarda da kullanılabilir. "Hedef Etrafında Ortalama" yöntemi olarak adlandırılan bu ölçeklendirme tekniği, sapmaların ölçeklendirilmesi için özel olarak geliştirilmiştir. Çalışmanın amacı farketmeksizin, bir değişkenin belli bir hedeften sapmasının ölçeklendirilmesi gerektiği durumlarda kullanılabilir.

Özetle bu çalışma, belli kısıtları olmasına rağmen kriz sonrası para politikalarını değerlendirme amacıyla gerçekleştirilmiş öncü çalışmalardan biri olarak ilgili yazındaki önemli bir eksikliği gidermekte, ileride bu konu üzerine gerçekleştirilecek olan çalışmalara bir yol açmaktadır. Bu çalışmadaki sonuçların gelecekte yürütülecek çalışmalarla geliştirilerek, merkez bankalarına kriz sonrası koşullarda oluşan yeni ortama uygun politikalar geliştirmede ışık tutması mümkün olabilecektir.

APPENDIX E: TEZ FOTOKOPİSİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü ☐

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YAZARIN

Soyadı : Bozkurt
Adı : Zeynep
Bölümü : İktisat

TEZİN ADI (İngilizce) : THE EVOLUTION OF CENTRAL BANKING PRACTICES IN DEVELOPING COUNTRIES: AN EFFECTIVENESS ANALYSIS ON THE POST-CRISIS POLICY MIXES OF SELECTED COUNTRIES

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