MONETARY POLICY OPERATING FRAMEWORK FOR FINANCIAL AND PRICE STABILITY: THE CASE OF TURKEY

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ABSTRACT

MONETARY POLICY OPERATING FRAMEWORK FOR FINANCIAL AND PRICE STABILITY: THE CASE OF TURKEY

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This thesis investigates whether the supplementary monetary policy, macro prudential and capital control tools can improve the efficiency of the monetary policy under the flexible inflation targeting strategy which also considers the financial stability. The thesis describes the basics of an efficient monetary policy operating framework including the monetary and macro prudential tools, and analyses the evolution of the central banking, economic imbalances and the structure of the financial system in Turkey and the impacts of the active use of the required reserve system on the loan and deposit markets in Turkish case, and search for the welfare implications of the capital control and macro prudential tools through a calibrated New-Keynesian small open economy Dynamic Stochastic General Equilibrium model which is consistent with the main economic and financial structure of Turkey.

Keywords: Inflation Targeting, Monetary Policy Operating Framework, Macro Prudential Tools, Capital Control Tools

ÖZ

FİNANSAL VE FİYAT İSTİKRARI İÇİN PARA POLİTİKASI OPERASYONEL ÇERÇEVESİ: TÜRKİYE ÖRNEĞİ

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Bu çalışma, destektekleyici para politikası, makro ihtiyati ve sermaye kontrolü araçlarının, fiyat istikrarını da gözeten esnek enflasyon hedeflemesi çerçevesinde para politikasının etkinliğini artırıp artıramayacağını incelemiştir. Çalışma, makro ihtiyati araçlar ve sermaye hareketleri dahil olmak üzere, etkin bir para politikası operasyonel çerçevesini açıklamış, Türkiye'deki merkez bankacılığının gelişimini, ekonomik dengesizlikleri ve finansal sistemin yapısını ve zorunlu karşılık sisteminin aktif kullanımının kredi ve mevduat faiz oranları üzerindeki etkilerini incelemiş, ve Türkiye'nin ekonomik ve finansal yapıları ile uyumlu kalibre edilmiş bir Yeni-Keynesçi açık ekonomi Dinamik Stokastik Genel Denge modeli aracılığı ile makro ihtiyati ve sermaye kontolü araçlarının sosyal refah üzerindeki olası sonuçlarını araştırmıştır.

Anahtar Kelimeler: Enflasyon Hedeflemesi, Para Politikası Operasyonel Çerçevesi, Makro İhtiyati Araçlar, Sermaye Kontrolü Araçları

To Hurican

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INTRODUCTION

The monetary policy refers to the policy decisions which adjust the level or the cost of the liquidity (or foreign exchange rates in open economies) to reach the economic objectives through affecting the decisions of the economic agents. Throughout the history, although the main responsibility of the central banks has always been to achieve; (i) price stability, (ii) financial stability, and (iii) output stability, the weights of these goals in the objective function have changed as a result of the changes in the economic theory, and economic and financial structures.[1] Similarly, the operational framework of the monetary policy has also evolved according to the objectives and market structures. The significant shifts in the objectives and operational framework of the monetary policy have occurred generally as a result of the severe economic crises. Although the development of the financial markets and the transition to a market based economy played critical roles, while the central banking in pre-1980 era was shaped by the "great depression" in 1930s, the central banking in post-1980 era was influenced by the "great inflation" in 1970s. The recent global crisis will likely affect the future of the central banking.

During the pre-1980s period, the economic policies were dominated by the Keynesian views and Bretton-Woods system. During this period, it was widely believed that; (i) there was a trade-off between inflation and unemployment, and (ii) this trade-off could be exploited through the interventionist fiscal and monetary policies to reach full employment. In this Keynesian policy framework, the monetary policy was subordinated to the fiscal policy, and the role of the central banks was broadly limited to support the fiscal policy especially in emerging countries, as in Turkey. During this era, central banks had multiple objectives such as; (i) price stability, (ii) financial stability, (iii) exchange rate stability, (iv) full employment, and (v) economic development. However, it was known that, since

[1] See Deane and Pringle (1995) for a general overview on the evolution of the central banking.

Tinbergen (1952), "for each and every policy target, there must be at least one policy tool, and if there are fewer tools than targets, then some policy goals will not be achieved". This fact forced the central banks to use more direct and indirect policy instruments in addition to the short term interest rates, such as; (i) required reserves and liquidity ratios, (ii) interest rate ceilings, (iii) selected credit limits, and (iv) compulsory government securities portfolios. Although the capital controls, fixed exchange rate regime and lack of well developed financial markets enabled the central banks to use this policy tool set to some extent, the monetary policy was not effective as it had multiple and conflicting objectives.

The transition to the floating exchange rate regime after the breakdown of the Bretton Woods system, oil price shocks and responses of the authorities to these shocks through looser fiscal and accommodative monetary policies in order to avoid the contractionary impacts in 1970s had resulted in higher inflation and lower economic growth. The poor economic performance caused a re-examination the roles of the monetary policy.[2] The monetarists' opposition on Keynesian approach and passive monetary policy which is symbolized by the Milton Friedman's quote "inflation is always and anywhere a monetary phenomenon in the sense that it is and can be produced only by a more rapid increase in the quantity of money than in output" started to influence the central banking. The monetarists simply claimed that, there was no trade-off between the inflation and output at least in the medium and long run, and high inflation was mainly a result of the accommodative monetary policy. They suggested that, in order to control inflation, central banks should focus on price stability through controlling the money supply. In addition to the poor economic performance under the "multiple goals" operating framework, as pointed out by Mishkin (2009.a) and Goodfriend (2007), the introduction of the rational expectations theory by Lucas (1972) and the time-inconsistency theory by Kynland and Prescot (1977) and Barro and Gordon (1983) provided the required solid theoretical support for the price stability oriented monetary policy. While the rational expectations theory simply claimed that; since the economic agents form their expectations and make decisions based on all available data, only the unanticipated policy changes can have temporary real affects, the time inconsistency

[2] See Mishkin (2009.a) for the evolution of monetary policy theory and central banking since 1970s.

theory claimed that; since the economic agents adjust prices or wages by considering the consequences of the discretionary policy, when the central banks try to exploit the rigidities in the markets to reach lower unemployment by looser monetary policy than their original announcements, the output clears at original level, but at a higher inflation rate than the originally targeted rate (which is defined as the discretionary inflation bias). Mishkin (2009.a) notes that; while the rational expectations theory simply highlighted; (i) the critical role of the managing expectations and (ii) the importance of the nominal anchors to affect expectations, the time inconsistency theory simply underlined the critical roles of the (i) credibility and (ii) transparency. The implication of the time inconsistency theory was that, in order to avoid the discretionary inflation bias, the best that central banks can do was announcing the inflation target and trying to reach this target.

Therefore, in late 1970s, central banks started to focus more on price stability in line with the monetarist propositions through the monetary targeting. In this intermediate targeting strategy, monetary aggregates were selected as the intermediate targets assuming that there was a stable and predictable relationship between the monetary aggregates and inflation as the monetarists claimed. It was also thought that; the announced monetary aggregate targets would act as a nominal anchor for the economic agents and shape the expectations. However, the other characteristic of 1980s was a global trend towards a market based economy through liberalization and deregulations. After 1970s, it was generally accepted that, "*liberalization and deregulation was holly, restrictions sinful"*[3], as leaded by Reagan in the U.S. and Thatcher in England. It was well understood that; money was the common denominator of the market equilibrium, and price stability was a pre-requisite of well functioning markets and stable economic growth. But, as a result of financial innovations, to define money became more complicated. Thus, in 1980s, as pointed out by Blinder (1998), central banks discovered; (i) the difficulties of finding right monetary aggregates, (ii) the problems of controlling the quantity of the liquidity, and (iii) the weak and unstable relationship between the monetary aggregates and inflation. Targeting the monetary aggregates caused huge volatility in the interest rates and in the financial markets. In addition, intermediate targets

[3] Deane and Pringle (1995).

were not effective nominal anchor for the economic agents. Then, in mid-1980s, most of the developed country central banks started to abandon the monetary targeting and started to search for a more efficient operating framework in line with the propositions of the rational expectations and time-inconsistency theories.

The experiences of the emerging countries with the intermediate targeting strategy were usually ended with severe crisis. In these countries, the exchange rate was one of the main determinants of the inflation and expectations. Thus, a lot of emerging countries tried to control inflation through the exchange rate based stabilization programs in 1990s and early 2000s. But, almost in all cases, these countries faced with the famous "impossible trinity" or "trilemma" problem.[4] Under the fixed exchange regime, as a result of the inconsistent fiscal policies and/or external shocks, these countries frequently faced with the speculative attacks which caused currency and banking crisis.[5] In 2000s, in a financially integrated world, the threats of the targeting foreign exchange rate were clearly recognized.

In 1990s, it was widely accepted that one of the principle role of an effective and efficient monetary policy was to manage expectations. And, the pre-conditions of this role were credibility, transparency, accountability, clear statement of objectives and central bank independence.[6] Meanwhile, a broad consensus started to emerge on the principles of an effective central banking. Mishkin (2009.b) lists seven widely agreed criteria of an effective and efficient central banking as;

> (i) price stability should be overriding goal of the monetary policy, (ii) an explicit nominal anchor should be adopted, (iii) a central bank should be goal dependent, (iv) a central bank should be instrument independent, (v) a central bank should be accountable, (vi) a central bank should stress transparency and communication, and (vii) a central bank should have also the goal of financial stability.

[4] See Obstfeld, Shambaugh, and Taylor (2003). The impossible trinity proposition simply states that, when the capital account is liberalized, the exchange and domestic interest rates can not be controlled at the same time. Therefore, central banks should choose fixed exchange rate regime and passive monetary policy in which the interest rate is determined in the market or floating exchange rate regime and active monetary policy in which central bank can control the short term interest rate.

[5] See Obstfeld and Rogoff (1995).

[6] See Goodfriend (2007).

After the inefficiencies of the intermediate targeting (monetary or exchange rate targeting) were proved, the search for a more efficient operating framework ended with the flexible inflation targeting strategy which was consistent with the consensus principles of an effective and efficient central banking. The inflation targeting strategy may simply be defined as a monetary policy strategy in which a central bank attempts to keep inflation in an announced target range or at an announced target in medium term by consistently adjusting the short term policy rate under the flexible exchange rate regime. Since the principle role of the monetary policy in an economy is to provide a nominal anchor for the economic agents, it is widely accepted that, as long as it is credible, inflation targeting strategy provides a very effective nominal anchor.

The inflation targeting strategy was firstly introduced in New Zealand in 1990 and has been gradually adopted by other developed countries and then by emerging countries. Under the inflation targeting strategy, a global disinflation and acceptable growth rates had been achieved during 1990s and pre-global crisis period in 2000s (Table 1.1).

Table 1.1. Global Growth and Inflation Indicators

Global Growth and Inflation Indicators (%)									
Country Groups		Average				Standard Deviation			
		1981-90	91-2001	2002-06	2007-11	1981-90	91-2001	2002-06	2007-11
World	Growth	3.2	3.1	4.2	3.3	1.2	0.9	1.0	2.5
	Inflation	17.3	14.9	3.7	4.2	4.9	12.1	0.1	1.3
Advanced Countries	Growth	3.1	2.7	2.5	0.8	1.5	1.0	0.6	2.8
	Inflation	6.2	2.6	2.0	2.0	3.2	0.9	0.3	1.2
Emerging Countries	Growth	3.5	3.9	6.8	6.3	0.9	1.1	1.4	2.2
	Inflation	48.3	44.4	6.2	6.9	24.4	43.4	0.5	1.5
Turkey	Growth	4.7	2.9	7.2	3.5	3.4	5.4	1.7	5.7
	Inflation	52.1	74.6	19.1	8.6	24.0	15.6	16.1	1.5

Source: IMF World Economic Outlook Database and author's calculations.
Note: The inflation rates are provided as average yearly inflation rate.

Although, there was some skepticism to relate this success mainly to the inflation targeting strategy, there had been a broad consensus on its formidable

contributions until the global crisis.[7] During the pre-crisis period, while the average inflation rate stabilized at around 2 % in developed countries, it declined to around 6 % from very high double digit levels in emerging countries. In addition, while the average growth rate of the developed countries were around 2.5 %, the average growth rate of the emerging countries reached up to 6.8 %. It should also be highlighted that the volatility of the inflation declined to negligible level in 2000s.

In accordance with the changes in the central banks' objectives and strategies, and development of the financial markets, the policy tools were also changed. In Bretton Woods era, in addition to the direct policy tools such as interest rate and credit growth ceilings, while the required reserves and discount window facility rates were the main policy tools of the central banks, the open market operations had secondary roles. But, as the liberalization and deregulation efforts accelerated the development of the financial markets, after 1970s, while the direct policy tools were completely removed from the policy tool set gradually until the end of 1980s, the market friendly indirect policy tools emerged as the main policy instruments.[8] The open market operations were started to be used as the main monetary policy tools, and the discount window facility and required reserves remained as supportive instruments. In this period, money market rates became the main indicator of the monetary conditions and monetary policy stance. Since 1980s, instead of the monetary aggregates, central banks have started to use only the short term money market rates as an operational target.[9] While the required reserves and discount window facility were remained as supportive policy tools, their roles in the monetary policy were reduced significantly. Since the required reserve system was seen; (i) as an indirect tax on banking system, and (ii) as an impediment on banking system development, the required reserve ratios were reduced to the negligible levels especially in the developed countries in 1980s and 1990s. Besides, the functions of the discount window facility were changed, and instead of providing

[7] Ball and Sheridan (2005) find that not the inflation targeting, but also some other factors reduced the inflation rate, by comparing a subgroup of OECD inflation targeting countries and other OECD countries. Lin and Ye (2007) and Angeriz and Arestis (2008) also reach similar findings.

[8] See Kneeshaw and Bergh (1989) for details on the evolution of policy tools in developed countries.

[9] See Bindseil (2004) for the history of operational targets in central banking.

conventional liquidity to the banking system or real sector, this facility was started to be used as a sub-item of the open market operations to function as standing facilities. In this new framework, central banks generally started to set upper and lower quotations around the policy rate to reduce the volatility of the short term interest rates through these standing facilities.[10] These facilities were started to be used as the tools of the lender or borrower of the last resort. Thus, since 1990s, while the short term interest rates emerged as a single operating target after the abandonment of the monetary targeting, the open market operations became almost the only monetary policy tool of the central banks.[11]

Until the global crisis, the main feature of the monetary policy was "single goal, single tool" operating framework under the flexible exchange rate regime. This feature was also consistent with the consensus view that the central banks can best contribute to the financial stability and growth through providing the price stability. As a result of this generally accepted view, it was assumed that, the financial stability could be contained through the micro prudential regulations, effective supervision and free market discipline. Therefore, the separation of the financial and price stability responsibilities was assumed to reduce the conflict of the objectives and to improve the capacity of the central banks on achieving price stability. For this purpose, the micro prudential tools were delegated to newly organized (regulations and supervision) agencies in some countries, as in Turkey. It was believed that; (i) the micro prudential tools such as capital adequacy and liquidity ratios, and effective on-site/off-site supervision could contain the order in the financial system, and (ii) the central banks could effectively focus mainly on price stability through the short term interest rates.

Although it was widely thought that, a broad consensus on central banking and monetary theory was achieved through the flexible inflation targeting strategy[12]

[10] This system is now called "corridor system".

[11] While the strict inflation targeting strategy accept the price stability as the sole goal, flexible inflation targeting strategy also include output stability in objective function, though its relative weight is lower. In this study, while "single goal" is defined to include price and output stability objectives, "single tool" refers to the short term policy rate.

[12] This period is called the "great moderation" in literature. See Goodfriend (2007) for how the neo-classical and new-Keynesian views converged to each other.

and the success of the price stability oriented inflation targeting framework was generally appraised, as the financial imbalances built up in a low inflation environment, the effectiveness of the "single goal, single tool" framework had also been questioned.[13] Some economists highlighted the inefficiencies of this framework on the financial stability side and the need for the macro prudential tools to support the monetary policy. They argued that the monetary policy should "lean against the wind" to reduce the growing imbalances, even though there was no inflationary pressure. But, as the practical difficulties of this strategy were taken into account and "clean after the burst" approach was assumed to be more efficient, these arguments could not get enough support. The supplementary macro prudential policy tools were adopted by only a small number of emerging countries. However, the impact of the "burst" has been devastating especially for the developed countries. While the average inflation rate remained at around 2 %, the average growth rate declined down to 0.8 % during 2007 – 2011 in these countries.

On the other hand, the other characteristics of 1990s and 2000s have been globalization and integration of the financial markets and huge capital inflows to the emerging countries. These trends, especially in emerging countries, have reduced the effectiveness of the domestic policy rates on the domestic economic activity under the "single goal, single tool" operating framework. Therefore, these countries have become more dependent on the international spill-over effects through the expectations, financial and trade channels. Moreover, the liquidity provided by the developed country central banks during and after the global crisis started to threaten the macro economic balances in emerging countries.

The cost of the global crisis together with the increase in macro economic imbalances has caused significant changes in the monetary policy operating frameworks especially in emerging countries. Firstly, central banks have started to concentrate more on the financial stability. Thus, in recent years, instead of the "single goal, single tool" framework, the "multiple goals, multiple tools" framework has started to be a new focus of the central banking within the flexible inflation

[13] Borio and Shim (2007) were among the leading economists who cited the inefficiency of "single goal, single tool" inflation targeting framework to avoid financial imbalances prior to global crisis.

targeting strategy.[14] The international institutions and G-20 countries have started to search for a new operational framework for the macro prudential policy.[15] Secondly, the central banks of the emerging countries have become more active in the foreign exchange markets, although an important suggestion of the proponents of the inflation targeting was the floating exchange rate regime. Thirdly, central banks have started to use old fashioned direct or indirect policy tools to shield the domestic economy from the external liquidity shocks. Fourthly, the coordinated use of the monetary, prudential, and fiscal tools has emerged.

The evolution of the central banking in Turkey has followed a similar pattern with a time lag.[16] Despite the necessary market reforms for a market based monetary policy operating framework were completed in late 1980s and early 1990s, the fragility of the financial system and heavy recourse of the Treasury to the CBRT credits had prevented the CBRT to conduct a price stability oriented monetary policy. Therefore, up to the end of 1990s, the CBRT had multiple and conflicting goals as a result of fiscal and financial stability problems. This period ended with a severe currency and banking crisis in 2001. After 2001, while the fiscal discipline and financial stability have been restored through the intensive reforms, the CBRT focused on the price stability through the inflation targeting strategy within the "single goal, single tool" operating framework.[17] Under the inflation targeting strategy, while the average growth rate exceeded the average growth rate of the previous decade, the average inflation rate converged to the average inflation rate of the emerging countries after following a sharp decline.

The main challenge that the CBRT has faced with during the inflation targeting period has been the capital flows. In addition to the favorable global liquidity conditions, as a result of the prudent and consistent fiscal and monetary policies and structural reforms, there have been huge capital inflows to Turkey. Although huge foreign capital inflows supported the economic growth and

[14] See for example Rethinking Central Banking, Committee on International Economic Policy and Reform (2011).

[15] See Lim et al. (2011), FSB-IMF-BIS Progress Report (2011)

[16] A brief history of the central banking in Turkey can be found in Önder (2005).

[17] Although the CBRT claimed to operate in a "single goal, single tool" framework, the CBRT also intervened in foreign exchange markets. That's why we use "more or less". See Chapter 3.

disinflation process, Turkey built up some economic imbalances such as huge current account deficit. The economic activity became more dependent on the capital flows which increased the volatility of the output. The increase in the financial integration with the global markets and heavy capital inflows to Turkey reduced the effectiveness of the monetary policy. By taking these vulnerabilities and inflexibility of the "single goal, single tool" operating framework into account, since the second half of 2010, the CBRT has resorted to the active use of the unconventional policy tools such as required reserves and standing facility rates to increase the flexibility of the monetary policy. In this respect, the CBRT is one of the leading central banks which use the supplementary policy tools actively. Within this framework, the CBRT adopted a hybrid inflation targeting strategy through concentrating more on the multiple and possibly conflicting goals such as financial stability, current account, exchange rate stability, in addition to the conventional goals of the inflation targeting strategy.

The ultimate objective of the economic policies is to achieve high and sustainable growth rates. The history suggests that in addition to the price stability, financial stability is another pre-condition of this objective. In fact, financial stability is also a pre-condition for an effective monetary policy. Within this perspective, although price stability should continue to be the overriding goal of the monetary policy, including macroeconomic stability in the objective function within the flexible inflation targeting strategy likely improves the social welfare. In fact, as Woodford (2011) points out that, this strategy may not conflict with the flexible inflation targeting strategy when the time span of the monetary policy is relaxed.

However, history also suggests that; multiple and possibly conflicting objectives can reduce the effectiveness and credibility of the monetary policy. Within this context, the credibility and consistency of a new monetary policy framework will continue to be the key elements of success. As the credibility is just gained as a result of the repeated successes, central banks will likely to face with a challenging environment with the use of the new policy tools consistent with the additional and possibly conflicting objectives. Therefore, central banks have to explain the new operational framework and communicate effectively. The effective communication requires, however, a consistent analytical framework to explain; (i)

why and when some supplementary and macro prudential tools are used, and (ii) how these tools affect the equilibrium conditions of the economy and social welfare.

Within this framework, the aims of this study are (i) to summarize the fundamentals of the monetary policy operational framework, (ii) to underline the main reasons of the inefficiency of the conventional inflation targeting strategy in the case of Turkey, and (iii) to explore the possibility of a more efficient monetary policy operating framework which also considers price and financial stability. With this study, we aim to contribute to the literature through (i) providing evidence on the effectiveness of the required reserve system on the loan market using time series analysis by using 2003 – 2011 period data, and (ii) presenting the efficiency and effectiveness of the macro prudential and capital control tools in a hybrid inflation targeting strategy. The results of the first part also analysis the behaviors and main determinants of the domestic and foreign currency deposit markets.

The effectiveness and efficiency of the policy tools depend on their contribution to the objectives of the central banks. Within this context, new-Keynesian Dynamic Stochastic General Equilibrium (DSGE) models are powerful tools to examine the welfare contributions of the alternative operating frameworks. These models also provide a coherent framework for the transmission mechanism analysis. Since the main problem of Turkey has been capital flows, the main aim of the supplementary policy tools has been to differentiate the interest rates for the foreign investors and residents in Turkish case. It is obvious that, if the supplementary monetary policy and macro prudential tools can be used counter-cyclically and consistently in line with the Tinbergen principle, then it is possible to smooth out the targeted variables under the "multiple goals, multiple tools" operating framework. In the second part, we specifically focus on the contributions of the macro prudential tools and capital controls to the loss function when the stabilities of the loans and external balance are included in the objective function by using a New-Keynesian DSGE model. Although we use calibrated parameters, they represent the main features of the Turkish economy.

The plan of this study is as follows. We highlight the basics of an efficient and effective monetary policy operating framework in modern central banking in the second chapter. The first pre-condition of an efficient and effective monetary policy

operating framework is a well understanding of the transmission mechanism. The transmission mechanism and frictions in the economy is simply determined by the regulations, financial and economic structures of a country. And, the key features of the operational procedures and policy tools are selected consistent with the transmission mechanism and objectives of the monetary policy. We note above that, the operating target of the central banks is the short term policy interest rate in the inflation targeting regime. In fact, the key variable in the transmission mechanism is the longer term interest rate which represents the overall financial conditions. Though the short term interest rates is the single operating target of the monetary policy in modern central banking, the actual monetary policy stance and overall financial conditions can be affected through the other policy tools and operational procedures. The central banks can also change the overall financial conditions through manipulating the liquidity conditions and liquidity risk perception in the markets. On the other hand, the exchange rate is another significant variable in the transmission mechanism in small open economies. The central banks of these countries often resort to intervene in the foreign exchange markets, although they declare floating exchange rate regime. Therefore, the exchange rate policy is an integral part of the overall monetary policy strategy in these countries. In addition, the macro prudential tools are also effective tools to target the loan markets through limiting the lending capacity of the banking system. These tools can effectively change the spread between the loan and policy rates. In this sense, countercyclical macro prudential regulations can help the monetary policy to reduce the output and price fluctuations.

Therefore, the authorities of a country have a very rich policy tool set in addition to the short term policy rate. However, there are also some basic principles in conducting policy tools. While the most important one is the transparency, the second one is a coherent coordination among the policy tools and among the related institutions when the tools are used together. Within this context, in the second chapter, we provide the required framework for the following chapters. We firstly discuss the transmission mechanism and its determinants briefly. Then, we provide basic information and best practices on the operational side of the monetary and foreign exchange policy. In this part, we highlight how the central banks can change

the overall financial conditions through the operational procedures and liquidity management strategies without changing the policy rate. On the foreign exchange policy side, we discuss why the central banks of the emerging countries often resort to intervene and the effectiveness of the interventions. In the last part of this chapter, we highlight why the macro prudential tools are necessary to support the interest rate tool. We also provide a general overview on the required institutional infrastructure for an effective coordination of the monetary policy and macro prudential tools, and underline the reasons for why the central banks should have a leading role in decision making process.

The efficiency of a monetary policy operating framework depends on the financial structure, potential economic imbalances and frictions in an economy. And every country has country specific characteristics. Therefore, in order to asses the efficiency of the existing or alternative monetary policy operating frameworks, the underlying economic and financial structures, the sources of the economic imbalances, and the evolution of the monetary policy operating framework should be re-visited. We evaluate the economic performance and monetary policy operating framework of Turkey in chapter three. We firstly provide an overview how the monetary policy operating framework evolved in Turkey to list the lessons of 1990s under the "multiple goals, multiple tools" operating framework. Then, we specifically highlight that, although the CBRT established very effective and efficient monetary policy and foreign exchange rate operational frameworks consistent with the flexible inflation targeting within the "single goal, single tool" operating framework during the implicit inflation targeting strategy in the first half of 2000s, this operating framework could not be successful to deal with the side effects of the capital flows thereafter. The main features of the financial system and the structure of the credit markets are the key factors that determine the effectiveness of the alternative policy tools and efficiency of the monetary policy operating framework. In the last part of this chapter, we provide detailed information on the main features of the Turkish financial system and loan markets and on the role of the foreign capital to evaluate the applicability of the supplementary policy tools.

In market based economies, the effectiveness of the policy tools is determined by the degree and speed of the pass through of the policy decisions to the

market rates. The fourth chapter is devoted to investigate the effectiveness of the supportive alternative policy tools. In this chapter, we list the main determinants of the loan and deposit rates with a theoretical set up. We specifically show that, the authorities can affect the equilibrium conditions in the loan markets through the required reserves, capital and liquidity ratios systems. Then, we investigate the long and short run relationship between the policy and loan/deposit rates, and specifically the impacts of the liquidity conditions and the country risk premium on these rates in Turkey by using Johansen vector error correction methodology. We specifically show that, the CBRT can change the monetary policy stance by manipulating the liquidity conditions through the required reserves without changing the policy rate.

In the fifth chapter, we explain the welfare implications of the supportive policy tools through a calibrated New-Keynesian DSGE model which is consistent with the economic and financial structure of Turkey. The model includes financial accelerator mechanism, partial dollarization and a simple banking system in addition to the standard DSGE model equations. In this chapter, we assume that, the central bank also aims to reduce the volatilities of the loans and trade balance for the financial stability purposes in addition to the volatilities of the inflation and output, and has three policy tools: (i) policy rate which is the main policy tool, (ii) a generic macro prudential tool, and (iii) a generic capital control tool. We investigate that, if the loss function of the central bank which consists of volatilities of inflation, output, loan and trade balance is reduced significantly, when these tools are used altogether under the "multiple goals, multiple tools" operating framework. In the last chapter, we conclude the study.

CHAPTER 2

TRANSMISSION MECHANISM, MONETARY POLICY OPERATING FRAMEWORK AND MACRO PRUDENTIAL TOOLS

Since the central banks decide on the policy tools by considering their objective function, transmission mechanism and frictions in the economy, an efficient monetary policy operating framework requires a well understanding of the transmission mechanism and frictions in the economy. In this context, DSGE models provide a comprehensive analytical framework about how the monetary and macro-prudential tools affect the key economic variables. However, in this chapter, rather than defining the detailed equations explicitly, we provide a brief overview on the transmission mechanism. Since, the methods of using each tool may result in different implications for the monetary policy stance, and the exchange rate policy is an integral part of the monetary policy even in the inflation targeting framework especially in emerging countries; we also summarize the basics and best practices of the monetary policy operating framework. Then, we discuss why the macro prudential tools are necessary especially for the emerging countries.

2.1. Transmission Mechanism and Monetary Policy

The transmission mechanism refers to the channels through which the monetary policy actions affect the real economy and prices. Although it is widely accepted that, there is no long term trade-off between inflation and output, there is a general consensus on the effectiveness of the monetary policy in the short term. But, in literature, there is no single explanation of the transmission mechanism of the monetary policy. The central bank policy decisions affect the economy through complex channels. In transmission mechanism analysis, some variants of the Figure 2.1 are widely used for illustrative purposes.

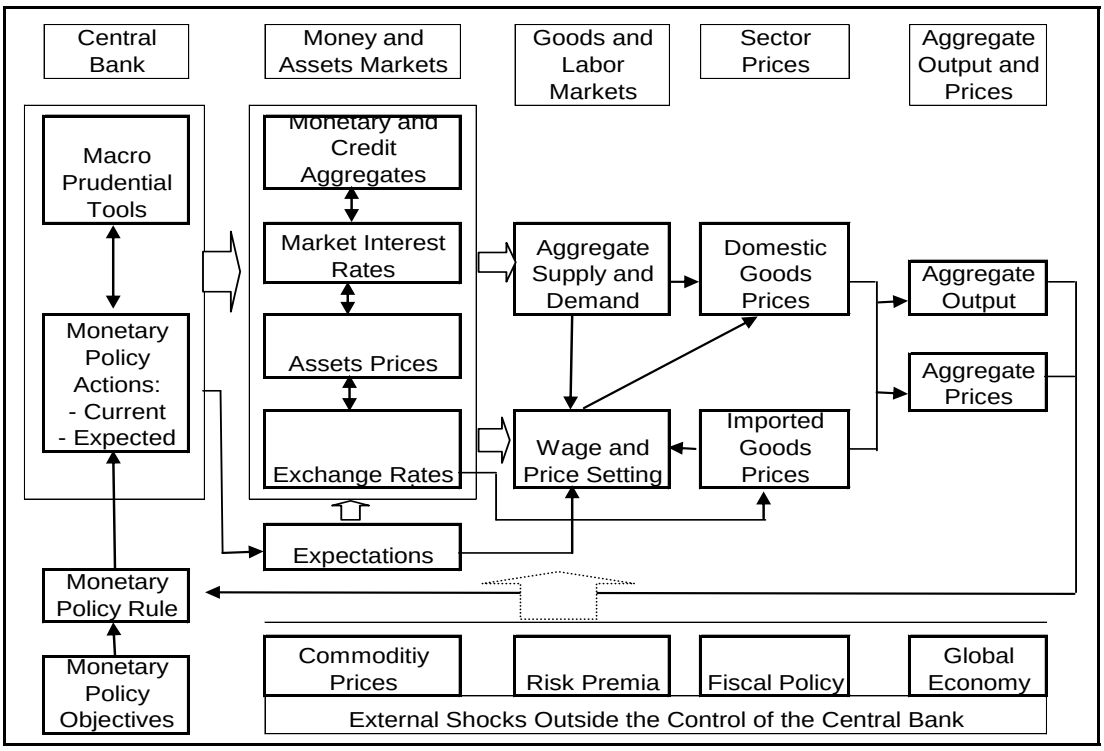

Figure 2.1: Monetary Policy Transmission Mechanism
Source: Loayza and Schmidt-Hebbel (2002) (We modified their figure).

In conducting monetary policy, central banks decide on the policy tools by considering their objective functions, and timing and effects of their tools on the economy through the transmission channels. Thus, a good understanding of the transmission mechanism of the policy tools is a pre-condition for an effective and efficient monetary policy. In a simple presentation, in the first stage of the transmission mechanism, the monetary policy decisions (and the macro prudential tools when used) affect the foreign exchange, bond, deposit and lending rates, and expectations. In the second stage, the changes in these rates affect the goods and labor markets through the aggregate demand and expectations. In the third stage, aggregate demand affects the demand and prices of the domestically produced goods. And in the final stage, the total production and inflation rate is determined. In addition, the external variables which are outside the control of the central banks such as commodity prices, risk premium and foreign interest rates, fiscal policy, global demand are also important determinants of the inflation and output.

2.1.1. Transmission Channels

In monetary economics literature, there are two views on the transmission mechanism channels: (i) the neo-classical money channels, (ii) the credit channels.[18] In addition to these frequently cited channels, in recent years the risk taking channel is also highlighted. In all these channels, in fact, the longer term real interest rate is the main determinant in the decision making process of the economic units. The central bank policy decisions can change the real interest rate because of the frictions in the labor and goods markets stemming from the nominal rigidities in the wage and price settings. The followings are the main money channels: (i) interest rate channel, (ii) assets price and real wealth channel, and (iii) exchange rate channel.

The money view which dominated the central banking operational framework up to the global crisis mainly relies on complete markets (well functioning, deep, and competitive) assumption. As will be discussed shortly, this assumption simply imply that the longer term interest rates is a risk adjusted weighted average of current and expected future short term interest rates. Therefore, central banks can determine the longer term interest rates through the short term policy rate. The interest rate channel is the main money channel. In this channel, monetary policy works through its cost of capital impact on the investment of the firms and on the purchases of durable goods and housing of the households. The real interest rate also affects consumption through the substitution effect. For example, when central bank raises the policy rate, the increase in cost of the capital causes a decline in the demand for the investment goods. In addition, an increase in the real interest rate reduces the consumption as the households substitute future consumption for the current one through increasing their savings. And, the decline in demand leads to a decline in aggregate output and inflation.

The assets price channel relies on the effects of asset prices on investments through Tobin "q", and on the effects of real wealth on consumption. Tobin "q" is simply defined as the market value of the firms divided by the replacement cost of

[18] See Loayza and Schmidt-Hebbel (2002), Mishkin (1995), and Boivin, Kiley and Mishkin (2010) for a more detailed summary on the transmission channels. In addition, the channels of transmission mechanism are briefly documented by Bank of England, and European Central Bank (2000) for the purpose of increasing communication with the markets and the public. See Chapter 5 for the detailed DSGE equations of the transmission mechanism.

capital. If “q” increases, the market value of the firms becomes more expensive relative to the replacement cost of capital. Therefore, as new investment becomes cheaper relative to the market value of the firms, firms prefer to increase investment through issuing equities. Within this context, when central bank tightens the monetary conditions, the price of equities and the demand for investments decline. Thus, the decline in investment demand causes a decline in the aggregate demand and inflation. On the other hand, real wealth effect works through the impact of the changes in the real wealth on the consumption. When central bank tightens the monetary policy, the decline in the real wealth of the households as a result of the decline in the equity, house and bond prices reduces the demand for the consumption goods. Therefore, the aggregate demand and inflation decline.

The exchange rate channel is another critical transmission channel especially in emerging countries. The exchange rate channel works through affecting both the demand and supply sides. On demand side, tightening the monetary conditions causes an appreciation of the domestic currency through the uncovered interest rate parity condition. This in turn reduces the foreign goods’ prices in terms of domestic currency, and the resulting expenditure shift to the imported goods leads to a fall in the demand for the domestically produced goods which reduces inflation through the demand side. On the supply side, the decline in the prices due to the domestic currency appreciation reduces inflation directly. In addition, the appreciation of the domestic currency decreases the foreign demand for the domestically produced goods. The exchange rate is also important for the expectations in emerging countries. In addition, the exchange rates may have significant impacts on the balance sheets of the households and firms. Especially in emerging countries, while firms have significant net FX debt to the banking sector and non-residents, households may have FX assets as a result of the dollarization. Therefore, considering its wide range of impacts, especially central banks of the emerging countries always keep an eye on the foreign exchange markets even in the floating exchange rate regime.

However, the proponents of the credit view argue that, the impact of the short term interest rates on the longer term interest rates is likely to be limited because of the market imperfections. In fact, Woodford (2011.a) points out the

significant roles of the financial intermediation and frictions in financial markets that became more apparent during and after the global crisis. He notes that, since not the policy rate but the actual longer term credit market rate is more critical for the economic activity, the significant spread between the policy and loan rates stemming from the financial conditions and imperfections may reduce the role of the policy rate in the transmission mechanism.

The credit view focus on the frictions arising from the information asymmetries between the financial institutions (banks) and borrowers (consumers and firms). In credit channel, when central bank tightens the monetary conditions through increasing the short term policy rate or by other tools, the net worth of the firms declines. Since the decline in the net worth may encourage firms for more risky investments, in order to avoid the adverse selection problem, banks tighten the credit conditions through increasing external finance premium which is charged over the risk free rate.[19] Thus, the increase in the loan rates as a result of an increase in risk premium reduces investment which causes a decline in the aggregate demand and inflation. Note that, (i) the financial accelerator mechanism amplifies the business cycles as it works pro-cyclically, and (ii) the exchange rate which also works pro-cyclically in emerging countries and has significant effects on the financial accelerator mechanism through the firms' balance sheets in case of dollarization.

In addition to the money and credit channels, the risk taking channel which is stemming from the effects of low interest rates environment, easy liquidity conditions and central bank reaction function on the risk aversion is also frequently cited in recent years.[20] Proponents of this view argue that, these factors causes excessive risk taking. Altunbaş et al. (2009) cite the two ways of this channel: (i) through the impact of these factors on valuation of the assets, (ii) through a more aggressive search for yields. They also argue that, these factors can cause a moral hazard problem as the agents perceive that monetary policy will be relaxed in case

[19] See Bernanke and Gertler (1995) and Smant (2002) for a general review of the credit channel. See Bernanke, Gilchrist and Gertler (1999) for the financial accelerator mechanism.

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[20] See Borio and Zhu (2008), Adrian and Shin (2009), and Altunbaş, Gambacorta and Marques-Ibanez (2009) for risk taking channel.

of an economic downturn. This phenomenon is also called “Greenspan Put” in the literature. According to this view, the risk taking channel aggravates the economic cycles. Gambacorta (2009) supports the significance of the risk taking channel by analyzing around 600 US and European banks’ balance sheets. He finds that, low interest rates over an extended period cause an increase in banks’ risk taking.

The last but not the least transmission channel is the expectation channel. This channel works mainly through the expectations of the economic agents about the future stance of the monetary policy and other financial conditions, and amplifies the effectiveness of other channels. According to this view, since most of the variables are determined in a forward looking way, not only the current stance of the monetary policy, but also the central banks’ signals may have significant effects on the interest rates and other variables. In effect, the signals of the central banks are as effective as the actual moves due to the significance of the expectation channel.

2.1.2. Determinants of the Transmission Mechanism

The transmission channels may work differently depending on the prevailing economic conditions and institutional and economic features of the individual countries. Boivin et al. (2010) notes that, the significance of the individual channels depends on the factors such as; (i) financial structure, (ii) regulations, (iii) degree of openness, and (iv) monetary policy strategy. Within this context, the main features of the economy and financial system also determine the choice of the policy tool set and the effectiveness of the monetary policy. When the financial system is well developed, diversified and competitive, the monetary policy decisions can affect all market rates and other financial prices more quickly and significantly. Similarly, as the developed markets reduce the financial constraints of the firms and households, the consumption and investment decisions become more responsive to the changes in the market rates and prices. In addition, although the expectation channel is very critical in transmission mechanism, as noted by BIS Papers No 35 (2008), the effectiveness of the monetary policy on the expectations depends on; (i) the credibility of the central bank, (ii) the degree of predictability of the monetary policy which depends on transparency and communication, and (iii) the commitment of the central banks. Therefore, the effectiveness of the monetary policy through the

expectation channel increases with the credibility, transparency and commitment of the central banks.

The money view assumes a frictionless financial system in which there are alternative investment and debt instrument for the banking system, firms, and households. Therefore, the private sector bonds and deposits for the households, the loans and private sector bonds for the firms, and the bank bills and deposits for the banking system are assumed to be close substitutes. According to the money view, the central bank policy stance can affect all relevant interest rates in the market through arbitrage. Therefore, the impacts of the banking system on the financial markets, saving and borrowing decisions, thereby on the economic activity are not significant. Since the introduction of the alternative policy tools such as required reserves, capital adequacy ratios, and liquidity ratios shift the financial activity to the unregulated instruments, the complete markets reduces the effectiveness of these measures. However, when the financial system is dominated by the banks, because of the market power of the banking system and lack of other alternative financial instruments for saving and borrowing, the pass through of the changes in monetary policy stance to the loan and deposit rates is likely to be slow and incomplete. In a broader perspective, when there are frictions in the markets, the changes in the central bank monetary policy stance may not be transmitted to all sectors of the financial system in a similar way.

In addition to the structure and development level of the financial markets, the other critical factor in transmission mechanism is the balance sheets of the economic agents. When the debt stocks of the agents increases, any change in the monetary policy stance generates significant cash flow effects. The other important factor in the transmission mechanism is the openness of the economy and its integration with the global markets. As the openness deepens, the role of the exchange rate in the transmission mechanism becomes more significant. Similarly, as the integration with the global markets increases, it is likely that the role of the domestic monetary policy interest rate on the domestic credit conditions and economic activity declines in small economies. The FX assets and liabilities of the residents are also important factors for the transmission mechanism. Therefore, in conducting monetary and foreign exchange policies and selecting the policy tool set,

central banks have to consider the asset and liability structures of the residents, the role of the foreign capital in the domestic markets, and the impacts of the policy tools on the exchange rate.

In addition to the transmission channel, the objective function of a central bank is another factor which determines the monetary policy operating framework. If central banks have a single objective (which is the price and output stability) consistent with the conventional flexible inflation targeting and there are well functioning markets, then within the "single goal, single tool" framework, the short term interest rate can be used as a single operating target. But, when central banks include more variables such as external balance, asset prices, financial stability and/or exchange rate stability, then they should widen the policy tool set within a "multiple goals, multiple tools" framework in line with the Tinbergen rule. Therefore, in designing an efficient and consistent monetary policy operational framework, the following items should be considered: (i) the objectives of the central bank, (ii) the structure of the financial system, (iii) the structure of the balance sheets of economic agents, (iv) the impacts of each policy tools on the money, foreign exchange, credit, deposit and securities market rates, (v) the coordination of the policy tools, and (vi) the coordination with other relevant institutions.

2.2. Monetary Policy Operating Framework

The second pre-condition for an effective monetary policy is an efficient operating framework consistent with the monetary policy strategy and transmission mechanism. The general framework of a monetary policy may be divided into two parts: (i) strategic part, and (ii) operational part (Figure 2.2).[21] In conducting monetary policy, firstly, the monetary strategy which includes the main goals and intermediate targets (if any) is decided. Since central banks focus on only inflation in the strict inflation targeting strategy and on inflation and output in the flexible inflation targeting strategy, and use the operating targets just to reach these targets directly, the intermediate targets become only indicators for the monetary policy. Then, central banks decide on the operational framework which includes operating

[21] See Ho (2008). We calibrate her figure.

targets and policy tools. In this sense, the operational framework of a monetary policy refers to the tools and procedures of the monetary policy. The operational procedures and policy tools are selected consistent with the objectives of the monetary policy and transmission mechanism. If other macro prudential tools are also used, then central banks need to coordinate the use of these tools to increase the effectiveness of the monetary policy.

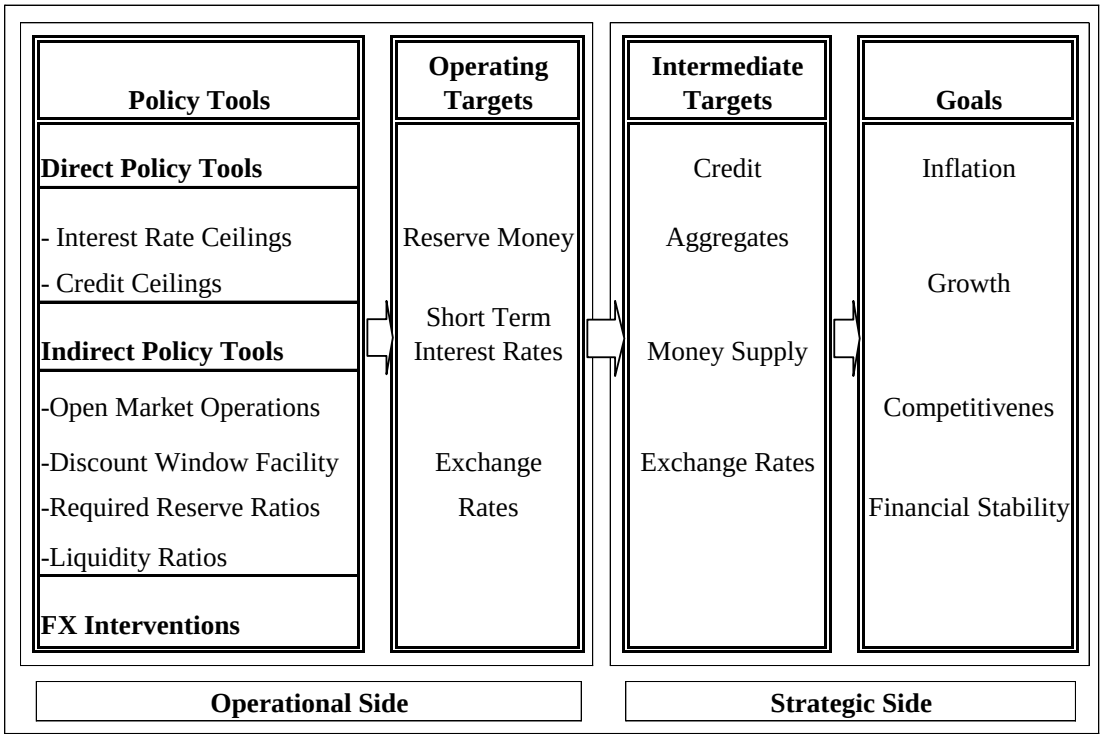

Figure 2.2: General Framework of Monetary Policy

As the critical role of the expectations in the transmission mechanism is taken into account, for an effective monetary policy, the central bank actions should give clear signals to the market about their intentions. Therefore, the operational framework should be transparent and well understood by the markets and public. In order to enable the markets and public to interpret the actions of the central banks correctly, in modern central banking, the efficient operational framework requires clear definitions of the; (i) operating targets, and (ii) monetary policy instruments.

2.2.1. Operating Targets

There are three candidate variables which can not be selected together as the operating target in market based open economies: (i) interest rates (price of liquidity), or (ii) aggregate liquidity conditions (quantity of liquidity), or (iii) exchange rate. The active monetary policy through the interest rates or liquidity conditions requires floating exchange rate regime. Thus, as the threats of selecting exchange rate as an operating (and intermediate) target in 1990s and early 2000s were experienced, it is not used anymore by most of the central banks.[22] Since the inefficiencies of the liquidity conditions or reserve positions, since 1980s, the short term interest rate is used as an operating target in modern central banking.[23]

Blanchard et al. (2010) list the underlying reasons of selecting the short term interest rate in modern central banking as an operating target as: (i) monetary policy affects economy mainly through the interest rates and asset prices, (ii) asset prices and interest rates are linked through arbitrage implying that; long term rates are simply the weighted average of the risk adjusted future short term rates, and the current value of the assets are simply the present value of the risk adjusted future values, (iii) markets are efficient implying that financial intermediation is not matter, and therefore, (iv) targeting only the short term interest rates is enough as the short term interest can affect both the asset prices and longer term interest rates, and targeting the short and longer term interest rates together is either redundant or inconsistent. In fact, Blanchard et al. (2010) simply highlights that, conventional inflation targeting strategy mainly relies on the assumptions of the money view.

Borio and Disyatat (2009) highlight two basic elements of the monetary policy implementation as: (i) mechanisms to signal the desired policy stance (signaling), and (ii) operations that involve the use of the central bank balance sheet to make the monetary policy stance effective (liquidity management). In modern (conventional) central banking, since the monetary policy stance is signaled through the policy rate, then, the liquidity management side becomes purely technical

[22] See Goldstein (2002).

[23] Bindseil (2004) analyzes the rise and fall of the reserves as an operating target. Bindseil states that, although the reserve money or similar reserve position targeting has been a significant focus in academics, historically the central banks mostly used the short term interest rate as the operating target explicitly or implicitly.

operations to reach the policy rate as long as central banks use the short term interest rates as a single instrument. However, if the supplementary (unconventional) policy tools are also used, then the stance and signals of the monetary policy may significantly deviate from what the policy rate implies.

In fact, the transparency is a *sine qua non* in modern central banking and in inflation targeting framework. Thus, for the efficiency and effectiveness, as a general rule, the target rate is (and should be) announced explicitly to enhance the signaling function. In line with this general rule, the volatility of the short term rate in the secondary markets is (and should be) reduced through the standing facilities to prevent confusion about the intentions. Otherwise, the expectations management efficiency of the monetary policy diminishes. When the complementary policy tools are also used, the communication of the monetary policy becomes more complicated.

2.2.2. Monetary Policy Tools and Their Functions

The implementation of the monetary policy involves the use of the direct regulatory administrative measures and indirect instruments to influence the equilibrium interest rates in the money markets. The central banks have a wide range of policy tools which are directly under their discretion. In addition to these direct and indirect policy tools, there are also other policy tools possibly under the control of other institutions which can affect the equilibrium interest rates and transmission mechanism significantly.

The direct instruments include measures that set limits on the interest rates and credits through the interest rate and quantity ceilings. The indirect instruments include required reserves, discount window facility and open market operations which affect the interest rates through changing the price of the liquidity. Since the direct policy tools are not consistent with the market based economy and modern central banking[24], they are usually excluded in the analysis of the monetary policy tool kit.[25] But in recent years, some types of direct policy tools are also used in macro prudential policy framework as will be discussed shortly.

[24] These instruments intervene and diminish the functioning of free market economy.

Even though the short term interest rate is selected as the main operating target, the actual monetary policy stance is also affected through the other policy tools and operational procedures. In this context, the monetary policy tools may be divided into two sub-groups as the conventional and unconventional monetary policy tools. The other policy tools which are possibly under the control of other institutions are discussed in the next section.

Conventional Monetary Policy Tools

From 1980s to the recent global crisis, standard open market operations are generally accepted as the main instrument of the monetary policy. Open market operations include: (i) repo and reverse repo, or deposit transactions, (ii) central bank bills, (iii) outright purchases, (iv) outright sales, (v) standing facilities which set upper and lower limits on overnight interest rates, and (vi) swap transactions. These operations are generally used just for the liquidity management purposes to achieve the policy rate targets. Therefore, under the normal conditions, these operations do not affect the overall stance of the monetary policy as long as they are just used to achieve the policy rate. In this case, the balance sheet of the central banks is determined endogenously. That is, at a given policy rate, the money demand determines the size of the reserve money and central bank's balance sheet.

As discussed in section 2.1, the economic activity is mainly determined by the longer term interest rates and overall financial conditions. And, the longer term interest rates are affected also by some risk factors and portfolio choices of economic agents, in addition to the current and signaled (expected future) policy rates. Under the conventional central banking, normally central banks do not target the yield curve, but they take it as an input during their decision making process. But the liquidity level in the market in general and overall financial conditions during the crisis may deviate the actual monetary stance from what the monetary policy rate implies. More explicitly, for example, at a given policy rate, there may be different levels of liquidity that imply different monetary tightness. In such cases, central

[25] See Alexander et al. (1996), and Buzeneca and Maino (2007) for the evolution of monetary policy tools in conducting monetary policy and diminishing role of the direct policy tools. Alexander et al. (1996) cite four reasons for abandonment of direct tools: (i) decreasing effectiveness as the economic agents found circumventing them, (ii) inefficiency in resource allocation, (iii) negative impact on regulated markets causing financial repression, and (iv) causing disintermediation.

banks may use policy tools to enhance the effectiveness of the policy rate on longer term rates. In addition, central banks may also target the longer term interest rates and financial conditions during the crisis to ease the market imperfections. For these reasons, in central banking practice, the open market operations may be divided into two groups as; (i) main operations to reach the policy target rates, and (ii) operations for structural liquidity management purposes.

Main Operations

The main operations are the liquidity management operations that aim to achieve the policy rate in inflation targeting regimes. These operations are conventional repo/reverse repo or deposits transactions with a short term standard maturity. The longer term interest rates are simply the weighted average of the risk adjusted future short term interest rates. Therefore, while central banks can control the short term interest rates, their capacity to control the longer term interest rates is relatively weaker. In addition, as the maturity of the operating target increases, while the flexibility of the liquidity management weakens, volatility of the short term interest rates increases. Consequently, central banks prefer to select "very" short term interest rates as an operating target, rather than the longer term rates.

In fact, there is no best practice or consensus on the maturity of the operating target. Gerlach-Kristen and Rudolf (2010) examine theoretically how the choice of the monetary operating procedures affects the volatilities of the inflation rate, output and market rates by taking; (i) one-month repo rate, (ii) one-month money market rate, and (iii) a three-month money market rate, in a simple calibrated DSGE model. Their results show that, while three operating procedures result in similar macroeconomic volatility under the commitment, targeting longer term market rates is more promising under the discretion. In other words, when there is uncertainty on the policy rate commitment, longer term operations reduce volatility. In practice, central banks usually select the overnight (O/N) market rate or weekly repo rate as an operating target depending on their own market conditions and customs.[26]

In order to distribute liquidity throughout the markets effectively, the liquidity is injected or withdrawn through the auctions. While some central banks

[26] See Ho (2008) for country experiences on the maturity of the policy instruments.

prefer fixed rate quantity auctions, others prefer variable rate price auctions. Since, the liquidity forecast errors of the central banks cause volatility in auction rates, central banks generally prefer fixed rate auctions. Otherwise, there are no significant advantages or disadvantages of these two methods as long as central banks can forecast the liquidity needs correctly and can maintain the secondary market and auction rates around the announced policy rate. But, it is more difficult to achieve the policy rate through the variable rate price auction method in practice during the crisis. Inherently, the variable rate auctions result in uncertainty in the markets and increases the liquidity risk.

Corridor System

The other important issue is the role and width of the corridor which is set up through the standing facilities. Even though central banks provide or withdraw the liquidity through the main instrument at a pre-announced policy rate, in order to prevent volatility in the money markets stemming from unforeseen changes in the liquidity or liquidity forecast errors made by themselves, central bank set upper and lower interest rates in O/N markets. And they stand ready to withdraw the excess liquidity or to provide the liquidity shortage as long as enough collateral is available. These facilities are called the standing facilities. The central banks act as "the lender of the last resort" or "the borrower of the last resort" through these facilities. Since the corridor system guarantees the liquidity and short term interest rate stability within the corridor, these facilities also act as a financial stability tool. Thus, O/N interest rates fluctuate around the policy rate within this corridor. Although the daily average of the interest rates may diverge from the policy rate, the average of the O/N rates gets very close to the policy rate in a required reserve maintenance period, as long as central banks do not make systematic liquidity forecast errors or do not do it intentionally.

The corridor system as a policy tool had not spotlighted academicians until recently, although it has been widely and actively used by central banks in practice. But as the liquidity in the money markets diminished and the volatility of the interest rates increased during the global crisis, the role of the corridor has started

the receive more attention in the literature.[27] During and after the global crisis, central banks have started to actively use the width of the corridor to reduce the volatility of the short term interest rates as in the U.S. case or to increase the uncertainty in short term interest rates as in Turkish case. Although there has not been a consensus on the use of the corridor system as an active monetary policy tool in the literature and among the practitioners yet, the CBRT claims to use the corridor system as an active monetary policy tool to increase the flexibility of the monetary policy.

Actually, under the normal conditions, there is no significant advantage of having a corridor system. In order to eliminate any volatility of the O/N rates it may also be suggested to set the standing facilities equal to the policy rate. In this case, central banks can lend and borrow at the policy rate and intermediate almost all money market transactions. However, in this strategy; (i) the work load of the central banks increases dramatically as all secondary market transactions shift to the central bank, (ii) all counterparty risks are undertaken by the central banks, (iii) secondary money markets disappear, and thereby (iv) counterparty risk assessment may diminish in the financial system. Therefore, central banks prefer to allow some volatility through the corridor system with a symmetric 1 or 2 percentage point width around the policy rate to promote secondary money markets.

While wider corridor increases the volatility of the O/N rate and uncertainty, narrower corridor makes O/N rates more stable but limits the development of the money markets as banks tend to avoid using interbank market to manage their liquidity. Goodhart (2009) is a leading economist who supports the corridor system as an active monetary policy tool. He suggests that treating the width of the corridor as a constant would be a waste of a good instrument. He defines the width of corridor as a measure of the cost of the central bank intermediation. In addition, Berentsen and Monnet (2006) analyze the optimal width of corridor and implication of widening the corridor instead of raising the policy rate by using a calibrated DSGE model. They conclude that, since it increases uncertainty, widening the width of the corridor can tighten the monetary conditions.

[27] See Whitesell (2006), Berentsen (2006), Berentsen, Marchesiani and Waller (2010), and Bindseil and Jablecki (2011.b) for the functions of the corridor system.

In another study, Ritz (2010), through a simple model, shows that, when the funding uncertainty increases, while the pass through from the central bank's policy rate to the market rates declines, the spread between the policy and loan rates increases. He also notes that, the deposit rate increases as the competition for the retail deposits tightens, and the banks with the wider deposit base performs better during the times of uncertainty. Although he does not directly model the corridor system, his conclusions support the use of the corridor system to reduce or increase the uncertainty in the money markets to ease or to tighten the monetary conditions respectively.

We also support that; the corridor system can also be used as a supplementary monetary policy tool (Figure 3). For example, if central banks want to increase the uncertainty in the markets to tighten the monetary conditions through increasing liquidity risk, they can increase the width of the corridor, otherwise decrease it. Similarly, to signal a change in the monetary policy stance, central banks can also make the corridor asymmetric around the policy rate.[28] In this respect, while an upward asymmetry implies tightening bias, a downward asymmetry implies easing bias. In addition, an upward asymmetry signals that borrowing from the central bank is more costly (risky) than lending to the central bank at the standing facility rate at the end of the day. In a downward asymmetry case, lending to the central bank becomes more costly relative to the borrowing from the central bank.

In practice, under the normal market conditions, although it changes the relative risks to some extent, the width of the corridor should not significantly affect the banks' behaviors and short or long term interest rates as long as the central bank continues to commit the stability of the short term interest rates around the announced policy rate in a required reserve maintenance period which is the rule of the game in the inflation targeting framework. The banking system can easily reduce the volatility of the short term interest rates by using the averaging property of the required reserve system. The changes in the corridor width may only affect market rates significantly when the market players perceive the change in the corridor width as a change of the monetary policy stance which will end up with a policy rate change in a short time. For this reason, central bank should also relax her

[28] See Quiros and Mendizabal (2009) for more discussion on how the asymmetric nature of the corridor can be used as a powerful policy tool.

commitment for stable short term interest rates and should make systematic liquidity surprises (liquidity squeeze or excess liquidity) to increase the effectiveness of the asymmetric or widened corridor. In this case, not a downward asymmetry, but an upward asymmetry extremely affects the market rates.[29]

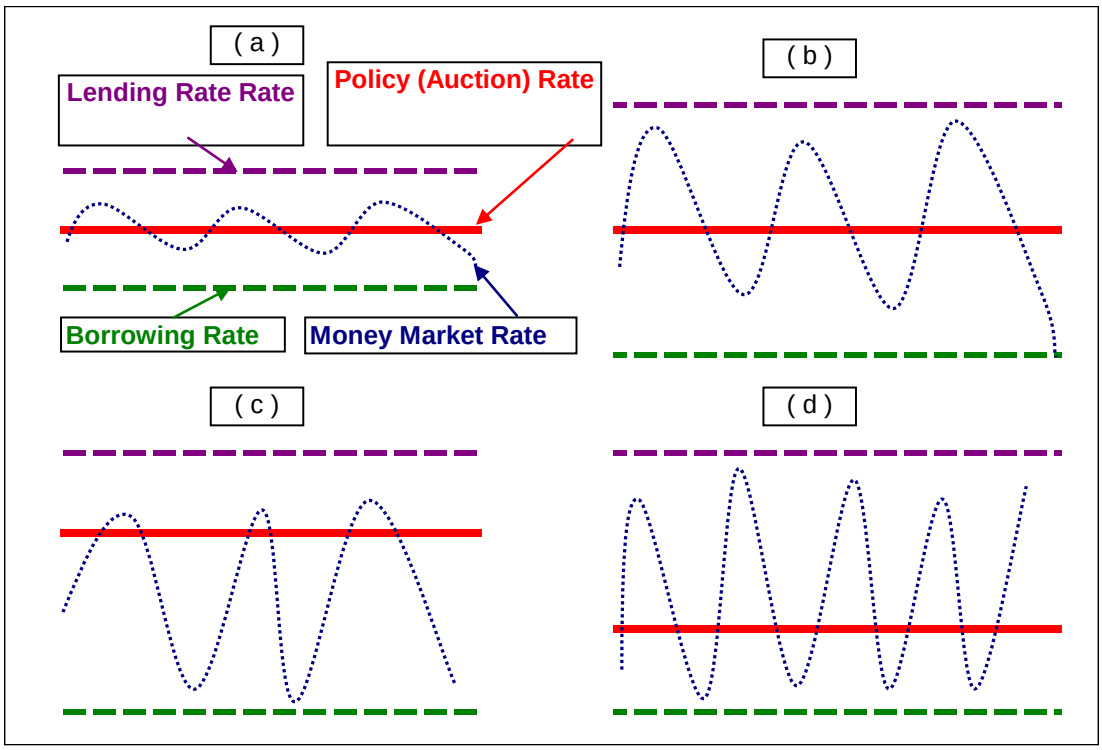

Figure 2.3: Effects of Different Types of Corridor on O/N Interest Rates.

The implications of the asymmetries can be discussed through the following example. Let the central bank policy rate is 5 % and central bank provides liquidity through the weekly repo transactions in a downward asymmetry case. If central bank tries to provide more liquidity than the market's need through the weekly repo auctions, the banking system realizes that the short term interest rates will decline below 5 % permanently, then banks do not borrow more than their needs from the central bank at the policy rate. And eventually the short term interest rates settle close to the policy rate as long as banks do not collide to reduce the equilibrium interest rate significantly. Thus, as long as the banking system has liquidity shortage

[29] See Chapter 3 for how the CBRT uses the corridor system to tighten the monetary policy stance through intentional liquidity surprises.

(i.e. central bank is the marginal liquidity provider) downward asymmetry does not have significant impacts on the short term rates in a competitive market even the central bank tries to exploit it.

However, an upward asymmetry works effectively if central bank does not commit or provide enough liquidity to the banking system. In this case, since central bank is the marginal liquidity provider, the short term interest rates do not settle at a level a bit higher than the policy rate or in between the policy and standing facility lending rates. But, the short term interest rates rise to the neighborhood of the central banks' standing facility lending rate as the liquidity shortage increases the competition in the money markets. Thus, there appear two policy rates for the markets: (i) the announced policy rate, and (ii) the lending facility rate. In this case, since the marginal liquidity is provided through the standing facility rate and short term interest rates settle around the standing facility rate, if the market participants perceive this strategy as a long lasting one, the standing facility rate becomes the benchmark (marginal) rate for the money markets, though central bank provides a significant part of the liquidity at the policy rate through the main operations. If central bank aims to reduce the short term interest rates to a level well below the standing facility lending rate but higher than the policy rate, then the volatility of the short term interest rates increases dramatically. This action complicates the perception of the monetary policy stance. In short, the central banks' ability to keep the short term money market rates close to the policy rate and to reduce the volatility of the money market rate is very difficult in an upward asymmetry case.

In addition, in an upward asymmetry case, when all banks have equal rights to get liquidity through the main operations, then the liquid banks also participate in auctions, and then lend these funds in money markets at higher rates to the illiquid banks.[30] In short, this strategy introduces an arbitrage opportunity (borrowing at lower rates from the central bank in main operations, and then lending to the illiquid banks at higher market rates) by using the central bank resources. For example, a small bank may generate huge profits just by using this arbitrage opportunity. In addition to this unfair arbitrage opportunity, the active and aggressive use of the width of the corridor (which causes volatile average short term interest rates) is not

[30] In modern central banking practice, all the participants should have equal rights to get liquidity through main operations to distribute the liquidity throughout the markets effectively.

consistent with the “transparency” and “clear definition of policy rate” conditions of the inflation targeting framework. Since the markets face with difficulties in determining the right longer term rates, exploiting the corridor system aggressively is not a sustainable and consistent strategy in developed financial markets.

On the other hand, when the money market liquidity disappears during the crisis, reducing the width of the corridor is likely to decrease the liquidity risk premium in the money markets. During these periods, although central banks provide more than enough liquidity, the liquid banks may prefer to lend to the central bank rather than to provide credit to the illiquid financial institutions or to the real sector. In this case, central bank may inject liquidity through the longer term structural transactions and force the banks to lend in the money markets or invest on short term instruments in a downward asymmetric corridor case. This strategy works through punishing the liquid banks which prefer lending their liquidity to the central bank.

In light of these analyses, we argue that, under the normal conditions, active use of the corridor system as a policy tool should be limited just for the signaling purposes. The corridor system may also be exploited for a short period of time during huge volatility in the currency markets to tighten the monetary conditions temporarily. The corridor width may also be used to change the level of the liquidity risk in the money markets. In these cases, central banks may tighten or loosen the monetary conditions without changing the policy rate. In fact, exploiting an asymmetric corridor through the daily liquidity operations is simply deciding the policy rate on a daily basis within a range. The practical implication of this strategy is that; the effective policy rate decision intervals are shortened from monthly to daily basis. Therefore, while the frequent use of the corridor system increases the flexibility of monetary policy, it distorts the functioning of the money markets and communication capacity of the central banks as the transparency and expectation management function of the monetary policy weaken.

Structural Operations

While the short term main operations are used to attain the policy (operational target) rate, the longer term maturity operations are used; (i) for the

structural liquidity management purposes during the normal times, or (ii) to intervene the yield curve (or overall financial conditions) in order to ease the market imperfections or to tighten the stance of the monetary policy. The first type is related with the conventional monetary policy. As discussed in Chapter 4, when the level of the liquidity shortage or excess liquidity exceeds some threshold level, because of the collateral, liquidity or capital adequacy constraints or optimum asset maturity allocation preferences of the banking system, the tightness of the monetary conditions may deviate from what the policy rate implies. For example, if there is too much structural (permanent) liquidity shortage, this creates stress in the money, bond and credit markets and the monetary policy becomes tighter than what the policy rate implies. In order to ease the tightness in the markets, the structural part should be provided through longer term repo or outright transactions (Figure 4).

Since, the maturities exceed two or more policy rate decision making meeting periods, under the normal conditions; it is preferable to conduct these operations through the price auctions which allow market conditions to determine the interest rate. The fixed rate longer term transactions imply yield curve intervention and longer term commitment of the central banks for the interest rate. Thereby, this strategy induces market players to take speculative positions accordingly. If central bank chooses a different monetary policy stance later on, then the credibility of the monetary policy weakens. Since the repo/reverse repo transactions do not require a specific security, these transactions do not affect the price of these securities in the secondary markets. But, in central banking practice, the maturities of these transactions are generally less than 3 months. On the other hand, as the outright transactions directly affect the supply or demand of the underlying securities, these transactions affect the secondary market prices. Therefore, while the reverse transactions are preferred for the shorter term structural operations, the outright transactions are generally used for the longer term structural operations by taking liquidity of the underlying securities into account. In outright transactions, since huge transactions on a specific maturity distort the yield curve, the underlying securities should be selected from a wide range of maturities to avoid significant impacts on the demand or supply conditions in the secondary markets.

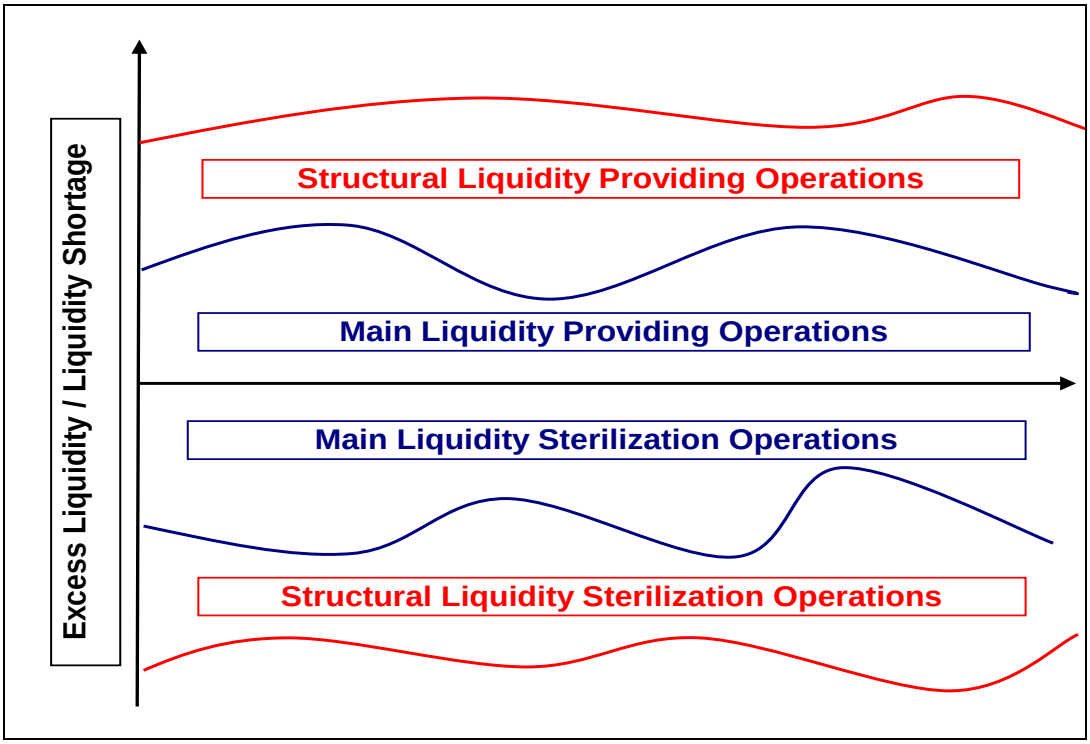

Figure 2.4: The Use of Main and Structural Operations

The other critical issue in conducting the structural operations is communicating with the markets. Especially in emerging countries which have monetary policy independence problem and experience of the central bank's role in public finance, these operations are prone to cause some credibility problems. Therefore, as long as the intention is just for an effective and efficient liquidity management, the underlying reasons of these operations should be clearly highlighted. Inherently, the rule based structural operations do not significantly affect the overall market conditions. For example, if the central bank announces that; when the liquidity shortage exceeds some level, she will conduct the longer term structural operations, the impact of these operations would remain limited.

Unconventional Monetary Policy Tools

Until the global crisis, the unconventional policy tools had not been used as active monetary policy tools. The unconventional monetary policy tools can be listed as reserve requirements, liquidity ratios, haircuts and collateral list, in addition

to the active use of the corridor system and outright transactions with an intervention motive.

The reserve requirement system is one of the oldest monetary policy tools. Following Borio (1997), we can list three critical functions of the reserve requirements.[31] Firstly, they can help to stabilize the short term interest rates in case of unforeseen liquidity conditions (buffer function). Secondly, they can be used to change the liquidity of the banking system (liquidity management function). Thirdly, they can be used as a source of revenue (income or tax function). The reserve requirements were first appeared as a tool to ensure the banks' liquidity against to their note issuances or loans in 18th and 19th century in Europe and North America. The primary purpose of the required reserves was to ensure the convertibility of the liabilities of the banks into the precious metals such as gold or silver.[32] Thus, at the initial stage, required reserves were kept in gold or silver. During this period, the states quickly realized the benefits of taxing the banking system through the required reserve system and forced the banks to keep government debt certificates and paper money issued by the central banks. Although, the main purpose of these ratios was to control the money supply and enhancing the banking system liquidity, in 20th century, while the liquidity strengthening mission had diminished as the central banks' lender of the last resort function strengthened, the main functions of the required reserve system had become to control the money supply and to tax the banking system to generate seignorage revenues to the governments.

During the liberalization and deregulation era after late 1970s, as a result of the financial innovations and expansion of the non-bank financial institutions, the share of banks' deposits or similar assets which were subject to the required reserves in total financial system diminished significantly. As the share of reservable assets declined, the distortionary effects of the required reserves had started to overweight its benefits for the central banks or governments. In addition, when the monetary targeting was abandoned and short term interest rate became the operating target of the monetary policy in 1980s, the money supply control function of the requires reserves disappeared. Thus, since 1980s, while the developed countries have reduced

[31] See Borio (1997) for more details and country experiences in developed countries.

[32] See Goodhart (1988), Davies (2002), and Feinman (1993).

these ratios to the negligible levels, the developing countries have reduced it significantly. In addition, central banks have started to remunerate the required reserves. During this period, instead of as an active monetary policy tool, required reserves were mainly kept to enhance the day-to-day liquidity management of the banking system to reduce the volatility of O/N money market rates. But in recent years, mainly the developing country central banks, from Latin America to Asia, have started to resort to use the "old fashioned" required reserves as an active monetary policy tool to mitigate the negative side effects of the capital inflows on the domestic economy and financial stability.[33]

The reserve requirement system can still be effectively used as long as the banking system's share in the domestic financial system is significantly large and the required reserve system covers all significant liabilities of the banking system. If the reservable liabilities also cover the non-bank financial institutions, the effectiveness of the required reserves system can extremely be strengthened. The effectiveness of the required reserves system also depends on the remuneration of the required reserves. Therefore, the remuneration rate may also be accepted as a complementary and effective monetary policy tool to strengthen the effectiveness of the required reserves. In addition to reserve requirements on the liability side of the financial institutions, the required reserve ratio may also be applied to the asset side. Reserving the assets of the banking system or other financial institutions has a limited use in modern central banking.[34] But, when central banks try to target some type of or some sector loans, this option may technically be a very effective tool. For example, if the consumer loans are targeted, then central banks can introduce the reserve requirement on these loans to dampen the consumer loan growth rates. Since, instead of the quantity, the price side is targeted, the reserve requirements on the assets do not conflict with the market based economic policies.

[33] See Borio and Shim (2007), Montoro and Moreno (2011), and Bascı and Kara (2011) for country experiences on the use of required reserves.

[34] According to Palley (2004), inflation targeting with single tool – single goal framework is not sufficient framework for monetary policy as the financial stability objective is not included in objective function., and must be supplemented by financial intermediary balance sheet regulations. In this respect, he argues that Asset Based Reserve Requirement can consistently be used for balance sheet regulations. On the other hand, Borio and Shim (2007) list some practices in East Asian and Eastern European country experiences even before the global crisis.

In practice, collateral list and haircuts are not actively used for the monetary policy purposes either. But as during the global crisis, the role of the collateral list and haircuts were appeared to be effective tools in reducing the stress in the financial markets.[35] Normally, central banks accept liquid and less risky assets as collateral for the open market operations and use haircuts to reduce the counterparty risks. The collateral list and haircuts may significantly affect the financial system ability to borrow from the central banks and affect the liquidity conditions in the market. Shortening the accepted collateral list and increasing the haircut ratios reduce the financial system borrowing ability, thus tighten the liquidity conditions. On the other, especially during the crisis, enlarging the collateral list and reducing the haircut ratios ease the tensions and liquidity risks of the financial system. Including or excluding some types of securities, for example private sector securities, also affects the demand for these securities. Thus, central banks can effectively use the collateral system to change the market conditions in line with the monetary policy objectives.

The central banks can also use outright securities transactions during the crisis to reduce the liquidity risk premium, to ease tensions in the markets, to intervene the yield curve, and to signal their longer term commitments for their policy stance. In these cases, these transactions may be categorized as unconventional monetary policy tools. Since the distinguishing features of these operations are the active use of their balance sheets by the central banks to affect the market prices directly beyond the impacts of the policy rate, Borio and Disyatat (2009) refer to such policies as "balance sheet policies". They highlight two main channels which the effects of balance sheet policy are transmitted as: (i) signaling channel, and (ii) balance sheet channel.

Borio and Disyatat (2009) point out that, since the communication of the central bank influences the public expectations regarding; (i) the future course of the monetary policy, (ii) the relative scarcity of the different assets and (iii) the risk and liquidity profiles of the securities which are all key factors in market valuation, the signaling channel is the integral part of the transmission mechanism. The central banks' transactions in longer term maturities also imply some kind of their

[35] See Borio and Disyatat (2009).

willingness to reduce the frictions and risk premium in the markets. The balance sheet channel relies on the imperfect substitutability of the asset classes. They note that, when the asset classes are imperfect substitutes, the central banks' interventions change the relative supply and demand of these asset types and affect the composition of the optimum portfolio structure of the private sector. For example, the central banks' purchases of some type of securities increase the demand for these securities, thereby decreases the equilibrium interest rate. Then, all interest rates decline as the private sector rebalances its portfolio by shifting its demand to other types of assets. If central banks purchase more risky assets, as the share of the risky assets in the private sector portfolio declines, the risk appetite is likely to increase. We note that, since these types of transactions include an intervention motive, the discretionary methods are likely to be more appropriate rather than rule the based methods.

2.3. Foreign Exchange Policy, Interventions, and Deposit and Swap Facilities

In literature, FX intervention is generally not listed in the central bank monetary policy tool set, but analyzed in the foreign exchange policy side. Since the transmission channel works mainly through the domestic interest rates in relatively closed developed economies, the literature on the monetary policy operating framework mostly concentrates on the closed economy version. But, in small open emerging country economies, the exchange rate is one of the most significant variables in the transmission mechanism through; (i) import prices, (ii) expectations, and (iii) balance sheet effect as a result of the net FX indebtedness. In addition, these countries are often prone to the foreign capital flows reversals which frequently cause in financial and economic crisis.

In these countries, there had been a long debate on the currency regimes until the general acceptance of the inflation targeting framework.[36] Up to 1990s, hybrid exchange rate regimes had been popular among the emerging countries. But, as a result of the successive currency and financial crisis, there has been a general tendency towards more flexible exchange rate regimes, though there has been still

[36] See Goldstein (2002).

some skepticism.[37] One of the main reasons of these skepticisms is the liability dollarization in these countries. Eichengreen and Hausmann (1999) assert that, residents in emerging countries can not borrow from abroad and from the domestic markets in longer term in domestic currency as a result of the credibility problem. They call this problem as "*original sin*". Therefore, as a result of the frictions in the financial markets, financial fragility is unavoidable, when a significant part of the domestic investments have currency and maturity mismatch problems. They also highlight the difficulties of the floating exchange rate regime in these countries stemming from the interest rate and exchange rate risk profile of the investments.

Similarly, Calvo and Reinhart (2000) argue that, the liability dollarization and high pass through from the exchange rate to the inflation in these countries cause "*fear of floating*". Therefore these countries often try to smooth out the exchange rate volatility through the interest rate and FX intervention, and try to allow only partial exchange rate adjustment, though they declare flexible exchange rate regime. In addition, Calvo et al. (2004) empirically find that, the domestic liability dollarization causes detrimental balance sheet effects in case of abrupt exchange rate movements, and huge current account deficits is the key determinant of the probability of the sudden foreign portfolio reversals (which they call "*sudden stops*") and crisis.

The other reason for the FX intervention has been to contain the current account deficit problem. Edwards (2002) investigates the behavior of the current account deficits in emerging countries and its role in financial crisis. He concludes that, since the increase in current account deficits increases the probability of the crisis, large current account deficit should be a concern. Edwards (2004) finds that, the current account deficit and level of the FX reserves are among a few variables that explain the capital flow reversals which usually associated with the "sudden stops". He also notes that countries with the flexible exchange rate regime are better in accommodating the shocks.

In another article, Edwards (2002) summarizes the common arguments on why the flexible exchange rate regime can not be adopted successfully in emerging countries as: (i) since the terms of trade is more volatile because of their import-

[37] Obstfeld and Rogoff (1995) highlight that, under a financially globalised world with high capital mobility, fixed exchange rates can not be a viable nominal anchor anymore.

export composition, there is excess volatility in exchange rate, (ii) since these countries are subject to frequent large external and internal shocks, the transmission mechanism is less certain to use the short term policy rate as a main policy instrument, and (iii) liability dollarization causes "fear of floating".

The other argument against the floating exchange rate regime in emerging countries had been the high pass through from the exchange rate to the inflation. But Taylor (2000) asserts that low level of inflation lowers all kinds of pass through including the pass through of exchange rate, commodity prices and wages. In effect, later on, it has been shown that, the exchange rate pass through weakens as the level of the inflation declines in a number of studies.[38] They also find that, the pass through declines as the volatility of exchange rate declines.

Edwards (2006) emphasize that, the degree of the pass through do not only determine inflation, but also affect the effectiveness of the nominal exchange rate as a shock absorber. He notes that the shock absorber role of the exchange rate depends on; (i) the effects of the nominal changes on the real exchange rate, (ii) the effects of the real exchange rate on the net external position of a country, and (iii) the effects of the changes in nominal exchange rate on the balance sheets and economic activity. Therefore, for an effective shock absorber role of the exchange rate, the changes in the nominal exchange rate should be translated into the real exchange rate. He notes that, the pass through should also be much lower in non-tradable sector than the tradable sector. But, even in case of a low level of pass through, the level of the net FX debt may still undermine this role.

Towbin and Weber (2011) analyze the role of the foreign currency debt and import structure using a sample which covers 101 non-G7 countries from 1974 – 2007. Their results also support the intervention in FX markets. They conclude that, there is no empirical evidence for the shock absorber role of the floating exchange rate regime in case of high FX debt and low pass through in tradable sector. They specifically find that, since the contractionary balance sheet effects dominate the expansionary expenditure switching impacts, the flexible exchange rate regime does not shield output from the real external shocks better than the pegs when the FX debt is high and the pass through in tradable sector is low.

[38] For example, see Baqueiro et al. (2002).

By taking the crisis prone fixed exchange rate regime and problems of implementing floating exchange rate regime, Goldstein (2002) proposes "managed floating plus" as the "least worst" option for emerging countries. He uses "managed" for intervening only to smooth out the excessive exchange rate volatility, "float" for not targeting any exchange rate level and allowing the market forces to be main determinant of the exchange rate, and "plus" for the inflation targeting framework and aggressive measures to reduce the currency mismatch.

Since the short term interest rate is the main policy tool in inflation targeting framework, for an effective monetary policy, there should not be any foreign exchange rate target. Therefore, within the "single goal, single tool" operating framework; (i) in line with the impossible trinity proposition, arguing the inefficiency of the interventions in a globalized financial markets, and (ii) in order to avoid the risk of transforming the exchange rate into a nominal anchor for the monetary policy that may take precedence over the inflation target, heavy exchange rate intervention had been widely criticized. Until the recent years, the inflation targeting literature had generally omitted the role of the exchange rate in emerging countries, and suggested that exchange rate was a matter to the extent that it affected output and inflation. For these cases, it was generally suggested that the policy rate should be used just to balance these impacts. But, in practice, in addition to adjusting the policy rate to reduce the impacts of the exchange rate on inflation and output, most of the emerging countries have often resorted to intervene in FX markets even under the inflation targeting regime. Furthermore, in recent years, some analytical studies have started to support the exchange rate intervention or include the exchange rate stability in the objective function in order to increase social welfare.

Roger et al. (2009) use a small consensus open economy DSGE model of a financially vulnerable emerging country and an advanced economy with calibrated parameters to compare the performance of the alternative policy rules in handling demand, cost-push, and risk premium shocks. Their results suggest that, although including the exchange rate smoothing and trade account balance in the objective function (hybrid inflation targeting) does not improve the social welfare in a developed country case, including the exchange rate smoothing in the objective

function provides some benefits for financially vulnerable economies. They conclude that, especially in case of risk premium disturbances, the hybrid approach may provide substantial benefits in reducing the volatilities of the exchange rate, interest rate and trade balance.

It is likely that, as a result of these types of conclusions and practices of the central banks, IMF has also started to support some exchange rate smoothing in monetary policy. In the IMF Position Note, Blanchard et al. (2010) suggest that, as the role of the exchange rate in small open economies through the pass through and balance sheet effects are considered, the central banks in these countries should openly recognize that the exchange rate stability is in their objective functions to increase the flexibility of the interest rates.

2.3.1. Foreign Exchange Interventions

Until recently, although central banks generally did not include the exchange rate explicitly in their objective functions, the emerging country central banks have always kept an eye on the exchange markets for the financial and economic stability purposes. Therefore, even the floating exchange rate regime is generally accepted, these countries can not or do not prefer to tolerate an excessive volatility in FX markets. Adler and Towar (2011) summarize the motives of the FX intervention from the officially declared central bank statements as: (i) to affect the level of the exchange rate, (ii) to affect the speed of the appreciation or depreciation, (iii) to contain the volatility of the exchange rate, and (iv) to increase FX reserves for the precautionary motives. They also note that none of the central banks declared any exchange rate level as a motive for the intervention.

It is widely accepted that exchange rate can only be determined by the supply and demand conditions in the market in longer term under free capital mobility. But it is also evident that the exchange rate can deviate significantly from the levels implied by the underlying economic fundamentals and macro economic policies which justify the FX interventions to some extend. Within this framework, Ishii et al. (2006) highlight that, since the FX intervention is not an independent monetary policy tool under the free capital mobility, the success of the intervention is conditional on the consistency of the targeted exchange rate with the

macroeconomic policies and underlying economic conditions.[39] They also note that, intervention is especially unlikely to be effective when the adverse exchange rate movements reflect the persistent macroeconomic imbalances, though the intervention can be used as a complementary instrument to support the macroeconomic adjustment policies by smoothing disruptive volatility of the exchange rate during the adjustment period. In other words, they simply suggest that FX intervention may be used to gain some time for the structural policies to realign the economy.

Adler and Towar (2011) analyze 15 countries and find robust results that intervention can slow the phase of appreciation although higher degree of capital account openness reduces its effectiveness. They also point out that, the intervention framework whether rule based or discretionary does not matter, and intervention is more effective when the currency appreciated more. Although they highlight that most of the interventions in their sample coincided with the easing of the global liquidity conditions that caused the appreciation pressures, their results are likely to be applicable in general, and support the view that the FX interventions are more effective when the currency move away from the equilibrium values implied by the macroeconomic fundamentals. Therefore, the timing is a very critical issue for the effectiveness of the interventions in central banking practice.

From the analysis of Ishii et al. (2006) the following issues about the FX intervention deserve some attention: (i) noting the importance of transparency, they suggest some degree of discretion to adopt the changes in market conditions, and (ii) a sharp change in exchange rate caused by a permanent shock does not call for an immediate intervention unless it causes a positive feedback trading and speculation. They also argue that FX intervention can smooth the volatility and reduce the adverse effects on expectations.

On the other hand, the international reserves have always been a critical factor for both preventing crisis and mitigating their adverse impacts. The level of the international reserves has always been a critical factor on risk premiums in emerging countries. IMF (2011) highlights the critical role of the reserves as;

[39] Ishii et al. (2006) list the effects of intervention through three channels as: (i) signaling, (ii) portfolio balance, and (iii) microstructures channels. See also Sarno and Taylor (2001) for a literature review on the effectiveness and the channels of the FX intervention.

> … liquidity buffers helped smooth consumption during this and past crisis, and enabled some countries to manage large outflows without experiencing a costly crisis. … In particular, reserves seem to have helped prevent episodes of exchange market pressure from affecting consumption. An event study shows that, during periods of exchange market pressure, EM countries with higher reserve holdings were more able to maintain more stable consumption growth (relative to the pre-event trend) than those with lower reserve levels. They were also more able to expand fiscal policy to help offset the effects of crisis, whereas low levels of reserves were associated with pro-cyclical fiscal contraction.

The increase in foreign investors share in the domestic markets implies significant volatility risk in turbulent times. Especially during portfolio outflows, the intervention capacity of the central banks is determined by the level of their FX reserves. Therefore, in addition to the exchange rate related motives, the other important motive for the intervention is the precautionary reserve accumulation during the favorable financial and economic conditions.

Although FX intervention is effective to some extent and there are some benefits of it, it is also likely to create some macroeconomic and financial imbalances if the foreign capital inflows trigger domestic credit booms and asset price bubbles.[40] It is also very risky for three reasons: (i) if central banks heavily involve in FX markets, this may encourages the private sector to open FX position and cause moral hazard problem, (ii) if central banks imply a level target implicitly or explicitly inconsistent with the underlying economic fundamentals and financial conditions, it is likely that central banks become the target of the markets, and in a globalised financial market, eventually, the markets win the game, and (iii) instead of the inflation targets, markets may start to see the exchange rate level as a nominal anchor of the monetary policy.

To sum it up, from these discussions, we conclude that; (i) there are good reasons to intervene in FX markets in emerging countries, therefore it is likely to be optimal to include the FX intervention as a supplementary tool in the monetary policy operating framework to smooth out the excessive volatility of the exchange rate and to increase the flexibility of the short term interest rate, (ii) exchange rate stability objective should be clearly subordinated to the inflation objective, (iii) exchange rate can be intervened through both the direct intervention and flexible

[40] See Mohanty and Turner (2006) for the impacts of capital flow on domestic credit and asset prices.

auction methods, but in any case, central banks should try to avoid targeting any exchange rate level, and therefore, (vi) it is more convenient to intervene through the transparent market friendly auctions whenever necessary.

2.3.2. Foreign Exchange Deposit and Swap Facilities

In emerging countries, the banking system intermediates FX lending in domestic credit markets through borrowing from the international markets. The residents in these countries are usually in net debtor position. In addition, domestic banking system has generally FX assets and liabilities maturity mismatch problem, though the net FX open position is limited by regulations. Therefore, during capital outflows period, the domestic liquidity position of the banking system may not be capable of matching the outflow through their liquid FX assets. This reality may in fact trigger a demand for FX, thereby increases the volatility in FX markets. The volatility likely causes a shift from the domestic currency deposits to the FX deposits in emerging countries with the currency substitution history. In addition to the volatility of the exchange rate, the FX liquidity problem also shifts FX interest rates as the competition for the FX deposits increases. But central banks can not act as a lender of the last resort on the FX side, as their capacity to provide liquidity limited by their FX reserves. In order to solve these temporary liquidity needs of the banking system without causing significant damage in the FX markets, one possibility is to provide strictly limited FX deposit (standing) facility at a level of interest rate which discourages moral hazard problem but reduces the stress in the markets.

In effect, during the global crisis, the developed country central banks also faced with this problem severely. This problem is solved through swap transactions between the central banks, and central banks provided FX liquidity to their banking system by using these borrowed FX reserves. Therefore, for an efficient monetary policy operating framework which also considers financial stability, it is beneficial to provide these types of FX standing facilities in advance. These types of facilities can provide some adjustment period for the economic agents and authorities, and are likely to be effective to smooth out the volatilities. Therefore, these facilities can be used as an indirect supplementary policy tool.

2.4. Macro Prudential Tools and Monetary Policy

During 1990s and in the first half of 2000s, central banks operated in a fairly benign global economic and financial environment. During this period, the main goal of the central banks was broadly limited to the price and output stability. In order to improve the effectiveness of the monetary policy, the institutional infrastructure was strengthened through the central bank independence, consistent with the "single goal, single tool" operating framework. In addition to the positive supply side shocks stemming mainly from the entry of China and some other closed economies to the global economy, the credible monetary policy provided low and stable inflation, and relatively high growth rates. The other characteristics of this period were the easy global liquidity conditions, financial globalization and financial innovations. The same period may also be characterized by the huge capital inflows to the emerging countries which is caused by both pull factors that resulted from the prudent domestic fiscal and monetary policies, and push factors that stemmed from the easy global liquidity conditions. These conditions eased the borrowing constraints of the firms and households. Therefore, a surge in credit growth was witnessed in almost all around the world.

Prior to the global crisis the conventional wisdom was that, the macroeconomic stability, free market discipline and micro prudential policies focused on individual financial institutions would be effective for maintaining the financial stability. But all these factors caused serious macroeconomic and financial imbalances which ended up with the global crisis. The crisis also highlighted the increased contagion risks of deepened trade and financial integration among countries. Actually, the potential risks stemming from the macroeconomic and financial imbalances, and the necessity for a new monetary policy framework were discussed in the literature and some international institutions such as in the Bank of International Settlement (BIS) well before the global crisis. The debate concentrated on the use of monetary policy for the asset price bubbles. As pointed out by Mishkin (2010), it was well known that, considering the key role of them in the transmission mechanism, the monetary policy theory suggested monetary policy response to the asset prices to optimize the social welfare. But, there was no consensus on the

effectiveness of the monetary policy on asset price bubbles. The views divided as "lean" and "clean" sides.[41]

The proponents of the "leaning against the wind" view suggested that the pre-emptive tightening of the monetary policy to prevent the asset price bubbles would reduce the boom-bust cycles and reduce the damage of the bursts to the economy. For example, Borio and Shim (2007) urged that;

> … the joint effect of financial liberalization, the establishment of credible anti-inflationary regimes and globalization of the real side of the economy may have been to make it more likely that, occasionally, financial imbalances built up against the background of low and stable inflation. These imbalances can have potential serious implication for the macro-economy and financial stability to the extent that they unwind in a disruptive way. By financial imbalances we mean overextentions in private sector balance sheets characterized by joint credit and asset price booms that "go too far", sowing the seeds of the subsequent bust. … It would be helpful for monetary policy frameworks to allow sufficient room for manoeuvre for policy to be tightened even if the near-term inflation pressures appear at bay, thereby leaning against the build-up of the imbalances.

They also suggested that, monetary policy should be supported by the counter-cyclical prudential polices to reduce the imbalances. One of the main conclusions of them was the tightened interdependence between monetary and prudential policies.

Meanwhile, the proponents of the "cleaning after the burst" view argued that, it is more practical and effective to solve the problem after the burst through easy monetary policy. Mishkin (2010) lists the main arguments of this group as:

> (i) it this very difficult to detect if there is a bubble, and the central banks have no comparative advantage over the private sector on the true market value of assets, (ii) the policy rates may not be effective to prevent the bubbles, (iii) while the bubbles may be in some sectors, the interest rates affect whole economy, therefore may not be optimal, (iv) pre-emptive tightening the monetary policy may burst the bubbles more severely causing more damage to economy, and (v) monetary authorities has enough tools to keep the damages of the burst at manageable levels if they respond in a timely manner eve if the interest rates fall to zero bound.

But as (i) the cost of "burst" exceeded the assumptions in the developed countries, (ii) the existence of the risk taking channel was proved, (iii) the imperfection in the financial markets became more clear, and (iv) the inefficiencies

[41] See White (2009) for a detailed discussion on "lean vs. clean" debate.

of the micro prudential policies and monetary policy with the "single goal – single tool" framework were realized during the global crisis, after the global crisis, in spirit of "global problems require global solutions", there has been a global search for a more efficient and effective macro prudential policy and consistent monetary policy operating framework. For this purpose, there is an ongoing evaluation process jointly by related international institutions; BIS, IMF, and Financial Stability Board (EFS) under the directions of G20 Leaders, in addition to research in academia.[42]

The analytical studies have started to support the inclusion of financial stability in the objective functions in inflation targeting framework. For example, in his analysis, White (2009) supports "leaning against the wind" through the pre-emptive tightening; to moderate the credit bubbles and to promote a more sustainable economic growth through the macro prudential tools in addition to the monetary policy tools. Boivin et al, (2010) point out that, since the conventional monetary policy objective is to maximize the social welfare through the inflation and output stabilization, flexible inflation targeting is consistent with the financial stability objective to the extent that financial imbalances affect inflation and output, and monetary policy is flexible and has an enough long time horizon. In their analysis, they conclude that, if the financial imbalances are specific to a sector or a market, the monetary policy may have a minor role, but if the imbalances have potential to affect the entire system then "leaning against the wind" is warranted.

However, Svensson (2009) notes that, (conventional) flexible inflation targeting framework is consistent with the financial stability objective to the extent that its effects on the price and output stability, therefore financial stability should only be an indicator rather than a target variable in the loss function of the central banks. On the other hand, Woodford (2011) argues that, central banks should; (i) include the financial stability in their objective function in addition to inflation and output for the sake of greater stabilization of the marginal risks, and (ii) use the monetary policy to "lean against the wind" even if it requires inflation and output to be below their medium term targets. He also suggests that, extending the flexibility of the conventional inflation targeting framework does not contradict with the inclusion of financial stability in the objective function. But, he hints that, when the

[42] See Progress Report to G20 (2011).

financial stability is included in the objective function, it may increase the potential conflicts among goal variables, therefore there should be additional macro prudential tools to relieve the pressure on the use of short term interest rates.

The macro prudential policy discussion generally concentrates on a developed country framework, though these tools are also applicable to emerging countries. However, the need for macro prudential measures in most of the emerging countries usually arises as a result of the capital flows. Therefore, the macro prudential tools in emerging countries are also related with the exchange rate policy. Under free capital mobility, it is very difficult to implement independent monetary policy through only the short term interest rates in emerging countries. For example, if central bank raises the short term policy rate to contain the inflationary pressures, the increase in the spread between the domestic and foreign interest rates causes more capital inflows which reduces the tightening impact of the monetary policy and causes macroeconomic imbalances. Though sterilized FX intervention is effective to some extent to reduce the phase of appreciation, capital inflow causes; (i) currency appreciation, (ii) excess liquidity which stimulates domestic credit and asset price bubbles, (iii) current account deficit, (iv) increase in FX debt, and (v) increase in non-residents share in domestic financial markets. All these factors increase the vulnerability of the economy and financial system, and reduce the effectiveness of the monetary policy in case of capital flow reversals as deeply discussed in "sudden stop" literature. Therefore, since the exchange, inflation and growth rates are also volatile in these countries as they are dependent on the size and direction of the capital flows, macro prudential framework in emerging countries is not limited to only financial stability problem, but should include broader macro economic imbalances.

2.4.1. Macro Prudential Tools

Clement (2010) defines the macro prudential measures as; "regulatory policies that aim to reduce systemic risks, to ensure stability of the financial system as a whole against domestic and external shocks, and to ensure that it continues to function effectively". In this sense, macro prudential policy covers the use of wider range of tools which also includes the old fashioned direct monetary policy tool kit,

and normally requires the involvement of other related institutions. The commonly used macro prudential tools and their purposes are given in Table 2.1.[43] The macro prudential tools normally target the liquidity/market risks or banking system leverage through limiting the banking system balance sheet or borrowing capacity of the borrowers. These macro prudential tools affect the banking system balance sheet size and its composition through introducing direct and indirect portfolio constraints and additional costs. As a result, the equilibrium interest rates in the financial markets, especially the interest rates in the targeted markets are also affected by these measures in addition to the impacts of the central bank policy rate.

Table 2.1. Macro Prudential Tools

		Banking System	
		Balance Sheet	Lending Contract
Vulnerability	Leverage	Capital Adequacy Ratio Provisioning Credit Growth Ceiling	Loan-to-Value Ratio Debt Service-to-Income Ratio Margin Requirements
	Liquidity or Market Risk	Reserve Requirements Ratio Liquidity Ratio Open FX Position Limit FX Lending Restriction Maturity Mismatch Limit	Valuation Rules

Source: CGFS Papers No 38 (2010).

Borio and Shim (2007) assert that, one of the basic principles of macro prudential policy is to encourage the build-up cushions in good times, when the imbalances typically emerge, so that they can be run down in bad times, as the imbalances unwind. They suggest that countercyclical macro prudential regulations can help monetary policy to reduce output fluctuations and lessen the risk of financial instability. In this framework, the central banks can achieve the same output and inflation objectives with smaller adjustment in policy rates as other tools

[43] See CGFS Papers No 38 (2010) for the classification of macro prudential tools.

perform similar functions. Although there is no consensus on the macro prudential policy operational framework yet, especially emerging countries have started to use these tools more actively since the global crisis.

In literature and practice, capital controls are listed as the last options considering their negative impacts. Within an emerging country context, capital controls may also be considered as macro prudential tools, or be used for macro prudential purposes. Ostry et al. (2011) define the capital controls as "the measures which limit the rights of residents or non-residents to enter capital transactions or to affect the transfer and payments associated with these transactions". They list the typical measures as; (i) taxes on flows from non-residents, (ii) unremunerated reserve requirements on such flows, (iii) special licensing requirements, and (iv) outright limits or bans.

The tools to handle the capital flow problem are commonly listed as fiscal policy, monetary policy, exchange rate policy, FX intervention, domestic prudential regulation, and capital controls. Ostry et al. (2010) argue that the policy mix depends on the state of an economy. They suggest that;

> if the economy is operating near potential, if the level of foreign exchange reserves is adequate, if the exchange rate is not undervalued, and if the flows are likely to be transitory, then use of capital controls –in addition to both prudential and macroeconomic policy- is justified as part of the policy toolkit to manage flows. Such controls, moreover, can retain potency even if investors devise strategies to bypass them, provided such strategies are more costly than the expected return from the transaction: the costs of circumvention strategies act as "sand in the wheels".

They also analyze the impact of capital controls in reducing vulnerabilities by using 37 emerging country data covering 2002 – 2009 periods, and conclude that; "Looking at the current crisis, our empirical results suggest that control aimed at achieving less risky external liability structure paid dividends as far as reducing financial fragility". Meanwhile, Ostry et al. (2011) suggest that capital controls should be the last option as their distortionary impacts are considered, though they admit the usefulness of these measures to reduce associated risks. They specifically argue that;

> A prerequisite for using capital controls is that domestic macroeconomic policies be appropriately set, and that non-discriminatory prudential policies have been adjusted to the extent possible. … Once the macroeconomic

> prerequisites for invoking capital controls are met (but not before), and if prudential measures can not suffice or are not effective, capital controls can be used to mitigate the risks associated with inflow surges.

In the empirical part of their study, they also analyze the impact of the capital controls and prudential policy in curtailing financial vulnerabilities by using 41 emerging country data covering 1995 – 2008 period, and conclude the followings: (i) higher restrictions through capital controls and FX related prudential regulations are associated with a smaller share of foreign debt, (ii) FX related prudential regulations and other prudential measures are strongly related with smaller credit growth, and (iii) countries with higher economy-wide capital account restrictions fared better than the others when crisis occurred.

Eyzaquirre et al. (2011) also propose a similar sequence of policy response for Latin American countries facing with easy global liquidity conditions and capital inflows that lead to demand boom, current account deficit, excess financial intermediation risks, and boom – bust cycles. In order to preserve macroeconomic stability and reduce the related risks, they suggest; (i) first, allowing exchange rate flexibility, (ii) pursuing a cyclical fiscal policies, (iii) pro-actively strengthening micro and macro prudential measures, and (iv) as a last option, to avoid risk of large current account deficit using temporary capital account restrictions.

In another study, Lim et al. (2011) analyze the effectiveness of the macro prudential tools using data from a group of 49 countries. They conclude that; the macro prudential tools may help dampen pro-cyclicality, and may help reduce risks, though highlighting the low degree of confidence of statistical analysis stemming from poor data quality and short history. Cordero and Montecino (2010) also argue that there are sufficient theoretical and empirical backings on the viability of capital controls to support monetary policy. They point out that, these measures may increase the flexibility of the monetary policy through enabling the use of short term interest rate for inflation, and facilitating more stable and competitive real exchange rate at the same time.

There are also other studies which analyze the efficiency of macro prudential measures and capital controls. For example, using an open economy calibrated DSGE model, Ünsal (2011) concludes that macro prudential measures improve welfare gain in case of a surge in capital inflows. She notes that, the macro

prudential measures are more effective than the capital controls. She also points out that, though capital controls can reduce capital inflows, financial imbalances can still build up. In addition, her results support that, macro prudential measures including capital controls can not substitute monetary police, but they can support.

In the macro prudential context, Glocker and Towbin (2011) analyze the impacts of the required reserves using a small open economy calibrated DSGE model with sticky prices, financial frictions, and banking sector. They conclude that; (i) if the main target of the central bank is the price stability, then reserve requirements contribute little to the economic stability, (ii) but, when the financial stability objective is included and there is FX debt, then, active use of the reserve requirements can substantially increase the social welfare.

To sum it up, there is a wide theoretical and empirical support for the use of macro prudential measures including capital controls whenever necessary. On the other hand, though there is a general consensus that monetary policy and macro prudential tools can usefully complement each other, it is widely accepted that they are not perfect substitutes. It is also frequently highlighted that while the monetary policy works mainly through affecting all market interest rates, macro prudential tools may be more useful to target specific sectors or market segments which are assumed to be risky.

2.4.2. Macro Prudential Policy and Institutional Framework

Although the macro prudential tool set is fairly rich in terms of the number of available tools, the control of these tools does not only belong to the central banks. It is generally distributed among a number of institutions. The general consensus in literature is that; while the monetary and fiscal policies should focus on macroeconomic imbalances, macro prudential policy should concentrate on systemic risk. Therefore, the main problem in policy implementation is the decision making process and coherent coordination among the relevant institutions. The Progress Report to G-20 (2011) states that, given the inter-linkages between macroeconomic and macro prudential policies, an effective macro prudential framework requires institutional arrangements and governance structures that can ensure open and frank dialogue among policymakers on policy choices. In this report, for an effective

institutional framework; the priorities are listed as; (i) having a clear objective, (ii) providing incentives and tools for authorities to act consistent with that objective, (iii) supporting accountability and transparency of decisions, and (iv) ensuring effective coordination across policy areas that have a bearing on financial stability.

In the literature or international working group reports, there is no consensus on the institutional structures. It is frequently highlighted that the institutional structures may be shaped by country-specific circumstances, such as the culture of cooperation, the need for checks and balances, and legal tradition. White (2009) suggests that, considering the role of the financial system in boom-bust cycles, and their macro economic nature, the control of the macro prudential policy tools should be left to the central banks, while regulators should continue to focus on micro prudential policies.

Blinder (2010) defines the systemic risk as "one that is either large enough in size or broad in scope that, if anything goes wrong, it can damage a significant portion of the financial system". He suggests that, since the systemic risk and financial stability is closely related with the output and price stability goals of central banks, and naturally central banks act as the lender of the last resort, by taking the accountability problem and deficiencies of regulators on macro economic matters into account, macro prudential policies should be left to central banks.

In a similar line, Blanchard et al. (2010) argue that; the interest rate policy alone is a poor tool to deal with financial imbalances stemming from excessive risk taking, excess leverage or asset price bubbles, but consistent use of the macro prudential policy may increase the flexibility of interest rate for inflation and output stabilization purposes when macro prudential policy is used for the financial stability purposes. They suggest that, since the coordination problem requires a centralized decision making process and central banks have a comparative advantage on the macroeconomic policies, it is better to strengthen the tool kit of the central banks rather than distribute among institutions.

Nier et al. (2011) analyze 7 types of models and note that each model has strengths and weaknesses. They list general key "desirables" for the macro prudential policy arrangements as:

> 1. The central bank should play an important role. 2. Complex and fragmented regulatory structures … should be avoided. 3. Participation of

> the treasury in the policy process is useful, but a leading role poses risks. 4. Systemic risk prevention and crisis management are different policy functions that should be supported by separate organizational arrangements. 5. Macroprudential policy framework should not become a vehicle to compromise the autonomy of other established policies. 6. Arrangements need to take account of country-specific circumstances.

Similarly, the Progress Report to G-20 (2011) also highlights that;

> (i) central banks should always be represented and play a leading role, (ii) although the involvement of finance ministry is better if important regulations are required, but a possible risk associated with a central involvement of finance ministries in the operation of macro prudential framework is a reduced degree of insulation from pressures linked to the political cycle, and (iii) committee-type arrangements can help to address possible frictions between the objectives of different policies, promoting the resolution of conflicts.

Summing up, in recent years "single goal, single tool" oriented monetary policy framework has been widely criticized. According to the proponents of active participation of central banks in reducing macroeconomic and financial imbalances, monetary policy should not focus only on short run inflation, but should also target these imbalances by taking inflation and output stability into account over the longer term.[44] It should be noted that, targeting macroeconomic and financial imbalances and inflation do not conflict with each other in longer term, as long as the central banks independence and their main objective are maintained.

However, as Bario and Shim (2007) highlight, when the politicians involve in the decision making process, it is difficult to take tightening macro prudential measures for longer term goals which exceeds the election cycles. While the costs of the macro prudential measures are felt shortly in credit markets, it takes longer term to observe the potential benefits. Because of that, while the leading role of the central banks in coordination and decision making process is widely supported, the risks of heavy involvement of the treasury or the government are frequently highlighted. From the monetary policy implementation perspective, including the macro stability objective in the operating framework may imply a move from rule based policies towards more discretionary policies. This fact also likely complicates the transparency and communication policies of the central banks.

[44] See for example Caruana (2010).

In effect, the main problem of the emerging countries is not the macroeconomic or financial imbalances stemming from the domestic policies in recent years. Rather, the macro prudential risks mainly stem from the foreign capital flows. The macroeconomic and financial risks in these countries can only be reduced by coordinated use of monetary, fiscal, prudential and (whenever necessary) capital controls. As the need for more supportive tools for an effective monetary policy, involvement of more institutions, and lack of strong coordination culture are considered, the decision making process and coherent coordination are more complicated in emerging countries. Therefore, we also support that; (i) central banks should have a leading role in macro prudential policy decision making process by transferring the control of the tools related with the balance sheets of the banking system, (ii) central banks should include the macro economic risks such as current account deficit and excessive credit growth in their objective function as they empowered with macro prudential tools, but should also keep the operational independence and continue to focus on price stability as the main goal.

CHAPTER 3

EVOLUTION OF CENTRAL BANKING, MONETARY POLCY OPERATING FRAMEWORK AND FINANCIAL STRUCTURE IN TURKEY

The experiences in 1990s and 2000s provide fruitful lessons for a more efficient and effective monetary policy operating framework and successful coordination among relevant institutions in Turkey. It is generally useful to divide the last 20 years of Turkish economic policies into two parts. In 1990s, looser fiscal policies, delay in structural reforms, and high inflation were widely cited as the main obstacles of the growth in Turkey. However, in last 10 years, Turkish economy has experienced a significant breakthrough in macro economic policies. As a result of the consistent and coordinated monetary and fiscal policies which are supported by the structural reforms, while the inflation rate declined close to the average of the other emerging countries, the average growth rate somewhat increased (Figure 3.1.a and 3.1.b). In this respect, the historical data clearly suggests that year 2002 is one of the critical turning points in Turkish economic history. While the historical average growth rate of Turkey is around 5 %, it declined to 3.4 %, and the average inflation rate climbed to 73.4 % in 1990s and early 2000s.[45] But, after 2001 crisis, as a result of the prudent monetary and fiscal policies and strong banking system, while the inflation rate stabilized at around 8 %, Turkish economy achieved 5.4 % average growth rate despite the global crisis (Table 3.1).

The success of macro economic policies in general and of monetary policy specifically is measured through their success on achieving price and output stability with high growth rates. In this sense, the increase in the growth in 2000s has widely been praised as "Turkish success". The data clearly suggests that, though the average growth rate during post-2002 period increased significantly relative to that of the pre-2002 period, it should be noted that other emerging and developing country growth rates also climbed from 3.8 % to 6.5 %. Similarly, the average

[45] Since 1923, the average growth rate is 4.9%, since 1950, it is 5 %, and since 1980, it is 4.2%.

growth rate of all countries in 2000s significantly exceeded that of the 1990s. Therefore, the increase in the average growth rate of Turkey has coincided with a favorable global business cycle especially in pre-global crisis period.[46]

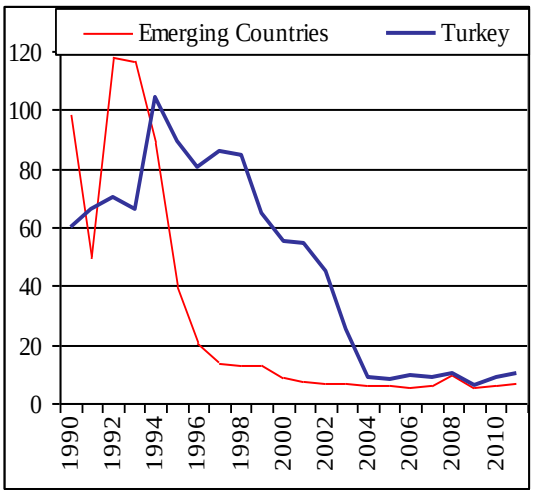

Figure 3.1.a: Inflation Rates (%)

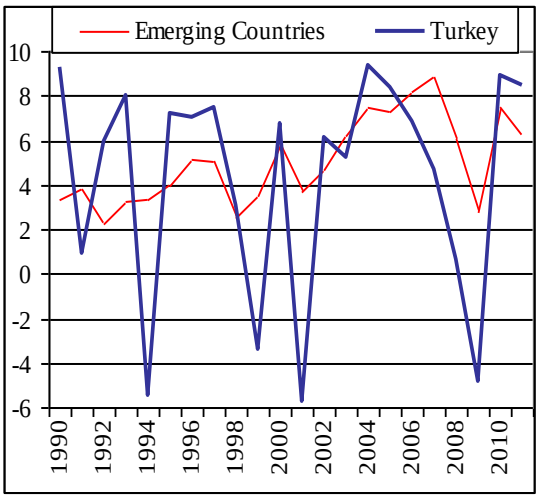

Figure 3.1.b: Growth Rates (%)

Source: IMF World Economic Outlook Database

Table 3.1. Average Growth Rates and Volatility (%)

	Averages				Standart Deviations			
	1990-01	2002-11	2002-06	2007-11	1990-01	2002-11	2002-06	2007-11
World	3.1	3.8	4.2	3.4	0.9	1.8	1.0	2.5
Emerging Countries	3.8	6.5	6.8	6.3	1.1	1.8	1.4	2.3
Turkey	3.4	5.4	7.2	3.6	5.5	4.4	1.7	5.8

Source: IMF World Economic Outlook Database and author's calculations.

In fact, despite the favorable global conditions during most of the period, the relative price stability and fiscal discipline could not result in significant improvement in output stability. The output volatility could only be reduced from 5.5 % to 4.4 %. When the post-2001 period was divided into pre-2006 and post-2006 periods, the data points out that, there is a clear worsening in the growth performance and in its volatility in the second half of 2000s. While the 7.2 %

[46] Erdem (2011) provides a comprehensive literature review and investigates the role of external factors on the business cycles of emerging market economies. She concludes that especially in the last 15 years, the impact of development in global economic conditions on emerging country economies has significantly increased.

average growth rate in Turkey exceeded 6.8 % of the growth rate of other emerging countries, and volatilities were converged during the 2002-06, after 2006, the average growth rate of Turkey sharply declined to 3.6 % while emerging countries' average remained at around 6.3 %.

Some part of the weak macro economic performance in the second half of 2000s may be attributed to: (i) the global crisis, (ii) close trade links with the European Union, and (iii) worsening in the terms of trade as a result of increase in energy prices. It may also be noted that, in fact, the strong banking system and prudent fiscal policies have reduced the vulnerability of the economy to the external shocks. In addition, the CBRT has also improved its monetary policy operating framework. Therefore, it may also be argued that, the increase in effectiveness of the monetary policy and its credibility prevented worsening in inflation, though economic performance was weaker relative to its peers.

Despite all these justifications for the weaker economic performance in recent years, it should be highlighted that Turkey has withdrawn an unprecedented capital inflow during the 2000s. Therefore, Turkey has also built up significant external and internal imbalances which intensified after the global crisis as a result of the favorable global liquidity conditions and credible domestic macroeconomic policies. We argue that two of the main suspects of these imbalances have been heavy foreign capital inflows and inefficiency of the "single goal – single tool" monetary policy operating framework.[47] If the monetary policy operating framework was designed to smooth out the impacts of the external shocks on domestic economic activity as early as in mid-2000s, the volatilities of the inflation and output, and growing imbalances could be reduced.

In fact, since the last quarter of 2010, these growing imbalances have forced the CBRT to change the monetary policy operating framework from "single goal, single tool" to "multiple goal, multiple tool" framework. The CBRT included the external (current account deficit) and financial stability (domestic credit growth) as explicit variables in her objective function. Then, the CBRT and Banking Regulation

[47] However the CBRT also targets the output and foreign exchange rates implicitly and loosely, she refrained to accept these variables as an explicit targets in her objective function and did not use other policy tools actively until 2010. That's why we classify the pre-2010 period monetary policy operating framework as "single goal – single tool" operating framework.

and Supervision Agency (BRSA) have started to use the required reserves and capital adequacy ratios to reduce these imbalances. In order to evaluate the efficiency of the CBRT's monetary policy operating framework and to suggest a more efficient one, there is a clear need of a re-visit: (i) the underlying economic and financial structures, (ii) the sources of the imbalances, and (iii) the recent history of the monetary policy operating framework of the CBRT.

3.1. A Brief History of Central Banking in Turkey up to 1990s

Though there has been a time lag as in most of the other emerging countries, the evolution of central banking in Turkey has followed a similar pattern with the developed countries' central banking.[48] The CBRT was established in 1930 and became operational in 1932. Initially, although the main objective of the CBRT was set as to contribute to the development of the country, the operational objective was mainly the price and exchange rate stability. But, during the World War II and in 1950s, the governments discovered the methods of resorting to the CBRT's balance sheet through the short term advance credits to the Treasury and direct credits to the public sector. From 1940s to 1990s, almost all increase in the reserve money had stemmed from the increase in public sector credits, while the banking sector credits had played only a fine tuning role.[49] Thus, in Turkey, the main function of the CBRT was to finance the budget deficits and public sector investments during that era.

Although, the inflation rates remained subdued during Bretton Woods era, high and variable inflation rates had become the main feature of the Turkish economy from 1970s to early 2000s (Figure 3.2). The main reason of this high and chronic inflation had been public sector deficits financed through the CBRT resources, accommodative monetary policies, and policies to keep TL undervalued to promote exports in 1980s which resulted in inflationary inertia.[50] While the main function of the CBRT was to finance public deficits within the fixed exchange rate

[48] Kazgan et al. (2000) and Önder (2005) provides a brief history of the central banking in Turkey.

[49] In addition to Annual Reports of the CBRT, the evolution of the CBRT balance sheet is available in Önder (2005). His figures show that, during 1940 – 1998, usually broadly more that 80 of reserve money had been financed through public sector credits.

[50] See Lim and Papi (1997) for a short review on the causes of high inflation in Turkey.

regime and with tight capital controls, up to mid 1980s, the CBRT had mostly used direct monetary policy tools. The main monetary policy tools were: (i) discount window facility rate, (ii) reserve requirements, (iii) liquidity ratios held in government securities, (iv) interest rate ceilings, and (v) selective credit limits. But, in addition to the domestic inconsistent monetary, fiscal and trade policies, the oil price shocks, economic stagnation and great inflation in developed countries had caused high inflation, low growth rates and balance of payment crisis in late 1970s.

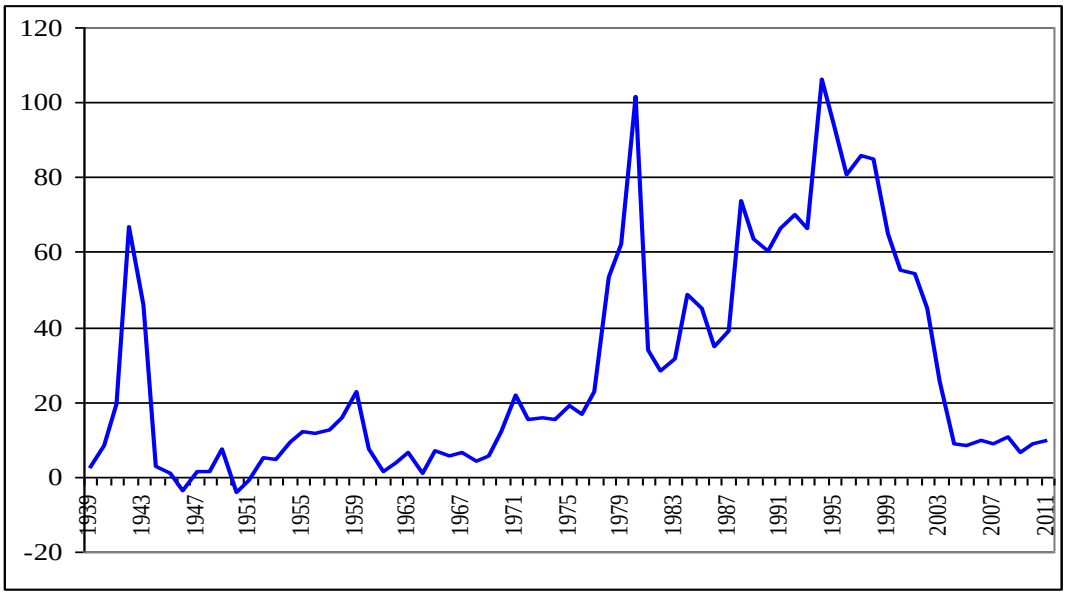

Figure 3.2: Inflation History of Turkey (%)
Source: CBRT Electronic Data Dissemination System (EDDS).

This crisis had resulted in a significant shift in all economic policies from an inward oriented one towards a market based economy through liberalization and deregulation of all markets starting from 1980, as in most of the other emerging and developed countries. The significant changes in financial markets in 1980s may be listed as: (i) establishment of the foreign exchange, money and securities markets (which enabled the treasury to finance the public deficits through bond issuances), (ii) a gradual elimination of restrictions on the foreign exchange markets and deregulation of the capital account, (iii) the elimination of the interest rate ceilings.

In market based economies, the critical factors for an efficient and effective monetary policy are; (i) the capacity of the central banks to control their balance sheets, in other words instrument independence, (ii) an effective and consistent

operating framework, and (iii) the existence of well functioning money, securities and credit markets. In late 1980s, the CBRT had significant role in establishment of the financial markets to use market based open market operations as an active policy tool. The initial steps towards an efficient operating framework consistent with the modern central banking were taken in the second half of the 1980s.[51] In 1987, the CBRT aimed to institute the infrastructure for market based monetary operations, and to promote the developments of money, securities and foreign exchange markets. For this purpose, the CBRT established Interbank Money Market Division, Open Market Division, Foreign Exchange and Banknote Division and Treasury Transactions Division within the Markets Department. The aim of the Interbank Money Market Division was to act as a blind broker for TL deposit trade between banks and to facilitate open market operations transactions though TL deposits on the behalf of the CBRT. The CBRT also started to use this market as standing facilities of the CBRT. The duties of the Foreign Exchange and Banknote Division were also similar to Interbank Money Market. At this market, the CBRT started to act as a blind broker between banks for their FX banknote, FX and FX deposit trades, and to use this market for its FX interventions. The CBRT also started to provide limited FX deposit facility to banks. The Open Market Operation Desk was established for standard repo, reverse repo and outright transactions. The aim of the Treasury Transactions Division was to sell the Treasury securities through auctions and taps on the behalf of the Treasury. The CBRT had a leading role on the developments of money and FX markets through these markets in Turkey.

The CBRT still conducts the monetary operations through these markets. In addition to these CBRT markets, Istanbul Stock Exchange also established Bond and Bills Market in 1992 and Repo-Reverse Repo Market in 1993. These organized markets have become the most developed money and securities markets in Turkey. In addition to these markets, the over the counter FX market has also developed. In addition, at the beginning of 1990s, the economy has started to operate under full capital mobility through eliminating all trade and capital restrictions.

[51] See Önder (2005) for the evolution of the monetary policy tools in Turkey.

3.2. The Monetary and Macroeconomic Policies in 1990s and the Lessons

The 1990s is widely characterized as a vicious circle period of the Turkish economy. The main characteristics of this period were political instability, delays in most needed structural reforms in agriculture, banking and social security systems, high fiscal deficits, fragile banking system and lack of public support for the structural reforms. These peculiarities caused very high and volatile inflation rates, very high real interest rates, low and volatile growth rates, worsening in fiscal deficits and increase in debt stock (Table 3.2).

Table 3.2. Main Macroeconomic Indicators in 1990s

	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
GDP Growth	6,0	8,0	-5,5	7,2	7,0	7,5	3,1	-3,4	6,8	-5,7
Average CPI Inflation	70,1	66,1	104,5	89,6	80,2	85,7	84,7	64,9	55,0	54,2
Current Account/GDP	-0,5	-3,2	0,3	-2,4	-1,0	-1,0	0,8	-0,4	-3,7	1,9
Pub.Sec. Primary Deficit/GDP	3,3	1,5	-3,5	-3,4	-2,2	-0,9	-2,5	0,2	-4,3	-6,0
Interest Payments/GDP	2,7	4,4	5,7	5,5	7,5	5,9	8,8	10,2	12,3	17,1
PSBR/GDP	7,9	7,7	4,6	3,7	6,5	5,8	7,1	11,6	8,9	12,1
Debt Stock/GDP	29,7	30,5	40,0	32,9	33,4	32,9	31,0	39,8	38,2	74,1
Duty Losses(Public Banks)/GDP			2,5	1,6	3,2	3,9	5,7	10,3	9,1	0,0
Debt Stock/M2Y	64,2	67,0	67,8	58,1	60,7	57,6	57,4	57,1	67,0	117,6
Month.to Mat.of Cash Dom.Debt							4,6	11,7	9,4	19,2

Sources: T.R. Ministry of Development, CBRT and Undersecretariat of Treasury.

When the public sector primary surplus after 1993 and the relatively lower public sector debt stock are considered, it is difficult to attribute the weaker economic performance to only the fiscal policies. We argue that the political instability, weak banking system and low credibility of the monetary and fiscal policies were the most important reasons of the vicious circle period dynamics and weak economic performance. In 1990-01 period, 12 coalition or minority governments with an average of 1 year term ruled in the country. Although these governments were generally aware of the structural problems of Turkey, as a result of the fragile political conditions, the governments could not focus on the roots of the problems. In fact, in addition to the short term cost of structural reforms, low debt stock of the firms and households, and widespread wage and price indexations

caused weak public support for the stabilization policies. Since the private sector was in a net lender position, the observable and short run costs of the high real interest rates during this period were mostly assumed by the Treasury which was the main borrower.

The other important factor for a weak economic performance was the weak financial system. The main features of the banking system were lack of transparency, lack of internal and external risk control mechanism, and being exposure to all types of risks. Although the published official banking system data did not signal any severe problems, it should be noted that the data was not a reliable indicator. It was known that some banks were established to finance mainly the group-firms' investments through inter-group credits. It was also common for these banks to hide their non-performing loans. The second problem of the banking system was the high FX risk exposure. As a result of the implicit real exchange rate targeting strategy of the CBRT and high Turkish Lira (TL) real interest rates, borrowing in FX and then lending to the Treasury in TL through open FX positions was a profitable business for the banks. Some part of the FX open positions was closed through non-credible or fake forward or swap transactions. For example, while the in-balance sheet net FX open position of the banking system increased from USD 5 billion to USD 17.4 billion during 1997 – 2000, the net FX position was only USD 5.5 billion in 2000.[52] Meanwhile, the high TL real interest rates forced the real sector to finance their investments through the banking system FX credits. Therefore, the banking system had both direct and indirect FX risk in this period. The other problem was the asset-liability mismatch. While the maturity of the deposits declined to around 4 months, the desire of the Treasury to extent its borrowing maturity caused huge interest rate risk for the banking system especially in 2000. Although, the Turkish banking system had all types of risks: credit, interest rate, liquidity and FX risks, because of the measurement methods and recording conventions, the officially announced banking system capital adequacy and profitability ratios were at internationally acceptable levels.

During this period, the Treasury was the main responsible institution for the supervision and regulations of the banking system, in addition to its public finance

[52] See Özatay (2011). In his book, he provides all critical macro-economic variables and discusses the main policy mistakes. See also Derviş (2001) for a brief analysis of 1990s.

responsibility. Any tight measures would increase the Treasury's cost of borrowing in the short run. Thus, in addition to political interventions, the conflict of interest also prevented tight measures which were necessary to reduce the risks undertaken by the banking system. The other critical problem was the unpaid duty losses of the public banks. During 1990s, the governments resorted to support agricultural and small and medium scale sectors through public banks' resources at significantly lower interest rates than the market rates. Therefore, the public banks incurred huge losses as they financed these credits through the deposits and interbank borrowing at higher interest rates. But the public banks did not record and report the duty losses transparently. These losses were not reported in public sector debt stock or borrowing requirements either. As the Treasury did not pay these losses, the liquidity needs of the public banks increased dramatically. The duty losses of the public banks accrued from 2.5 % of GDP to 9.1 % of GDP during 1994 – 2000.

On the other hand, although the CBRT established the required infrastructure and instruments for an effective monetary policy in late 1980s and early 1990s, the treasury's heavy reliance on the CBRT credits up to 1994, and then the fiscal dominance and weak banking system after 1994 prevented the CBRT to conduct an active and effective monetary policy until 2002 (Figure 3.3).

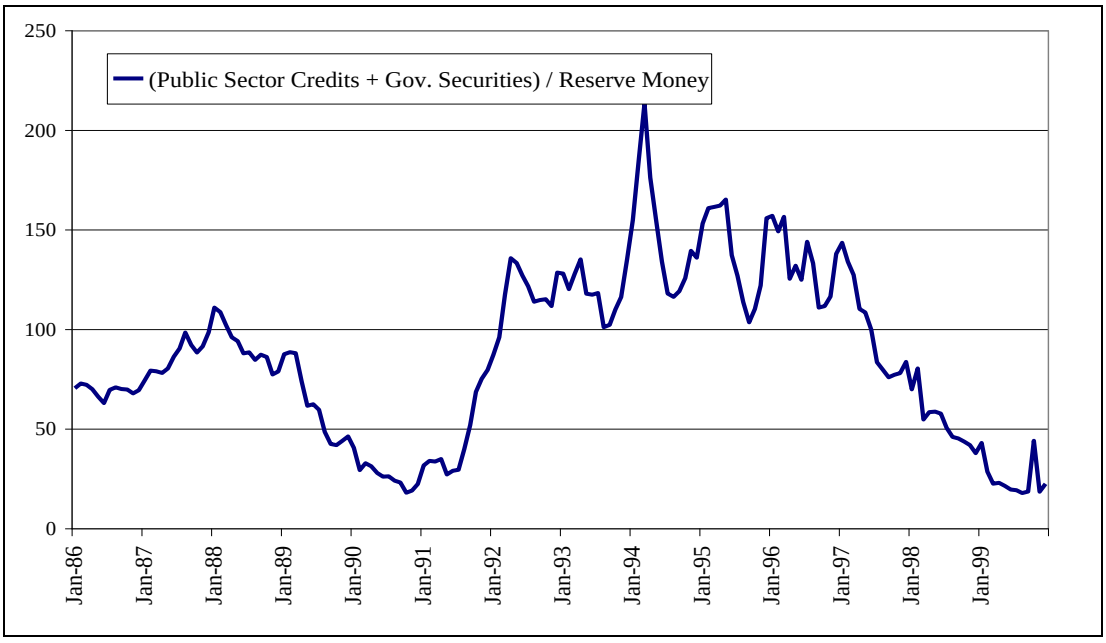

Figure 3.3: The Share of Public Sector in Reserve Money
Source: CBRT EDDS and author's calculations.

Year 1994 was one of the critical turning points for the central banking in Turkey as the short term advance credits and other forms of public sector credits had started to be eliminated gradually to enhance the instrument independence of the CBRT and her ability to control her balance sheet. Although, after 1994, the fiscal discipline had been maintained in terms of primary fiscal deficits, and tight monetary policy had applied in terms of high real interest rates, the vicious circle process could not be broken mainly due to the credibility problem which caused nominal rigidities in inflation, very high interest rates and volatility in exchange rates.

During this period, the weak banking system, fiscal dominance, and frequent external and domestic shocks had forced the CBRT to have multiple and conflicting objectives. Especially after 1994 crisis, the CBRT adopted a kind of hybrid monetary policy strategy. The main features of the monetary policy operating framework of the CBRT during 1995 – 1999 were:[53]

(i) Multiple goals: (a) to contain inflation as much as possible, (b) to keep competitiveness as much as possible through implicit real exchange rate targeting, and (c) to reduce the volatility in financial markets to help the Treasury for domestic borrowing roll-over.

(ii) Multiple intermediate targets: real exchange rate, and reserve money or net domestic assets.

(iii) Multiple tools: (a) open market operations, and (b) exchange rate transactions through intervention and compulsory FX transfers.

Though the CBRT was aware of the inconsistency of having multiple and conflicting objectives under free capital mobility, she tried to find a balance between these objectives. Under these conditions, because of a mix of the monetary and exchange rate targeting, the CBRT could not use the short term interest rate as the main policy tool up to 2001. The higher volatility of the short term interest rates than

[53] In Annual Reports (1995, 1996, 1997, 1998, 1999), the CBRT clearly highlights that it used monetary aggregate and exchange rates as nominal anchors at the same time due the frequent turbulence in financial markets. The CBRT also points out that containing volatility in the markets was in its objective function.

the volatility of the FX rate points out that, the CBRT focused more on stability of FX rates in 1990s through FX intervention (Figure 3.4).[54]

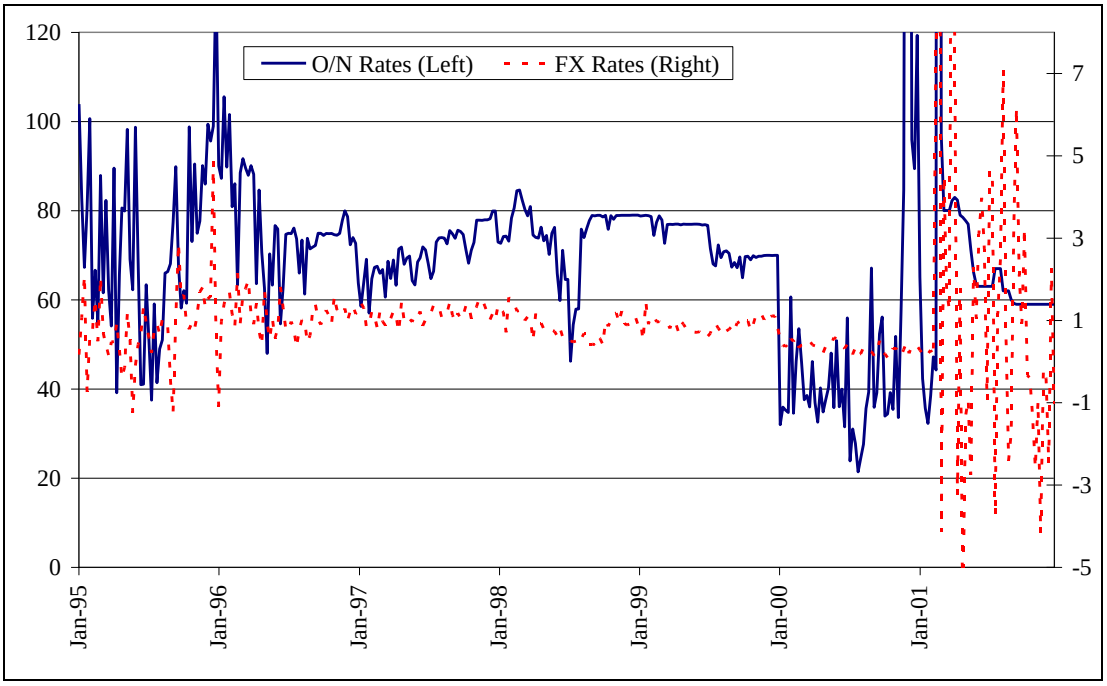

Figure 3.4: O/N Interest Rates and Weekly Change in Exchange Rate (Basket, %)
Source: CBRT EDDS and author's calculations.

Although the CBRT set standing facilities lending and borrowing rates at the interbank money market, she did not announce these rates to the market and changed whenever she wanted without any explanation. Similarly, repo and reverse repo auctions were held through price auctions in which the CBRT announced the amount of the auctions and interest rates were determined by the demand for or supply of liquidity. Therefore, there was a transparency problem. The main indicators of the change in monetary policy stance were the change in CBRT standing facilities' rates and FX intervention.[55]

[54] If a central bank targets the exchange rate, then volatility in interest rate increases as implied by the impossibly trinity proposition. If a central bank focuses on control of the short term interest rates as the main policy tool, then the volatility of exchange rate increases. Therefore, the relative volatilities of these two variables provide clear information on the relative importance of exchange rate and interest rate as a policy tool.

[55] As discussed in Chapter 2, transparency is a pre-condition for an effective monetary policy. But, sometimes, central banks may claim that, in order to preserve flexibility, they opt for non-transparent monetary policy strategies during volatile market conditions. As a central banker with some crisis experiences, we think that, the desire for the flexibility usually increases when some pre-conditions of

In fact, it is clearly unfair to attribute the volatility in financial markets and worsening in economic performances to only domestic fiscal and monetary policies. The second half of the 1990s was full of emerging market crisis and natural disasters.[56] In the analysis, the negative effects of South Asian crisis in 1997, crisis in Russia in 1998, Brazil in 1999, Argentina in 2000, and severe Bolu and Gölcük earthquakes in 1999 should also be taken into account. These external shocks and natural disasters clearly reduced the effectiveness of the domestic macroeconomic policies. In addition, the credibility problem stemming from the fragile political structure and past mistakes, and high risk premiums reduced the endurance of the Turkish economy to these shocks. In 1999, although the public sector primary position was almost in balance, when the public banks duty losses are included, the Public Sector Borrowing Requirement / Gross Domestic Product (PSBR/GDP) ratio shifted to 21.9 %, and the debt stock/GDP ratio increased to 50.2 %. This trend was clearly unsustainable.

In order to break this vicious circle, despite the huge literature on "mirage of fixed exchange rate regimes" and other emerging country experiences, a strong exchange rate based stabilization program supported by the tight fiscal and structural reform targets was introduced at the end of 1999.[57] The main rationale for the exchange rate based program was to solve the credibility problem.[58] It was assumed that, with the pre-announced exchange rate path, because of the high pass through and borrowed credibility, the inflation and interest rates would be reduced in a short period which would eliminate the fiscal dominance in the economy. Then, more flexibility in exchange rates would be allowed gradually during the exit strategy.

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effective monetary policy has started to wane, or when central banks focus on short term multiple and conflicting goals rather than the longer term price stability objective as in 1990s in Turkey.

[56] In the literature, the negative effects of these factors on poor economic performance in second half of the 1990s are frequently downsized.

[57] See for example Obstfeld and Rogoff (1995).

[58] The exchange rate was the main explanatory variable of inflation. For example, Lim and Papi (1995) found that, initially monetary aggregates, but then the exchange rate played the central role in the inflationary process in Turkey. They also highlighted that inertial factors and public sector deficits were significant variables which determined the inflation. Kibritçioğlu (2002) also provides a comprehensive literature survey on inflation in Turkey. He also summarizes the consensus view as that; the inflation was inertial and main determinant was the exchange rate, though public deficits and money financing also had some role during pre-2002 period.

But, as a result of the delays in structural reforms especially on banking system side, worsening in terms of trade, volatility in emerging markets and fragile banking system, the CBRT faced with the famous "impossible trinity" problem. The exchange rate based stabilization program collapsed by sequential liquidity crisis in November 2000 and currency crisis in February 2001.[59] The result of this stabilization program was severe banking and currency crisis.[60] As a result of the depreciation of TL, high real interest rates and the cost of banking sector rehabilitation, the debt stock of public sector increased up to 74.1 % of GDP at the end of 2001.

When the level of public debt stock and public sector primary deficits (which are frequently cited in literature as the main suspects of the weak economic performance and crisis in 1990s) are taken into account, it is difficult to justify the high real interest rates and lower growth rates of 1990s through only the looser fiscal policies. Even after the severe economic crisis in 1994, while the government debt stock was only 40 % of GDP according to the revised GDP series (53.8 % by the old series), the ratio of domestic debt stock to M2Y was 67.8 %.[61] As a result of 73.5 % average inflation and lack of confidence to economic policies, domestic average real interest rates remained around 15 %. Another result of the confidence problem was the less than 1 year average maturity of the public debt stock. Although the public sector had created significant primary surplus since 1994, the increase in interest payments had worsened debt stock ratios.

The experiences in 1990 provide rich lessons for the future monetary policy operating framework for the policymakers. Four of the most important lessons of the 1990s are: (i) critical roles of the credibility and transparency of the monetary and fiscal policies, (ii) high costs of inflation and irresponsible fiscal policies, (iii) significant role of the financial stability for an effective monetary policy operating framework especially during turbulent periods, and (iv) ineffectiveness of the

[59] See CBRT (2003) public announcement on crisis for the details of crisis.

[60] Ozatay and Sak (2002) provide a comprehensive analysis of 2001 crisis. They put a special emphasis on the fragility of the banking system. See also Celasun (2002) for more details on the underlying reasons of the crisis.

[61] M2Y is the total money supply including FX deposits.

monetary policy with multiple and conflicting objectives when it is not coordinated by fiscal and prudential policies.

3.3. Monetary and Macroeconomic Policies in Post-2002 Period

The collapse of the stabilization program has caused significant changes in macroeconomic policies in Turkey. The first four critical moves were:[62] (i) introduction of the floating exchange rate regime, (ii) stabilization of the money markets, (iii) resolution of the banking system's liquidity and open FX position problems through debt swap and capital injection by the Treasury in coordination with the CBRT, and (iv) providing full operational independence to the CBRT by making amendments of her law in 2001. The law that was amended in April 2001 made the CBRT full instrument independent and all forms of public sector credits were forbidden. The new law clearly states that the CBRT's primary objective is to achieve and maintain the price stability. Meanwhile, Turkey had introduced a new IMF and World Bank endorsed stabilization program with strong targets for the disinflation, fiscal discipline, reforms in banking system and privatization.[63] The banking system reforms included; (i) recapitalization of the banking system, (ii) introducing strict rules for the liquidity and capital adequacy ratios, and (iii) strengthening the supervision and regulatory power of the BRSA.[64]

Meanwhile, as the inefficiency of intermediate targeting through monetary aggregates or exchange rates was proved and the credibility of these intermediate targeting strategies was disappeared, Turkish authorities opted for the inflation targeting strategy in a gradual manner. It was well known that, a successful full fledged and credible inflation targeting strategy in emerging countries requires:[65] (i) absence of fiscal dominance, (ii) lower level of inflation, (iii) lower pass-through from exchange rates to inflation, (iv) well developed financial markets and sound banking system, (v) independent central bank (managerial and instrument

[62] See Serdengeçti (2002) more detail.

[63] See Derviş (2001) for the main building blocks of the new stabilization program. The economic policies in the following five years were designed broadly in line with this program, though there have been some modifications.

[64] See BRSA (2010) for more details on reform in banking system.

[65] See Freedman and Ötker-Robe (2010).

independence), (vi) lower level of dollarization, and (vii) well understanding of the transmission mechanism and efficient operating framework, as pre-conditions.

The pre-conditions of inflation targeting were fulfilled to a great extent during 2002 – 2005. During this period; while the exchange rate pass through to inflation declined from around 60 % to 30 % as markets and public had got accustomed with the floating exchange rate policy, inflation rate was reduced from around 70% to less than 10 %.[66] In addition, while restructuring and reforms in the banking system was completed, the fiscal dominance was significantly eased as a result of maintained fiscal discipline. In addition, inflation expectations converged to the targets as a result of increased credibility of the CBRT. Meanwhile, the CBRT improved the monetary policy operating framework and its modeling capacity. Then, the CBRT introduced full fledged inflation targeting in 2006 within more or less "single goal – single tool" monetary policy operating framework.[67]

3.4. Macroeconomic Performance in Post-2002 Period

The implicit inflation targeting period is one of the success stories of the Turkish economic history. The commitments to the program targets through the prudent fiscal and monetary policies, and structural reforms had increased the credibility of monetary and fiscal policies. And after a long time, the announced inflation targets have started to act as a nominal anchor. Therefore, after 2002, Turkish economy entered a virtuous cycle period which continued up to 2006. During 2002 – 2005, while the annual average inflation rate declined from 54.2 % to 8.2 %, the average growth rate increased up to 7.3 % (Table 3.3).

Although the real interest rates remained high, an average of 6.8 % public sector primary surplus to GDP ratio carried fiscal deficit to a positive territory in 2006. Therefore, during this period, the pubic debt to GDP ratio declined from 74.1 % to 45.5 %, and while the inflation rate declined to the level of other emerging

[66] Leigh and Rossi (2002) estimated the pass-through rate as 60 % for wholesale prices and 45 % for consumer prices in 2002. Kara and Öğünç (2005) found that the pass-through rate declined to around 30 % in 2005 for core CPI, just prior to full-fledged inflation targeting. Kara and Öğünç (2011) estimated the pass-through as 15 % in their revised study.

[67] See Ersel and Ozatay (2008) for the discussion of the improvements in macroeconomic conditions in Turkey for inflation targeting strategy. Kara (2006) also provides detailed information for the transformation of monetary policy from implicit to explicit inflation targeting.

country averages, the average growth rate exceeded the 6.8 % average growth rate of these countries. It should be noted that, this period was also coincided with favorable global conditions. The global characteristics of the 2002 – 2007 were: (i) intensive reform process in most of the emerging economies, and (ii) increase in global liquidity which induced huge capital inflows to the emerging countries. When the general trend of the foreign capital inflows, decline in inflation and increase in growth rates in almost all emerging countries are considered, although it is difficult to attribute the improvements in domestic macroeconomic conditions in Turkey to only domestic policies, a significant part of these improvements stemmed from the prudent fiscal and monetary policies.

Table 3.3. Main Trends of Economic Indicators in Turkey (%)

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
GDP Growth	-5.7	6.2	5.3	9.4	8.4	6.9	4.7	0.7	-4.8	9.0	8.5
Average CPI Inflation	54.2	45.1	25.3	8.6	8.2	9.6	8.8	10.4	6.3	8.6	9.9
Current Account/GDP	1.9	-0.3	-2.5	-3.7	-4.6	-6.1	-5.9	-5.7	-2.3	-6.4	-9.9
Pub.Sec. Primary Deficit/GDP	-6.0	-5.5	-6.1	-6.8	-7.3	-8.1	-5.9	-3.9	-0.7	-2.3	-2.3
Interest Payments/GDP	17.1	14.8	12.9	10.1	7.0	6.1	5.8	5.3	5.6	4.4	3.3
PSBR/GDP	12.1	10.0	7.3	3.6	-0.1	-1.9	0.1	1.6	5.1	2.3	1.0
Debt Stock/GDP	74.1	69.2	62.2	56.6	51.1	45.5	39.6	40.0	46.3	43.1	40.0
Debt Stock/M2Y	117.6	111.5	128.6	121.1	105.1	88.5	78.4	66.9	72.1	60.0	56.3
Month.to Mat.of Cash Dom.Debt	19.2	12.8	12.4	11.8	19.6	22.3	25.7	24.4	25.0	30.9	31.1

Sources: T.R. Ministry of Development, CBRT and Undersecretariat of Treasury.

On the monetary policy side, in 2002, it was announced that the inflation rate would gradually be reduced down to 8 % in 2005, by setting year-end inflation targets (Table 3.4). Then, in 2003, the medium term inflation target for beyond 2006 was set at 4 %, consistent with the acceptable price stability level for emerging countries.[68] During the implicit inflation targeting period, year-end inflation rates had always declined below the targets. The success of the monetary policy quickly improved the credibility of the CBRT. Though the gap between one year ahead inflation expectations and targets was 15 percentage points at the beginning of the

[68] Because of Balassa-Sameulson effect, generally higher inflation targets than the developed countries are accepted in emerging countries during the convergence process.

2002, this credibility gap was completely closed in 2004. Therefore, the inflation inertia had significantly waned as the inflation targets had started to act as a strong anchor for the economic agents.

Table 3.4. Inflation Targets and Realizations (Year-End, %)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Inflation Target (T)	35.0	20.0	12.0	8.0	5.0	4.0	4.0	7.5	6.5	5.5
Realization (R)	29.7	18.4	9.3	7.7	9.7	8.4	10.1	6.5	6.4	10.4
Difference (R - T)	-5.3	-1.6	-2.7	-0.3	4.7	4.4	6.1	-1.0	-0.1	4.9

Source: CBRT.

However, the success of the implicit inflation targeting period could not be maintained during the explicit inflation targeting period. In the first year of the inflation targeting strategy, while the target was 5 %, mainly as a result of the volatility in exchange rate at the middle of the year, the inflation rate jumped to 9.7 %. This failure reduced the nominal anchor role of the inflation targets (Figure 3.5).[69] In addition, when the inflation rate accelerated in 2008 mainly as a result of increases in commodity prices, Turkish authorities opted for changing the inflation targets instead of tightening the monetary policy. In 2008, it was announced that during 2009 – 2011 period the inflation rates would gradually decline to 5.5 %. But, in 2011, the inflation rate jumped to double digit level (10.4 %) again. As a result of these frequent failures, inflation expectations became sticky at around 7 %. To sum it up, although the initial conditions for explicit inflation targeting were successfully satisfied just in 4 years, and the inflation rate was reduced to single digits after a three decade of high and chronic inflation period, the CBRT was not successful to keep the inflation at low levels.

In addition, during the explicit inflation targeting period, the average growth performance is significantly lower than that of the implicit inflation targeting period. While the average growth rate of the emerging countries is 6.3 % in 2007 – 2011, and there is only 50 basis points decline relative to that of the 2002 – 2006, the

[69] The targets within a year are calculated by simple interpolation consistent with the end year targets in Figure 3.5. The difference between targets and expectations is defined as monetary policy credibility gap.

average growth rate of Turkey declined from 7.2 % to 3.6 %. Although some part of this poorer performance may be attributed to the global crisis, when the other emerging country growth performances are considered, it is difficult to ignore the negative effects of the domestic policies, such as reform fatigue, increase in foreign exchange debt level, and loss of competitiveness as a result of the TL appreciation.

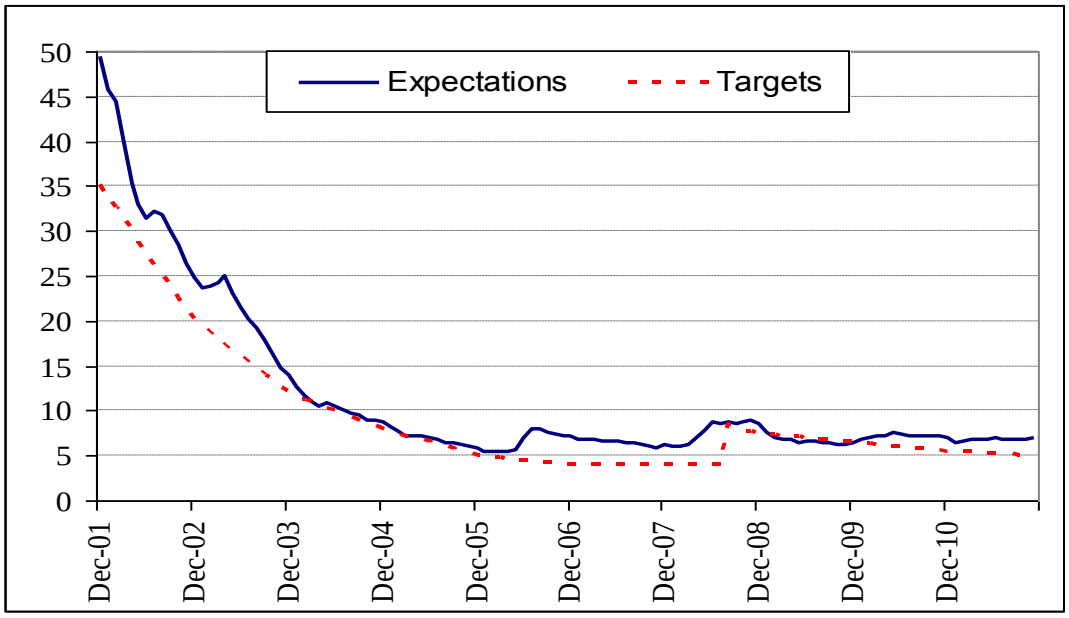

Figure 3.5: Inflation Targets and Inflation Expectations
Source: CBRT.

Despite the relatively poor performances on growth and inflation fronts, fiscal discipline and political stability have continued to be the main anchors of the economy. As a result of privatization revenues and fiscal discipline, the debt stock to GDP ratio declined from 45.5 % in 2005 to 40 % in 2011. Similarly, the ratio of pubic sector interest payments to GDP declined down to 3.3 % in 2010 from 17.1 % in 2001 and 12.3 % in 2000. However, the macroeconomic imbalances have grown significantly during the second half of 2000s. The main differences of pre-2000 and post-2000 periods are: (i) huge increase in all forms of capital inflows, (ii) significant increase in the current account deficit and external debt stock, and (iii) significant decline in the saving rate (Table 3.5). While investment rate remained broadly stabile, saving rate declined steadily from around 21 % to 13 % in the last 10 years. In the same period, unprecedented huge current account deficits caused

significant increase in net foreign financial debt stock (excluding direct investments) from only USD 89.6 billion in 2001 to USD 295.6 in 2011.

Table 3.5. Selected Economic Indicators in Turkey

Selected Economic Indicators in Turkey (% or billion USD)				
	1990-2001	2002-11	2002-06	2007-11
Investments / GDP (Average, %)	21.7	19.7	19.3	20.0
Savings / GDP (Average, %)	20.8	15.0	15.9	14.0
Current Account / GDP (Average, %)	-0.9	-4.8	-3.4	-6.1
Current Account (Total, Billion USD)	-19.7	-294.3	-77.1	-217.2
Net Direct Investments (Total, billion USD)	9.1	97.2	32.4	64.8
Net Portfolio Investment (Total, billion USD)	12.1	43.9	19.5	24.4
Net Public and Private Borrowing (Total, billion USD)	24.8	164.8	52.4	112.4
Increase in CBRT Reserves (Total, billion USD)	4.0	68.1	42.1	26.0
CBRT Intern. Reserves (End of Period, billion USD)	20.0	88.3	63.3	88.3
Net Finan. Ext. Debt Stock (End of Period, billion USD)	89.6	295.9	182.9	295.9
CBRT Reserves / Net Financial External Debt (%)	22.3	29.8	34.6	29.8

Sources: T.R. Ministry of Development, CBRT and Undersecretariat of Treasury.

The other impact of huge capital inflow was the appreciation of TL until 2010. During the implicit inflation targeting period, the CBRT has resorted intervention more aggressively to accumulate foreign exchange reserves to reduce the risks stemming from increase in foreign debt stock, rather than to allow the real exchange rates and current account deficits to adjust. However, in the second half of 2000s, the CBRT was more inclined to let the current account deficits and real exchange rates to absorb the foreign capital flows. Therefore, while the ratio of CBRT reserves to total financial debt stock increased from 22.3 % to 34.6 % in 2001 – 2006, this ratio declined to % 29.8 in 2011.

The increase in current account deficit in the second half of 2000s can not be explained by only higher energy and other commodity prices. Although the terms of trade worsened sharply in early 2000s which was mostly coincided with the crisis years and implicit inflation targeting period, there has been a very gradual deterioration thereafter (Figure 3.6). One of the implication of huge current account deficit and appreciation of TL during the explicit inflation targeting period is the imported disinflation which explains some part of success in inflation. The other

implication of increase in net foreign debt stock will be structural current account deficit in the following years as the non-residents start to withdraw the returns of their investments even they keep the principal in the country.

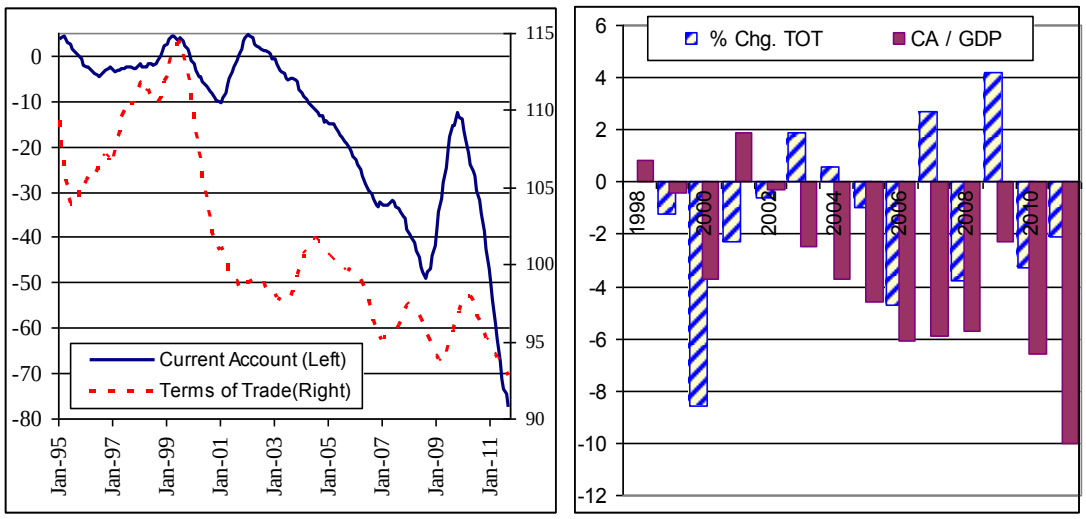

Figure 3.6: Current Account Deficit (billion USD) and Terms of Trade
Source: CBRT EDDS and authors calculations.

3.5. Evolution of Monetary Policy Operating Framework in Post-2002 Period

The collapse of the exchange rate based economic program resulted in a dramatic changes in the operational framework of the monetary policy in line with the changes in macroeconomic policies. After restoring the confidence in money markets through eliminating the TL liquidity and FX open position problems of the banking system, the CBRT tried to set up an efficient monetary policy operating framework consistent with the inflation targeting strategy. The CBRT announced the floating exchange rate regime in the morning of February 22nd. Just after the crisis, in order to restore the confidence in the markets the CBRT and the Treasury took the three important steps:[70] (i) The CBRT announced that she would actively set lending and borrowing rates in ISE Repo-Reverse Repo Market, and would not allow any failure in this market. Therefore, the CBRT implicitly guaranteed the smooth functioning of money markets which was vital for financial stability. (ii) In coordination with the Treasury, while the Treasury issued government securities to

[70] The critical role of quick and coordinated response to the crisis was appreciated during the global crisis by the developed countries. In this respect, the quick and coordinated response of Turkish authorities has been shown a "best practices" example.

the illiquid public and intervened banks to restore their capital, the CBRT purchased TL 14 billion of these securities from these banks. The CBRT also provided privileged repo lines to these banks. Therefore, the pressure of these banks on money markets was removed. (iii) The Treasury's debt swap operation solved the banking system's open FX position problem. Therefore pressure on FX markets was also reduced.

All critical operations were realized in just three months. In order to establish a well functioning and consistent operational framework under floating exchange rate regime, the CBRT took five important steps starting from the second half of 2001:[71] (i) Firstly, O/N interest rate was selected as the main policy tool. In this framework, the CBRT firstly concentrated on increasing the role of the short term interest rates in the transmission mechanism under the floating exchange rate regime. And to increase that role, the CBRT continuously stressed that while the main policy tool was the short term interest rates, the main objective was "only and only" the price stability. Thereby O/N interest rates were determined consistent with the inflation targets. In addition, to increase the efficiency of the operating framework and to avoid any volatility in short term interest rates, the CBRT set the upper and lower O/N interest rate quotations in Interbank Money Market and Istanbul Stock Exchange Repo-Reverse Repo Market to establish a corridor system. (ii) Secondly, the CBRT concentrated on transparency and accountability. In addition to "multiple goals - multiple tools" problem, another problem in 1990s was the transparency. The CBRT generally had not explained the reasons of its policy changes. In order to increase the accountability and credibility of the decisions and to increase the role of the interest rates in the transmission mechanism through its effects on longer term interest rates and on expectations, the CBRT started to announce policy rate changes through press releases which included the detailed underlying reasons. (iii) Thirdly, the CBRT worked on establishing floating exchange rate regime, after a long history of pegged regimes with various degrees. Despite the heavy criticism, the CBRT refrained from targeting any explicit

[71] See Özatay (2009) for more details on the initial steps taken to improve the effectiveness of the monetary policy, and some anecdotal evidences. However some minor modifications were done in line with changes in the market structure, the CBRT had kept the general guidelines of monetary policy operating framework established in 2002 even during the global crisis. However, the operating framework was changed significantly in the second half of the 2011.

exchange rate level through direct interventions in foreign exchange market to reduce the role of foreign exchange rates in expectation formation. The CBRT also warned the public about the FX position risks to avoid moral hazard problem. (iv) Fourthly, although, required reserve ratios were maintained at 6 % for Turkish Lira liabilities, and 11 % for foreign Exchange liabilities, the CBRT started to pay close to market interest rates to these accounts to eliminate the indirect taxation of banking system. In 2002, the CBRT started to index the TL required reserves interest rate to the policy rate. (v) And finally, since the end of 2001, the CBRT has started to announce the annual general framework of the "Monetary and Foreign Exchange Policies and Liquidity Management" strategies for the next year to increase the transparency and its communication with the markets. In its first yearly announcement, the CBRT called monetary policy strategy as implicit inflation targeting. Although, quarterly reserve money targets consistent with the IMF Standby agreement conditionality were announced as intermediate targets, during this period, the CBRT had used the policy rate only in line with the consistency of inflation targets and inflationary trends.

Until June 2010, there had been excess liquidity in the market as a result of liquidity providing operations to the public and intervened banks and heavy FX purchases (Figure 3.7). Therefore, though in some cases longer term structural operations were also used to tighten the monetary conditions as in the second half of 2006, or to ease the stress in the money markets as in 2009, the CBRT kept the O/N borrowing rate as policy rate. Although there had been excess liquidity, the CBRT used only O/N borrowing facility to withdraw excess liquidity and tried to increase the coordination with the Treasury to ease sterilization problem, until June 2006. Within this coordination, the Treasury borrowed more than its needs and kept this liquidity at its accounts within the CBRT.

The excess liquidity had been one of the main problems of the CBRT in 2005 and 2006. The FX interventions in late 2005 and in first quarter of 2006 reached to USD 14.9 billion. The excess liquidity increased up to 20 billion TL which eased monetary conditions more than the policy rate implied.[72] Then, the domestic credits and demand exploded. During this period, however the longer term structural

[72] The implication of the liquidity level on monetary policy stance is discussed in Chapter 2 and 4 in details. The excess liquidity in April 2006 reached up to 60 % of the reserve money.

operations and the effectiveness of some unconventional policy tools were evaluated within the CBRT, assuming tightening domestic monetary conditions through the longer term operations with higher interest rates would attract more capital inflow, it was decided that these operations would be ineffective.[73] Although the required move was changing the operational framework to increase flexibility of monetary policy through increasing required reserves, tightening the liquidity and capital adequacy ratios and introducing some taxes to capital flows, all these issues were not credited in central banking practice and inflation targeting framework during those years. In addition, the BRSA was reluctant to use macro prudential tools.

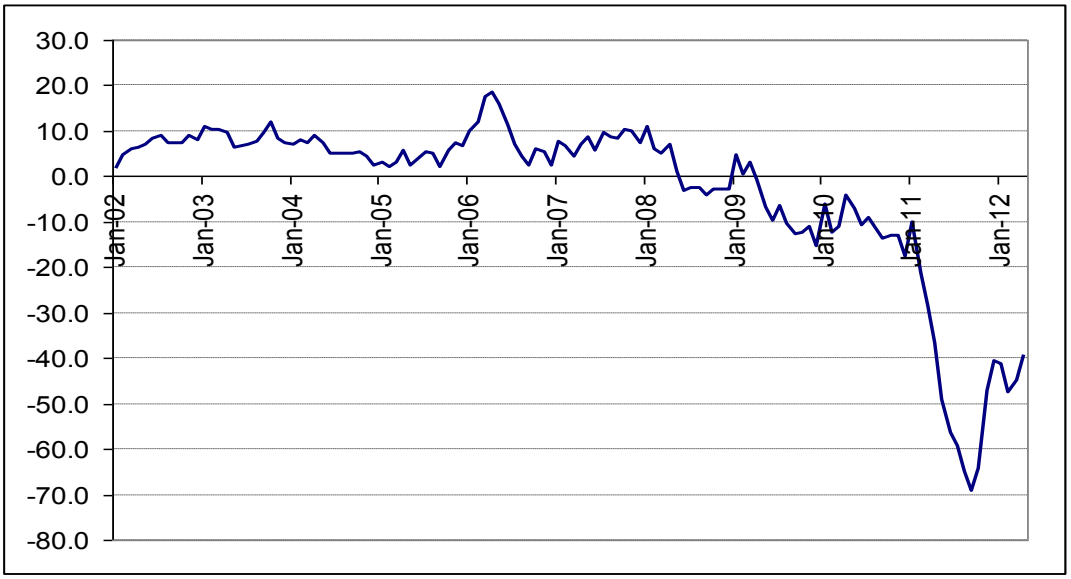

Figure 3.7: Open Market Operations (Billion TL)
Source: CBRT EDDS and author's calculations.

In fact, Turkey used capital tax for other purposes at the end of 2005. Before 2006, while the non-bank residents were subject to a withholding tax on government securities earning, there was an exception for non-residents. At the end of 2005, Turkey introduced 10 % withholding tax to the government securities portfolio of the non-residents which were issued after 2005 to equate the tax for all investors. Actually, the result of this experience clearly supported the effectiveness of capital controls. With the introduction of tax, non-residents shifted their new investments to

[73] We were also a junior member of the decision making team of the CBRT, and supported the ineffectiveness of the longer term structural operations.

swap transactions (Figure 3.8).[74] During June 2006, as a result of the heavy complaints of foreign investors and volatility in financial markets, the government removed this tax. Then, the new foreign portfolio investment concentrated on government securities again. This experience suggests that, as long as capital control tax is introduced to the main investment instruments which the foreigners concentrate on and can not avoid the tax, it is effective. We should also note that, the Resource Utilization Support Fund (RUSF) levy can also be effectively used as a capital control tax to smooth out external borrowing. This levy was introduced to the credits since 1988. While the rate of levy on consumer credits has changed between 10 % and 15 % of the interest payments, it has been set as zero for the banking system private sector credits since 2004. In addition, while the foreign credit to private sector is subject to 3 % levy, the levy for the foreign credits to financial institutions is set to zero.

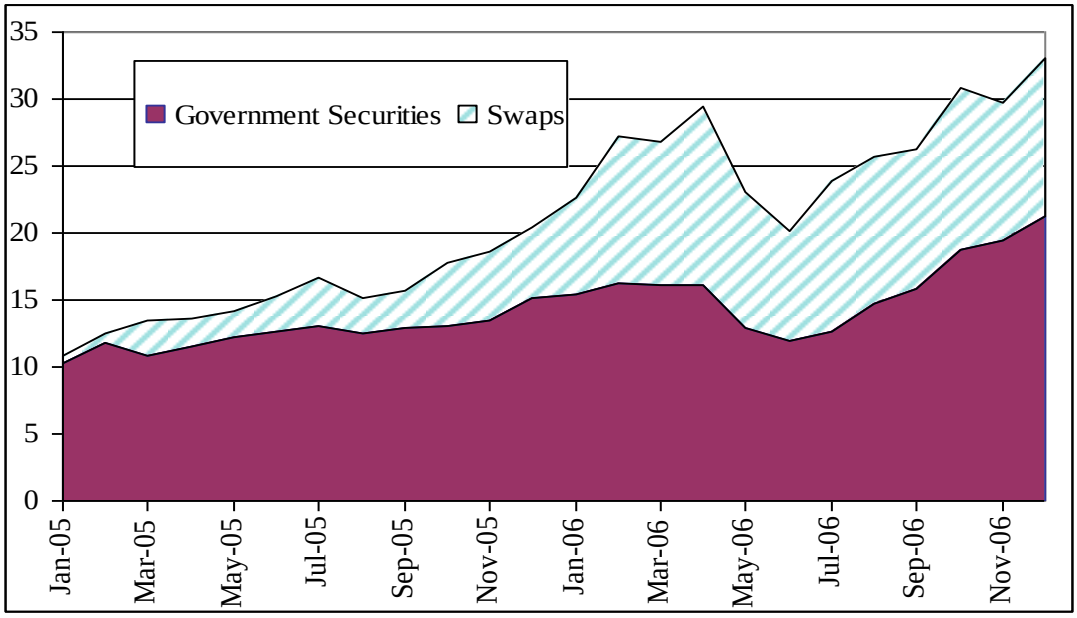

Figure 3.8: Foreign Portfolio Investments on Securities and Swaps[75]
Source: CBRT EDDS, BRSA and author's calculations.

[74] Swap transactions were not subject to withholding tax.

[75] While the non-residents' government securities portfolio is published regularly by the CBRT, there is no published data on swap transactions. In swap transactions, while the banks sell FX to non-residents at the value date, they re-purchase at the maturity date at a pre-set price. Since the banking system record the re-purchase of FX at maturity on off-balance sheet position, we derived the volume of swap transactions by taking the difference of on-balance sheet and off-balance sheet FX position of the banking system published by the BRSA.

In the second half of 2006, although the general structure of the operating framework was not changed, in order to contain the volatility of exchange rates and to enhance the effectiveness of the policy tools, the CBRT had widened the policy tool set and used 2 weeks and 1 month TL deposit auctions. When the excess liquidity increased in the market, the CBRT also issued central bank liquidity bills with a maturity up to 90 days to sterilize the excess liquidity for a short period of time. But these tools are used for only fine tuning purposes and for a short period.

On the other hand, during the global crisis, since the stress in the market increased, to ensure the markets on liquidity conditions, although there was no net liquidity shortage, the CBRT had started to hold repo auctions up to 3 months. Through these operations, the CBRT actually conducted a kind of quantitative easing strategy by injecting more liquidity than the market needed, and sterilized it through O/N borrowing at policy rate. In addition, during the global crisis, the CBRT also reduced TL required reserve ratio from 6 % to 5 % to just give an easing signal to the markets, though its net liquidity effect was limited. Despite all these revisions, the general structure of operational framework which was set up in 2002 was contained up to 2010. While the width of corridor was set as 2.5 and 3 percentage points, the O/N rate had generally settled at the CBRT borrowing rate (Figure 3.9).

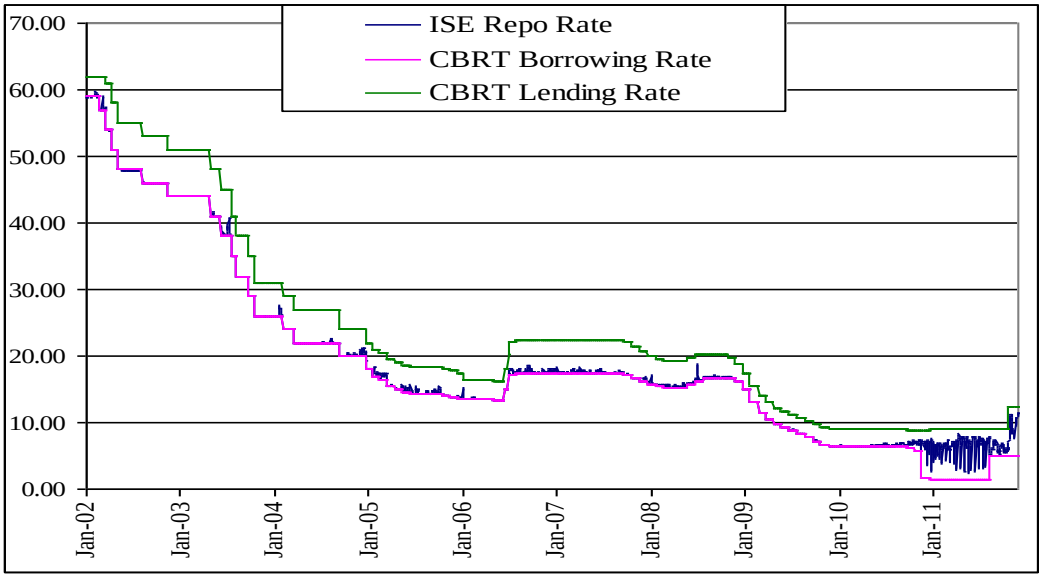

Figure 3.9: CBRT Corridor and Secondary Market O/N Rates
Source: CBRT EDDS.

In May 2010, the CBRT announced that, its operating framework would be changed when the liquidity shortage became permanent, and its policy rate would be weekly repo auction rate, and these auctions would be held at fixed (policy) rate.[76] And as the liquidity shortage increased in June, the CBRT has started to conduct its liquidity operations at fixed interest rate quantity repo auctions.[77] Meanwhile, the CBRT set a corridor around the policy rate. This operational framework which continued up to October 2010 was a fine-tuned version of the previous one, and was consistent with the inflation targeting framework. After October 2010, because of the acceleration in credit growth and current account deficits, and increase in capital inflows, the CBRT has refined the monetary policy goals and operating framework. The CBRT has started to target economic imbalances through including financial stability in her objective function explicitly. Consistent with the new objective function, the CBRT has started to use a more flexible liquidity management strategy by frequently changing the width and symmetry of the corridor, and by using the required reserve ratios as an active policy tool to affect the liquidity conditions through its direct cost effect and its indirect liquidity effect on banking system.[78]

In the last quarter of 2010 and in the first half of 2011, initially, the lower limit rate of the corridor was reduced to increase the downward volatility of the short term interest rates and to reduce the effective short term interest rates for non-residents. By this operation, it was aimed to reduce the short term capital inflows. But as discussed in Chapter 2, as long as central banks do not conduct structural longer term operations to provide short term excess liquidity, downward asymmetry does not work. In practice, though the CBRT's move did not change the two week average of O/N rates, the decrease in the transparency of the monetary policy reduced the capital flow.[79] On the other hand, to tighten the monetary conditions for residents without using the policy rate, the CBRT eliminated interest payments to

[76] See CBRT (2010), The Public Announcement of CBRT on Exit Strategy. In this announcement, the CBRT provides detailed explanations on monetary policy strategy during the global crisis and hints the details of operating framework for the following period, though operating framework was changed significantly in the second half of the 2011.

[77] In quantity auctions, while the CBRT announces interest rate and the quantity of auctions, the liquidity is distributed to the participants according to their shares of bids in total demand.

[78] See Chapter 4 for the effectiveness of the required reserve system.

[79] In Turkey, required reserve maintenance period covers two weeks with carry over provision.

required reserves in September 2010. Then, as the domestic demand picked up and current account deficit worsened, in order to tighten the monetary conditions through its direct and indirect effects, the CBRT had started to increase the required reserves aggressively in the first half of 2011.

When the worsening in current account deficit and market distrust on unconventional monetary policy caused significant TL depreciation, in addition to her aggressive FX interventions, the CBRT has started to ease monetary conditions by reducing the required reserve ratio implicitly through allowing the banks to hold FX deposits at the CBRT for their TL reserve requirements. Therefore, though the CBRT sold almost USD 15 billion and withdrawn 25 billion TL, the liquidity shortage of banking system declined from around 70 billion TL to 40 billion TL.[80] The practical aim of this strategy was to reduce stress in the market through FX sales, while supporting the economic activity through easing liquidity conditions. As the demand for FX continued in the last quarter of 2011, the CBRT changed her strategy again through increasing the upper limit of the interest rate corridor, and has started to provide less liquidity to the market than the required (Figure 3.10). While the CBRT had continued to provide some portion of the liquidity through regular fixed rate weekly repo auctions at policy rate, the remaining portion was provided at upper limit rate of the corridor through late lending facility. In addition, the CBRT has also started to provide liquidity through the competitive monthly auction, which complicated the transparency of actual CBRT policy stance further.

This strategy tightened the monetary conditions through; (i) increasing the average cost of the CBRT open market operations funding, (ii) increasing the short term secondary market rates, and (iii) increasing the liquidity risk premium through uncertainty.[81] More importantly, this strategy differentiates the rates for residents and non-residents. Since the non-residents are short term net lenders, the policy rate

[80] See Figure 3.7. Normally, domestic banks keep some part of FX liquidity within the foreign banks for short term liquidity requirements. This part of FX liquidity may also be regarded as idle liquidity. As the CBRT allows banks to keep some part of TL reserve requirements in FX, this strategy in fact eases the liquidity conditions of the banking system up to some level, as they just transfer their FX liquidity from foreign banks to the CBRT without changing their balance sheet or portfolio structure.

[81] As discussed in Chapter 2, the CBRT marginal rate determines the short term secondary market rates. Therefore, as the CBRT starts to provide some part of liquidity at upper limit of the corridor regularly, then, that rate becomes the marginal rate for the markets, and secondary market rates are determined by taking that rate as the benchmark rate.

for them increases up to the late O/N lending facility rate, and they lend at around 10 % to the domestic banks, though the CBRT provides some part of liquidity through the regular repo auctions at policy rate.

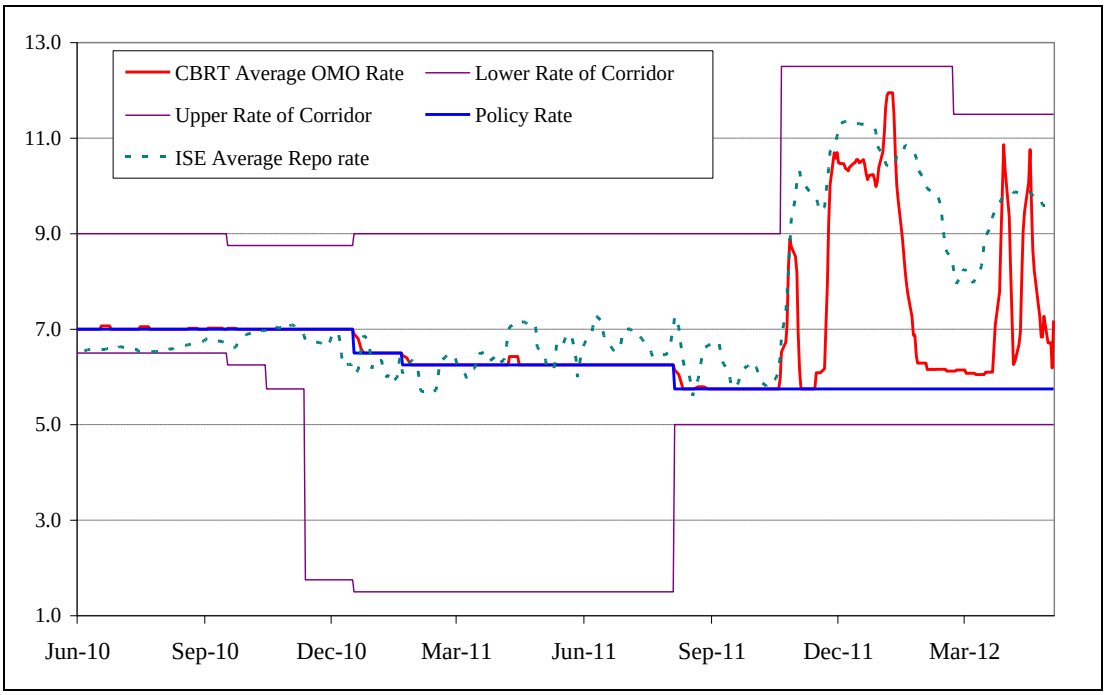

Figure 3.10: CBRT and O/N Market Interest Rates (%)[82]
Sources: CBRT EDDS, ISE and author's calculations.

Assume that one-week repo (policy) rate is 5 %, upper limit of the corridor is 10 %, and banking system's open position is 15 TL, and 5 TL is provided by the CBRT through the repo auctions at policy rate, 5 TL is provided by the CBRT at 10 % through the late lending facility, and non-residents provide 5 TL to the banking system at 10 %. Under these circumstances, the banking system average funding rate increases from 5 % to 8.3 %, while the interest rate for non-residents increases to 10 %. The effects of this strategy on deposit rates depend on the competition in the deposit market. Therefore, in central banking language, tightening the average funding rate without changing the policy rate implies differentiation of interest rates for residents and non-residents. And, one of the practical implications of this strategy is to target foreign exchange rates. In effect, the CBRT raised the effective funding rate when the exchange rate depreciated (Figure 3.11).

[82] In order to eliminate the required reserve maintenance period seasonality, 5 day moving averages are used.

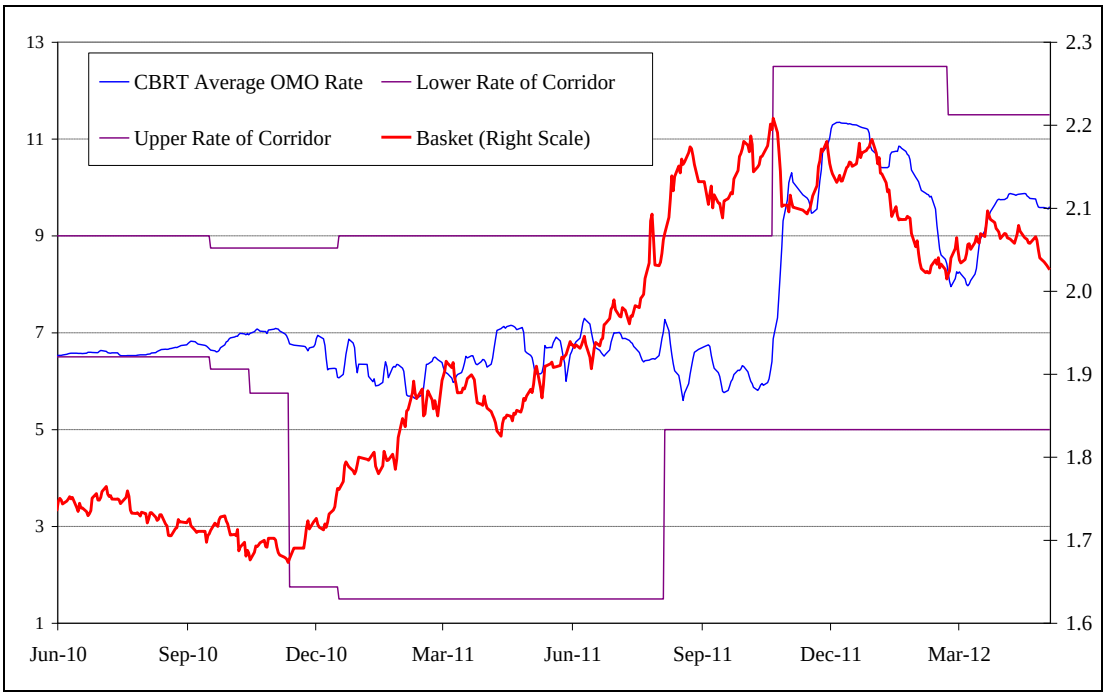

Figure 3.11: O/N Rates and Exchange Rate[83]
Sources: CBRT EDDS and author's calculations.

In addition, during the days in which the demand for foreign exchange increased, in late 2011, the CBRT has started to cancel regular fixed-rate weekly repo auctions (at policy rate) and provided liquidity through variable rate repo auctions at significantly higher rates than the policy rate. Therefore, the exchange rate level and exchange rate volatility has become the implicit target of the monetary policy, and short term interest rates has started to be determined by demand and supply conditions in FX markets.[84] Although the CBRT enjoys the flexibility of monetary policy operating framework, the frequent use corridor system will likely reduce the transparency. The increase in the uncertainty of monetary policy will likely cause more output volatility through more volatile longer term interest rates. Therefore, we claim that, excessive use of the corridor system is not a sustainable strategy as it distorts the markets as in 1990s.

[83] For Exchange rate, the basket which composed of Euro and USD with 50 % weights is used.

[84] In 1990s, the CBRT had tried to target exchange rate and interest rates. and the volatility of these were high. The results of new framework have started to resemble some characteristics of 1990s.

3.6. Foreign Exchange Policy in Post - 2002 Period

On the exchange rate policy side, though the CBRT was usually very careful in not targeting any level explicitly, it has frequently intervened the exchange rate especially through the auctions and direct intervention: [85] (i) to increase the international reserves, (ii) to prevent excessive volatility, and (iii) to reduce excessive appreciation or depreciation. The real exchange rates and amount of interventions during the last 10 years are given in Figure 3.12.[86]

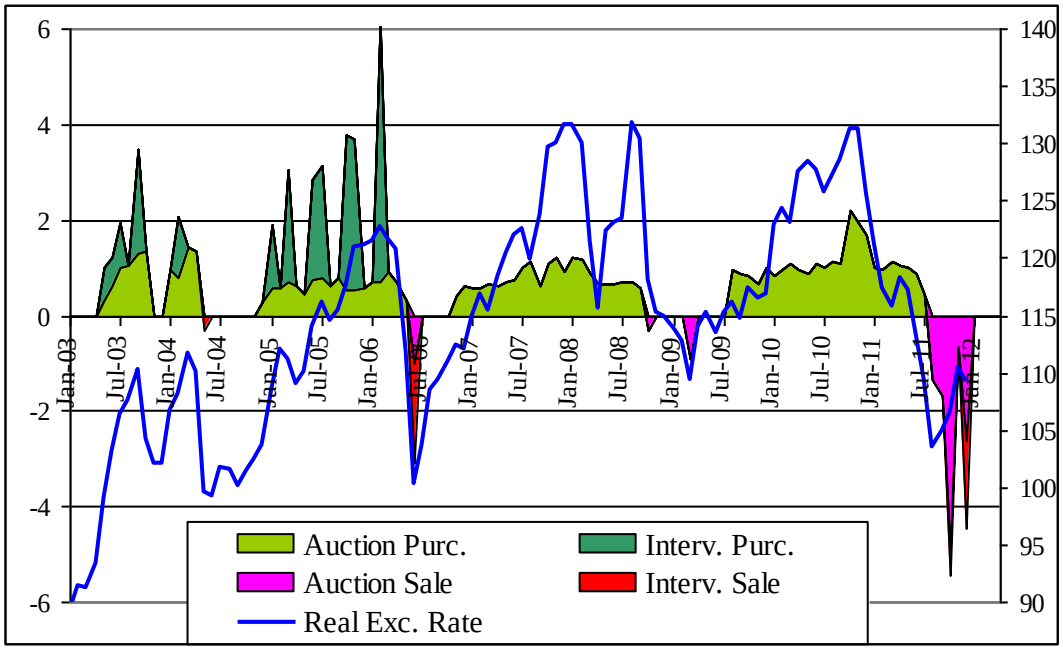

Figure 3.12: The Real Exchange Rate and CBRT Interventions
Source: CBRT and author's calculations.

Figure 3.12 suggests that, since the direct interventions intensified as the currency appreciated, the CBRT implicitly and loosely targeted the real exchange rate up to first quarter of 2006. It may also be argued that, during this period, the

[85] Since in auctions the CBRT determines the quantity and price is determined by the market, the auction system is more convenient under floating exchange regime. In addition, auctions do not signal any specific exchange rate level, if they used in a transparent way, for example if the auction program is announced in advance. But if the auction amounts are changed frequently or the auction amounts are determined daily, then auction system gets close to direct intervention. Since the second half of the 2011, the CBRT FX sale auctions have been a kind of direct intervention in central banking language.

[86] Although, we classified the sale actions as auctions, almost all (except during 2009) CBRT sale auctions resemble intervention motive as they are announced by taking daily volatility and levels into account.

CBRT "leaned against the wind" more aggressively. But after 2006, though the TL appreciated more than the previous period, the CBRT refrained from direct intervention, but used auctions in order to "lean against the wind". The figure also suggests that the CBRT intensified the interventions at some threshold levels to reduce depreciation or appreciation. However, during the last 10 years, the CBRT had never target any level explicitly up to the second half of 2011. Though the volatility is reduced in the last period, the intensity of FX sale interventions clearly signals an implicit level target level in market terminology.

The recent literature on this issue provides strong evidence on the effectiveness of the interventions as summarized in Chapter 2. In the case of Turkey, the evidence also suggests that exchange rate intervention has been effective as long as the intervened levels deviate from what the underlying economic fundamentals imply. Otherwise, there has always been a risk of distorting the markets and ineffectiveness. The intensity of the CBRT FX purchase is given in Table 3.6. While the CBRT's net purchase was USD 45.7 billion during 2002 – 2006, net purchase declined to USD 28.3 billion during 2007 – 2011. It should be highlighted that, while the FX purchase was USD 23.2 billion, the direct purchase intervention reached to 25.6 billion in first period. This detail also supports the aggressiveness of the CBRT. On the other hand, after 2006, while the CBRT preferred to purchase USD 43.1 billion through only auctions, it sold USD 14.8 billion through explicit or implicit direct interventions.[87]

It should be noted that, while the maturity of consumer loans increased from 17 months in 2002 to 60 months in 2010, the maturity of deposits remained around only 2.5 months (Table 3.11). At first sight, the maturity mismatch between asset and liability sides of the banking system implies huge interest rate risk for the banking system. Although there is no published data, an important part of these credits are financed through the banks' longer term (around 3 years) maturity TL-FX swaps transactions with the non-residents. Therefore, the non-resident investments in longer term TL through swap transactions with the banking system have also contributed the decline in credit constraints of the residents.

[87] Note that, though the CBRT sold some part of FX through auctions in 2011, these auctions were in fact implicit direct interventions as the auction amounts are announced daily or changed frequently.

Table 3.6. The CBRT FX Sales and Purchases

	FX Purchases			FX Sales			Net
	Auction	Interven.	Total	Auction	Interven.	Total	Puchase
2002	0,8	0,02	0,8	0,0	0,02	0,02	0,8
2003	5,7	4,3	10,0	0,0	0,0	0,0	10,0
2004	4,8	1,3	6,1	0,0	0,0	0,0	6,1
2005	7,5	14,6	22,1	0,0	0,0	0,0	22,1
2006	4,4	5,4	9,8	1,0	2,1	3,1	6,7
Total	**23,2**	**25,6**	**48,8**	**1,0**	**2,1**	**3,1**	**45,7**
2007	9,9	0,0	9,9	0,0	0,0	0,0	9,9
2008	7,5	0,0	7,5	0,3	0,0	0,3	7,2
2009	4,3	0,0	4,3	0,9	0,0	0,9	3,4
2010	14,9	0,0	14,9	0,0	0,0	0,0	14,9
2011	6,5	0,0	6,5	11,2	2,4	13,6	-7,1
Total	**43,1**	**0,0**	**43,1**	**12,4**	**2,4**	**14,8**	**28,3**
Gr.Total	**66,3**	**25,6**	**91,9**	**13,4**	**4,5**	**17,9**	**74,0**

Source: CBRT and author's calculations.

If we put in a nutshell, the last 10 years of the monetary policy operating framework and exchange rate policy can be evaluated in three different periods (Table 3.7). Each period has term-specific characteristics. The priorities of the CBRT can be observed through the realized inflation and growth rates, the real exchange rate deviation from other emerging country currencies, the use of the policy tools, the intensity of CBRT FX interventions and the policy rate responses to these variables.

During the implicit inflation targeting period of 2002 – 2005: (i) The CBRT implemented a very tight monetary policy in terms of real interest rates.[88] The average real interest rates gradually declined from 27.5 % to 8.9 %. (ii) The current account deficit remained below 5 % threshold level. (iii) GDP growth rates exceeded cyclically acceptable levels.[89] (iv) Although inflation rates declined below the

[88] In order to include all items of monetary stance, such as current policy rate, expected future policy rates, liquidity level and use of other tools, one year government securities real interest rates (by taking one year ahead inflation expectations) are used.

[89] We assumed that in the base line, the domestic business cycle follows the same pattern of the world. If we assume the trend growth rate is 5 % for Turkey, cyclically consistent growth rate of Turkey can be calculated by global cycle as adjuster. Thus, within this simple framework, deviation of actual growth rate from adjusted acceptable level provides some rough ideas about the domestic policies. Cyclical acceptable growth rates are calculated by using (World Growth Rate / Average World Growth Rate) * 5 % as adjuster.

targets every year, they were significantly higher than the average inflation of the emerging countries until 2004, and converged to the emerging country averages in 2005. (v) Because of heavy capital inflows, TL appreciated, and the CBRT heavily resorted to intervene to prevent further appreciation and to increase reserves. (vi) High nominal and real interest rates of this period are justified by the desire of the CBRT to contain the domestic and external balances. Otherwise, lower real interest rates during this period could explode the domestic demand further. (vii) Therefore, under the implicit inflation targeting strategy and with favorable global conditions, the monetary policy successfully reached its objectives while maintaining external and internal balances to a great extent.

The second period covers 2006 – 2009. During this period: (i) While the inflation rate exceeded the targets and emerging country averages, growth rate declined below the cyclically acceptable levels. (ii) The CBRT allowed more appreciation by reducing the intensity of the FX intervention until 2008. (iii) The average real interest rates declined to 3.6 % in 2009. (iv) Therefore, in this period, the CBRT concentrated on a more balanced approach for price stability and economic growth. For this purpose, the CBRT was likely to allow more TL appreciation to reduce inflationary pressures, rather than reducing domestic demand through more aggressive policy rate. Then, the CBRT focused on financial stability during the global crisis. (v) Although the success of the monetary policy on maintaining financial stability during the global crisis could be appraised, it should also be note that the dependency of the growth rates in Turkey to the capital flow was tested. And we note that, the economic growth rates in 2008 and 2009 were significantly lower than the cyclically consistent levels. In addition, the average inflation rate during this period significantly exceeded that of the emerging countries.

The third period includes the post-global crisis years. In 2010 and 2011: (i) Average inflation rate exceeded the targets and emerging country averages. (ii) Growth rates significantly exceeded the cyclically acceptable levels. (iii) As the capital inflow increased in 2010, the current account deficit exploded in 2010 and 2011. (iv) TL appreciated in 2010, but started to depreciate in 2011. (v) Despite these deviations, the average real interest rates remained at historically low levels, at

0.7 % and 1.9 % in 2010 and 2011 respectively. (vi) The figures clearly suggest that very loose monetary policy stance supported by easy global liquidity conditions intensified the macroeconomic imbalances. (vii) On the other hand, the CBRT has started to use unconventional policy tools through required reserves, liquidity management techniques and corridor system, and heavy FX interventions to reduce macroeconomic risks and to increase flexibility of the policy rate. Therefore, since late 2010, the CBRT changed her strategy towards a "multiple goal – multiple tool" monetary policy framework.

Table 3.7. A Summary Statistics on Key Economic Variables[90]

		2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Inflation	Target	35.0	20.0	12.0	8.0	5.0	4.0	4.0	7.5	6.5	5.5
	Emerging Count.	6.8	6.6	5.9	5.8	5.6	6.5	9.2	5.2	6.1	7.5
	Realization	29.7	18.4	9.3	7.7	9.7	8.4	10.1	6.5	6.4	10.4
	Real - Target	**-5.3**	**-1.6**	**-2.7**	**-0.3**	**4.7**	**4.4**	**6.1**	**-1.0**	**-0.1**	**4.9**
	Real - Emerg.	**22.9**	**11.8**	**3.4**	**1.9**	**4.1**	**1.9**	**0.9**	**1.3**	**0.3**	**2.9**
GDP	Accaptable	3.8	4.8	6.4	6.0	7.0	7.2	3.7	-0.9	6.8	5.2
	Realization	6.2	5.3	9.4	8.4	6.9	4.7	0.7	-4.8	8.9	8.5
	Gap	**2.4**	**0.5**	**3.0**	**2.4**	**-0.1**	**-2.5**	**-3.0**	**-3.9**	**2.1**	**3.3**
Real Exchange Rate Relative to Country Groups	Emerging		100	106	112	106	112	108	99	105	91
	Average		100	100	100	100	100	100	100	100	100
	Gap		**0**	**-6**	**-12**	**-6**	**-12**	**-8**	**1**	**-5**	**9**
	World		100	104	114	113	122	123	115	127	112
	Average		100	100	100	100	100	100	100	100	100
	Gap		**0**	**-4**	**-14**	**-13**	**-22**	**-23**	**-15**	**-27**	**-12**
CA / GDP	Acceptable	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0
	Realization	-0.3	-2.5	-3.7	-4.6	-6.1	-5.9	-5.7	-2.3	-6.4	-9.9
	Gap	**4.7**	**2.5**	**1.3**	**0.4**	**-1.1**	**-0.9**	**-0.7**	**2.7**	**-1.4**	**-4.9**
Expected Real Interest Rate		27.4	22.6	13.7	8.9	10.2	11.1	10.5	3.6	0.7	1.9
FX Intervention (Bio. USD)		0.8	10.0	6.1	22.1	6.7	9.9	7.2	3.4	14.9	-7.1

Sources: CBRT, IMF WEO and author's calculations.

3.7. Credit Markets and Financial Structure in Turkey

The main features of the financial system and the structure of the credit markets are the key factors that determine the effectiveness of the alternative policy tools and efficiency of the monetary policy operational framework of a country. In

[90] Relative real exchange rate is derived from the CPI based real exchange rates published by the CBRT.

emerging countries, growth rate is strongly affected by the external liquidity conditions, in addition to the domestic policies. And, since the securities markets are not well developed, the banking system plays a critical role in domestic credit availability in those countries. Another main feature of most of the merging countries is the existence of FX credits in addition to the domestic currency credits.[91] The credit markets in Turkey have all these characteristics.

3.7.1. Developments in Credit Markets in Post-2002 Period

Turkish economy is highly dollarized. The loan supply consists of TL and FX loans. The TL side includes almost only the banking system credits. But, the FX side includes banking system credits and direct credits of non-residents to the private sector. Non-residents also extent FX credits to the banking system, thereby increases loan supply through the domestic banking system. In addition, the impact of the non-residents on the banking system loan supply is not limited to this direct relationship. The decisions of the banking system on portfolio size and portfolio structure are significantly affected by the non-residents' investments on TL or FX Turkish assets, for example on government securities. Therefore, the credit markets in Turkey are significantly affected by the capital flows, directly and indirectly.

In 2000s, the main trends in the financial system have been: (i) significant growth of the banking system, (ii) elimination of the public sector crowding-out effects, (iii) decrease in credit constraints, and (iv) increase in direct and indirect roles of non-residents in financial markets. In 2002 – 2011, the role of the non-residents in domestic markets continuously increased (Table 3.8). Meanwhile, as a result of stability which triggered a massive foreign financial capital inflows to the domestic markets, the non-residents' Turkish assets (including equities) increased from USD 129 billion to USD 383.8 billion in 2002 – 2011. During this period, non-residents increased their FX loans to the banking system from USD 7.2 billion to USD 62.3 billion. In the same period, the increase in non-residents' investment on TL assets has especially been remarkable. The share of the FX assets in non-residents' portfolio declined from 96.2 % to 71.7 % as they increased their TL portfolio from USD 4.9 billion to USD 28.3 billion. Therefore, the impact of the

[91] The details of supply of credits in dollarized open economies are analyzed in Chapter 4.

non-residents in TL credit markets has significantly increased. These capital flow figures highlight the main factors behind the volatile growth rates, increase in macroeconomic imbalances, and development in credit markets in last 10 years.

Table 3.8. Non-Residents' Financial Assets (Billion USD, %)

	2002		2011	
	Size	Share	Size	Share
Net Non-Resident Financial Position	72.3		207.5	
Total Assets	129.0	100.0	383.8	100.0
Total FX Assets	124.1	96.2	275.1	71.7
To Private Sector	61.7	47.8	211.7	55.1
Loans to Private Sector	37.5	29.1	119.8	31.2
To Banking Sector	24.2	18.8	91.9	23.9
Loans	7.2	5.6	62.3	16.2
Deposits	17.0	13.2	29.6	7.7
To Public Sector	62.4	48.4	63.4	16.5
Loans to Public Sector	43.9	34.0	34.9	9.1
Eurobonds	18.5	14.3	28.5	7.4
Total TL Assets	4.9	3.8	108.7	28.3
Government Securities	1.5	1.2	37.8	9.8
Swaps & Credits	-	-	23.4	6.1
Deposits	-	-	8.4	2.2
Equities	3.4	2.6	39.1	10.2

Source: CBRT and author's calculations.

During the same period, the ratio of the total banking system assets to GDP increased from 60.6 % to 94 % (Table 3.9). Meanwhile, a result of prudent fiscal policies, the crowding out effect of the public sector in credit markets eased significantly. Thereby, while the share of the securities in total banking system assets declined from 40.6 % to 23.4 %, the share of loans increased from 23 % to 56.1 %. In addition, as a result of the reverse currency substitution, the share of TL assets increased from 56.9 % to 69.7 %. In addition to the increase in loan supply, the decline in credit constraints has been another important underlying factor of the domestic and external imbalances. In this period, the demand for loans also shifted as the increase in loan maturities and decline in nominal interest rates significantly reduced the consumer credit constraint.[92] This shift factor may simply be shown by

[92] The literature on the decline in saving rate in Turkey is relatively scarce. Fletcher et al. (2007) focus on the impacts of the increase in public saving and increase in confidence as a result of

the share of monthly repayments of a loan which is 10 times of the minimum wage in a minimum wage earner cash flow (Table 3.10).[93] While the share of the monthly repayment of the loan in a minimum wage was 87 % in 2002 which was unaffordable, it declined to 32 % in 2005 and 25 % in 2011. As the monthly loan repayments declined steadily, down to around 25 % of the minimum wage, more and more people have become eligible for the consumer credits. Therefore, not only the decline in real interest rates, but also the decline in nominal interest rates and the increase in loan maturities have been other dominant factors in credit and domestic demand growth. In fact, the easing in credit constraints has been the main underlying reasons of the decline in saving rate in recent years in Turkey.

Table 3.9. Main Trends in Banking System (%)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total Assets/GDP	60.6	54.9	54.8	62.7	65.9	69.0	77.1	87.6	91.2	94.0
Share of TL Assets	56.9	62.0	63.8	68.7	66.9	71.7	69.7	73.3	74.4	69.7
Share of Securities	40.6	42.8	40.3	35.1	31.8	28.3	26.5	31.5	28.6	23.4
Share of Loans	23.0	26.5	32.4	38.4	43.8	49.1	50.2	47.1	52.2	56.1

Source: BRSA.

Table 3.10. Consumer Budget Constraint and Consumer Loans Interest Rate

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Minimum Wage (TL)	236	306	434	489	531	574	624	680	745	817
Loan (TL)	2,360	3,060	4,340	4,890	5,310	5,740	6,240	6,800	7,450	8,165
Interest Rate (%)	53.1	43.1	29.1	21.1	20.4	20.3	20.1	17.3	12.3	13.5
Monthly Paym (TL)	206	213	238	156	158	169	197	204	182	202
Mont. P./Min.W.(%)	87	70	55	32	30	30	32	30	24	25

Source: www.alomaliye.com/yillar_iti_**asgari_ucret**ler.htm, and CBRT.

disinflation and macroeconomic stabilization as the underlying reasons of decline in saving rate. They suggest fiscal discipline and pension reform to increase the saving rate. Van Rijkeghem and Üçer (2009) provide the most comprehensive study on the decline in saving rate in recent years in Turkey. They find that, the increase in liquidity as a by-product of improved prospects and increase in homeownership as the main determinants of decline in saving rate. They suggest that the decline in the saving rate is temporary, and may disappear in the long-run. But, the continuous decline in the saving rate after this study didn't confirm their expectation, at least up to now.

[93] The banks are eager to extent consumer credits up to the 10 times of monthly wages in Turkey.

It should be noted that, while the maturity of the consumer loans increased from 17 months in 2002, to 60 months in 2010, there has not been any increase in maturity of the deposits which remained only around 2.5 months (Table 3.11). At first sight, the maturity mismatch between the asset and liability sides of the banking system balance sheet implies a huge interest rate risk. Although there is no published data, an important part of these credits are financed through the banks' longer term (around 3 years) maturity TL-FX swaps transactions with the non-residents. Therefore, the non-resident's investments in longer term TL assets through the swap transactions with the banking system have also contributed to the decline in credit constraints.

Table 3.11. Maturities of Deposits and Loans of the Banking System (Months)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
TL Deposits	2.5	2.8	3.0	2.9	2.3	2.4	2.3	2.4	2.3	2.8
FX Deposits	2.6	2.7	2.7	2.9	2.9	2.9	2.9	2.8	2.9	3.0
Consumer Loans	18.1	22.8	26.3	51.7	57.2	54.6	50.9	50.1	57.0	58.9

Source: CBRT and Turkish Banking Association (TBA).

As the credit constraints of the consumers eased, the consumer credits became the main driver of the credit growth (Table 3.12). During the last 10 years, while the share of the consumer loans in total TL loans increased from 32.6 % to 46.7 %, the share of the real sector loans declined from 67.4 % to 53.3 %. Therefore, the increase in the loan supply has supported the consumption more than the investments.

Table 3.12. Composition of TL Credits of the Banking System (Share, %)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Consumer Loans	32.6	36.5	41.5	40.4	41.5	42.6	43.7	43.8	45.5	46.7
Real Sector Loans	67.4	63.5	58.5	59.6	58.5	57.4	56.3	56.2	54.5	53.3

Source: BRSA.

The domestic and external sources of the credit growth in Turkey are given in Table 3.13. Since the main holder of the TL government securities has been the

banking system, and foreign investment on these securities has forced the banking system to change their optimal portfolio allocation, the non-residents' investment on these securities also supported the growth in domestic TL credits, indirectly.[94] In addition to non-residents' securities investments, their TL lending to banking sector through the swap transactions and FX loans to the banks are other indirect sources of the banking system credits. Therefore, in calculations, in addition to the non-residents' direct FX credits to the private sector, their FX credits and TL lending through the swap transactions and their investment on government securities are also included to cover all direct and indirect roles of the non-residents' in credit growth.

Table 3.13. Changes in Loan Supply and Resources (Billion TL) [95]

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Banking System TL Loans	16.1	28.1	49.2	49.6	53.9	45.1	26.1	95.6	101.0
Total FX Credits	9.6	16.1	20.1	41.7	68.5	41.0	-20.6	23.0	33.3
Banking System FX Loans	5.9	6.3	7.9	10.5	24.9	14.4	-0.5	34.5	22.2
Foreign Direct Loans	3.8	9.8	12.3	31.2	43.6	26.6	-20.1	-11.5	11.1
Total Loan Supply	25.7	44.2	69.3	91.3	122.4	86.1	5.5	118.6	134.4
Domestic Sources	14.5	21.1	33.8	44.0	66.6	70.7	30.9	71.9	79.7
Foreign Sources	11.2	23.1	35.5	47.3	55.8	15.4	-25.4	46.7	54.7

Source: CBRT, BRSA and author's calculations.

The figures in Table 3.14 show that, in 2003 – 2011, when 2009 is excluded, the average of the year over year changes in the loan supply to GDP is around 10 %, and the share of the TL loans in changes in total loans is around 62 %. The data highlights that around 40 % of the loans supply is financed by non-residents, directly or indirectly, and clearly points out the dependence of the credit market and the domestic economic activity to the foreign capital flow.

[94] Not only the amount of non-residents' investment on government securities, but also the longer maturities of these investments has supported the increase in loan maturities.

[95] Not the changes in total portfolio, but the real changes are preferred to include only actual portfolio inflow or outflow. The real values are calculated by deducting interest rate accumulation and price changes.

Table 3.14. Ratio of Changes in Total Loan Supply to GDP and Resources (%)

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total Loan Supply	5.7	7.9	10.7	12.0	14.5	9.1	0.6	10.7	10.4
Share of TL Loans	62.6	63.6	71.0	54.3	44.0	52.4	477.0	80.6	75.2
Share of FX Loans	37.4	36.4	29.0	45.7	56.0	47.6	-377.0	19.4	24.8
Share of Domestic Sources	55.1	47.9	48.9	56.1	55.3	82.5	600.7	64.3	59.8
Share of External Sources	44.9	52.1	51.1	43.9	44.7	17.5	-500.7	35.7	40.2

Source: CBRT, BRSA and author's calculations.

3.7.2. Financial Structure of Turkey

In order to complete the analysis, the role of the non-bank financial institutions in the economy should also be overviewed. The financial system is dominated by the banking system in Turkey (Table 3.15). The banks still constitute the 88 % of the domestic financial system. The share of other domestic financial institutions is not significant enough to affect the market conditions. Therefore, this figure suggests that, the credit channel is likely to be a significant transmission channel, and the frictions in the banking system are likely to be critical for the economy. This financial structure also suggests that, the monetary measures introduced by the authorities on banking system assets and liabilities could be significantly effective to change the equilibrium interest rates in the markets.

Table 3.15. Financial Institutions in Turkey (Billion TL, %)

	2002		2011	
	Size	Share	Size	Share
Banks	212.7	88.0	1,217.7	87.9
Mutual Funds	9.3	3.8	30.2	2.2
Leasing and Factoring	5.9	2.4	34.3	2.5
Insurance and Pension Funds	5.4	2.2	54.2	3.9
Other Intermediaries	8.5	3.5	48.7	3.5
Total	241.8	100.0	1,385.1	100.0

Source: BRSA and Capital Market Board (CMB).

The other characteristic of the Turkish financial system is the dominant role of the government in securities markets (Table 3.16). Although the share of equities increased from 8 % to 18.9 % from 2002 to 2010, the share of the private sector

bond is only 3.1 %. Therefore, the real sector is still dependent on the banking sector and direct non-resident credits.

Table 3.16. Outstanding Volume of Securities Markets (Billion TL, %)

	2002		2011	
	Size	Share	Size	Share
Public Sector Bonds	150.9	92.0	368.8	78.0
Private Sector Securities	13.2	8.0	103.8	22.0
Equities	13.2	8.0	89.3	18.9
Banking Bonds	-	-	10.2	2.2
Commercial Bonds and Others	-	-	4.3	0.9
Total	164.1	100.0	472.6	100.0

Source: CMB.

Within this financial system, the share of deposits is 73.7 % of the total non-bank private sector financial assets (Table 3.17). The data highlights that residents strongly prefer shorter term deposits. Thus, it can be concluded that deposits and other financial instruments are not close substitutes. Under these conditions, it may be expected that the interest rates of the deposits and securities may diverge from each other significantly. There are two explanations for this market structure: (i) while the maturities of government securities are longer, private sector prefers very short term maturities, and/or (ii) since banking system has a monopoly power in the distribution channels of the securities, banks can set a wedge between the deposit and securities rates to exploit the market power to keep deposit rates lower.

Table 3.17. Non-Financial Residents Domestic Portfolio (Billion TL, %)

	2005		2011	
	Size	Share	Size	Share
TL Deposits	150.1	43.3	464.2	51.2
FX Deposits	82.2	23.7	203.5	22.5
TL Government Securities	55.3	15.9	67.3	7.4
FX Government Securities	5.3	1.5	6.5	0.7
Mutual Funds, Repo and Others	30.9	8.9	111.9	12.3
Equities	23.0	6.6	52.9	5.8
Total	346.8	100.0	906.3	100.0

Source: BRSA.

The insignificant level of private sector securities market also strengthens the role of the banking system and non-residents in credit markets. The share of the banking system loans in total credit market clearly points out the critical and increasing role of the banking system in transmission mechanism. While the share of the banking system loans in total credit market was only 37.7 %, and the share of the direct non-residents loans was 47.5 % in 2002, as a result of financial deepening, the share of the banking system increased to 65.5 % in 2011 (Table 3.18).

Table 3.18. Total Credit Market (Billion TL, %)

	2002		2011	
	Size	Share	Size	Share
Banking System TL Loans	20.1	15.5	484.8	46.5
Non-Bank TL Loans & Bonds	5.9	4.6	47.5	4.6
Equities	13.2	10.2	89.3	8.6
Banking System FX Loans	28.8	22.2	198.1	19.0
Non-Residents FX Loans	61.5	47.5	223.1	21.4
Total	129.5	100.0	1,042.8	100.0

Source: CMB, BRSA and CBRT.

To sum it up the financial structure, the financial and credit markets in Turkey are dominated by the banking system and non-residents. Since the credit channel plays a critical role, in the monetary policy transmission mechanism analysis, the CBRT has to consider the effects of its policy tools on the behavior of banking system. In addition, the CBRT has to consider the reactions of the non-residents to her decisions on the monetary policy operating framework in order to prevent undesired volatilities in the financial markets.

CHAPTER 4

ALTERNATIVE POLICY TOOLS AND TURKISH EXPERIENCE WITH REQUIRED RESERVES

In market based economies, the effectiveness of the short term policy rates or other policy tools is mainly measured by the degree and speed of the pass through of the policy decisions to the loan, deposits and other market rates which are the main determinants of the investment, consumption and saving. Since there are only domestic currency and domestic banking system in a closed economy, the control of the central banks on the credit conditions is relatively simple and effective. However, when the integration with the rest of the world deepens, the central banks' control on the domestic financial system and economic activity significantly weakens. Therefore, in order to increase the flexibility of monetary policy, the need for supplementary policy tools increases.

The commonly suggested supplementary policy tools to increase the effectiveness of monetary policy especially for the small open economies are; (i) required reserve system, (ii) banking system capital adequacy and liquidity ratios, and (iii) capital controls. The main function of these tools is to change monetary conditions without changing the policy interest rate. In this chapter, we firstly describe the equilibrium conditions in loan and deposit markets by using main the features of the Georg and Pasche (2008) model to show how supplementary monetary policy tools affect market conditions.[96] We specifically focus on the direct and indirect effects of the required reserves on the loan and deposit markets. Then, we provide some evidence on the effectiveness of the required reserves in Turkish case.

[96] Georg and Pasche (2008) explicitly derive the banking system behavior on supply of loans and demand for reserves by taking portfolio theory and liquidity consideration into account to show the endogeneity of money supply. In this chapter, keeping the core idea, we make some revisions in derivations for simplicity. We adopted the impacts of the policy tools and open economy version.

4.1. Theoretical Framework

The main characteristics of the loan and deposit markets described in this part are broadly consistent with the Turkish economy. In this economy, the main policy instrument of the central bank is the short term interest rate. The central bank exogenously sets an interest rate for her lending through the open market operations. Therefore, the money supply (deposits) is endogenously determined by the loan demand of the private sector and the loan supply of the banking system through a multiplier process. The multiplier process and markets equilibrium work through the balance sheets of the economic units. The balance sheets of the economic units are as follows:

a) Households and firms: Households and firms have deposits (D_{TL}), government bonds (B_{TL}^{HH}) and banking system capital (BC) as financial assets, and houses (Hs) and physical capital (PC) of the firms as investments on the assets side of the balance sheet in domestic currency (Figure 1). These assets are financed through loans (L_{TL}) and net financial wealth (NFW). In open economy version, households also hold foreign exchange deposits (D_{FX}) in domestic banking system as assets (to be realistic and for simplicity, private sector does not hold domestic or foreign exchange (FX) bonds). They can borrow in FX from the domestic banking system (L_{FX}) and from the foreign financial institutions (L_{FX}^{FP}). There is no legal FX open position restriction for the non-bank private sector. Thus, private sector can undertake currency risk. The insignificance of the equity and private sector securities markets in Turkey and in most of the other emerging countries enable us to assume no equity or private sector bond markets.

b) Banking system: The banking system the keeps required reserves ($R_{TL} = \mu_{TL} * D_{TL}$, where μ_{TL} is the required reserve ratio which is determined by central bank) as a ratio of the deposits, and holds loans and government securities (B_{TL}^{B}) as portfolio. The banking system finances these assets through the deposits, open market operations (OMO) borrowing, and banking system capital (BC). Since, the central bank targets the short term interest rate, and acts as an active lender of the last resort in domestic currency, banks do not need to keep excess

reserves for some unforeseen liquidity needs.[97] In open economy version, banks are allowed to accept FX deposits of the private sector, to borrow loans from non-residents in FX (L_{FX}^{FB}), and to borrow through swap transaction in TL (SW_{TL}). For swap transactions, banks have to deliver liquid foreign FX assets (cash) as a collateral to the foreign counterparties. Micro prudential measures do not allow banks to have FX open positions.[98] Banking system holds required reserves ($R_{FX} = \mu_{FX} * D_{FX}$) and government FX bonds (B_{FX}^{B}), and extends FX loans (L_{FX}). On the FX side, central bank does not act as the lender of the resort, therefore for unforeseen liquidity needs, banking system also keeps some liquid foreign assets (R_{FX}^{F}).

Private Sector

Assets	Liabilities
D_{TL}	L_{TL}
B_{TL}^{HH}	
Hs	
BC	NFW
PC	
D_{FX}	L_{FX}
	L_{FX}^{FP}

Banking System

Assets	Liabilities
R_{TL}	D_{TL}
L_{TL}	OMO
B_{TL}^{B}	BC
	SW_{TL}
R_{FX}	D_{FX}
L_{FX}	L_{FX}^{FB}
B_{FX}^{B}	
R_{FX}^{F}	

Figure 4.1: Assets and Liabilities of Private Sector and Banking System

c) Non-residents: In open economy version, non-residents invest in treasury bonds in TL (B_{TL}^{F}), and in FX (B_{FX}^{F}), extend FX credits to the banking system and private sector, and lend domestic currency to the banking system through swap transactions.

[97] Though excess reserves are usually included in modeling the banking system's behavior, when the monetary policy operating framework eliminates the end-of-day or intra-day liquidity risks through an effective corridor system and intra-day liquidity facilities, and the reserve requirement system with carry-over facilities, and when there is an efficient payment system, excess reserve needs of the banking system disappears. Banks just keep cash in vault in their branches which may be disregarded under cash-free economy assumption. For example, Turkish banks' excess reserves have always been negligible since 2001.

[98] Note that, FX open position in banking system is strictly limited by the regulator after 2001 crisis.

d) Central Bank: In closed economy version, while central bank injects the domestic currency liquidity through the open market operations against collateral and buying treasury bonds (B_{TL}^{CB}) from the banking system, banking system keeps the required reserves at the central bank (Figure 2). In open economy version, central bank can change the domestic currency liquidity through buying or selling FX in the market. In addition, banking system keeps FX required reserves at the central bank.

e) Treasury: The treasury finances budget deficits through issuing TL and FX bonds. We assume that debt stock and its composition are fixed.

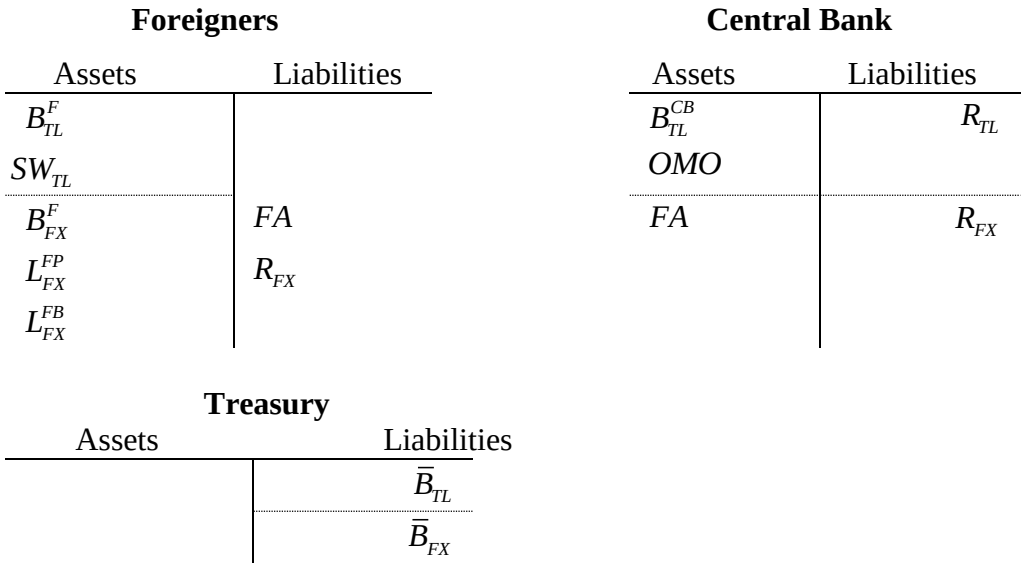

Figure 4.2: Assets and Liabilities of the Foreigners, Central Bank and Treasury

4.1.1. Equilibrium Interest Rates in a Closed Economy

In closed economy version, the decisions of the banking system are critical for the monetary and credit conditions. The banking system balance sheet identity can be written as follows:

$$R_{TL} + B_{TL}^{B} + L_{TL} = D_{TL} + OMO + BC \tag{4.1}$$

Since $R_{TL} = \mu_{TL} * D_{TL}$, then equation (4.1) becomes;

$$\mu_{TL} D_{TL} + B_{TL}^{B} + L_{TL} = D_{TL} + OMO + BC \tag{4.2}$$

From equation (4.2), we can write the banking system loan and bond portfolio as;

$$L_{TL} + B_{TL}^{B} = (1-\mu)D_{TL} + OMO + BC \tag{4.3}$$

We assume that the banking system's capital is fixed. There is an exogenous default risk of loans $(1-\delta)$ which does not depend on the total volume of loans. The central bank remunerates required reserves at some percentage of her policy rate (τ_{TL} is the remuneration rate which is a percentage of the policy rate). The objective of the banking system is to maximize the following profit function:

$$Max\pi = r_{TL}^{L}\delta L_{TL} + r_{TL}^{B}B_{TL}^{B} - (r_{TL}^{D} - r_{TL}^{CB}\tau_{TL}\mu_{TL})D_{TL} - r_{TL}^{CB}OMO \tag{4.4}$$

Since, the central bank targets the short term interest rate, the banking system can enlarge its balance sheet by increasing its loan and/or bond portfolio through borrowing from the open market operations facility as long as it is profitable and there is enough collateral, even the deposits are assumed to be constant in the short run. Since the central bank open market operation facilities are available, unless there are some constraints, the deposits and central bank facilities are close substitutes. Then the central bank policy rate becomes the marginal cost of funds for the banks. This assumption implies that, the interest rate of the deposits should be around the "policy rate minus the cost of the required reserves". In other words, the cost of the required reserves can completely be transmitted to the depositors.[99]

Within this framework, the first step of the banking system's optimal portfolio decision process is to decide on the optimal shares of bonds (λ_{TL}^{B}) and loans (λ_{TL}^{L}) in its total portfolio:

$$\lambda_{TL}^{B} + \lambda_{TL}^{L} = 1 \rightarrow \lambda_{TL}^{B} = (1-\lambda_{TL}^{L}) \tag{4.5}$$

Then, the banking system decides on the optimal total volume of its portfolio (V). If we assume that the deposits and banking system capital are fixed in the short run, the total volume is determined by the open market operations.

$$V = L_{TL} + B_{TL}^{B} \rightarrow V = (1-\mu)D + OMO + BC \tag{4.6}$$

[99] When the total cost of the deposits (deposit rate plus direct cost of required reserves) exceeds the policy rate, banks prefer borrowing from the central bank instead of paying higher total cost to the deposits. Note that, open market operations borrowing is not subject to required reserves. In addition, in the analysis, we ignore the operational costs to collect deposits. The independence between deposits and loan rates is called "dichotomy".

Assuming there is no covariance between the loan and bonds rates, for one unit of loan, the expected return and variance are given as:[100]

$$\mu_{TL}^{L} = \delta L r_{TL}^{L} - (1-\delta)L = \delta r_{TL}^{L} - (1-\delta) \tag{4.7}$$

$$(\sigma_{TL}^{L})^2 = \delta(r_{TL}^{L} - \mu_{TL}^{L})^2 + (1-\delta)(-1-\mu_{TL}^{L})^2 \tag{4.8}$$

Assuming there is no default risk and no significant interest rate volatility for the bonds, the expected return and variance of the bonds are given as: [101]

$$\mu_{TL}^{B} = r_{TL}^{B} \tag{4.9}$$

$$\left(\sigma_{TL}^{B}\right)^2 = 0 \tag{4.10}$$

The expected return μ_{TL}^{P} and variance σ_{TL}^{P} of portfolio can be written as:

$$\mu_{TL}^{P} = \lambda_{TL}^{L}\mu_{TL}^{L} + \left(1-\lambda_{TL}^{L}\right)\mu_{TL}^{B} \tag{4.11}$$

$$\left(\sigma_{TL}^{P}\right)^2 = \left(\lambda^{L}\right)^2\left(\sigma_{Tl}^{L}\right)^2 + \left(1-\lambda^{L}\right)^2\left(\sigma_{TL}^{B}\right)^2 = \left(\lambda^{L}\right)^2\left(\sigma_{Tl}^{L}\right)^2 \tag{4.12}$$

Georg and Pasche (2008) calculate the optimum shares of the bonds and loans by assuming the following optimization problem:

$$\max U(\pi) = \mu_{Tl}^{P} - \theta_{TL}(\sigma_{TL}^{P})^2 \tag{4.13}$$

Where, the risk aversion parameter is (θ_{TL}). The first order condition for the optimal share of the loans results in:

$$\lambda_{TL}^{L} = \frac{\mu_{TL}^{L} - \mu_{TL}^{B}}{2\theta\left(\sigma_{TL}^{P}\right)^2} \tag{4.14}$$

After finding the optimum shares of the loans and bonds per unit of portfolio, banking system decides on the optimal volume of total portfolio, by maximizing the following utility function:

$$\begin{aligned} &\max U(\pi) = \mu_{TL}^{P}V - \theta_{TL}(\sigma_{TL}^{P})^2V^2 \\ &= \mu_{Tl}^{P}\left(\left(1-\mu\right)D + OMO + BC\right) - \theta_{TL}(\sigma_{TL}^{P})^2\left(\left(1-\mu\right)D + OMO + BC\right)^2 \end{aligned} \tag{4.15}$$

Note that the utility function includes the expected profit, variances and risk aversion parameter, and the total portfolio volume can be changed through the open market operations in the short run. Assuming that the banks are risk averse, then the marginal utility of the portfolio is a decreasing function of the volume.

[100] We assume that loans are un-collateralized.

[101] Note that, we assumed that, there is no private sector securities market. Therefore banks hold only risk-free government securities. Therefore, the variance of risk-free bond return is zero.

At the optimum, since the marginal cost of the funds is equal to the central bank policy rate, the banking system expands its portfolio volume up to the point where the marginal utility is equals to the central bank policy rate. Then, by following Georg and Pasche (2008), the first order condition of the utility function with respect to the total volume results in:

$$V = \frac{\mu_{TL}^{P} - r_{TL}^{CB}}{2\theta(\sigma_{TL}^{P})^{2}} \tag{4.16}$$

The demand for the optimum level of the OMO can also be found by using first order condition of the utility function with respect to the OMO:

$$\mu_{TL}^{P} - 2\theta\left(\sigma_{TL}^{P}\right)^{2}\left[\left(1-\mu_{TL}\right)D + OMO + BC\right] = r_{TL}^{CB} \tag{4.17}$$

Then, the banking system borrows as long as the marginal utility exceeds the marginal cost

$$OMO = \arg\max\left\{\left(\frac{\mu_{TL}^{P} - r_{TL}^{CB}}{2\theta(\sigma_{TL}^{P})^{2}} - (1-\mu_{TL})D_{TL} - BC\right), 0\right\} \tag{4.18}$$

Then, the demand for the open market operations (in the short run) in implicit form with the impact signs can be written as:

$$OMO = OMO(\overset{+}{r_{TL}^{L}}, \overset{+}{r_{TL}^{B}}, \overset{-}{r_{TL}^{CB}}, \overset{-}{\delta_{TL}}, \overset{-}{\theta_{TL}}, \overset{+}{\mu_{TL}}, \overset{-}{D_{TL}}) \tag{4.19}$$

From the total portfolio volume, the loan supply and bond demand functions of the banking system can be derived as:

$$L_{TL}^{S} = \lambda_{TL}^{L} V = \lambda_{TL}^{L} = \frac{\mu_{TL}^{L} - \mu_{TL}^{B}}{2\theta\left(\sigma_{TL}^{B}\right)^{2}} \frac{\mu_{TL}^{P} - r_{TL}^{CB}}{2\theta(\sigma_{TL}^{P})^{2}} \tag{4.20}$$

$$B_{TL}^{B} = \lambda_{TL}^{B} V = \left(1 - \frac{\mu_{TL}^{L} - \mu_{TL}^{B}}{2\theta\left(\sigma_{TL}^{B}\right)^{2}}\right) \frac{\mu_{TL}^{P} - r_{TL}^{CB}}{2\theta(\sigma_{TL}^{P})^{2}} \tag{4.21}$$

Therefore, the implicit form of the loan supply and bond demand functions can be written as:

$$L_{TL}^{S} = L_{TL}(\overset{+}{r_{TL}^{L}}, \overset{-}{r_{TL}^{B}}, \overset{-}{r_{TL}^{CB}}, \overset{-}{\delta_{TL}}, \overset{-}{\theta_{TL}}) \tag{4.22}$$

$$B_{TL}^{B} = B_{TL}^{B}(\overset{-}{r_{TL}^{L}}, \overset{+}{r_{TL}^{B}}, \overset{-}{r_{TL}^{CB}}, \overset{+}{\delta_{TL}}, \overset{-}{\theta_{TL}}) \tag{4.23}$$

In this process, there is no direct role for the deposits. And, since central bank guarantees to provide unlimited liquidity at the policy rate, the volume of the

open market operations is determined by the equilibrium condition in the loan market. In the long run, the level of the deposits, thereby the money supply is determined through multiplier process endogenously. Assuming that the central bank just provides liquidity only through the open market operations, by definition, the change in the level of the open market operation is equal to the change in money base or equivalently to the change in required reserves.[102] Since in the long run money base should be equal to the reserve requirements, the long-run volume of the open market operations and deposit functions can be written as:

$$\begin{aligned} OMO &= \mu_{TL} D_{TL} = \frac{\mu_{TL}^{P} - r_{TL}^{CB}}{2\theta(\sigma_{TL}^{P})^{2}} - (1-\mu_{TL}) D_{TL} - BC \\ \rightarrow D_{TL} &= \frac{\mu_{TL}^{P} - r_{TL}^{CB}}{2\theta(\sigma_{TL}^{P})^{2}} - BC \end{aligned} \tag{4.24}$$

Up to this point, we haven't introduced any policy constraint on the portfolio decision of the banking system. We assumed that, central bank only sets the policy rate, and the banking system decides on its portfolio structure and volume depending on the risks, policy rate (which is the marginal cost of the funds) and returns. When there is no limit for the open market operations, the required reserve ratio affects only the interest rate of the deposits and the level of the open market operation. Any increase in required reserves is financed through the open market operations without affecting the loan markets.

However, in practice, central banks ask collateral for the open market operations, and government securities are used as collateral. Therefore, the level of the open market operations is limited by the securities portfolio of the banking system. In addition, central banks usually require some haircut rate (h) in order to avoid the default risk.[103] Thus, the open market operations level should be limited by the following constraint:

$$OMO \leq (1-h) B_{TL}^{B} \tag{4.25}$$

As the level of the open market operations gets closer to the collateral value of the bond portfolio (which is equal to the discounted market value of the bond portfolio

[102] Note that, we assumed a cash-free economy.

[103] The haircut rate is defined as the percentage by which the value of securities is reduced to calculate the collateral value.

by haircut rate), banks become gradually more and more cautious to expand their portfolio by using the open market operations.[104]

We may provide two possible explanations for this behavior as: (i) the risk of a decline in bonds' price which reduces the collateral value, and (ii) the risk of a deposit shift from some banks to others which increases the open market operation borrowing (and additional collateral) requirements for the individual banks. Although we assume a representative bank, in practice, the portfolio structures of the banks are not homogenous. While some banks have more, others may have less government securities which can be used as collateral. In addition, since there are a lot of banks in the system with different level of risk awareness, as the portfolio constraints affect these banks' portfolio choices, the competition likely starts to diminish gradually.

These factors reduce the close substitutability of the open market operations and the deposits. This in turn implies that, as the level of the open market operations increases, at least all cost of the required reserves can not be transmitted to the deposit rate. Thus, it is reasonable to assume that, when the $(OMO/((1-h)B_{TL}^{B}))$ ratio increases, after some critical levels, banking system loan supply and bond demand start to decrease, and the competition for the deposits starts to increase.

In addition to the required reserves, monetary and/or regulatory authorities can also use the liquidity and capital adequacy ratios, and provisions to affect the banking system's balance sheet volume and its structure. In effect, however the central banks' collateral system is related with the default problem, when they bind and banking system is the main financial institution in the credit market, these are very robust macro prudential tools to support monetary policy.

Although, in the previous analysis, we assume that banks decide on their portfolio volume by balancing risks and expected returns, central banks or other responsible regulators do not let the banking system to choose its own optimal total portfolio volume and portfolio allocation. These regulators control the total portfolio volume through the capital adequacy ratio. The capital adequacy ratio is simply the

[104] In fact, since the impact of this constraint signifies as the open market operations borrowing increases, its functional form is more likely to be exponential.

ratio of the bank's capital (BC) to the risk weighted assets.[105] In Turkish case, the capital adequacy ratio consists of three components: (i) credit risk, (ii) liquidity risk, and (iii) operational risk, and can simply be defined as;[106]

$$\frac{BC}{\text{Credit Risk + Liquidity Risk + Operational Risk}} \geq \bar{\varphi}_{car} = 8\% \tag{4.26}$$

$$\frac{BC}{\sum_i r_{w,i} V_i + \sum_j r_{l,j} V_j + \sum_z r_{o,z} V_z} \geq \bar{\varphi}_{car} = 8\% \tag{4.27}$$

Where, $\bar{\varphi}_{car}$ is the minimum capital adequacy ratio set by the regulator, $V_{i,j,z}$ are the volumes of individual type of portfolio (assets), and $r_{w,l,o}$ are the risk weights related with the individual type of assets. These parameters are very flexible in practice. The authorities can also differentiate the risk weights of the individual type of assets according to their maturities. When the authority increases the risk weights, the capital adequacy ratio declines, and the banking system becomes reluctant to increase its portfolio. The authority can also force the banking system to change its portfolio allocation. Since, provisioning also works very similar to the capital adequacy ratio, we ignore its impacts.

The other tool to affect the banking system's behavior is the liquidity ratio. The liquidity ratio can be defined as:[107]

$$\frac{\sum_i l_{w,i} A_i}{\sum_j l_{w,j} L_j} \geq \bar{\varphi}_{liq} = 100\% \tag{4.28}$$

Where, $\bar{\varphi}_{liq}$ is the minimum liquidity ratio set by the regulator, A_i and L_i are the individual type of assets and liabilities, respectively, and $l_{w,i}, l_{w,j}$ are the liquidity weights of the related assets and liabilities. Through these ratios and weights, the authority can intervene the weighted maturity of the assets of the banking system.

[105] Also includes other types of banking system's own resources in addition to the core capital.

[106] For exposition purposes, we simplified the original complex formula. Though, the BRSA set the minimum capital adequacy ratio 8 % in line with international standards, implicit target is 12 %. When the capital adequacy ratio falls below that level, the BRSA limits the new branches. For details, see BRSA (2006-a): "Regulation on Measurement and Evaluation of Capital Adequacy of Banks."

[107] While the total minimum liquidity ratio is set as 100 %, the FX liquidity ratio was set 80 %. See BRSA (2006-b): "Regulation on Measurement and Evaluation of Liquidity Adequacy of Banks." for details of Turkish case.

Thus, the capital adequacy and liquidity ratios and related risk and liquidity weights which are determined by the regulators also limit the total portfolio volume, and thereby banking system borrowing from the central bank through the open market operations. With the similar reasons listed for collateral constraint case, as the actual capital adequacy ratio gets closer to the level set by the regulator, banking system becomes more reluctant to enlarge its portfolio even it is profitable and there is enough collateral.

Up to now, we have listed three types of constraints that affect the portfolio volume of the banking system: (i) collateral constraint which is affected through the required reserve ratio and haircut rate, and (ii) capital adequacy and liquidity constraints. Thus, these parameters should also be included in the reduced form of the loan supply and bond demand functions. When these constraints are not redundant, these functions take the following forms:

$$L_{TL}^{S} = L_{TL}(\overset{+}{r_{TL}^{L}}, \overset{-}{r_{TL}^{B}}, \overset{-}{r_{TL}^{CB}}, \overset{-}{\delta_{TL}}, \overset{-}{\theta_{TL}}, \overset{-}{\mu_{TL}}, \overset{-}{h}, \overset{-}{\bar{\varphi}_{car}}, \overset{-}{r_{w}}, \overset{-}{\bar{\varphi}_{liq}}, \overset{-}{l_{w}}) \tag{4.29}$$

$$B_{TL}^{B} = B_{TL}^{B}(\overset{-}{r_{TL}^{L}}, \overset{+}{r_{TL}^{B}}, \overset{-}{r_{TL}^{CB}}, \overset{+}{\delta_{TL}}, \overset{-}{\theta_{TL}}, \overset{-}{\mu_{TL}}, \overset{-}{h}, \overset{-}{\bar{\varphi}_{car}}, \overset{-}{r_{w}}, \overset{-}{\bar{\varphi}_{liq}}, \overset{-}{l_{w}}) \tag{4.30}$$

For completeness, the demand and supply sides of the bond, loan and deposit markets should be in equilibrium. Any change in market conditions also affects the private sector asset allocation, thus, changes the demand for the loans and bonds and the supply of deposits. By using the private sector balance sheet (assuming bank capital and net financial wealth is constant), the demand for loans can be written as a function of the private sector bond demand, deposit supply, and desired investments:[108]

$$L_{TL}^{D} = L_{TL}^{D}(B_{TL}^{HH}, D_{TL}^{S}, f(H, PC)) \tag{4.31}$$

In line with the literature, the private sector demand for bonds, deposit supply and desired investments can be written as:

$$B_{TL}^{HH} = B_{TL}^{HH}(\overset{-}{r_{TL}^{L}}, \overset{+}{r_{TL}^{B}}, \overset{+}{y}) \tag{4.32}$$

$$D_{TL}^{S} = D_{TL}^{S}(\overset{-}{r_{TL}^{L}}, \overset{-}{r_{TL}^{B}}, \overset{+}{y}) \tag{4.33}$$

[108] Private sector loan demand should be equal to the deposit supply, government securities demand and investment demand of private sector.

$$f(H+PC)=f(r_{TL}^{\bar{L}},r_{TL}^{\bar{B}},y^{+}) \tag{4.34}$$

Therefore, the loan demand function becomes:

$$L_{TL}^{D}=L_{TL}^{D}(r_{TL}^{\bar{L}},r_{TL}^{+B},y^{+}) \tag{4.35}$$

If we assume that the Treasury's bond supply is fixed, the equilibrium in bond market is determined by the bond demand of the banking system, central bank, and private sector:

$$\bar{B}_{TL}^{S}=B_{TL}^{HH}(r_{TL}^{\bar{L}},r_{TL}^{+B},y^{+})+B_{TL}^{B}(r_{TL}^{\bar{L}},r_{TL}^{+B},r_{TL}^{\bar{CB}},\delta_{TL}^{+},\theta_{TL}^{-})+B_{TL}^{CB} \tag{4.36}$$

Within this framework, the equilibrium bond and loan market interest rates can be defined as:

$$r_{TL}^{B*}=r_{TL}^{B}(r_{TL}^{+L},r_{TL}^{+CB},\delta_{TL}^{-},\theta_{TL}^{+},y^{+},B_{TL}^{\bar{CB}}) \tag{4.37}$$

$$r_{TL}^{L*}=r_{TL}^{L}(r_{TL}^{+B},r_{TL}^{+CB},\delta_{TL}^{+},\theta_{TL}^{+},y^{+}) \tag{4.38}$$

When the capital adequacy and liquidity ratios and collateral constraint bind, the equilibrium rate in the loan market is defined as follows:

$$r_{TL}^{L*}=r_{TL}^{L}\left(r_{TL}^{+B},r_{TL}^{+CB},B_{TL}^{\bar{CB}},\delta_{TL}^{+},\theta_{TL}^{+},y^{+},\mu_{TL}^{+},\tau_{TL}^{-},h_{TL}^{+},\varphi_{car}^{+},r_{w}^{+},\varphi_{liq}^{+},l_{w}^{+}\right) \tag{4.39}$$

The impacts of the supplementary policy tools depend on the structure of the banking system. Although, it is usually assumed that the banking system consists of similar banks, individual banks may have different asset and liability structures. While the collateral constraint binds for some banks, liquidity or capital adequacy ratios may bind for others. Therefore, the existence of different individual banks with different portfolio structures, and capital adequacy and liquidity ratios can reinforce the total net effect of these three constraints on the loan supply and bond demand of the banking system. This implies that, while a bold move is required in case of single tool, slight moves may be extremely effective in case of a coordinated use of these tools. In light of these arguments, the tools and their effects may be summarized as follows:

(a) Required reserves: An increase in required reserves increases the banking system borrowing requirement from the central bank. This policy tool is ineffective and does not affect the loan and bond markets equilibrium interest rates as long as (i) the open market operations limit due to the collateral constraint does

not bind, and (ii) central bank remunerates these reserves at policy rate. However, when the collateral constraint gradually starts to be effective, any increase in the required reserves causes a significant impact on the loan and bond markets through its liquidity effect. In addition, the dichotomy[109] the between loan and deposit rates disappears. When the collateral constraint becomes effective; (i) deposit rate starts to respond to the liquidity conditions and exceeds the central bank's policy rate, (ii) deposit rate becomes the marginal cost variable after some threshold level. Thus, the degree of the collateral constraint determines the impact of the required reserves on the banking system's loan supply and bond demand.

(b) Interest payment to the required reserves: Since the required reserves are funded through the open market operations at the policy rate, there is no net required reserves' cost to be transmitted to the deposit or loan rates, as long as (i) central bank remunerates these reserves at policy rate, and (ii) open market operations' borrowing limit (collateral constraint) does not start to bind. When (i) central bank does not pay or pays less than the policy rate, and (ii) collateral constraint does not bind, then, the banking system can completely transfer costs to the depositors. But, as the open market operations' limit starts to bind, as a result of the increase in competition for the deposits, while some portion of the cost is transferred to the borrowers, some portion may be assumed by the banking system. Thus, the decision on the interest rate payment to the required reserves may strengthen the effectiveness of the required reserves depending on the degree of collateral constraint.

(c) Haircut rate: The haircut rate determines the collateral value of the banking system's bond portfolio and limit of the open market operations. For example, when the market value of a bond portfolio is 100 units, and haircut rate is 10 %, banking system can borrow 90 units. If the haircut rate is increased to 20 %, the banking system's open market operation limit declines to 80 units. This rate may significantly reinforce the impact of the required reserve system on bond, loan and deposit markets, especially when the collateral constraint is binding.

(d) Capital adequacy and liquidity ratios: Since these ratios are related with the leverage, they directly limit the portfolio volume, even the collateral

[109] In dichotomy case, required reserves affect only the deposit rate. Since, the marginal rate is the policy rate, loan rate is indifferent to a change in the deposit rate or changes in the required reserves.

constraint does not bind. Thus, when it starts to bind gradually, it becomes a very effective and direct tool to change the loan and bond market conditions.

(e) Risk and liquidity weights: These weights strengthen the effectiveness of the capital adequacy and liquidity ratios. These weights may also affect the banking system portfolio decision when they are set different than the market risk weights for each asset type in their utility maximization process. For example, increasing the risk weights of the loans causes a shift from loans to bonds, in addition to a decline in total portfolio.

The other policy tool of the central banks is the direct purchase or sale of the government securities. When the central bank purchases government securities, firstly, the total supply (for the banking system) declines. Thereby, the interest rate of the bonds shifts downward. Then, the interest rate of the loans decreases as the banking system and private sector rebalance their portfolios. In addition, the banking system reduces its open market operations borrowing as it gets permanent alternative liquidity. When the policy rate is unchanged, while central bank bond purchase loosens, bond sale tightens the credit conditions.

The central bank's operations in the bond market also affect the banking system's optimal asset allocation. Up to now, in addition to some simplifying assumptions, the maturity mismatches between the assets and liabilities of the banking system is also disregarded. The central banks usually provide liquidity through the short term repo transactions. Especially in emerging countries with a history of high and volatile inflation, the maturity of deposits is very short relative to the loans' and bonds' maturities. The longer term interest rates are simply the weighted average of current and risk adjusted expected future central bank policy rates. This implies that, the longer term interest rates are not only determined by the current policy rate, but also by the expected stance of the monetary policy in the future which introduces interest rate risk for the banking system stemming from assets an liabilities maturity mismatch. This risk forces the banking system to allocate its optimum portfolio volume into different maturities. Thus, the central bank's bond purchase or sale also intervene the allocation of their portfolio between various maturities.

For example, when the optimum level of total portfolio of the banking system is TL 100 with TL 50 loans and TL 50 bonds, and with an average maturity of 2 year; if central bank purchases TL 20 3-year bonds, this intervention causes; (i) a decline in the total portfolio by TL 20, (ii) a decline in average maturity below two years, and (iii) an increase in the share of the loans from 50/100 to 50/80 which violates the original optimum portfolio allocation. Then, the banking system tries to readjust its portfolio by increasing its demand for the longer maturity bonds. In other words, on the one hand, banking system tries to increase the total portfolio volume by taking new equilibrium interest rates into account, on the other, it tries to re-adjust the share of the bonds and loans by taking their new relative equilibrium interest rates. Since the bond is fixed, and new demand concentrates on longer term, although the increase in demand for new assets to increase the total portfolio lowers all interest rates, the decline in interest rates of longer term maturities is likely to be more significant. Thus, the operations of the central banks in longer term bond markets have more significant impacts on the markets than the short term liquidity operations. Note that, the foreign investors' longer term bond demand has more significant impacts than their short term money market investments. Therefore, foreign investments in longer term securities signifies the impacts of the foreign capital flows on domestic markets as will be discussed in open economy case.[110]

To sum it up, in closed economy case, central bank can effectively change the monetary and credit conditions through the supplementary policy tools in addition to the policy rate.

4.1.2. Equilibrium Interest Rates in Open Economy

When the FX assets and liabilities and non-resident investors are allowed, in addition to the assets and liability allocations in the same currency, the residents also decide on the currency composition of their balance sheets. To be consistent with the practice and for the sake of simplicity, it is assumed that FX open position is not allowed in the banking system's balance sheet. Thereby, the currency compositions of the balance sheets are mainly determined by the decisions of the central bank, treasury, non-bank private sector and non-residents. The central bank's operations

[110] Note that, in Chapter 3, we listed foreign investment in longer term government securities and swap transactions as the underlying reasons of the increase in credit growth in 2000s in Turkey.

(interventions) in the FX market, foreign capital inflow/outflow, and non-bank private sector demand for FX loans and assets and liability distribution preferences between currencies significantly affect the monetary and credit conditions and FX rate.

In the open economy case, there are two interest rates in the economy: (i) the domestic currency (TL) interest rate is determined mainly by the central bank, and (ii) the FX interest rate is determined mainly by the external factors, specifically by the foreign central banks and country risk premium. In addition, while the Treasury issues both TL and FX bonds, non-residents actively participate in the bond and loan markets. While non-residents can extend only FX loans to the banking system and non-bank private sector, they can invest in both TL and FX bonds, and TL money markets. Therefore, the total loan supply, and the total FX and TL bond demands can be written as:

$$L_T^S = L_{FX}^S + L_{TL}^S \rightarrow L_T^S = L_{FX}^B + L_{FX}^{FP} + L_{TL}^S \tag{4.40}$$

$$B_T^D = B_{TL}^D + B_{FX}^D \rightarrow B_T^D = B_{TL}^B + B_{TL}^{HH} + B_{TL}^{CB} + B_{TL}^F + B_{FX}^B + B_{FX}^F \tag{4.41}$$

It is assumed that the banking system decides on the FX side of the assets similar to the TL side. But, this time, there is no open market operation facility.[111] Therefore, there is no specific constant marginal cost, and banking system has to keep some FX liquidity (R_{Fx}^F) as a percentage (α_{FX}) of the FX deposits and FX loans from the non-residents for unforeseen residents' FX deposit shifts to TL or foreign FX loan withdrawals. In addition, as the difference between the domestic FX loans' and foreign liquid assets' interest rates decline, banking system starts to keep more foreign liquid assets, thus α_{FX} increases. To be realistic, non-residents' loans to the banking system are subject to the same required reserve ratio with the FX deposits. Taking these factors into account, the FX side of the banking system balance sheet takes the following form:

$$R_{FX}^F + L_{FX}^B + B_{FX}^B = (1-\mu_{FX})(D_{FX} + L_{FX}^{FB}) \tag{4.42}$$

$$L_{FX}^B + B_{FX}^B = (1-\mu_{FX} - \alpha_{FX})(D_{FX} + L_{FX}^{FB}) \tag{4.43}$$

[111] Note that, central banks do not act as a lender of last resort in FX market. As discussed in Chapter 2, they may provide only limited FX liquidity during turbulences in FX market to reduce the volatility.

In this case, the FX loans and bond portfolio is determined by the residents' FX deposit preferences and the availability of non-resident FX loans to banking system. The banking system's objective is to maximize its profits given the portfolio structure of the balance sheet, and to allocate the assets between FX loans and FX bonds. As in TL side, it is assumed that the central bank remunerate the required reserves at some portion (τ_{FX}) of foreign central bank rate (r_{FX}^{FCB}).

We assume that, banks' behavior on portfolio structure is similar to the TL side. For simplicity, assuming that the FX deposits and foreign borrowing are close substitutes, the FX deposit rate is determined by the rate of the FX loans extended to the banking system by the non-residents. On the other hand, the interest rate of non-resident loans to the banking system and private sector is determined by the country risk premium (ϕ^{CRP}) of the domestic country. Then, the banking system's FX loan supply and direct foreign FX credits to the real sector may be defined as:

$$L_{FX}^{B} = L_{FX}^{B}(r_{FX}^{\overset{+}{L}}, r_{FX}^{\overset{-}{B}}, r_{FX}^{\overset{-}{FCB}}, \mu_{FX}^{\overset{-}{}}, \phi^{\overset{-}{CRP}}, \overline{\varphi}_{car}^{\overset{-}{}}, r_{w}^{\overset{-}{}}, \overline{\varphi}_{liq}^{\overset{-}{}}, l_{w}^{\overset{-}{}}, \delta_{FX}^{\overset{-}{}}, \theta_{FX}^{\overset{-}{}}) \tag{4.44}$$

$$L_{FX}^{FP} = L_{FX}^{FP}(r_{FX}^{\overset{-}{FCB}}, \phi^{\overset{-}{CRP}}) \tag{4.45}$$

Assuming there are significant financial frictions for the real sector that limit the direct access to the international loan markets (therefore there are only a limited number of firms which can directly borrow from these markets), banking system loan rates represent the equilibrium interest rates for the FX loans. Therefore, the equilibrium in FX loan interest rates can be defined as:

$$r_{FX}^{L*} = r_{FX}^{L}(r_{FX}^{\overset{+}{B}}, r_{FX}^{\overset{+}{FCB}}, \phi^{\overset{+}{CRP}}, \mu_{FX}^{\overset{+}{}}, \overline{\varphi}_{car}^{\overset{+}{}}, r_{w}^{\overset{+}{}}, \overline{\varphi}_{liq}^{\overset{+}{}}, l_{w}^{\overset{+}{}}, \delta_{FX}^{\overset{+}{}}, \theta_{FX}^{\overset{+}{}}, y^{\overset{+}{}}) \tag{4.46}$$

The non-residents' portfolio investments of on the domestic securities and swaps have also indirect effects on the domestic currency loan markets. For example, when the foreign investment in government TL securities increases, since the TL bond supply is fixed, as the banking system and private sector sell the existing bond portfolio and try to re-adjust portfolio allocation according to their utility function by increasing their demand for the bonds, the interest rate of bonds declines. The decline in bonds also causes a smaller decline in loan rates as the banking system tries to resist the decline in total volume of TL portfolio and increases the loan supply as the profit maximization function implies. Similarly,

when the supply of FX deposits increases as a result of an increase in foreign demand for TL assets, the FX deposit rate also declines, and causes a decline in FX loan rates.[112] In addition to the portfolio investment on domestic currency assets, an increase in foreign loan supply to domestic economy also influences the domestic currency credit markets. When the supply of the FX loans increases and FX loan rates declines; as a result of a shift from domestic currency loans to the FX loans, the demand for the domestic currency loans, and therefore domestic currency loan rates decline. Therefore, since the country risk premium is a proxy for foreign portfolio flow, this variable should also be included as an explanatory variable in domestic currency equilibrium loan rate function.

4.2. Use of Supplementary Policy Tools and Stylized Facts in Loan and Deposit Markets in Turkey

In 2000s, the required reserve system had not been used as an active monetary policy tool until September 2010. The main function of the required reserve system was to support the banking system liquidity and effectiveness of central bank liquidity management operations. In order to support the banking system through reducing indirect taxation, the CBRT had started to remunerate the required reserves in August 2001. Though initially the TL remuneration rate was well below the CBRT policy rate, starting from August 2003, the CBRT had determined the remuneration rate at around 70 – 80 % of the weighted average of the deposit rates (Figure 4.3). [113] In January 2006, the CBRT indexed the remuneration rate to the 75 % of the policy rate. The CBRT had also started to remunerate the FX required reserves at around half of the international short term interest rates in May 2002. In December 2008, in order to support the TL assets and liabilities, while indexation in TL side was increased to % 80, FX remuneration is cancelled. In September 2010, the CBRT decided to use the required reserve system as an active monetary policy tool, and cancelled TL remuneration to increase the effectiveness of the required reserves.

[112] Note that, when foreigners invest in TL securities, they sell FX to residents to obtain TL, therefore residents FX deposits increases.

[113] However the CBRT announced the remuneration rate as 40 % in September 2002, since the coverage was limited, effective remuneration was around 26 %.

The required reserve base includes almost all on-balance sheet liabilities of the banking system excluding the domestic interbank deposits and banks' own resources.[114] Until December 2008, the CBRT kept the uniform TL required reserve ratio as 6 %, and FX reserve ratio as 11%. During the global crisis, in order to support the liquidity of the banking system, the CBRT reduced TL required reserve ratio to 5 % in October 2009, and FX required reserve ratio to 9 % in December 2008. As the economy had started to recover and markets were stabilized, the CBRT had started to increase the FX required reserves to 10 % in April and June 2010, gradually.

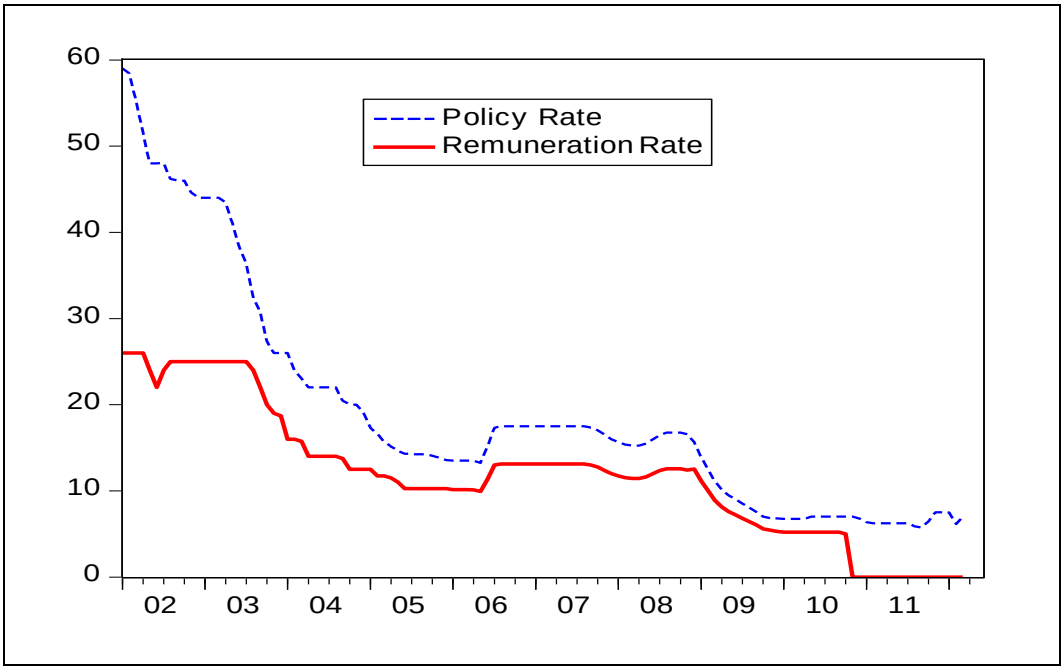

Figure 4.3: Remuneration Rate of TL Required Reserves (%)
Source: CBRT and author's calculations.

Within the flexible monetary policy framework, the CBRT had started to increase the required reserve ratios in September 2010, and to differentiate reserve ratios according to the types and maturities of the liabilities in January 2011, to support the longer term maturities and to tighten monetary conditions. Within this strategy, the effective average required reserve ratio had increased from 5 % to around 13.5 % for TL and from 10 to 12 % for FX liabilities until July 2011. When

[114] See CBRT (2005): "Zorunlu Karşılıklar Hakkında Tebliğ, Sayı: 2005/1" for more details.

the demand for the FX increased and interest rates shifted upwards in summer months of 2011, the CBRT started to reduce the effective required reserve ratio directly or indirectly (Figure 4.4). Until October 2011, the effective required reserve ratios of TL and FX was reduced to around 10.5 % and 10 % respectively. In addition, the CBRT started to allow the banks to keep some portion of their TL required reserves in FX and gold in September 2011. The rationales for this strategy were: (i) to increase the gross FX reserves of the CBRT, and (ii) to increase the TL liquidity. Then, banks have started to keep a significant portion of the TL reserve requirements in FX and gold.[115] As a result of this strategy, while the TL liquidity increased significantly, effective TL reserve requirements kept in TL declined sharply.

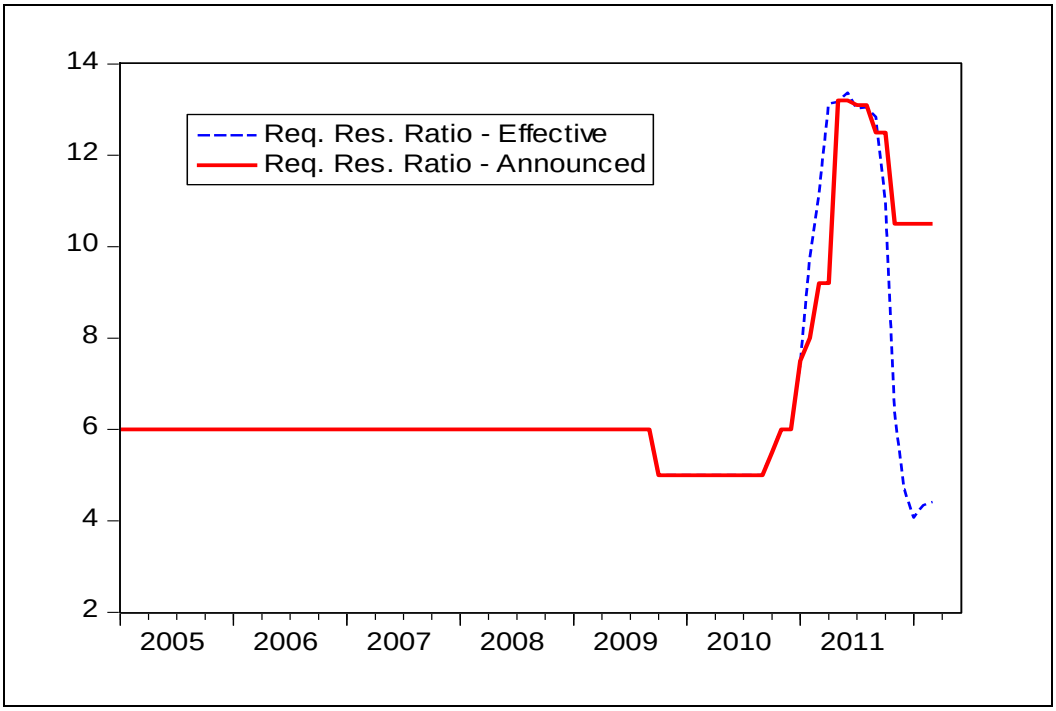

Figure 4.4: Announced and Effective TL Reserve Requirement Ratios[116]
Source: CBRT and author's calculations.

[115] Since, the CBRT does not act as a lender of last resort, Turkish banks has to keep a significant amount of liquid FX assets (usually 15 – 20 billion USD) within the foreign banks. As short term foreign interest rates are close to zero, Turkish banks have started to keep FX liquidity within the CBRT. Therefore, this strategy eased TL liquidity conditions indirectly.

[116] Since there is no available data for all liabilities which are subject to reserve requirements, since April 2011, we approximated the effective rates by dividing deposits which are subject to reserve requirements by bank reserves with the CBRT. Therefore, since we overestimate the effective actual reserve requirements by around 2.6 % after 2011, we subtracted 2.6% from the actual results.

As discussed in the previous section, however the CBRT guarantees to provide unlimited liquidity at policy rate through the repo auctions or at upper limit of the corridor through the late lending facility under the inflation targeting framework, borrowing capacities of banks are limited by their collateral. The Figure 4.5 provides some clues why the CBRT enabled banks to keep some portion of their TL reserve requirements in FX and gold. More explicitly, during the summer of 2011, the securities used in repo transaction increased up to the 75 % of the risk and haircut adjusted government securities portfolio of the banking system. Therefore, the collateral constraint of the banking system reached to a risky region. Considering the heterogeneity of the liquidity distribution among the banks, it is likely that, the collateral constraint had already got very close to its limits for some banks. The figure suggests that, the main motive behind the relaxation of TL required reserves was to ease the collateral constraint to avoid further pressure on the loan rates. This policy is used to ease the monetary policy stance implicitly.

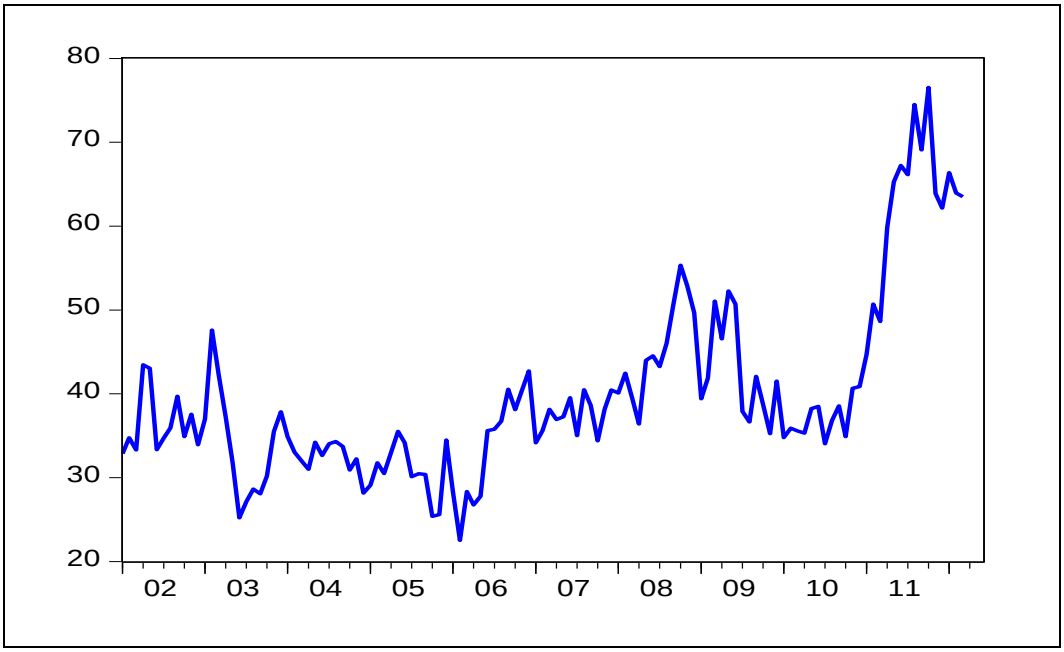

Figure 4.5: Ratio of Repo Transactions to Risk and Haircut Adjusted Securities Portfolio (%)[117]
Source: CBRT and author's calculations.

[117] The banking system provides liquidity through repo transaction from ISE Repo Market and CBRT facilities. For these transactions, government securities are used as collateral. In calculating haircut and risk adjustments, we assumed 10 % hair-cut which is the current rate of the CBRT, and 3 standard deviation of government securities interest rates in last 6 months as price risk, and 10 % deposit withdrawal risk.

On the other hand, the direct cost of the TL required reserve system has always been limited relative to the policy interest rates, even after the CBRT cancelled the remuneration (Figure 4.6). In calculating the direct cost of the TL required reserves, we assume that, banking system finances the required reserves through the open market operations. Therefore, we assume the average open market operations funding rate as funding cost of the required reserves.[118] Assuming that the cost of the FX used for the TL reserve requirements is very low, we ignored that part in the direct cost calculation.[119] Although, during early 2000s, the direct cost of TL required reserve system seems to be high, it was around 2 - 3 % of the policy rate on average. Although the direct cost of the TL required reserve system increased up to 1 % after September 2010, it declined to around 40 basis points (which is 5 % of policy rate) in early 2012.

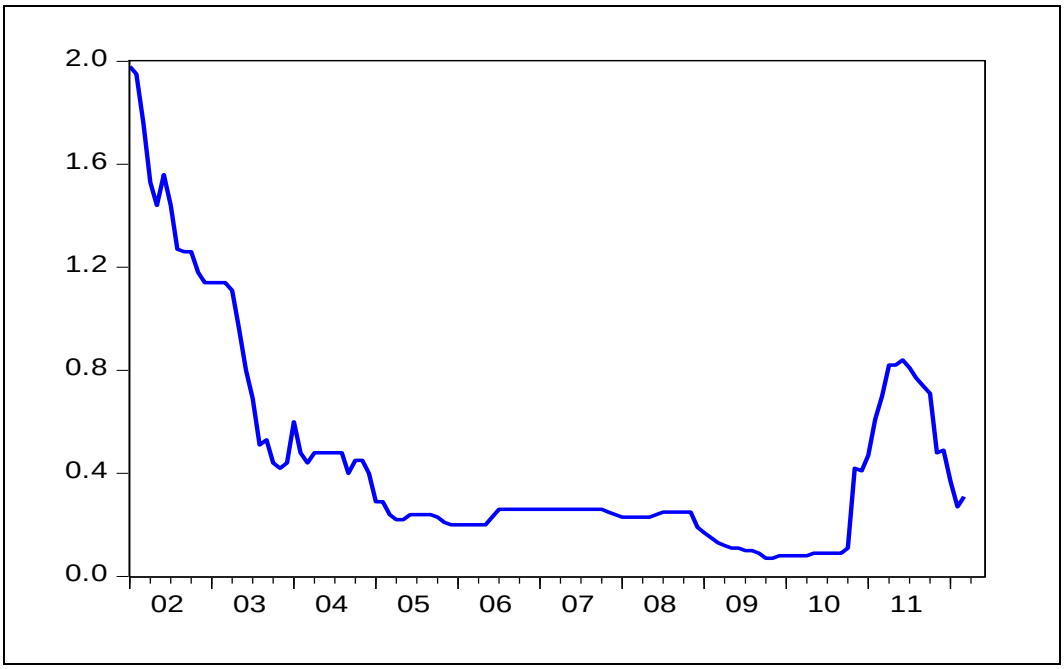

Figure 4.6: Direct Cost of Effective TL Required Reserves to Banking System
Source: CBRT and author's calculations.

[118] Because, the CBRT average open market operations funding has exceeded the announced policy rate significantly since the second half of the 2011, we didn't use the announced rate as marginal rate.

[119] Although by taking current level of excess FX liquidity of the banking system and negligibly low short term international interest rates into account, this assumption does not alter the analysis, in case of higher international interest rates and decline in FX liquidity of the banking system, we should also include FX funding costs. In fact, in 2012, the FX deposit rates increased as a result of the increased competition for FX deposits.

The deposit, loan, and policy rates are given Figure 4.7. The figures suggest that, the loan and deposit rates closely follow the policy rate. There are two noteworthy points in loan and deposit rate data that should be highlighted: (i) the average deposit (excluding sights) rates are always above the policy rate, and (ii) the loan rates are more volatile than the deposit rates (Figure 4.8). In the previous section, we assume that the open market operations and deposits are close substitutes, therefore, when the liquidity constraint does not bind, the cost of the required reserves is transferred to the depositors. But, the positive and significant difference between the deposit and policy rates seems to contradict with the theoretical set-up provided in previous section. However, when (i) the fringe benefits of large customer base, such as sale of other banking instruments and services, (ii) being a reliable source during the volatile market conditions, and (iii) higher quality of the deposits in calculating the liquidity ratios and in evaluating the rating of the individual banks are taken into account; there are justifications for a bit higher deposit rates than the policy rate.

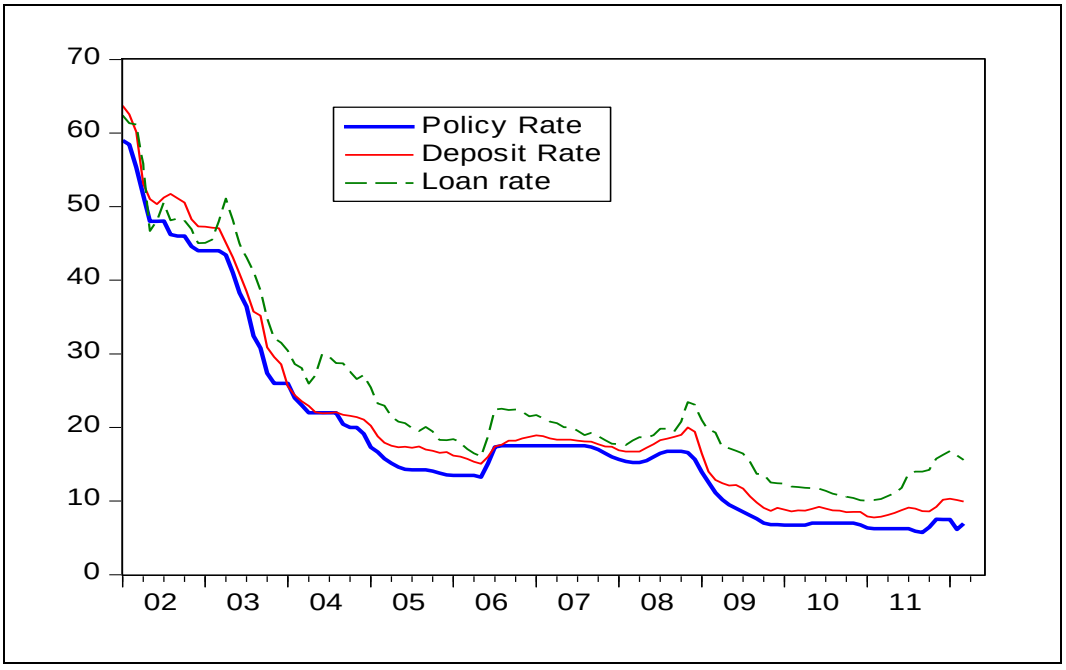

Figure 4.7: Deposit, Loan and Policy Rates
Source: CBRT and author's calculations.

The figure 4.8 also suggests that, when the cost of the required reserves was increased through the elimination of the remuneration and increasing the required reserve ratio after September 2010, the increase in cost was not transmitted to the deposit rate. In fact, the spread between the deposit and policy rates has widened. On the other hand, while the lower volatility of deposit rates can be explained by the the short maturities of the deposits, higher volatility of the loan rate may be explained by being more exposed to the changes in the risk premium as a result of their longer maturities. As a result of tightening the monetary policy through the unconventional policy tools, specifically through the required reserves, since last quarter of the 2010, while the loan rates increased almost 6 percentage points, the increase in deposit rate remained around 1 percentage point. These visual conclusions support the effectiveness of the required reserves on deposit and loan rates through the liquidity conditions.

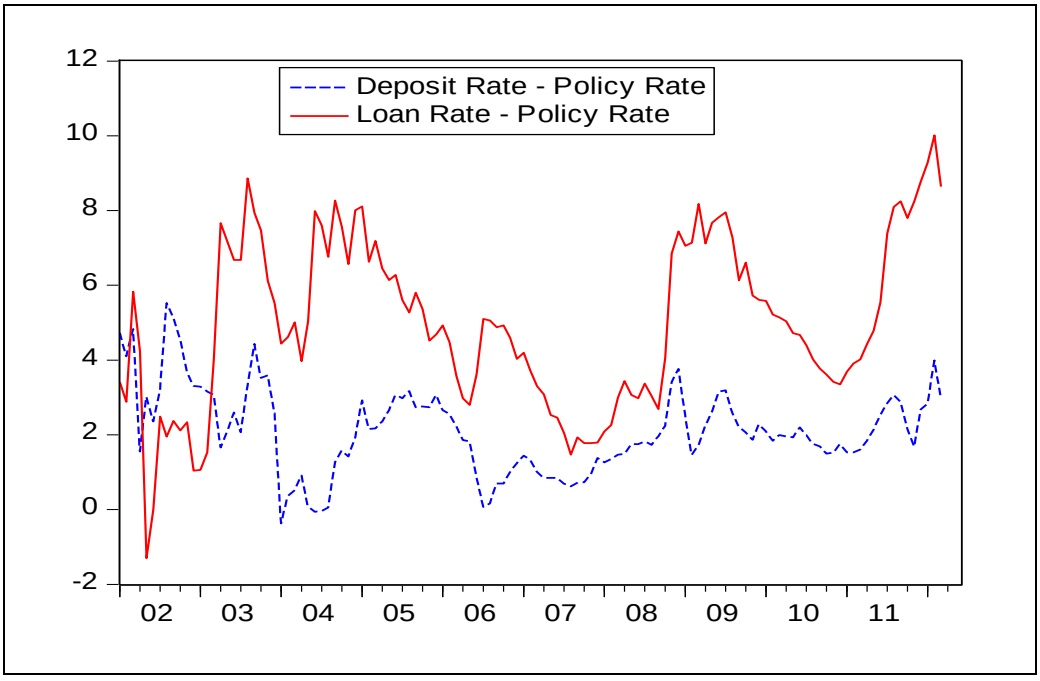

Figure 4.8: Spread between Loan – Deposit Rates and Policy Rate
Source: CBRT and author's calculations.

The spreads between the deposit and short term (3 months) government security rates, and the loan and longer term government security (15 months) rates suggest that, while the deposit rates are slightly higher than the short term

government securities rates, the loan rates are significantly higher than the longer term government securities rate especially in last one year (Figure 4.9). Three explanations for the significantly higher spread between the loan and government securities rates are; (i) collateral constraint of the banking system which increases the demand for government securities, while it decreases the loan supply, (ii) non-residents' investments on government securities, and (iii) the increase in the risk premium of the longer term credits especially during the volatile market conditions.

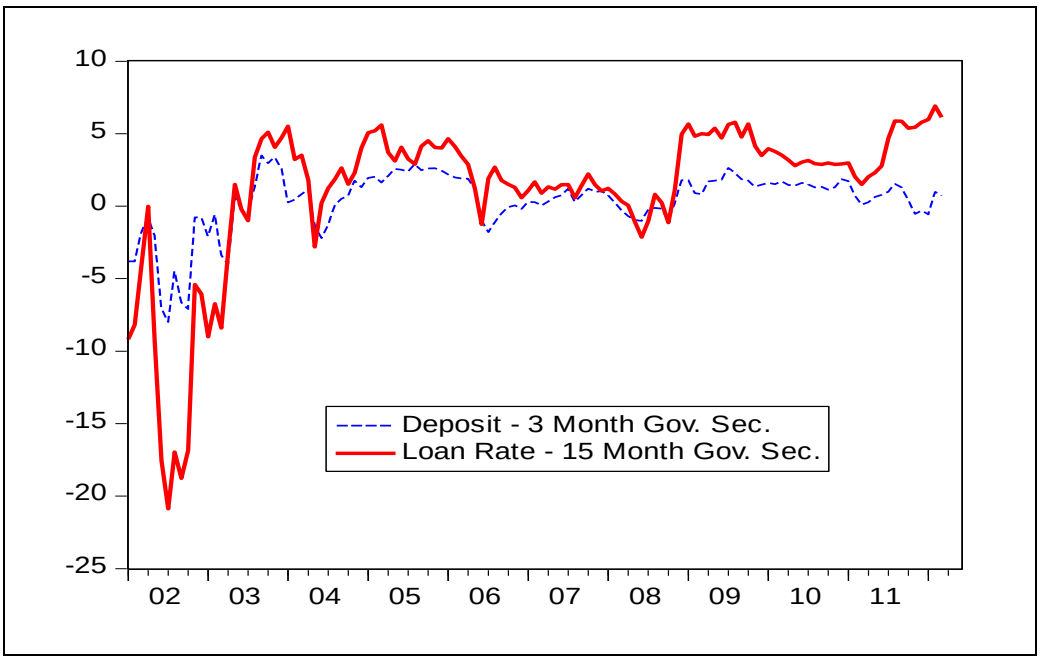

Figure 4.9: Spread between Deposit/Loan and Government Securities Rates
Source: CBRT and author's calculations.

As discussed in Chapter 3, though there is a decline, Turkey is still a highly dollarized country. Therefore, the developments in TL side are not enough to conclude the loan and deposit markets. On FX side, while there is published historical FX deposit rates data, there is no available data for the FX loan rates. The volatile nature of the spread between the TL loan and TL government securities rates suggests that Treasury's Eurobond rates can not be a good proxy for the FX loan rates. Therefore, we ignore the analysis on the FX loan rates.

Although we assume that foreign interest rate and country risk premium determine the domestic FX deposit rates, the Figure 4.10 suggests that there are some anomalies during pre-2004 period. The correlation between the LIBOR

rate/country risk premium and FX deposit rate has strengthened only after 2004.[120] It is difficult to explain how the Turkish banks could maintained the domestic FX rates close to the international interest rates when Turkish Eurobond and CDS rates were around 6 - 10 % during early 2000s. We think that, very short maturities of the FX deposits and the difficulties of the residents to access to the international markets can partially explain this case. The other explanation may be the residents' desire to hedge themselves against the depreciation rather than focusing on the FX interest income in those years.

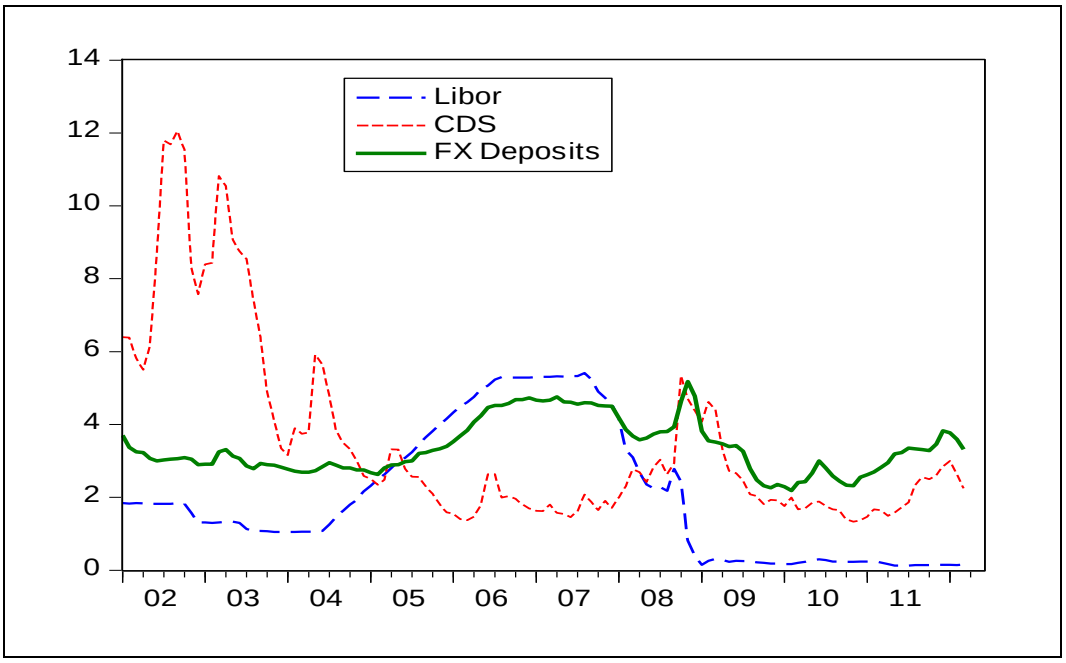

Figure 4.10: FX Deposits, CDS and LIBOR Rates
Source: CBRT, Bloomberg and author's calculations.

The other critical factors that determine the banking system behavior in loan and deposit markets are the capital adequacy and liquidity ratios. While the minimum liquidity ratio is 100 %, the minimum capital adequacy ratio is 8 % in Turkey. However, these minimum ratios have not been changed since 2001, the BRSA made some minor revisions on the accounting rules during the global crisis to increase the flexibility of the banking system and to support the economic activity. However, the use of these tools for macro prudential purposes surfaced in 2011

[120] The share of USD deposits in total FX deposits is around 65 %. Since interest rates of Euro deposits follow a similar pattern, we ignored them.

when the inefficiency of the single policy tool was accepted by the authorities. In order to limit the credit growth and support the monetary policy, the BRSA increased the risk weights of the consumer credits excluding the automobile and housing loans.

However, the figures in Table 4.1 suggest that, the robust liquidity and capital adequacy positions of the banking system reduce the effectiveness of the risk weights or minimum capital and liquidity adequacy ratios adjustments as a policy tool. For example, although the BRSA increased the risk weights of some loan types in June 2011, the capital adequacy ratio declined slightly from around 19 % to 16.6% in 2011. On the other hand, though the high global level of these ratios imply ineffectiveness of the small adjustments in risk weights, it is likely that, the BRSA's steps affected some individual banks which have lower the capital adequacy, and reduced the competition in credit markets. Therefore, these figures also support the coordinated use of capital adequacy and liquidity ratios with the required reserves in order to be effective.

Table 4.1. Banking System Capital and Liquidity Adequacy Ratios in Turkey (%)

	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012-I
Capital Adequacy	25.1	30.9	28.2	23.7	21.9	18.9	18.0	20.6	19.0	16.6	16.6
Liquidity						168.5	167.0	169.5	165.1	151.8	153.2

Source: BRSA.

4.3. Literature Review on Interest Rate Pass-through in Turkey

The literature on interest rate pass-through provides a clear evidence of a strong and symmetric pass through from the policy rate to the loan and deposit rates in Turkey during post 2002 period. These studies use error-correction methods or Auto Regressive Distributive Lag (ARDL) model. However, the literature relies on only the relationship between the loan-deposit rates and policy rate, and ignores the impacts of the other variables on the loan and deposit rates. All these studies conclude that, the CBRT policy rate is an effective tool to influence the market rates

In a detailed analysis, Aydın (2007) investigates the pass through from (assuming that the CBRT can control money market rates) the money market rates to

the retail loan rates by using micro level panel data of June 2001 – September 2005 period individual banks' cash, automobile, housing and corporate loan rates. His estimation relies on an ARDL model. Though his data set includes the crisis period, he observes a strengthening co-movements of the money market and loan rates after the 2001 crisis, and highlights that the pass through; (i) to the cash and automobile loan rates are complete, (ii) to the corporate rate is incomplete, and (iii) to the housing loan rate is incomplete, but stronger than the corporate loan rate. He concludes that the CBRT has a control over the loan rates within a quarter.

Özkan (2009) examines the pass-through to the retail rates for the period April 2001 and December 2006 through the error correction method. His results show that, while the pass through to the loan and deposit rates are almost complete in the long-run, the short run flexibility is higher in loan rates relative to the deposit rates. He also concludes that, there is no asymmetric response of the loan and deposit rates to the policy rate changes.

In a recent study, Yüksel and Özcan (2011) examine the asymmetric adjustment properties of the retail interest rates to the policy rate changes by using December 2001 – April 2011 data. They also find significant pass-through to all types of retail loans including cash, vehicle, housing and commercial loans, and reject the asymmetric response to the policy rate changes.

On the other hand, Alper et, al. (2011) investigate whether the liquidity conditions can affect the lending behavior of the banking system.[121] However, they do not investigate the pass-through or response of the loan rates to the changes in liquidity and policy rate, they focus on investigating the impacts of the liquidity conditions on the loan growth rates in the context of existence of bank lending channel in line with Bernanke and Blinder (1998) by using bank groups' panel data. They estimate the TL credit growth by using panel instrumental variable regression method and 2002 Q4 – 2011 Q1 data. They use the ratio of the difference between the liquid assets and liquid liabilities to the total assets as a proxy for the liquidity condition. While their main liquid assets are cash, interbank lending including lending to the CBRT, and securities portfolio, their liquid liabilities include money

[121] This paper is published just after the preliminary version of this chapter. To our knowledge, it is the first published paper which documents the impact of liquidity conditions on loan markets, and share very similar views with us on the liquidity channel.

market borrowing including repo transactions with the CBRT. They do not record the required reserves as a liquid asset. They show that, the individual bank's and the overall system's liquidity are important determinants of the bank lending in Turkey. They specifically highlight that, the individual banks do not only consider their own liquidity, but also the overall liquidity conditions. In addition, they conclude that, the CBRT can manipulate the liquidity positions through other policy tools to affect the loan markets.

Although there also a lot of studies on other emerging and developed countries which focus on the interest rate pass through or the bank lending channel, the most relevant case with this chapter is studied by Herrera et al. (2010) on Colombian data. Colombia is an emerging country which has similar features of Turkey and uses the required reserves as an active supplementary policy tool to contain the demand resulting from heavy capital inflow which induced large FX intervention of the Central Bank during the pre-global crisis period, and to increase the liquidity during the crisis when the capital outflows resulted in liquidity drain. Herrera et al. (2010) investigate the effects of reserve requirements in inflation targeting regime by using Johansen Vector Error Correction Cointegration methodology on monthly data for the period May 2002 – October 2009. They use the policy interest rate, slope of the yield curve of government securities, industrial production index, and remuneration adjusted required reserve ratio, in addition to loan rates as variables. Their results show that, required reserve system is an important long term determinant of the loan interest rates and has been effective in strengthening the pass through from policy rate to the deposit and lending rates. They also analyze the impact of the net credit position (open market operation) with the Central Bank, and find that low "in net credit" position (or high liquidity) weakens the transmission of policy rates to the deposits and short term lending rates. Their results imply that, as the liquidity shortage increases in the market, the effectiveness of the monetary policy improves.

4.4. Econometric Evidence: Determinants of Loan and Deposit Rates

We focus on the main determinants of the deposit and loan rates, and the effectiveness of other policy tools on these rates. We use Johansen vector error

correction methodology to investigate the long and short run relationship between the policy and the loan/deposit rates, and specifically the impacts of the liquidity conditions and the country risk premium on these rates. We analyze the period of January 2003 – March 2012 which covers the implicit and explicit inflation targeting periods. When a data frequency is shorter than a month, the monthly average of that variable is used. While the domestic data is obtained from the Electronic Data Dissemination System of the CBRT and BSRA web-site, we relied on Bloomberg for the foreign interest and credit default swap (CDS) rates. Our data set consists of the TL loan rate (r_l), TL deposit rate (r_d), Euro and USD deposit rates (r_euro and r_usd respectively), international short term interest rates (libor and eonia), CBRT policy rate (r_cb), cost of required reserves (rrcost), indicator of liquidity conditions (liq), CDS rate of Turkey (cds), and seasonally adjusted industrial production index gap (y_gap). The calculations are performed by using E-views.

The methodology of Johansen (1988, 1991, 1995) estimates the vector error correction model which can be specified as $\Delta x_t = \Pi x_{t-1} + \sum_{i=1}^{k} \Gamma_i \Delta x_{t-i} + u_t$, where x_t is an *n* x 1 vector of I(1) variables. If Π has less than full rank, but the rank of Π is not equal to zero, then Π can be written as $\Pi = \alpha\beta'$ where α is an $(n \times r)$ matrix of weights interpreted as a speed of adjustment towards equilibrium, and β is an $(n \times r)$ matrix of parameters determining the cointegrating relationships. The numbers of cointegrating vectors are determined by the trace and maximum eigenvalue tests.

We investigate the existence of unit root and stability through Augmented Dickey Fuller (ADF) and Phillips Perron (PP) tests The ADF test (Dickey and Fuller (1979 and 1981)) is based on the test regression $\Delta x_t = \alpha + \beta t + \delta x_{t-1} + \sum_{i=1}^{k} \gamma_i \Delta x_{t-1} + u_t$ where Δ represents the first difference operator, α is constant, β is the coefficient of a time trend (t), *k* is the lag order of the autoregressive process, and u_t is the white noise error term. Under the null hypothesis that x_t has a unit root, $\delta = 0$. The PP test (Phillips and Perron, 1988) estimates the non-augmented form of this regression and directly modifies the *t*-ratio

of the δ coefficient to correct for any serial correlation and heteroscedasticity in the error term.

Since we are mainly interested in the effects of the policy rate and liquidity condition on the loan and deposit rates, we use the weighted average of all types of retail loans for the loan rate. Deposit rate is a weighted average of the different maturities. Since the banking system external borrowing is determined by the short term interest rates in international markets rather than the foreign central banks' policy rates, we use the weighted average of the O/N Libor and Eonia rates in USD and Euro deposit rates respectively. The 5 year CDS rate is used for the country risk premium. The correlation coefficients matrix of the selected variables is given in Table 4.2.

Table 4.2. Correlation Coefficients of Variable[122]

Variables	d_cb	d_rd	d_rl	d_cds	d_rrcost	d_liq	d_ygap
d_cb	1.00	0.74	0.64	0.41	0.48	0.09	-0.01
d_rd	0.74	1.00	0.62	0.33	0.28	0.15	0.06
d_rl	0.64	0.62	1.00	0.62	0.20	0.02	-0.06
d_cds	0.41	0.33	0.62	1.00	0.17	0.14	-0.01
d_rrcost	0.48	0.28	0.20	0.17	1.00	0.27	-0.04
d_liq	0.09	0.15	0.02	0.14	0.27	1.00	-0.06
d_ygap	-0.01	0.06	-0.06	-0.01	-0.04	-0.06	1.00

Although, we intend to use the cost of required reserve (rrcost) to estimate the direct cost impact of the required reserves in the model, since remuneration rate is indexed to the policy rate for a long period, and the liquidity has been determined by the changes in required reserve ratio in last two years, in order to avoid severe multi-collinearity problem, we have to exclude the cost of the required reserves in the models. Since the direct cost of the required reserves is small, and there is a strong correlation between the cost of required reserves and liquidity level in the sample, we assume that the liquidity indicator used in the model also represents the direct cost of the required reserves, in addition to its indirect liquidity effect.

[122] d_.. stands for the difference.

In fact, CDS is a critical variable for all markets in Turkey. It represents the longer term credibility of the economic policies. It can also be used as a proxy for the size and direction of the capital flows. Therefore, it affects all variables, and we find cointegrating vectors for the long-run. But, to avoid severe multi-collinearity problem in the short-run, we also have to exclude CDS rates in the models.

The unit root tests show that, while all variables have unit roots in levels, they are stationary in first differences (Table 4.3). For the loan rate, firstly, we investigate the existence of a cointegrating vector for r_l, r_cb, liq and y_gap. While we obtain a cointegrating vector for r_l, r_cb and liq, the coefficient of y_gap is insignificant (Table 4.4). Therefore, we exclude y_gap.

Table 4.3. Unit Root Tests

Var.	Trend	Augmented Dickey-Fuller		Phillips-Perron	
		Level	First Difference	Level	First Difference
r_l	no	-2.396 (3)	-4.435 (2)	-2.671 (4)	-6.346 (2)
r_d	yes	-3.069 (1)	-5.217 (0)	-3.016 (1)	-5.200 (3)
r_cb	yes	-2.898 (1)	-5.671 (0)	-2.842 (5)	-5.684 (0)
liq	no	-1.624 (0)	-12.205 (0)	-1.463 (3)	-12.531 (7)
cds	no	-2.602 (4)	-6.812 (3)	-2.375 (4)	-8.129 (3)
r_euro	no	-1.733 (1)	-7.923 (0)	-0.634 (0)	-7.915 (4)
r_usd	no	-1.548 (2)	-7.292 (1)	-1.349 (0)	-5.081 (14)
libor	no	-0.994 (3)	-3.800 (2)	-0.729 (5)	-5.716 (2)
eonia	no	-1.133 (4)	-3.770 (3)	-0.951 (7)	-4.078 (1)

Notes: (1) For all first differences, unit root null hypothesis are rejected at 1 percent critical value. Critical values are taken from the tables compiled by MacKinnon (1996). (2) Numbers in parentheses denote the lag length and are determined by using the minimum value of Akaike information criterion. The maximum lag is taken as 6. (3) The sample period is 2003M1-2012M3.

Table 4.4. Johansen Cointegration Test (for r_l r_cb liq)

Eigenvalues	0.316	0.090	0.070
Hypotheses	r=0	r≤1	r≤2
λ-trace	60.69**	18.49	8.00
99 % critical values	42.92	25.87	12.52
λ-max	42.20**	10.49	8.00
95 % critical values	25.82	19.39	12.52

Notes: (1) The statistics λ-trace and λ-max are trace and maximum eigenvalue statistics. (2) VAR includes five lags on each variable and a constant term. Trend variable is restricted to the cointegration space. (3) The superscripts ** signify the rejection of the null hypothesis at 1 percent critical values. Critical values are extracted from Osterwald and Lenum (1992). (4) The estimation period is 2003M1-2012M3.

The estimated long-run and short run equations are given in Table 4.5, and Table 4.6. We use the end of month data for the liquidity conditions. Therefore, in order to avoid the short term volatility in liquidity conditions arising from some technical reasons, for example the end of period balance sheet adjustments of the banking system, we take two month moving average. In addition to avoid the loss of information, we use a limited number of dummies for the external shocks which do not affect the policy rate and liquidity condition, but shifts the loan rates.

Table 4.5. Vector Error Correction Estimates (Long-run)

Sample: 2003M01 2012M03		Included observations: 111	
Cointegrating Eq:	CointEq1	Standard Errors	t_statistics
r_l(-1)	1.000		
r_cb(-1)	-0.597	(0.074)	[-8.117]
liq(-1)	-0.205	(0.046)	[-4.479]
@TREND(02M01)	0.103	(0.026)	[4.025]
C	-10.348		

Table 4.6. Vector Error Correction Estimates (Short-run)

Dependent Variable: d(r_l) Method: Least Squares

Sample (adjusted): 2003M01 2012M03

Included observations: 111 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.240	0.079	-3.047	0.003
CointEq1	-0.205	0.040	-5.073	0.000
d(r_l(-1))	0.035	0.081	0.431	0.667
d(r_cb(-1))	0.336	0.124	2.707	0.008
d(liq(-1))	0.054	0.028	1.897	0.061
dum0303	3.832	0.779	4.921	0.000
dum0403	2.695	0.770	3.501	0.001
dum0604	3.058	0.738	4.141	0.000
R-squared	0.654	Prob(F-statistic)		0.000
Adjusted R-squared	0.630	Durbin-Watson stat.		1.813

The results suggest that, not only the central bank policy rate, but also the liquidity condition is an important determinant of the loan rates in the long run, though pass through from the policy rate to the loan rate is not complete. The impact of the liquidity is also significant both in the short and long runs. The results imply that, a 10 % increase in liquidity condition increases the weighted average loan rate by 54 basis points. By considering around TL 450 billon required reserve base, 1 % increase in the required reserve ratio increases the liquidity indicator by around 2.5 %, and average loan rate by 14 basis points. The impact of a 1 % increase in required reserves in the long run is around 50 basis points.

We perform the same methodology to the weighted average of the TL deposit rates. We achieve a cointegrated vector without the trend (Table 4.7). The estimated long run and short run equations are given in Table 4.8, and Table 4.9, respectively. The results suggest that, while the pass through from the policy rate to the deposit rate is complete, the impact of the liquidity is with the expected sign but insignificant. On the other hand, in the short run, the impact of the liquidity is significantly positive. The results imply that, an increase in required reserves which

tightens the liquidity indicator, increases the deposit rate. This result is expected, but it is in contrast to the theoretical part which assumes a complete transfer of the required reserve costs to the depositors when the collateral constraint does not bind.

Table 4.7. Johansen Cointegration Test (for r_d r_cb liq)

Eigenvalues	0.22	0.09	0.02
Hypotheses	r=0	r≤1	r≤2
λ-trace	40.32**	13.42	2.54
99 % critical values	29.80	15.50	3.84
λ-max	26.90**	10.88	2.54
95 % critical values	21.13	14.27	3.84

Table 4.8. Vector Error Correction Estimates (Long-run)

Sample: 2003M01 2012M03 Included observations: 111

Cointegrating Eq:	CointEq1	Standard Errors	t_statistics
r_d(-1)	1.000		
r_cb(-1)	-0.951	(0.022)	[-43.070]
liq(-1)	-0.010	(0.019)	[-0.551]
C	-2.265		

Table 4.9. Vector Error Correction Estimates (Short-run)

Dependent Variable: d(r_d) Method: Least Squares

Sample (adjusted): 2003M01 2012M03

Included observations: 111 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.197	0.066	-2.967	0.004
CointEq1	-0.265	0.061	-4.330	0.000
d(r_d(-1))	0.393	0.107	3.666	0.0004
d(r_cb(-1))	0.049	0.105	0.466	0.6420
d(liq(-1))	0.047	0.021	2.178	0.0316
R-squared	0.494	Prob(F-statistic)		0.000
Adjusted R-squared	0.475	Durbin-Watson stat.		2.115

We perform similar analysis for the FX side. Since, Euro and USD deposits rates equations yields similar results, instead of providing results of the individual equations, we opt for the weighted average (65 % of USD and 35 % of Euro) of the related interest rates. Therefore, "r_dfx" stands for the weighted average of the FX deposit interest rates, "fore" stands for weighted average of foreign money market rates. The Tables 4.10 to 4.12 suggest that, although the pass-through from the foreign money market rates and CDS is not complete, they are the main determinants of the FX deposit rates in Turkey. Note that, because of the anomalies discussed above, we could only include the data from 2004. Table 10 shows the existence of co-integration vector at 1 % significance level.

Table 4.10: Johansen Cointegration Test (for r_dfx r_fore cds)

Eigenvalues	0.43	0.09	0.05
Hypotheses	r=0	r≤1	r≤2
λ-trace	55.51**	14.23	5.14
99 % critical values	42.92	25.87	12.52
λ-max	41.28**	9.09	5.14
95 % critical values	25.82	19.39	12.52

Table 4.11. Vector Error Correction Estimates (Long-run)

Sample: 2004M01 2012M03		Included observations: 99	
Cointegrating Eq:	CointEq1	Standard Errors	t_statistics
r_dfx(-1)	1.000		
r_fore(-1)	-0.615	(0.034)	[-18.275]
cds(-1)	-0.673	(0.059)	[-11.473]
@TREND(02M01)	-0.028	(0.002)	[-12.152]
C	1.764		

Table 4.12. Vector Error Correction Estimates (Short-run)

Dependent Variable: d(r_dfx) Method: Least Squares

Sample (adjusted): 2004M01 2012M03

Included observations: 99 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.005	0.012	0.395	0.694
CointEq1	-0.184	0.047	-3.886	0.000
d(r_dfx(-1))	0.429	0.097	4.404	0.000
d(r_dfx(-2))	-0.073	0.089	-0.819	0.415
d(fore(-1))	0.220	0.084	2.606	0.011
d(fore(-2))	0.242	0.089	2.712	0.008
d(cds(-1))	0.034	0.036	0.933	0.353
d(cds(-2))	-0.109	0.039	-2.784	0.007
R-squared	0.599	Prob(F-statistic)		0.000
Adjusted R-squared	0.568	Durbin-Watson stat.		1.854

The empirical results of this Chapter show that:

(i) Since the average maturity of the deposits is less than 3 months, the pass through from the policy rate to the deposit rates is complete. In addition, although it is not significant in the long run, the short and long run coefficients of the liquidity condition are positive. This result implies that, although the direct cost of the required reserves is tried to be transmitted to the deposit rates, indirect effect of the liquidity which stems from the change in required reserves eliminates the direct cost effect of an increase in required reserves on the deposit rates. In fact, as the liquidity condition is tightened further, it is likely that the indirect liquidity effect can significantly overweight the direct cost effect. Therefore, the direct cost of the required reserves is assumed by the banking system and/or transmitted to the loan rates.

(ii) Since the loan maturities are very long (around 5 years for consumer credits) relative to the policy rate, the pass-through to the loan rate is

not complete. However, the liquidity condition significantly affects the loan rate.

(iii) Although the banking system has some control over the FX deposit rates, these rates are mainly determined by the international money market rates and country risk premium. It is also likely that the FX loan market rates are also determined by these two variables.

Therefore, we conclude that, the policy rate is an effective tool to control the TL loan and TL deposit rates, and the CBRT can effectively manipulate the monetary conditions through the required reserves. In addition, the results imply that, the use of capital adequacy and liquidity ratios can reinforce the effectiveness of the required reserves system.

CHAPTER 5

A MEDIUM-SIZE DSGE MODEL AND EFFICIENCY OF ALTERNATIVE MONETARY POLICY TOOLS

Up to the global crisis, "single goal, single tool" operating framework and money view with the complete markets assumption had dominated the central banking. The role of the macro prudential policies and frictions in financial system were generally disregarded. However, after the global crisis, the following views has started to emerge: (i) monetary policy framework should have dual objectives as financial and price stability, (ii) interest rate as a single monetary policy tool is not sufficient to reach these objectives, and (iii) in order to satisfy the Tinbergen principle, a well coordinated use of the macro prudential tools is necessary. The need for multiple objectives and additional tools have become more evident especially in emerging countries which are exposed to the frequent capital reversal problem in order to reduce the impact of the external liquidity conditions on domestic credit markets, and to contain the domestic and external imbalances. Therefore, in recent years, there is a growing research to provide necessary analytical framework for an efficient use of the macro prudential tools.

The macro prudential tools include a wide range of regulations such as capital and liquidity requirements, reserve requirements, FX open position regulations, haircuts, etc.[123] In an emerging country framework, the capital controls may also be considered as supplementary policy tools. As discussed in the previous chapters, most of these tools can target different segments of the markets, and may result in different impact on the economy. However more complex theoretical models are more helpful to asses the theoretical impacts of these tools on the transmission mechanism thoroughly, in practice, the impacts of these tools depend on the structure of the financial system, balance sheet of the banking system, and whether the tools' constraints bind or not. For example, the impact of a one percent

[123] See Chapter 2 for details.

change in capital adequacy ratio on the credit markets depends on the current level of that ratio for the individual banks and for the system in general. In addition, policymakers may reach similar results by using a large number of alternative combinations. Therefore, in practice, policymakers use a combination of macro prudential tools by taking the micro structure of the financial system into account, and adjust these to reach the desired impacts. That is why, we focus on the representative (generic) forms of the macro prudential and capital control tools.[124]

The New Keynesian DSGE models are powerful tools which provide a coherent framework and necessary micro foundation for the transmission mechanism and monetary policy analysis.[125] In this chapter, in order to analyze the efficiency of the supplementary tools, a calibrated medium size open economy DSGE model is set up with the financial accelerator mechanism suggested by Bernanke, Gertler, and Gilchrist (1999)[126] which is widely used in New Keynesian DSGE literature. The calibration of the parameters is performed in line with the DSGE literature and by considering the main characteristics of Turkey. We evaluate the efficiencies of the alternative monetary policy operating frameworks which are supported by the macro prudential and/or capital control tools through their contributions to the central bank's objective function.

5.1. Main Characteristics of the Model

The micro-foundations of the model are set up broadly in line with the seminal DSGE model of Smets and Wouters (2003, 2007). In order to include the main characteristics of the Turkish economy, financial frictions and financial dollarization are included in the model. The financial accelerator mechanism proposed by BGG is added up as in Vilagi et al. (2010). In order to show the impacts of a change in foreign exchange rate on the economy through the balance sheets, a partial financial dollarization is allowed in the entrepreneurs balance sheets as in

[124] Unsal (2011) and Kannan et al. (2009) also follow generic form approach rather than analyzing the impact of a particular type of tools through a banking system with more micro-foundations. Our approach is similar to Unsal (2011).

[125] See Benes et al. (2007) and Gali and Gertler (2007). Towar (2009) also provides information on the benefits of using DSGE models.

[126] From now on, we abbreviate them as BGG.

Florian and Montoro (2009). An explicit banking system is also required in a DSGE model for the efficiency and effectiveness analysis of the alternative monetary policy frameworks. Therefore, we also include a simplified version of the banking system of Glocker and Towbin (2011).

The model includes domestic and foreign economy. The domestic economy includes nine sectors; (i) households, (ii) banking system, (iii) capital goods producers, (iv) intermediate goods producers (v) retailers, (vi) import sector, (vii) export sector, (viii) rest of the world, and (ix) central bank. The set-ups of all behavioral relationships follow the standard approaches of the DSGE literature.

5.1.1. Households

In order to include the main characteristics and dynamics of the household sector in an emerging country, it is possible to divide the households sector into subgroups as the borrowers and savers, and the financially constrained and unconstrained.[127] However, all households are assumed to be identical and able to participate in borrowing and saving activities, for the sake of simplicity. Therefore, they can optimize their savings and consumption. But, they are assumed to borrow or save only through the banking system. They are not allowed to borrow from or lend to the foreign markets directly. We assume that this is a realistic assumption for the Turkish case in line with the previous discussions. This assumption enables us to include country risk premium in banking system equilibrium conditions, rather than in households' first order condition.

In the model, households are assumed to be identical and infinitely lived. They maximize the following standard separable utility function:

$$U(C,H) = E_0 \sum_{t=0}^{\infty} \beta^t \varepsilon_t^C \left[\frac{(C_t - hC_{t-1})^{1-\sigma_C}}{1-\sigma_C} - \frac{H_t^{1+\sigma_H}}{1+\sigma_H} \right] \tag{5.1}$$

Subject to the following budget constraint:

$$C_t = \frac{W_t}{P_t} H_t + Div_t - \frac{S_t D_t^* - I_{t-1}^{D^*} S_t D_{t-1}^*}{P_t} - \frac{D_t - I_{t-1}^D D_{t-1}}{P_t} \tag{5.2}$$

[127] When some share of households is allowed to be financially constrained, they can only consume their labor income. Therefore, the direct effect of the real interest rates on consumption is removed.

Where, $\log \varepsilon_t^C = \rho_C \log \varepsilon_t^C + u_t^C$; $u_t^C \sim WN(0, \sigma_C^2)$ is the consumption (preference) shock, C_t is the real consumption, H_t is the labor hours supply, β is the time preference parameter, h is the degree of the habit formation, σ_C is the coefficient of the relative risk aversion of households, σ_H is the inverse elasticity of the work effort with respect to the real wage, Div_t is the real dividends, D_t^* is the FX deposits, I_t^{D*} is the gross FX deposits interest rate, S_t is the nominal foreign exchange rate, D_t is the domestic currency deposits, I_t^D is the gross domestic currency deposit rate, and P_t is the domestic price level. The foreign exchange rate represents the foreign currency value in domestic currency. Therefore, an increase in exchange rate implies depreciation of the domestic currency. We assume that households keep some part of their deposits in foreign currency, and there is no cash in the economy.

The standard first order conditions of the households' utility maximization problem with respect to the consumption, labor hours, net foreign currency assets and net domestic currency assets are as follow:

$$\lambda_t = \frac{\varepsilon_t^C}{\left(C_t - hC_{t-1}\right)^{\sigma_C}} \tag{5.3}$$

$$\varepsilon_t^C H_t^{\sigma_H} = \lambda_t \frac{W_t}{P_t} \tag{5.4}$$

$$\lambda_t = E_t\left[\lambda_{t+1}\beta I_t^{D*} \frac{S_{t+1}}{S_t}\frac{P_t}{P_{t+1}}\right] \tag{5.5}$$

$$\lambda_t = E_t\left[\lambda_{t+1}\beta I_t^{D} \frac{P_t}{P_{t+1}}\right] \tag{5.6}$$

Solving (5.3) and (5.6), the standard Euler equation is obtained:

$$\varepsilon_t^C \left[C_t - hC_{t-1}\right]^{-\sigma_C} = E_t\left[\varepsilon_{t+1}^C (C_{t+1} - hC_t)^{-\sigma_C} \beta I_t^D \frac{P_t}{P_{t+1}}\right] \tag{5.7}$$

Solving (5.3), (5.5) and (5.6), the uncovered interest parity (UIP) condition is obtained:

$$E_t\left[I_t^{D*} \frac{S_{t+1}}{S_t}\frac{P_t}{P_{t+1}}\right] = E_t\left[I_t^D \frac{P_t}{P_{t+1}}\right] \tag{5.8}$$

Where, $\Pi_t = \frac{P_t}{P_{t-1}}$ is the gross inflation.

The log-linear forms of the consumption equation including a shock to represent a domestic demand, and the uncovered interest rate parity condition around the steady states can be written as in (5.9) and (5.10) respectively.[128]

$$\hat{c}_t = \frac{1}{1+h} E_t \hat{c}_{t+1} + \frac{h}{1+h} \hat{c}_{t-1} - \frac{1-h}{\sigma_C (1+h)} \left(\hat{i}_t^D - E_t \hat{\pi}_{t+1} \right) + \varepsilon_t^C \tag{5.9}$$

$$E_t \hat{s}_{t+1} - \hat{s}_t = \hat{i}_t^D - \hat{i}_t^{D*} \tag{5.10}$$

Therefore, the real exchange rate (q) is defined as:

$$\hat{q} = \hat{q}_{t-1} + \hat{s}_t - \hat{s}_{t-1} + \hat{\pi}_t^* - \hat{\pi}_t \tag{5.11}$$

Where, $\hat{\pi}^*$ is the deviation of the foreign inflation from the steady state. These equations state that: (i) In addition to the forward and backward looking components, the expected real deposit rate is another main determinant of the consumption. An increase in the expected real deposit rate decreases consumption. However, higher habit persistence reduces the impact of the expected real interest rate on consumption as the rigidity increases. (ii) An increase in the difference between domestic and foreign currency deposit rates causes a nominal appreciation of the domestic currency. (iii) While a nominal depreciation and foreign inflation causes real depreciation, an increase in domestic inflation results in a real appreciation of the domestic currency.

We assume that, wages are completely flexible and households can optimize. Therefore, solving (5.3) and (5.4), the labor supply equation can be derived as:

$$H_t^{\sigma_H} = \frac{1}{\left(C_t - hC_{t-1} \right)^{\sigma_C}} w_t \tag{5.12}$$

Where, $w_t = W_t / P_t$ is the real wage. The log-linear of the labor supply is derived as:

$$\hat{H}_t = \frac{1}{\sigma_H} \left[\hat{w}_t - \sigma_C \left(\frac{1}{(1-h)} \hat{c}_t - \frac{h}{(1-h)} \hat{c}_{t-1} \right) \right] \tag{5.13}$$

[128] In this chapter, a hat over a variable indicates its log-deviation from its steady state (for example, $\hat{x}_t = \log(x_t) - \log(x_{ss})$. The steady states of variables are shown as x_{ss} . Generally, small case letters are used for log-linear forms of related variables. $E_t x_{t+1}$ represents the expected (t+1) value of a variable at time (t).

The labor supply equation simply shows that, while an increase in consumption reduces the labor supply, an increase in real wage increases it.

Since the model includes open economy characteristics, the consumption bundle is represented by a CES index of the domestically produced goods (C_t^H) and imported foreign goods (C_t^M) given by;

$$C_t = \left[(1-\alpha_M)^{\frac{1}{\rho^M}} \left(C_t^H\right)^{\frac{\rho^M-1}{\rho^M}} + (\alpha_M)^{\frac{1}{\rho^M}} \left(C_t^M\right)^{\frac{\rho^M-1}{\rho^M}} \right]^{\frac{\rho^M}{\rho^M-1}} \tag{5.14}$$

Where, ρ^M is the elasticity of substitution between domestic and imported goods, and α_M is the share of imported goods in consumption. The households maximize total expenditure on consumption goods according to;

$$P_t C_t = P_t^H C_t^H + P_t^M C_t^M \tag{5.15}$$

The inter-temporal optimization of this function gives three important first order conditions which determine the consumer goods price index and optimal allocation of expenditures between domestic and foreign goods, in other words, the demand functions for the imported and domestically produced consumption goods:[129]

$$P_t = \left[(1-\alpha_M)\left(P_t^H\right)^{1-\rho^M} + (\alpha_M)\left(P_t^M\right)^{1-\rho^M} \right]^{\frac{1}{1-\rho^M}} \tag{5.16}$$

$$C_t^M = \alpha_M \left(\frac{P_t^M}{P_t} \right)^{-\rho^M} C_t \tag{5.17}$$

$$C_t^H = (1-\alpha_M) \left(\frac{P_t^H}{P_t} \right)^{-\rho^M} C_t \tag{5.18}$$

The log-linear form of the relative price of the home goods to the total consumer prices in (5.18) can be derived as:

$$\hat{t}_t^H = \hat{t}_{t-1}^H + \hat{\pi}_t^H - \hat{\pi}_t \tag{5.19}$$

Then, the log-linear form of the consumer price inflation can be written as the weighted sum of the domestically produced goods' and imported goods' inflations:

[129] Consumptions in the equations are also stands for the total consumption, investment and export. It is assumed that exports, investment and entrepreneur consumption have domestic and imported goods component with the same composition.

$$\hat{\pi}_t = (1-\alpha_M)\hat{\pi}_t^H + \alpha_M \hat{\pi}_t^M \quad (5.20)$$

Therefore, as the share of imported goods in total consumption increases, the impacts of the foreign inflation and exchange rate also increase.

5.1.2. Banking System

Although the other parts of the model include standard open economy equations of the New Keynesian DSGE literature, we rely on a simple banking system block. When central bank does not allow any FX open position, it becomes more practical to divide the banking system into FX and TL banks. In order to keep simplicity and tractability of the model, it is assumed that the banking system consists of two types of banks: FX banks and TL banks. This assumption allows us to use different policy tools for the FX and TL banks. Each bank has two types of units: deposit unit and lending unit.[130] The deposit unit collects deposits and lends to the lending unit with zero mark-up over the funding cost which also includes macro prudential costs imposed by the authorities. Each unit operates in a competitive market, and the deposits are under full guarantee of the government.

The FX deposit and foreign borrowing are perfect substitutes. More explicitly, banks borrow resources from the domestic depositors and external creditors at the same interest rate. Note that, the borrowing rate of the foreign credits includes the country risk premium and capital control costs as will be discussed shortly. However, the TL deposit and central bank open market operations are not perfect substitutes. Since the TL deposit does not require a collateral and there are fringe benefits of having a wide deposit base, though banks pay the same interest rate to the deposit and open market operations, when the costs of macro prudential measures such as required reserves which are applicable only to the deposits (not to the open market operations) are included, the total cost of the deposits exceeds the policy rate. If we assumed that, deposit and open market operations were perfect substitutes, then, the cost of the macro prudential measures would be transmitted to the depositors, and not the interest rate of the deposit, but the total cost of the deposit

[130] In order to keep tractability of the transmission mechanism, and to derive the first order conditions easily, it is common to divide banking system to saving and deposit units. See, for example, Angelini et al. (2010), Gerali et al. (2010), Dib (2010), and Glocker and Towbin (2011).

would be equal to the policy rate. Therefore, the deposit rate paid to the depositors would be lower than the central bank's policy rate.

These assumptions which are consistent with the features of the Turkish financial markets which are discussed in chapters 3 and 4 imply the followings for the TL side of the banking system: (i) TL deposit unit set the deposit rate (I_t^D) equal to the policy rate (I_t^{CB}). In other words, it is assumed that, as a result of the short maturity of the deposit and competition in the deposit market, the pass through from the policy rate to the deposit rate is complete and instantaneous. The deposit rate adjustment cost is ignored. Since the central bank's open market operations and deposit are not close substitutes, the banking system can not transmit the macro prudential costs to the depositors. (ii) The deposit unit lends its funds to the lending unit in interbank money market at (I_t^{IB}) with a gross mark-up rate (Φ_t^{MP}) (which includes the costs imposed by the authorities through the reserve requirements and liquidity/capital adequacy ratios) over the gross deposit rate. The macro prudential tools simply work through imposing additional costs to the banking system directly and indirectly as in required reserves, or through affecting the banking system's optimum portfolio decision as in liquidity and capital adequacy ratios. Thus, it is assumed that, the macro prudential mark-up is a policy variable which summarizes (represents) all types of costs imposed through the macro prudential tools, and all these costs imposed by the authorities are transferred to the borrowers.[131] We also assume that central bank has full control over the macro-prudential mark-up rate and can set the mark-up rate at a desired level. These simplifying assumptions imply the following equilibrium conditions in TL side:

$$I_t^D = I_t^{CB} \tag{5.21}$$

$$I_t^{IB} = I_t^D \Phi_t^{MP} \tag{5.22}$$

Where, I_t^{CB} is the gross central bank policy rate, and I_t^{IB} is the gross interbank lending rate. The log-linear forms of these equations are as follow:

$$\hat{i}_t^D = \hat{i}_t^{CB} \tag{5.23}$$

$$\hat{i}_t^{IB} = \hat{i}_t^{CB} + \hat{\phi}_t^{MP} \tag{5.24}$$

[131] However banking system may assume some costs through reducing their profit margin in practice, competitive market assumption enable us to transfer these costs to borrowers.

The domestic currency interbank rate equation implies that central bank can affect the interbank rate through the policy rate and/or macro-prudential tools. Any change in these tools is completely transmitted to the interbank lending rate.

Since we assume that FX deposit and borrowing from abroad (B^*) are close substitutes; not the FX deposit rate and foreign interest rate but the cots of these two sources should be equal. The banking system pays some gross country risk premium (Φ_t^{CRP}) to the external creditors over the foreign interest rate as a result of imperfect integration with the rest of the world. Following Schmitt-Grohe and Uribe (2003), gross country risk premium is defined as:[132]

$$\Phi_t^{CRP} = \exp\left(\varphi^{CRP} \left(\frac{S_t B_{t+1}^*}{P_t Y_t} \right) + \left(\varepsilon_t^{CRP} \right) \right) \tag{5.25}$$

Where, Y is the real GDP, φ^{CRP} is the elasticity of the risk premium with respect to the external debt position, and ε_t^{CRP} is the exogenous component of the country risk which represents the changes in risk appetite in the global markets and credibility of the domestic economic and political conditions, and follows AR(1) process. We represent the nominal foreign debt over nominal domestic output by (b^*). Then, the log-linear form of the country's risk premium and risk premium shock process can be written as:

$$\hat{\phi}_t^{CRP} = \varphi^{CRP} \hat{b}_t^* + \hat{\varepsilon}_t^{CRP} \tag{5.26}$$

$$\hat{\varepsilon}_t^{CRP} = \rho_{CRP} \hat{\varepsilon}_{t-1}^{CRP} + u_t^{CRP} \tag{5.27}$$

This risk premium implies that, an increase in foreign debt level results in an increase foreign borrowing rate of the banking system. In addition, the other tool of the central bank is the capital control (Φ_t^{CC}) which affects the cost of borrowing from abroad. The capital controls simply work through imposing additional costs to the external borrowing. Thus, it is assumed that, the capital control mark-up is a policy variable which summarizes (represents) all types of costs imposed through

[132] In DSGE literature, it is common to assume zero steady state net external debt or assets, and risk premium is usually used to ensure the stationary foreign debt level. But, in order to allow the impact of changes in exchange rate, in this chapter, some positive (40 %) steady state external debt level is assumed to be consistent with the emerging country case. Assuming annual 40 % of steady state external debt to GDP and 0.05 risk premium elasticity imply 2 % annual steady state country risk premium.

the capital control tools, and all these costs imposed by the authorities are transferred to the banking system's external borrowing rate. We also assume that, central bank can adjust the interest rate equivalent of the capital control cost. Therefore, the equilibrium conditions in FX side of the banking system is defined as:

$$R_t^{D*} = R_t^* \Phi_t^{CRP} \Phi_t^{CC} \tag{5.28}$$

Where R_t^* is the gross foreign interest rate, and Φ_t^{CC} is the gross capital control cost rate. Therefore, equilibrium condition in the FX side in log-linear form is:

$$\hat{i}_t^{D*} = \hat{i}_t^* + \hat{\phi}_t^{CRP} + \hat{\phi}_t^{CC} \tag{5.29}$$

This equation states that, any change in the foreign interest rates, country risk premium and cost of the capital controls is directly and completely transmitted to the foreign exchange deposit rate. Although it is also possible to impose macro prudential measures to the FX side, it only increases the number of policy tools and complicates the tractability of the model. Therefore, we assume that, central bank rely on the capital controls on the FX side rather than the macro prudential measures. Then, the log linear form of the FX interbank rate is:

$$\hat{i}_t^{IB*} = \hat{i}_t^{D*} \tag{5.30}$$

If we included macro prudential measures for the FX side, due to the perfect substitution assumption, these costs would be applied both to the FX deposit and external borrowing, and transmitted to the borrowers.

5.1.3. Capital Goods Producers

It is assumed that the capital goods are produced competitively. These firms are owned by the households. The capital good producers replenish the depreciated capital and produce new capital goods. They purchase depreciated capital ($(1-\delta)K_{t-1}$) from the entrepreneurs and investment goods (I) from the retailers. They combine these goods and produce new capital to sell to the entrepreneurs. For simplicity, it is assumed that the composition of the investment goods is the same as that of the consumption goods. Therefore, the import demand function for the investment goods is similar to the consumption goods' import demand function. Following BBG and Christensen and Dib (2006), it is assumed that capital good producers face with a quadratic cost adjustment function. Their objective is to

choose the quantity of the investment goods to maximize profits through the following function:

$$\max_{I_t} E_t \left[Q_t I_t - I_t - \frac{\chi}{2}\left(\frac{I_t}{K_{t-1}} - \delta \right)^2 K_{t-1} \right] \tag{5.31}$$

Where, $Q_t = P_t^K / P_t$ is the real price of the capital goods, χ is the capital adjustment cost parameter, and δ is the depreciation rate. By taking the first derivative with respect to the investment, the following first order condition is derived:

$$E_t \left[Q_t - 1 - \chi\left(\frac{I_t}{K_{t-1}} - \delta \right) \right] = 0 \tag{5.32}$$

Then, the log-linear form of the investment demand or capital supply is derived as:

$$\hat{Q}_t = \chi\left[\hat{I}_t - \hat{k}_{t-1} \right] \tag{5.33}$$

The investment demand function simply represents the Tobin Q dynamics. As the real price of investment goods increases, the demand for investment goods increases. The capital stock accumulates according to the following law of motion:

$$K_t = (1-\delta)K_{t-1} + I_t \tag{5.34}$$

Then, the log-linear form of the capital accumulation is derived as:

$$\hat{k}_t = (1-\delta)\hat{k}_{t-1} + \delta \hat{I}_t \tag{5.35}$$

5.1.4. Intermediate Good Producers

The intermediate good producers use labor and capital as the inputs of the production. It is assumed that producers have the following Cobb-Douglas production function:

$$Y_t = A_t K_{t-1}^{\alpha} H_t^{1-\alpha} \tag{5.36}$$

Where, A_t is a common total factor productivity parameter, and K_{t-1} is the capital which is produced at time (t-1) but used in production at time (t). It is assumed that the total factor productivity is subject to a productivity shock which follows AR(1) process given by $\log A_t = \rho_a \log A_{t-1} + u_t^a$; $u_t^A \sim WN(0, \sigma_{u^a}^2)$. The intermediate goods producers rent the physical capital from the entrepreneurs. They pay for renting

physical capital at rental rate (z_t). The intermediate goods producers' objective is to minimize the following cost function:

$$\underset{K_{t-1},H_t}{Min} \rightarrow w_t H_t + z_t K_{t-1} \tag{5.37}$$

The cost minimization subject to the production function results in following first-order conditions:

$$z_t = \xi A_t \alpha (K_{t-1})^{\alpha-1} (H_t)^{1-\alpha} \tag{5.38}$$

$$w_t = \xi A_t (1-\alpha)(K_{t-1})^{\alpha} (H_t)^{-\alpha} \tag{5.39}$$

Where ξ is the lagrange multiplier or real marginal cost. The optimal capital-labor ratio is derived as:

$$\frac{K_{t-1}}{H_t} = \frac{\alpha}{1-\alpha}\frac{w_t}{z_t} \tag{5.40}$$

Then, the log-linear form of the optimum capital-labor allocation or labor demand equation can be written as:

$$\hat{H}_t = -\hat{w}_t + \hat{z}_t + \hat{k}_{t-1} \tag{5.41}$$

The labor demand equation states that the intermediate goods producers increase the labor demand relative to the capital goods demand as the difference between rental rate and real wage increases. Using the first order conditions, the real marginal cost of the home produced goods can be written as:

$$mc_t^H = \frac{1}{A_t}\left(\frac{1}{1-\alpha}\right)^{1-\alpha}\left(\frac{1}{\alpha}\right)^{\alpha} w_t^{1-\alpha} z_t^{\alpha} \tag{5.42}$$

Then, the log-linear forms of the real marginal cost of the home produced goods and the supply of the domestic goods equations are derived as:

$$\hat{mc}_t^H = \alpha \hat{z}_t + (1-\alpha)\hat{w}_t - \hat{a}_t \tag{5.43}$$

$$\hat{y}_t = \hat{a}_t + \alpha \hat{k}_{t-1} + (1-\alpha)\hat{H}_t \tag{5.44}$$

While any increase in real wage and rental rates increase the real marginal cost, an increase in productivity reduces it.

5.1.5. Entrepreneurs

The entrepreneurs' behavior and their relationship with the banking system have critical roles in the transmission mechanism. These relationships summarized

in this section follow the main features of BGG (1999) model.[133] The main function of the entrepreneurs is to buy capital from the capital producers and rent to the intermediate goods producers. They are assumed to operate in a competitive market. The entrepreneurs buy capital[134] K_t at a real price Q_t at time t and rent to the intermediate goods producers. The Intermediate goods producers use capital at time $t+1$, at rental rate z_{t+1}. The entrepreneurs re-sell used capital to the capital producers at a real price (Q_{t+1}).

The entrepreneurs have never enough net worth to finance their operations. They finance their assets (capital stock) through their own net worth (N) and banking sector total loans (L) which consists of domestic currency and FX loans. Following Florian and Montoro (2009), we assume that, because of dollarization in the economy, entrepreneurs borrow some portion (α^{DF}) of the loans in FX.[135] L_t is the real domestic currency equivalent of the total loans. Therefore, the balance sheet of the entrepreneurs in real terms (divided by the price level) is defined as:

$$Q_t K_t = N_t + L_t \tag{5.45}$$

Then, the log-linear form of the entrepreneurs' balance sheet identity which determines the loan demand is written as:

$$\phi_{ss}^{KN}\left(\hat{Q}_t + \hat{k}_t\right) = \hat{n}_t + \left(\phi_{ss}^{KN} - 1\right)\hat{l}_t \tag{5.46}$$

Where, ϕ_{ss}^{KN} is the steady state capital to net worth ratio. Banks are assumed to satisfy all loan demand at the monitoring cost adjusted interbank lending rate. The loan demand equation states that while an increase in value of the capital stock increases the loan demand, an increase in net worth reduces it.

The entrepreneurs' demand for capital goods depends on the expected marginal real return on capital which they lend and the expected real marginal cost of borrowing in the next period. The entrepreneurs invest on capital until to the point

[133] In DSGE modeling, it is common to adopt BGG approach for the financial accelerator mechanism. See Christensen and Dib (2006), Dib (2010), Gilchrist et al. (2009), and Gelain et al. (2010) for the use of financial accelerator mechanism proposed by BBG in DSGE models.

[134] Since, capital will be used in next period we use (t+1).

[135] In literature, generally, the effects of FX debt are analyzed through assuming all loans are in FX as in Towbin and Pascal (2011).

where the expected real marginal return on capital is equal to the expected real marginal cost of finance. Therefore, the expected return on capital in the next period is, in fact, the expected required level of return to invest in new capital goods. The expected gross real return on one unit capital is determined by the revenues generated through the capital income (or rental rate) plus capital gains net of the depreciation as in the right hand side of the equation 5.47:

$$E_t R_{t+1}^K = E_t \left[\frac{z_{t+1} + Q_{t+1}(1-\delta)}{Q_t} \right] \tag{5.47}$$

Where, R_t^K is the gross real return on capital. Then, the log-linear form of the real return on capital (price of capital) can be written as;

$$E_t \hat{r}_{t+1}^K = \left(\frac{z_{ss}}{r_{ss}^K} \right) E_t \hat{z}_{t+1} + \left(\frac{1-\delta}{r_{ss}^K} \right) E_t \hat{Q}_{t+1} - \hat{Q}_t \tag{5.48}$$

The capital demand equation simply states that; an increase in the spread between the expected real return on capital and expected real rental rate causes a decline in price of the capital goods.

In BGG (1999) framework, because of the agency problem, the financial contract between the banking system and entrepreneurs includes an external finance premium. The entrepreneurs invest up to the point where the financial risk premium plus risk free real rate is equal to the real return of the capital in the next period. BGG (1999) explicitly show that; (i) the external finance premium is a function of firms leverage ratio, and (ii) the elasticity of the external risk premium is functions of the monitoring cost, characteristics of the distribution of the entrepreneurial returns and expected life span of the firms. In this part, we rely on an implicit formulation rather than the explicit form of BGG. Although the reduced form of the risk premium function assume a constant elasticity with respect to the leverage ratio, it is more convenient for simplicity. Even in this form, it is possible to allow a time varying risk premium.[136] Since, the default is more probable when the ratio of the external resources to the net worth increases, the entrepreneurs' risk premium is assumed to be a function of the leverage ratio as in the following reduced form:

[136] In BBG (1999) model, bankruptcy costs and default parameters are included. However, for simplicity, we exclude these details, and use the reduced form.

$$\Phi_t^{FRP} = \Phi^{FRP}\left(\frac{Q_t K_t}{N_t}\right) = \left(\frac{Q_t K_t}{N_t}\right)^{\varphi^{FRP}} \tag{5.49}$$

Where, $\Phi^{FRP'}(.) > 0$, $\Phi^{FRP'}(1) = 1$, and φ^{FRP} is the elasticity of financial risk premium with respect to leverage ratio.[137] The log-linear form of the external risk premium equation is derived as:

$$\hat{\phi}_t^{FRP} = \varphi^{FRP}\left[\hat{Q}_t + \hat{k}_t - \hat{n}_t\right] \tag{5.50}$$

Within this setting, while an increase in price of the capital and/or capital stock itself increases the external finance premium, any increase in the net worth reduces it.

The entrepreneurs' problem is to equate the expected return on capital to the external finance premium adjusted risk free rate. Note that, the loans consist of the domestic currency and foreign exchange with fixed proportions in our framework. Therefore, the demand for the capital should satisfy the following optimization condition:

$$E_t R_{t+1}^K = \Phi^{FRP} E_t \left\{ \left[I_t^{IB}\right]^{1-\alpha^{DF}} \left[I_t^{IB*} \frac{S_{t+1}}{S_t}\right]^{\alpha^{DF}} \frac{1}{\Pi_{t+1}} \right\} \tag{5.51}$$

The, the log-linear form of this equation can be written as:

$$E_t \hat{r}_{t+1}^K = \hat{\phi}_t^{FRP} + (1-\alpha^{DF})(\hat{i}_t^{IB} - E_t\hat{\pi}_{t+1}) + \alpha^{DF}(\hat{i}_t^{IB*} + E_t\Delta\hat{s}_{t+1} - E_t\hat{\pi}_{t+1}) \tag{5.52}$$

Therefore, expected (required) return on capital increases when the risk free (average) interbank lending rate increases. The increase in average interbank lending rate can stem from an increase in (i) central bank policy rate, (ii) macro prudential measures, (iii) foreign interest rate, (iv) country risk premium and/or (v) capital controls. In addition, while an increase in inflation expectation results in a decline in expected (required) return on capital, an increase in expected depreciation and risk premium increase it. We can define the average weighted risk free real interbank rate and average steady state gross interbank real rate as:

$$E_t \hat{r}_{t+1}^{av} = (1-\alpha^{DF})(\hat{i}_t^{IB} - E_t\hat{\pi}_{t+1}) + \alpha^{DF}(\hat{i}_t^{IB*} + E_t\Delta\hat{s}_{t+1} - E_t\hat{\pi}_{t+1}) \tag{5.53}$$

$$R_{ss}^{av} = \left[\left(I_{ss}^{IB}\right)^{\alpha^{DF}} \left(I_{ss}^{IB*}\right)^{\left(1-\alpha^{DF}\right)}\right] \tag{5.54}$$

The aggregate entrepreneurial net worth evolves according to:

[137] See Christiano et al. (2010) and Dib(2010) for the functional form of the risk shock. A 0.045 external risk premium elasticity, and 2.5 steady state level of K/N ratio imply an annual 4 % steady state external risk premium.

$$N_{t+1} = \vartheta V_t + (1-\vartheta)\bar{g} \tag{5.55}$$

The entrepreneurs' life time is limited. They leave the market with the probability of $(1-\vartheta)$. Then, the expected time of the entrepreneurs' survival is $(1/\vartheta)$. They are replaced by new entrepreneurs with a small net worth $\bar{g}$ from the departing one. The net income which accumulates net worth is simply the difference between the realized return on capital and cost of the loans which interest rates were set one period earlier. In BGG framework, entrepreneurs pay some monitoring cost over risk free rate. Following Gelain et al. (2010), we define the net income on capital (V_t) with the following form:

$$V_t = R_t^K Q_{t-1} K_{t-1} - E_{t-1}\left(R_t^{av} + \frac{m_t}{Q_{t-1}K_{t-1} - N_{t-1}} \right)(Q_{t-1}K_{t-1} - N_{t-1}) \tag{5.56}$$

Where, $m_t / (Q_{t-1}K_{t-1} - N_{t-1})$ is the expected monitoring cost. Therefore, while the actual (realized) return on capital changes as a result of a change in real price of the capital, the cost of the loans may change as a result of an unexpected change in inflation and exchange rates. Ignoring the monitoring cost, the evolution of the net worth in log-linear form is derived as:[138]

$$\hat{n}_t = \vartheta \begin{Bmatrix} \phi_{ss}^{KN} R_{ss}^{av} \left(\Phi_{ss}^{FRP} \hat{r}_t^K - E_{t-1}\hat{r}_t^{av} \right) \\ +\phi_{ss}^{KN} R_{ss}^{av} \left(\Phi_{ss}^{FRP} - 1 \right)\left(\hat{Q}_{t-1} + \hat{k}_{t-1} \right) + R_{ss}^{av} \left(E_{t-1}\hat{r}_t^{av} + \hat{n}_{t-1} \right) \end{Bmatrix} \tag{5.57}$$

The leaving entrepreneurs are assumed to consume their net worth.

$$C_t^e = (1-\vartheta) N_t \tag{5.58}$$

As given in the steady state calculations section, consumption of leaving entrepreneur is around 2 % of the quarterly total consumption at the steady state. Therefore, total consumption can be written in log-linear form as:

$$\hat{c}_t^T = 0.987\hat{c}_t + 0.013\hat{n}_t \tag{5.59}$$

5.1.6. Retailers and Inflation Rate

The main function of the retail sector is to buy the intermediate goods from the intermediate goods producers at the marginal cost, to convert these intermediate

[138] Following Gelain et al. (2010), the monitoring cost is excluded assuming it is small enough to ignore.

goods through brand-naming to the final goods without any cost, and to sell at a monopolistically competitive market. These firms are owned by the households. In order to represent the rigidities in real life, following Calvo (1983) and allowing indexation, it is assumed that, in price setting, some retailers can not optimize the prices. It is assumed that, at each period, only a fraction $\left(1-\theta^H\right)$ can optimize their prices. The retailers those do not optimize set the prices by taking past inflation and inflation target into account. It is assumed that the targeted inflation is equal to the steady state level of inflation which is zero. Assuming λ_H is the parameter of degree of price indexation to the past inflation for those do not optimize the prices, the price equation of the domestic goods retailers those do not optimize is given as:[139]

$$P_t^H = (\pi_{t-1})^{\lambda_H} P_{t-1}^H \tag{5.60}$$

Following Gelain and Kulikov (2009), let Y_t^i be the final good sold by the retailer i, and the final domestic output is a CES composite of retail goods. Then, the total final goods output is given by:

$$Y_t = \left[\int_0^1 \left(Y_t^i\right)^{\frac{1}{1+\mu_t^P}} di\right]^{1+\mu_t^P} \tag{5.61}$$

Where, μ^P is the mark-up and subject to a stationary mark-up price shock: $\log \mu_t^P - \mu^P = \rho_P(\log \mu_{t-1}^P - \mu^P) + u_t^P$; $u_t^P \square WN(0,\sigma^2)$.

The cost minimization of the following problem subject to Y_t^i;

$$\min_{\{Y^i\}} \int_0^1 P_t^i Y_t^i di \quad s.t. \quad \left[\int_0^1 \left(Y_t^i\right)^{\frac{1}{1+\mu_t^P}} di\right]^{1+\mu_t^P} \geq Y_t \tag{5.62}$$

results in the following demand function for good i;

$$Y_t^i = \left(\frac{P_t^i}{P_t^H}\right)^{-\frac{1+\mu_t^P}{\mu_t^P}} Y_t \tag{5.63}$$

where, P_t^H is the price index of the domestic final goods. The domestic price index of the final goods can be written as;

[139] Note that, the inflation target is assumed to be the steady state inflation which is equal to zero.

$$P_t^H = \left[\int_0^1 \left(P_t^i\right)^{-\frac{1}{\mu_t^P}} di\right]^{-\mu_t^P} \tag{5.64}$$

Then, the retailers set prices to maximize the future discounted profits;

$$\max_{P_t^H} \; \mathrm{E}_t \sum_{k=0}^{\infty} \left(\beta\theta^H\right)^k \frac{\lambda_{t+k}}{\lambda_t} \left[\prod_{s=1}^{k} \left(\pi_{t+s-1}\right)^{\lambda_H} \frac{P_t^i}{P_{t+k}^H} - MC_{t+k}\right] Y_{t+k}^i$$

subject to, (5.65)

$$Y_{t+k}^i \left[\prod_{s=1}^{k} \left(\pi_{t+s-1}^H\right)^{\lambda_H} \frac{P_t^i}{P_{t+k}^H}\right]^{-\frac{1+\mu_{t+k}^H}{\mu_{t+k}^H}} Y_{t+k}$$

The first order condition of this problem is derived as:

$$\begin{aligned} &\mathrm{E}_t \sum_{k=0}^{\infty} \left(\beta\theta^H\right)^k \frac{\lambda_{t+k}}{\mu_{t+k}^P} \left[\prod_{s=1}^{k} \left(\frac{\pi_{t+s-1}^H}{\pi_{t+s}^H}\right)^{\lambda_H} \frac{P_t^i}{P_{t+k}^H}\right]^{-\frac{1}{\mu_{t+k}^H}} \frac{\bar{P}_t^H}{P_t^H} Y_{t+k} = \\ &\mathrm{E}_t \sum_{k=0}^{\infty} \left(\beta\theta^H\right)^k \lambda_{t+k} \frac{1+\mu_{t+k}^P}{\mu_{t+k}^P} \left[\prod_{s=1}^{k} \left(\frac{\pi_{t+s-1}^H}{\pi_{t+s}^H}\right)^{\lambda_H}\right]^{-\frac{1+\mu_{t+k}^H}{\mu_{t+k}^H}} MC_{t+k} Y_{t+k} \end{aligned} \tag{5.66}$$

Since in each period some portions of the retailers re-adjust their prices optimally, while the rest index prices to the past inflation and inflation target, the aggregate price index in period (t) is:

$$\left(P_t^H\right)^{-\frac{1}{\mu_t^P}} = \theta^H \left[\left(\pi_{t-1}^H\right)^{\lambda_H} P_{t-1}^H\right]^{-\frac{1}{\mu_t^P}} + \left(1-\theta^H\right)\left(\bar{P}_t^H\right)^{-\frac{1}{\mu^P}} \tag{5.67}$$

Then, log-linear form of the domestic goods inflation (π_t^H) equation can be written as:[140]

$$\hat{\pi}_t^H = \frac{\beta}{1+\beta\lambda_H} E_t\hat{\pi}_{t+1}^H + \frac{\lambda_H}{1+\beta\lambda_H}\hat{\pi}_{t-1}^H + \frac{(1-\theta^H)(1-\beta\theta^H)}{\theta^H(1+\beta\lambda_H)}\hat{mc}_t^H + \hat{\varepsilon}_t^H \tag{5.68}$$

Where, ε_t^H is the cost-push shock which may stem from a change in mark-up. Therefore, inflation of the domestically produced goods is mainly determined by the changes in real marginal cost which is, in fact, functions of real wage, rental rate and productivity.

[140] See Adolfson (2007) for the details of derivation.

5.1.7. Imports

For simplicity, it is assumed that imports are final goods and distributed by the retailers. The import sector retailers which are owned by the households buy foreign goods, and sell to the capital goods producers and consumers. These retailers operate in a monopolistic competitive market and behave similar to the domestic good retailers in price setting. Therefore, they set prices with indexation to the past inflation with a Calvo parameter. Then, the log-linear of the imported goods inflation ($\hat{\pi}_t^M$) equation can be written as:

$$\hat{\pi}_t^M = \frac{\beta}{1+\beta\lambda_M} E_t\hat{\pi}_{t+1}^M + \frac{\lambda_M}{1+\beta\lambda_M}\hat{\pi}_{t-1}^M + \frac{(1-\theta^M)(1-\beta\theta^M)}{\theta^M(1+\beta\lambda_M)}\hat{mc}_t^M \tag{5.69}$$

Where, λ_t^M is the degree of indexation, and θ_t^M is Calvo parameter for the import retailers. The import sector's marginal cost (mc_t^M) obeys the law of one price. Then, the marginal cost of the imported goods equation in terms of the domestic currency is:

$$mc_t^M = \frac{S_t P_t^*}{P_t^M} \tag{5.70}$$

The log-linear form of the real marginal cost of imported goods in terms of import price which is in domestic currency unit, can be written as:

$$\hat{mc}_t^M = \hat{s}_t + \hat{p}_t^* - \hat{p}_t^M \tag{5.71}$$

which is also equal to:

$$\hat{mc}_t^M = \hat{mc}_{t-1}^M + \Delta\hat{s}_t + \hat{\pi}_t^* - \hat{\pi}_t^M \tag{5.72}$$

Therefore, any increase in exchange and foreign inflation rates increase the imported goods inflation. Since the consumption, investment and exported goods are assumed to have same composition and same preferences, the total demand for the imported goods can be written as:[141]

$$M = (\alpha_M)\left(\frac{P_t^M}{P_t}\right)^{-\rho_M}(C_t^T + I_t + X_t + G_t) \tag{5.73}$$

Then, the log-linear form of the import demand equation is derived as:

[141] Normally, the shares of imported goods in each category are likely to be significantly different. But, allowing different share would introduce new equations and result in more complex model. Therefore, these simplifying assumptions improve the tractability of the model. In addition, we assume that, exogenous government consumption has also import component similar to the consumption and investments.

$$\hat{m}_t = -\rho_M \hat{t}_t^M + \frac{1}{I_{ss} + C_{ss}^T + G_{ss} + X_{ss}} \left(C_{ss}^T \hat{c}_t^T + I_{ss} \hat{I}_t + G_{ss} \hat{g}_t + X_{ss} \hat{x}_t \right) \quad (5.74)$$

Where, t_t^M is the relative price of the imported goods to the price of the consumer goods. The deviation of the relative prices from the steady state is written as:

$$\hat{t}_t^M = \hat{t}_{t-1}^M + \hat{\pi}_t^M - \hat{\pi}_t \quad (5.75)$$

The import demand equation states that, while an increase in imported goods inflation relative to the total consumer inflation reduces the imported goods demand, an increase in demand for export, consumption and investment increases the demand for imports. The critical parameter in this equation is the elasticity which represents the substitutability of the imported and domestically produced goods. Higher elasticity implies higher impact of any change in relative prices on the import demand.

5.1.8. Exports

In order to include the effects of the import prices on the export prices, we assume that exported goods are a combination of domestically produced and imported goods. The export sector purchases goods from the domestic intermediate goods producers and importing firms at marginal costs, and through a costless brand-naming sell these differentiated goods to abroad. They also operate in a monopolistically competitive market. The exported goods' composition is also assumed to be similar to the composition of the consumption goods. Similar to the domestic and import prices, there is an indexation (λ_X) with Calvo parameter (θ^X) in export pricing. The log-linear form of the exported goods inflation (π_t^X) equation can be written as:

$$\hat{\pi}_t^X = \frac{\beta}{1+\beta\lambda_X} E_t \hat{\pi}_{t+1}^X + \frac{\lambda_X}{1+\beta\lambda_X} \hat{\pi}_{t-1}^X + \frac{(1-\theta^X)(1-\beta\theta^X)}{\theta^X (1+\beta\lambda_X)} \hat{mc}_t^X \quad (5.76)$$

Since the exported goods have a similar composition with the consumption goods, the marginal cost of the exported goods in terms of consumer prices is a weighted sum of the marginal costs of the imported and domestically produced goods:

$$\hat{mc}_t^A = (1-\alpha_M) \hat{mc}_t^H + (\alpha_M) \hat{mc}_t^M \quad (5.77)$$

Then, the real marginal cost in terms of export prices in foreign currency is defined as:[142]

$$mc_t^X = \frac{P_t mc_t^A}{S_t P_t^X} \frac{P_t^*}{P_t^*} \tag{5.78}$$

And, the log-linear form of the real marginal cost of the export prices is as follows:

$$\hat{mc}_t^X = \hat{mc}_t^A - \hat{q}_t - \hat{t}_t^X \tag{5.79}$$

Where t_t^X is the relative price of export goods to the foreign price, and its log-linear form is defined as:

$$\hat{t}_t^X = \hat{t}_{t-1}^X + \hat{\pi}_t^X - \hat{\pi}_t^* \tag{5.80}$$

Thus, while an increase in weighted average of the domestically produced and imported goods marginal costs increases the marginal cost of exports, any increase in real exchange rate and relative prices reduces it.

In addition, in line with the relevant literature, in order to include the rigidities in export sector, it is assumed that there is some persistence in foreign demand for the exports. Then, the export demand (foreign demand) function of the domestically produced goods is a function of the relative prices and foreign output (Y^*), and is defined in the following form:

$$X_t = \left[\left(\frac{P_t^X}{P_t^*} \right)^{-\rho_X} Y_t^* \right]^{(1-h_X)} X_{t-1}^{h_X} \tag{5.81}$$

Where, ρ_X is the elasticity of substitution between domestic and foreign goods, and λ_X is the degree of persistence. Then the log-linear form of the export demand equation can be written as:

$$\hat{x}_t = h_X \hat{x}_{t-1} + (1-h_X)\left[-\rho_X \hat{t}_t^X + \hat{y}_t^* \right] \tag{5.82}$$

The export demand equation implies that, while an increase in the export price relative to the foreign price reduces the export demand, an increase in foreign demand increases it. On the other hand, a higher persistence parameter reduces the impact of the relative price and foreign output on the export demand in the short run.

[142] The average marginal cost is firstly converted to nominal level in terms of domestic currency, and then converted to the real marginal cost in terms of the exports prices in foreign currency.

5.1.9. Domestic and External Equilibrium Conditions

For the sake of simplicity, it is assumed that the government budget is in balance. Therefore, government expenditures, taxes and transfers are excluded in the analysis. We also assume that government consumes only domestic goods. In addition, all profits of the retailers are transferred to the households equally. The domestic goods market equilibrium condition requires that the domestic production should be equal to the sum of the domestic production for consumption, investment and exports. Therefore, the domestic goods market equilibrium condition is defined as follows: [143]

$$Y_t = C_t^{H,T} + I_t^H + X_t^H + G_t^H \tag{5.83}$$

Where, the superscript "H" represents the home portion of the consumption, investment and exports. The log-linear form of the goods market equilibrium is derived as:

$$\hat{y}_t = \frac{1}{(1+\alpha^M + tb_{ss})}\left(\frac{C_{ss}^T}{Y_{ss}}\hat{c}_t^{H,T} + \frac{I_{ss}}{Y_{ss}}\hat{I}_t^H + \frac{X_{ss}}{Y_{ss}}\hat{x}_t^H + \frac{G_{ss}}{Y_{ss}}\hat{g}_t^H\right) \tag{5.84}$$

On the other hand, the external debt stock plays a critical role on the country risk premium. The evolution of the external debt stock may be defined as the sum of the trade deficit, principal of the existing debt stock and interest payments. Therefore, the external debts stock equation in terms of domestic currency can be written as:

$$S_t B_t^* = I_{t-1}^* \Phi_{t-1}^{CRP} \Phi_{t-1}^{CC}\left(-S_t P_t^X X_t + S_t P_t^* M_t + S_t B_{t-1}^*\right) \tag{5.85}$$

The domestic currency value of the external debt stock is defined in terms of the ratio to the nominal GDP:

$$b_t^* = \frac{S_t B_t^*}{P_t Y_t} \tag{5.86}$$

Then, the ratio of the net foreign assets to the nominal domestic production is defined as:

[143] In literature, investment goods and exports are widely assumed to be consists of only domestically produced goods. Since the exported goods are also assumed to include some imported components in addition to the domestic production with the same import share as in consumption and investment goods, we obtain slightly different goods market equilibrium condition.

$$\frac{S_t B_t^*}{P_t Y_t} = I_{t-1}^* \Phi_{t-1}^{CRP} \Phi_{t-1}^{CC} \left\{ -\frac{S_t P_t^X}{P_t Y_t} \frac{P_t^*}{P_t^*} X_t + \frac{S_t P_t^*}{P_t Y_t} M_t + \frac{P_{t-1}}{P_t} \frac{S_t}{S_{t-1}} \frac{Y_{t-1}}{Y_t} \frac{S_{t-1} B_{t-1}^*}{P_{t-1} Y_{t-1}} \right\} \tag{5.87}$$

Then, the deviation of the debt stock from the steady state value can be derived in the following form:

$$\frac{b_{ss}^*}{I_{ss}^* \Phi_{ss}^{CRP} \Phi_{ss}^{CC}} \left(\hat{b}_t^* - \hat{i}_t^* - \hat{\phi}_{t-1}^{CRP} - \hat{\phi}_{t-1}^{CC} \right) = -\frac{X_{ss}}{Y_{ss}} \left(\hat{q}_t + \hat{t}_t^X + \hat{x}_t - \hat{y}_t \right) + \frac{M_{ss}}{Y_{ss}} \left(\hat{q}_t + \hat{m}_t - \hat{y}_t \right) + b_{ss}^* \left(\Delta \hat{s}_t - \Delta \hat{y}_t - \hat{\pi}_t + \hat{b}_{t-1}^* \right) \tag{5.88}$$

where, b_{ss}^* is the steady state ratio of the external debt to domestic output.[144] But, accepting a non-zero net foreign debt or asset in steady state implies a positive or negative trade balance in the steady state to pay the interest payments of the steady state debt stock.[145]

5.1.10. Monetary Policy

It is assumed that central bank has a quadratic loss function. In base line "single goal, single tool" case, the objective of the central bank is defined as the minimization of the volatilities of inflation and output around the steady state with the following loss function:

$$\mathrm{L}_B = \left[\hat{\pi}_t^2 + \lambda_y \hat{y}_t^2 \right] \tag{5.89}$$

Where λ_y is the weight of volatility of output relative to the volatility of inflation.

In "multiple goals, multiple tools" framework, central bank also targets the financial stability through stabilizing the loans and trade balance. Therefore, the alternative loss function is defined as;

$$\mathrm{L}_A = \left[\hat{\pi}_t^2 + \lambda_y \hat{y}_t^2 + \lambda_l \hat{l}_t^2 + \lambda_{tb} \hat{tb}_t^2 \right] \tag{5.90}$$

Where λ_l and λ_{tb} are the weights of the volatilities of the loans and trade balance relative to the volatility of inflation, respectively.

[144] For simplicity, since it is assumed that all price indices converges each other at the steady state, the nominal GDP is defined in terms of consumer prices rather than the GDP deflator.

[145] See the derivation of steady state ratios in section 5.2.1.

The model is closed with various alternative forms of the monetary policy rules. The central bank is assumed to use a simple open economy policy rule consistent with the operating frameworks:

$$\frac{I_t^{CB}}{I_{ss}^{CB}} = \left(\frac{I_{t-1}^{CB}}{I_{ss}^{CB}}\right)^{\rho_r} \left[\left(\frac{\Pi_t}{\Pi_{ss}}\right)^{\rho_\pi} \left(\frac{Y_t}{Y_{ss}}\right)^{\rho_y} \left(\frac{q_t}{q_{ss}}\right)^{\rho_q} \left(\frac{L_t}{L_{ss}}\right)^{\rho_l} \left(\frac{TB_t}{TB_{ss}}\right)^{\rho_{tb}}\right]^{(1-\rho_r)} \tag{5.91}$$

Where, ρ_r is the interest rate smoothing parameter, ρ_π is the coefficient of the inflation gap, ρ_y is the coefficient of the output gap, ρ_q is the coefficient of the real exchange rate gap, ρ_l is the coefficient of the loan stock gap, ρ_{tb} is the coefficient of trade balance gap. In base line policy rule; $\rho_q = \rho_l = \rho_{tb} = 0$. The log-linear form of the base line policy rule is derived as:

$$\hat{i}_t^{CB} = \rho_r \hat{i}_{t-1}^{CB} + (1-\rho_r)\left[\rho_\pi \hat{\pi}_t + \rho_y \hat{y}_t + \rho_q \hat{q}_t\right] \tag{5.92}$$

In order to show the inefficiency of the "multiple goals, single tool" operating framework, the following log-linear form of the simple interest rate rule is also tested:

$$\hat{i}_t^{CB} = \rho_r \hat{i}_t^{CB} + (1-\rho_r)\left[\rho_\pi \hat{\pi}_t + \rho_y \hat{y}_t + \rho_q \hat{q}_t + \rho_l \hat{l}_t + \rho_{tb} \hat{tb}_t\right] \tag{5.93}$$

In addition to the base line form of the monetary policy rules based on short term policy rate, in "multiple tools" framework, it is assumed that central bank also uses the macro prudential and capital control rules. We assume that the macro prudential and capital control tools target the loan and trade balance stability. Therefore, their log-linear forms are defined as follows:

$$\hat{\phi}_t^{MP} = \rho_{mp} \hat{\phi}_{t-1}^{MP} + (1-\rho_{mp})\left[\rho_{q,mp} \hat{q}_t + \rho_{l,mp} \hat{l}_t + \rho_{l,mp} \hat{tb}_t\right] \tag{5.94}$$

$$\hat{\phi}_t^{CC} = \rho_{cc} \hat{\phi}_{t-1}^{CC} + (1-\rho_{cc})\left[\rho_{q,cc} \hat{q}_t + \rho_{l,cc} \hat{l}_t + \rho_{tb,cc} \hat{tb}_t\right] \tag{5.95}$$

Where, $\rho_{..}$ s are the related coefficients in the rule functions.

5.1.11. Rest of the World

In the model, the economy faces with the external demand, supply and interest rate shocks in addition to the domestic demand and supply, and risk premium shocks. Since the external shocks are correlated with each other in practice, instead of assuming individual external shocks, the rest of the world is

modeled through three equations: (i) aggregate demand, (ii) aggregate supply, and (iii) monetary policy rule. The domestic economy is assumed to be too small to affect the rest of the world. Therefore, the domestic shocks and developments in the domestic economy do not affect the rest of the world. It is also assumed that the rest of the world central bank applies a flexible inflation targeting strategy by using a simple interest rate policy rule. The rest of the world's log-linear equations are defined as:

$$\hat{y}_t^* = \beta_{yf}\hat{y}_{t+1}^* + \left(1-\beta_{yf}\right)\hat{y}_{t-1}^* - \beta_{if}\left(\hat{i}_t^* - \hat{\pi}_{t+1}^*\right) + \varepsilon_t^{yf} \quad (5.96)$$

$$\hat{\pi}_t^* = \alpha_{\pi f}\hat{\pi}_{t+1}^* + \left(1-\alpha_{\pi f}\right)\hat{\pi}_{t-1}^* - \alpha_{yf}\hat{y}_t^* + \varepsilon_t^* \quad (5.97)$$

$$\hat{i}_t^* = \rho_{if}\hat{i}_{t-1}^* + \left(1-\rho_{if}\right)\left(\rho_{\pi f}\hat{\pi}_t^* + \rho_{yf}\hat{y}_t^*\right) \quad (5.98)$$

Where, β_{yf} is the coefficient of the expected output gap, β_{if} is the coefficient of the real interest rate gap, $\alpha_{\pi f}$ is the coefficient of the expected inflation, ρ_{if} is the coefficient of the lagged interest rate, $\rho_{\pi f}$ is the coefficient of the inflation gap, and ρ_{yf} is the coefficient of the output gap. The rest of the world is assumed to face with the demand and supply shocks in the following AR(1) forms:

$$\varepsilon_t^{yf} = \lambda_{yf}\varepsilon_{t-1}^* + u_t^{yf} \quad (5.99)$$

$$\varepsilon_t^{\pi f} = \lambda_{yf}\varepsilon_{t-1}^{\pi f} + u_t^{\pi f} \quad (5.100)$$

5.2. The Policy Tools and Transmission Mechanism

In this section, we provide brief information on the transmission mechanism of the policy tools through the policy shocks and log-linear model equations summarized in Table 5.1. The schematic presentation of the model is given in Figure 5.1. We use the calibrated parameters provided in Table 5.2, and the optimal policy coefficients which are provided in Table 5.3. There are three types of policy shocks: (i) policy rate shock, (ii) macro prudential cost shock, and (iii) capital control cost shock. Each shock is a one-time shock. After each shock, the economy returns to the equilibrium as the policy rate rule function works.

Table 5.1. The log-linear Equation of the DSGE Model

Household Consumption Demand: $\hat{c}_t = \frac{1}{1+h}\hat{c}_{t+1} + \frac{h}{1+h}\hat{c}_{t-1} - \frac{1-h}{\sigma_C(1+h)}\left(\hat{i}_t^D - E_t\hat{\pi}_{t+1}\right) + \varepsilon_t^C$

Total Consumption: $\hat{c}_t^T = 0.987\hat{c}_t + 0.013\hat{n}_t$

Investment Demand: $\hat{Q}_t = \chi\left[\hat{I}_t - \hat{k}_{t-1}\right]$

Production: $\hat{y}_t = \hat{a}_t + \alpha\hat{k}_{t-1} + (1-\alpha)\hat{H}_t$

Capital Accumulation: $\hat{k}_t = (1-\delta)\hat{k}_{t-1} + \delta\hat{I}_t$

Labor Demand: $\hat{H}_t = -\hat{w}_t + \hat{z}_t + \hat{k}_{t-1}$

Wage - Labor Supply: $\hat{H}_t = \frac{1}{\sigma_H}\left[\hat{w}_t - \sigma_C\left(\frac{1}{(1-h)}\hat{c}_t - \frac{h}{(1-h)}\hat{c}_{t-1}\right)\right]$

Entrepreneur Balance Sheet: $\phi_{ss}^{KN}\left(\hat{Q}_t + \hat{k}_t\right) = \hat{n}_t + \left(\phi_{ss}^{KN} - 1\right)\hat{l}_t$

External Finance Premium: $\hat{\phi}_t^{FRP} = \varphi^{FRP}\left[\hat{Q}_t + \hat{k}_t - \hat{n}_t\right]$

Expected Return on Capital:

$$E_t\hat{r}_{t+1}^K = \hat{\phi}_t^{FRP} + (1-\alpha^{DF})(\hat{i}_t^{IB} - E_t\hat{\pi}_{t+1}) + \alpha^{DF}(\hat{i}_t^{IB*} + E_t\Delta\hat{s}_{t+1} - E_t\hat{\pi}_{t+1})$$

Price of Capital Goods: $\hat{r}_{t+1}^K = \left(\frac{z_{ss}}{r_{ss}^K}\right)\hat{z}_{t+1} + \left(\frac{1-\delta}{r_{ss}^K}\right)\hat{Q}_{t+1} - \hat{Q}_t$

Evolution of Net Worth:

$$\hat{n}_t = \vartheta\begin{Bmatrix}\phi_{ss}^{KN}R_{ss}^{av}\left(\Phi_{ss}^{FRP}\hat{r}_t^K - \hat{r}_t^{av}\right) \\ +\phi_{ss}^{KN}R_{ss}^{av}\left(\Phi_{ss}^{FRP} - 1\right)\left(\hat{Q}_{t-1} + \hat{k}_{t-1}\right) + R_{ss}^{av}\left(\hat{r}_t^{av} + n_{t-1}\right)\end{Bmatrix}$$

Marginal Cost and Inflation of Home Goods: $\hat{mc}_t^H = \alpha\hat{z}_t + (1-\alpha)\hat{w}_t - \hat{a}_t$

$$\hat{\pi}_t^H = \frac{\beta}{1+\beta\lambda_H}E_t\hat{\pi}_{t+1}^H + \frac{\lambda_H}{1+\beta\lambda_H}\hat{\pi}_{t-1}^H + \frac{(1-\theta^H)(1-\beta\theta^H)}{\theta^H(1+\beta\lambda_H)}\hat{mc}_t^H + \hat{\varepsilon}_t^H$$

Marginal Cost and Inflation of Imported Goods: $\hat{mc}_t^M = \hat{mc}_{t-1}^M + \Delta\hat{s}_t + \hat{\pi}_t^* - \hat{\pi}_t^M$

$$\hat{\pi}_t^M = \frac{\beta}{1+\beta\lambda_M}E_t\hat{\pi}_{t+1}^M + \frac{\lambda_M}{1+\beta\lambda_M}\hat{\pi}_{t-1}^M + \frac{(1-\theta^M)(1-\beta\theta^M)}{\theta^M(1+\beta\lambda_M)}\hat{mc}_t^M$$

Marginal Cost and Inflation of Exported Goods:

$$\hat{mc}_t^A = (1-\alpha_M)\hat{mc}_t^H + (\alpha_M)\hat{mc}_t^M$$

$$\hat{mc}_t^X = \hat{mc}_t^A - \hat{q}_t - \hat{t}_t^X$$

$$\hat{\pi}_t^X = \frac{\beta}{1+\beta\lambda_X}E_t\hat{\pi}_{t+1}^X + \frac{\lambda_X}{1+\beta\lambda_X}\hat{\pi}_{t-1}^X + \frac{(1-\theta^X)(1-\beta\theta^X)}{\theta^X(1+\beta\lambda_X)}\hat{mc}_t^X$$

Consumer Price Inflation: $\hat{\pi}_t = (1-\alpha_M)\hat{\pi}_t^H + \alpha_M\hat{\pi}_t^M$

Relative Prices: $t_t^H = t_{t-1}^H + \pi_t^H - \pi_t \;;\; \hat{t}_t^M = \hat{t}_{t-1}^M + \hat{\pi}_t^M - \hat{\pi}_t \;;\; \hat{t}_t^X = \hat{t}_{t-1}^X + \hat{\pi}_t^X - \hat{\pi}_t^*$

Table 5.1. (Continued)

Import Demand: $\hat{y}_t = \frac{1}{(1+\alpha^M + tb_{ss})}\left(\frac{C^T_{ss}}{Y_{ss}}\hat{c}^{H,T}_t + \frac{I_{ss}}{Y_{ss}}\hat{I}^H_t + \frac{X_{ss}}{Y_{ss}}\hat{x}^H_t + \frac{G_{ss}}{Y_{ss}}\hat{g}^H_t\right)$

Export Demand: $\hat{x}_t = h_X\hat{x}_{t-1} + (1-h_X)\left[-\rho_X\hat{t}^X_t + \hat{y}^*_t\right]$

Demand for Home Goods: $\hat{c}^H_t = -\rho_M\hat{t}^H_t + \hat{c}^T_t \;\;;\;\; \hat{I}^H_t = -\rho_M\hat{t}^H_t + \hat{I}_t \;\;;\;\; \hat{x}^H_t = -\rho_M\hat{t}^H_t + \hat{x}_t$

Domestic Equilibrium: $\hat{y}_t = \frac{1}{(1+\alpha^M + tb_{ss})}\left(\frac{C^T_{ss}}{Y_{ss}}\hat{c}^{H,T}_t + \frac{I_{ss}}{Y_{ss}}\hat{I}^H_t + \frac{X_{ss}}{Y_{ss}}\hat{x}^H_t + \frac{G_{ss}}{Y_{ss}}\hat{g}^H_t\right)$

External Balance :

$$\frac{b^*_{ss}}{I^*_{ss}\Phi^{CRP}_{ss}\Phi^{CC}_{ss}}\left(\hat{b}^*_t - \hat{i}^*_t - \hat{\phi}^{CRP}_{t-1} - \hat{\phi}^{CC}_{t-1}\right) =$$

$$-\frac{X_{ss}}{Y_{ss}}\left(\hat{q}_t + \hat{t}^X_t + \hat{x}_t - \hat{y}_t\right) + \frac{M_{ss}}{Y_{ss}}\left(\hat{q}_t + \hat{m}_t - \hat{y}_t\right) + b^*_{ss}\left(\Delta\hat{s}_t - \Delta\hat{y}_t - \hat{\pi}_t + \hat{b}^*_{t-1}\right)$$

Banking System Equilibrium Conditions:

$$\hat{i}^D_t = \hat{i}^{CB}_t \;\;;\;\; \hat{i}^{IB}_t = \hat{i}^{CB}_t + \hat{\phi}^{MP}_t \;\; \hat{i}^{D*}_t = \hat{i}^*_t + \hat{\phi}^{CRP}_t + \hat{\phi}^{CC}_t \;\;;\;\; \hat{i}^{D*}_t = \hat{i}^{IB*}_t$$

Country Risk Premium: $\hat{\phi}^{CRP}_t = \varphi^{CRP}\hat{b}^*_t + \hat{\varepsilon}^{CRP}_t$

Uncovered Interest rate Parity: $\hat{s}_{t+1} - \hat{s}_t = \hat{i}^D_t - \hat{i}^{D*}_t$

Real Exchange Rate: $\hat{q} = \hat{q}_{t-1} + \hat{s}_t - \hat{s}_{t-1} + \hat{\pi}^*_t - \hat{\pi}_t$

Monetary Policy Rules: $\hat{i}_t = \rho_r\hat{i}_{t-1} + (1-\rho_r)\left[\rho_\pi\hat{\pi}_t + \rho_y\hat{y}_t + \rho_q\hat{q}_t + \rho_l\hat{l}_t + \rho_{tb}\hat{tb}_t\right]$

$$\hat{\phi}^{MP}_t = \rho_{mp}\hat{\phi}^{MP}_{t-1} + (1-\rho_{mp})\left[\rho_{q,mp}\hat{q}_t + \rho_{l,mp}\hat{l}_t + \rho_{tb,mp}\hat{tb}_t\right]$$

$$\hat{\phi}^{CC}_t = \rho_{cc}\hat{\phi}^{CC}_{t-1} + (1-\rho_{cc})\left[\rho_{q,cc}\hat{q}_t + \rho_{l,cc}\hat{l}_t + \rho_{tb,cc}\hat{tb}_t\right]$$

Foreign Economy: $y^*_t = \beta_{yf}y^*_{t+1} + (1-\beta_{yf})y^*_{t-1} - \beta_{if}\left(i^*_t - \pi^*_{t+1}\right) + \varepsilon^{yf}_t$

$$\pi^*_t = \alpha_{\pi f}\pi^*_{t+1} + (1-\alpha_{\pi f})\pi^*_{t-1} - \alpha_{yf}y^*_t + \varepsilon^{\pi^*}_t$$

$$i^*_t = \rho_{if}i^*_{t-1} + (1-\rho_{if})\left(\rho_{\pi f}\pi^*_t + \rho_{yf}y^*_t\right)$$

Domestic shocks: $\varepsilon^C_t = 0.80\varepsilon^C_t + u^C_t \qquad \varepsilon^{\pi^H}_t = 0.80\varepsilon^{\pi^H}_t + u^{\pi^H}_t \qquad \varepsilon^A_t = 0.80\varepsilon^A_t + u^A_t$

External Shocks: $\varepsilon^{yf}_t = 0.80\varepsilon^{yf}_t + u^{yf}_t \qquad \varepsilon^{\pi^*}_t = 0.80\varepsilon^{\pi^*}_t + u^{\pi^*}_t \qquad \varepsilon^{CRP}_t = 0.80\varepsilon^{CRP}_t + u^{CRP}_t$

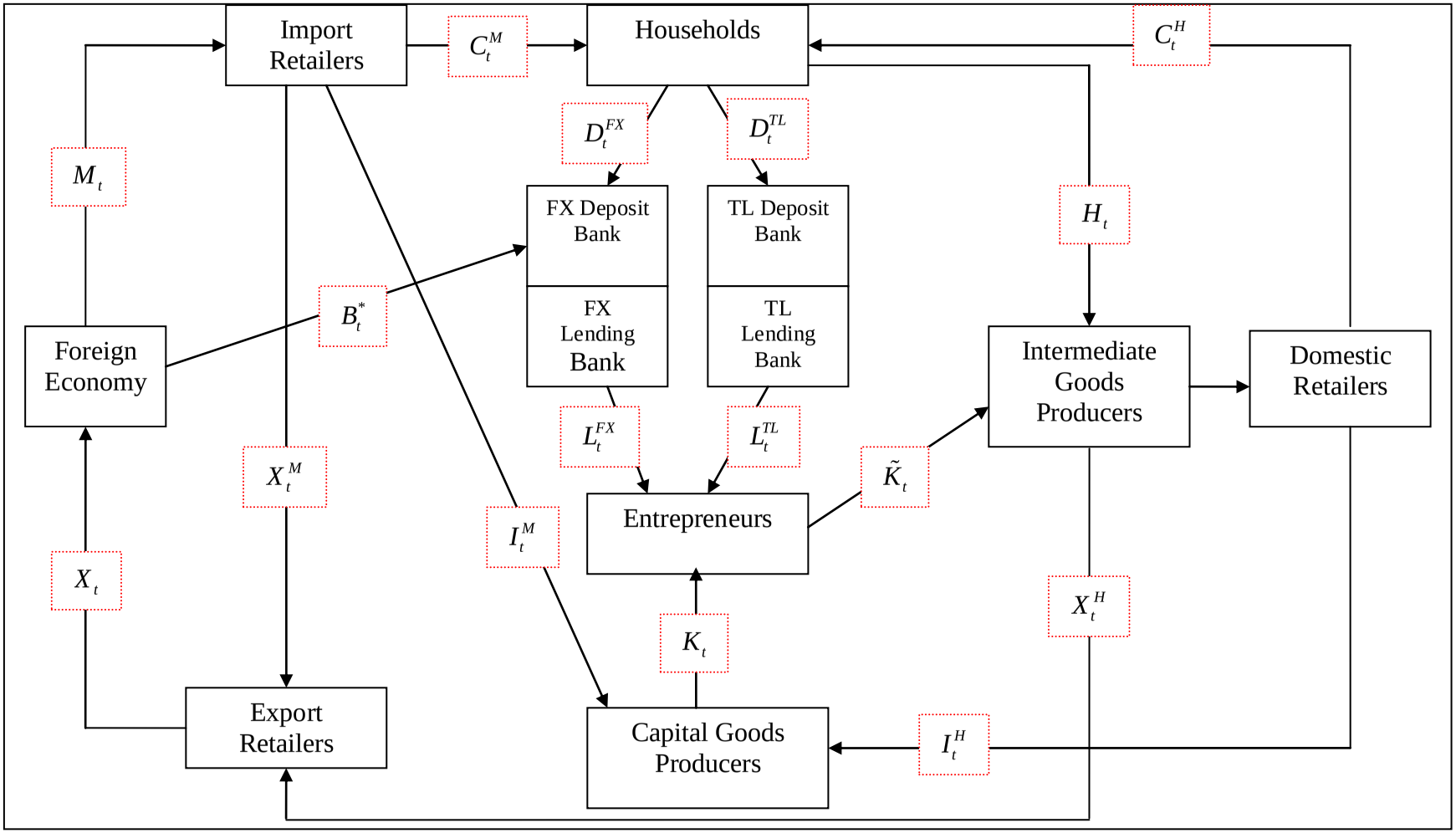

Figure 5.1: Schematic Presentation of the Model (Exogenous government expenditures is excluded in presentation).

In case of a policy rate shock, the monetary policy transmission mechanism of the DSGE model (assuming the capital control and macro prudential tools are not used) works through as follows (Figure 5.2):

(i) Through the banking system equilibrium equations, an increase in policy rate (i_cb) increases the domestic currency deposit rate (i_d).

(ii) Though an increase in policy rate does not affect the foreign deposit rate directly, the decline in the country risk premium (crp) causes a slight decline in FX currency deposit rate (i_df).

(iii) Therefore, while the domestic currency interbank lending rate increases (i_IB), the interbank foreign currency (i_fIB) lending rate slightly declines, thereby the real average interbank lending (r_IBav) rate increases.

(iv) Through the uncovered interest rate parity condition, the nominal and real exchange rates (q) appreciate.

(v) Through the relative price equations, while the import price in domestic currency unit declines relative to the domestically produced good prices (t_m), export prices in foreign currency increases relative to the foreign prices (t_x).

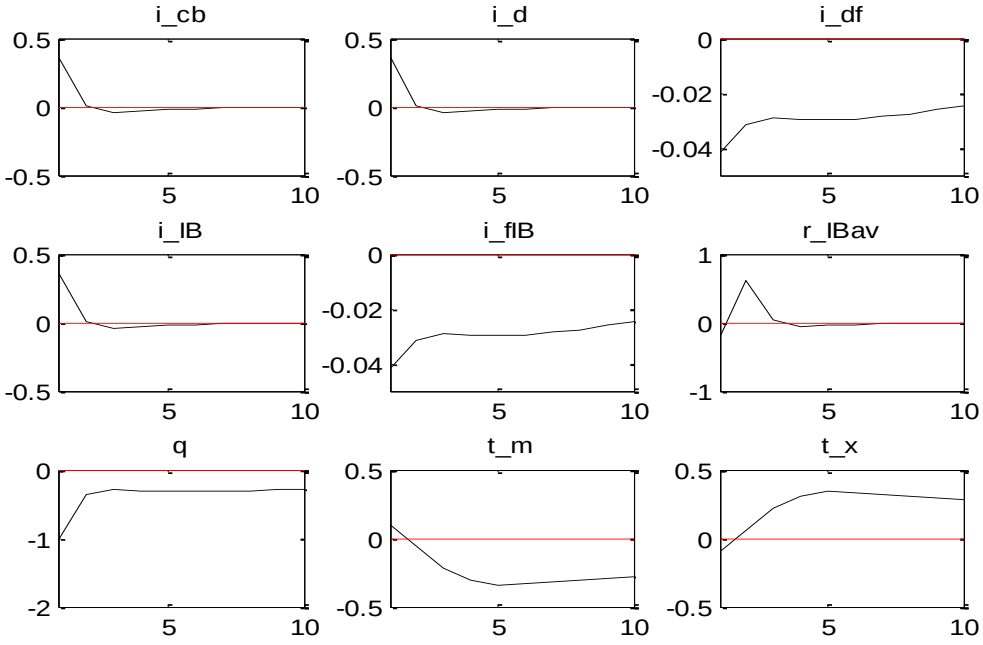

Figure 5.2: Impacts of the Policy Rate Shock on the Variables

(vi) The appreciation of the domestic currency results in a decline in the exports (x) through the export demand equation, and the imports (m) increases gradually following an initial decline caused by the appreciation of the domestic currency and the decline in the domestic demand through the import demand equation.

(vii) Therefore, the trade balance (tb) produces surplus. On the other hand, appreciation of the domestic currency and trade balance surplus reduces the external debt stock (b_f) through the external balance equation. Therefore, the country risk premium (crp) declines.

(viii) Meanwhile, the increase in real interest rate causes a decline in the real price of the capital (Q) and net worth (n), and increase in the real loan stock (l) through the related price of capital, firms' balance sheet and evolution of net worth equations.

(ix) Although the appreciation of the domestic currency reduces the impact of unanticipated increase in the real interest rate paid to the loans, the higher decline in entrepreneur net worth relative to the real value of the capital stock causes an increase in the external finance premium (frp) through the external finance premium equation.

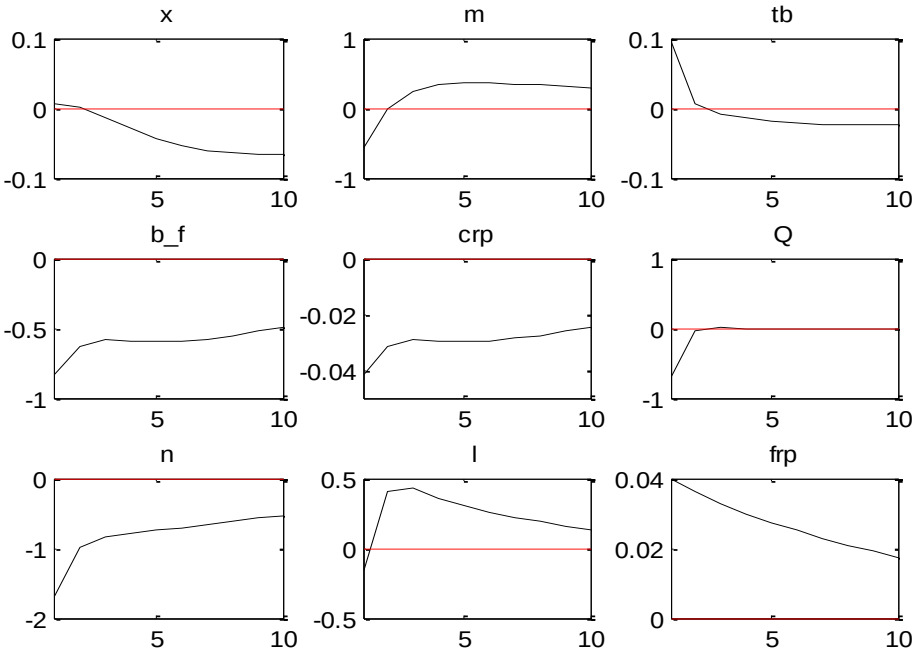

Figure 5.2: (Continued)

(x) The increase in the real interest rate and decline in the net worth of the entrepreneurs reduces the total consumption (c_t) through the consumption equations.

(xi) The decline in the real price of the capital goods reduces the demand for investment (I) through the investment demand equation.

(xii) Therefore, through the domestic market equilibrium condition equation, the total demand for the domestically goods and domestic production (y) declines.

(xiii) Meanwhile, real wages (w) and rental rate (z) declines through the labor demand and supply equations as the demand for labor and capital goods decline.

(xiv) Therefore, the marginal cost of the domestically produced goods (mc_h) declines through the related equation.

(xv) While the decline in the marginal cost of the domestically produced goods reduces the inflation of the domestically produced goods (inf_h), the appreciation causes a decline in the inflation of the imported goods (inf_m) through the related equations. Therefore, the weighted sum of the inflation of the consumer goods (enf) declines.

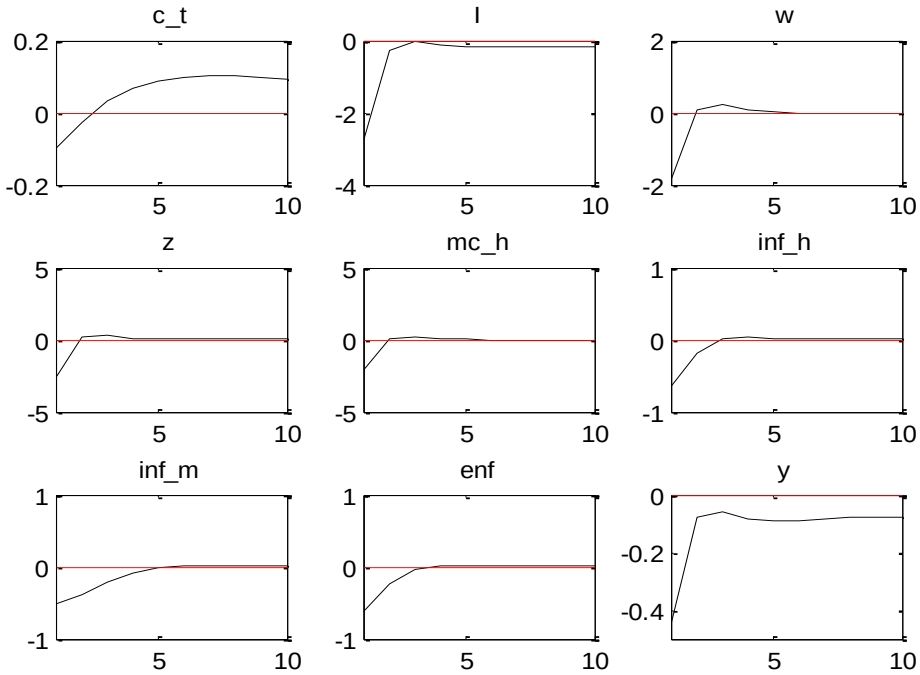

Figure 5.2: (Continued)

The main function of the macro prudential tool is to increase the spread between the deposit and interbank TL rates. The increase in the macro prudential cost affects only the interbank TL rate directly and proportionately. There is no direct effect of the macro prudential cost on the exchange, deposits and FX loan rates. Its direct effects work through the financial accelerator mechanism. An increase in the loan rate reduces the net worth of the entrepreneurs and investment demand. Then, inflation and output decline. Therefore, the macro prudential tool enables the central bank to tighten the TL loan rate[146] without increasing the attractiveness of domestic interest rates for the foreign investors. However, any change in the macro prudential cost affects other variables as the central bank reacts to the inflation and output by changing the policy rate. The impacts of a one-period macro prudential cost shock on transmission mechanism are provided in Figure 5.2.

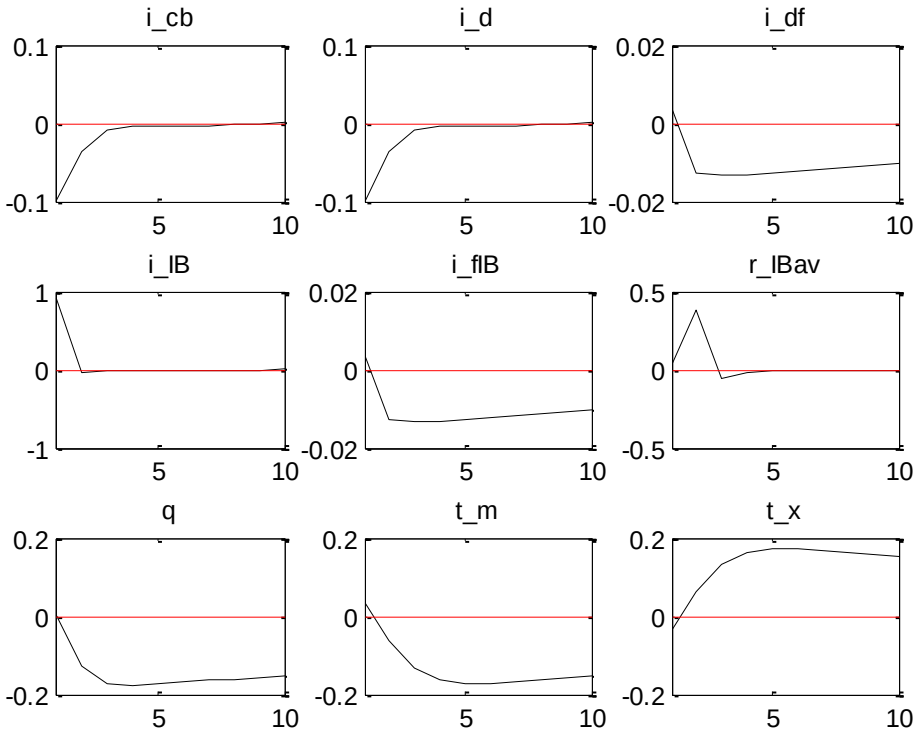

Figure 5.3: Impacts of the Macro Prudential Tool Shock on the Variables

[146] Note that, we assume that households take consumption decisions by taking the TL deposit rate into account. If we allowed households to borrow at the loan rates, then we would need to divide household sector into the savers and borrowers which would complicate the analysis.

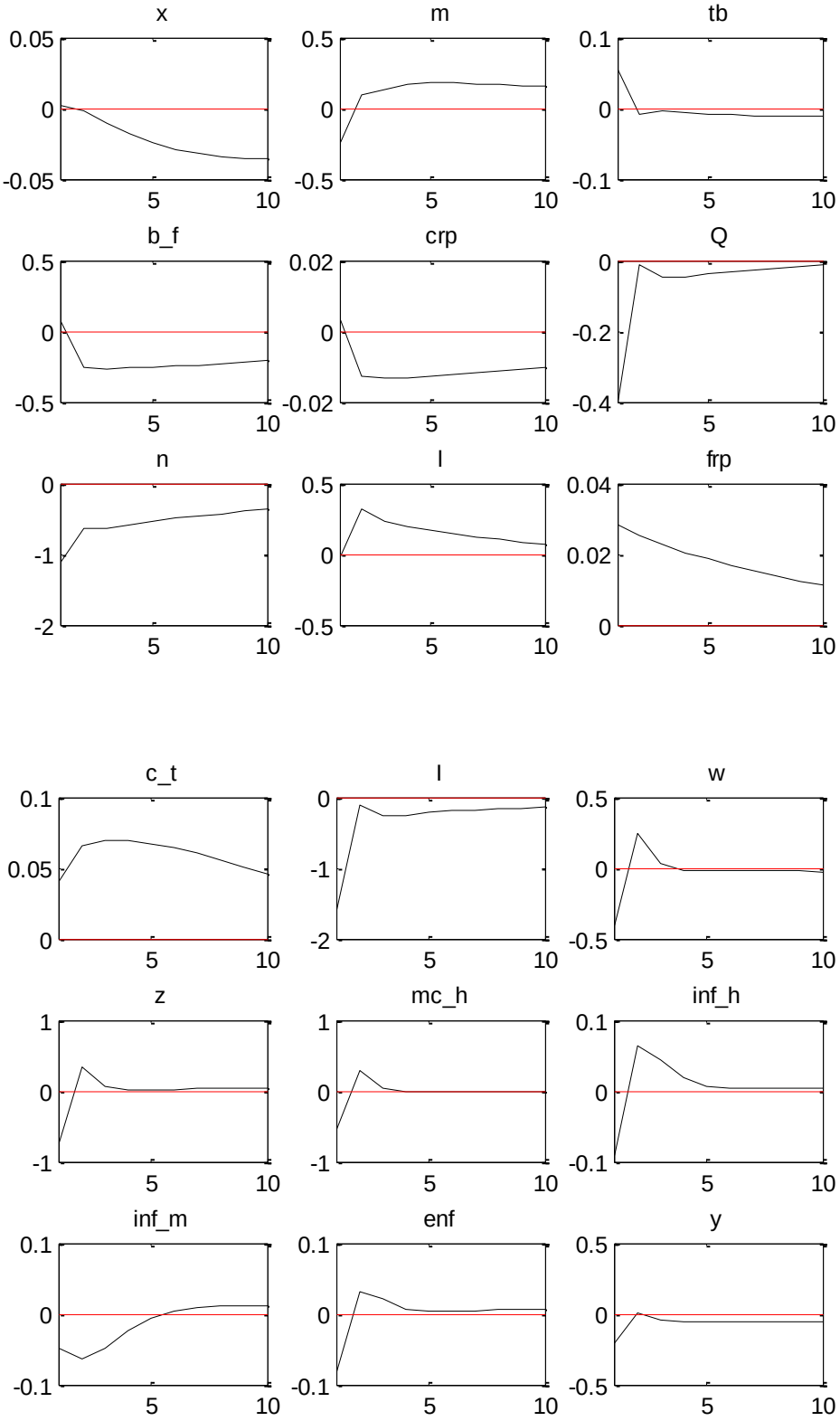

Figure 5.3: (Continued)

On the other hand, the main function of the capital control tool is to change the cost of external borrowing. The increase in macro prudential cost affects the interest rates of the FX borrowing, FX lending and FX deposits directly and proportionately. It also affects the exchange rate through the UIP condition. When the capital cost is increased for a period; since the spread between the foreign and domestic currency deposit rates increases, the domestic currency depreciates through the UIP conditions. In addition, as the FX interbank rate increases, the average financing cost of the entrepreneurs increases. The remaining impacts of the capital control cost follow the transmission of the standard depreciation and increase in average cost of financing. Therefore, the capital control cost is a useful tool to smooth out; (i) the appreciation or depreciation of the domestic currency through balancing the change in the spread between the domestic and foreign interest rates which may stem from the use other policy tools or external shocks, and (ii) the FX loan rate.

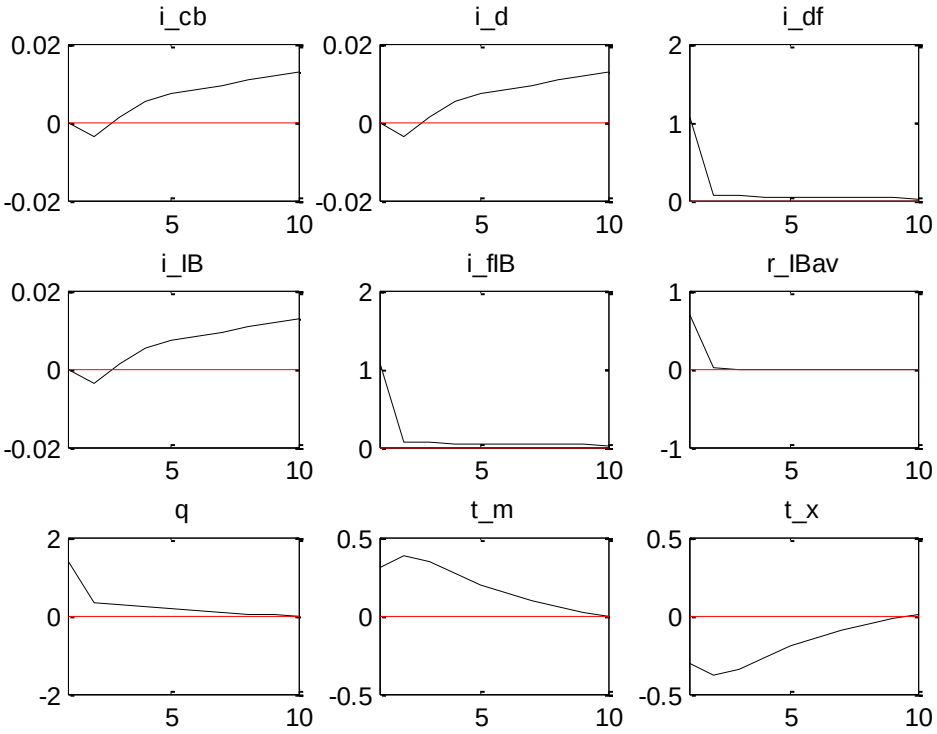

Figure 5.4: Impacts of the Capital Control Tool Shock on the Variables

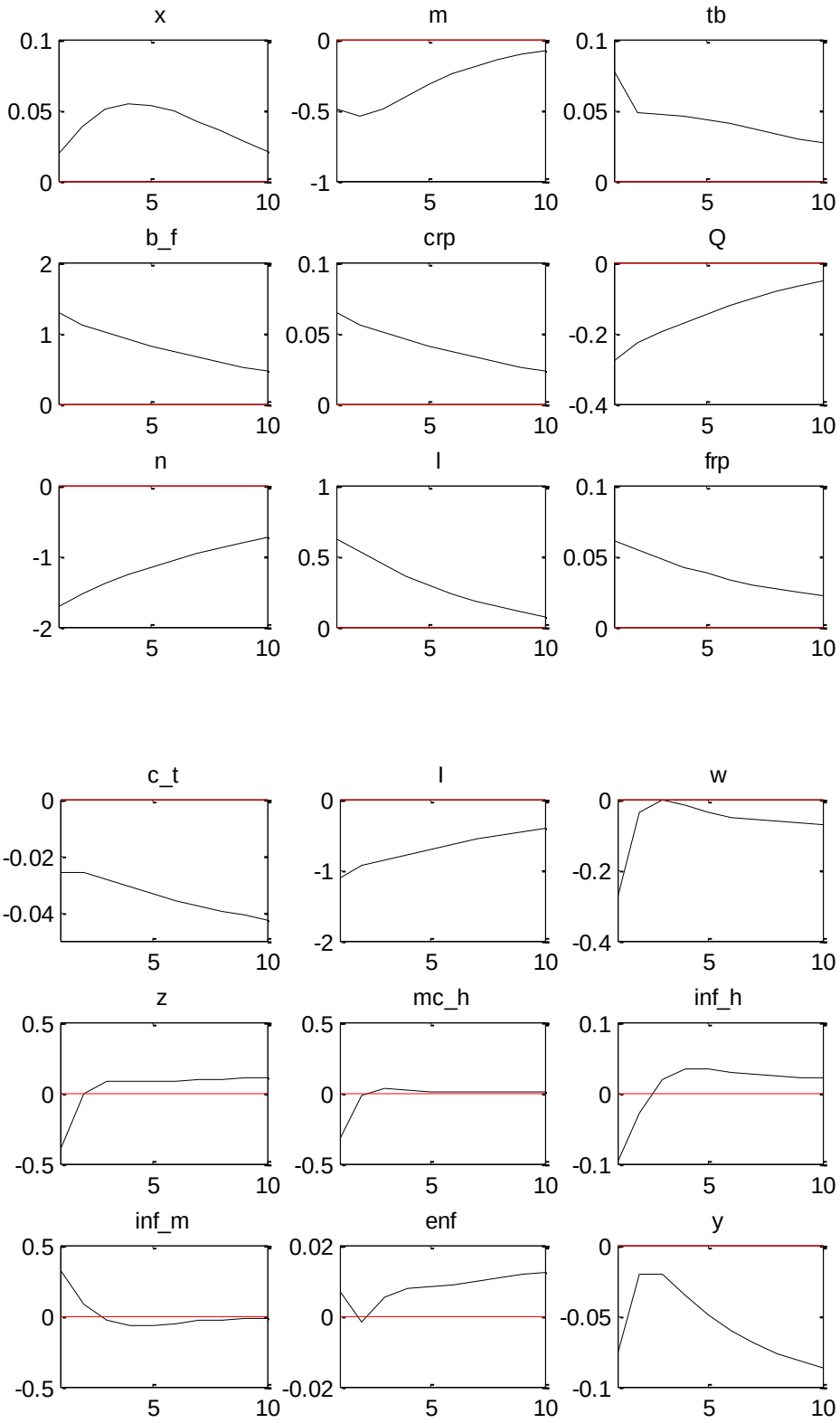

Figure 5.4: (Continued)

5.3. Steady State Values

We assume that, in the steady state, the gross domestic and foreign inflation rates are $\Pi = 1, \Pi^* = 1$, the productivity is $A = 1$, and all relative prices are equal to 1. Then, from the Euler equation;

$$\left[C - hC\right]^{-\sigma_C} = \left[\left(C - hC\right)^{-\sigma_C} \beta I^D \frac{P}{P}\right]$$

we get the steady the state value of the real and nominal TL deposit interest rates as:

$$I_{ss}^{D} = \frac{1}{\beta} \tag{5.101}$$

By using the uncovered interest rate parity condition and assuming the steady state value of the external risk premium and capital control costs are greater than zero;

$$E_t\left[I^{D^*} \frac{S}{S} \frac{P}{P}\right] \Phi^{CRP} \Phi^{CC} = E_t\left[I^D \frac{P}{P}\right]$$

We get the steady state value of the real and nominal FX deposit interest rates as;

$$I_{ss}^{CB} = I_{ss}^{D} = I_{ss}^{D^*} = I_{ss}^{*} \Phi_{ss}^{CRP} \Phi_{ss}^{CC} = I_{ss}^{IB^*} \tag{5.102}$$

Assuming the steady state value of the macro prudential cost is greater than zero, the steady state value of the domestic and foreign currency interbank rate is derived as:[147]

$$I_{ss}^{IB} = I_{ss}^{CB} \Phi_{ss}^{MP} \tag{5.103}$$

$$I_{ss}^{IB^*} = I_{ss}^{CB} \tag{5.104}$$

By using the optimization condition of the loan rate, and assuming $Q = 1$ at the steady state;

$$E\ R^K = \Phi^{FRP}\left(\frac{QK}{N}, \varepsilon^{FRP}\right) E\left\{\left[I^{IB}\right]^{1-\alpha^{DF}} \left[I^{IB^*} \frac{S}{S}\right]^{\alpha^{DF}} \frac{P}{P}\right\}$$

The steady state value of the return of the capital goods is written as:

$$R_{ss}^{K} = \Phi_{ss}^{FRP} (I_{ss}^{IB})^{1-\alpha^{DF}} (I_{ss}^{IB^*})^{\alpha^{DF}} \tag{5.105}$$

Where, $\Phi_{ss}^{FRP} = 1.04$ is the exogenously given steady state annual value of the firm external finance premium. Similarly, by using the expected return of capital equation;

[147] Note that, we assumed that while the central bank uses macro-prudential costs for only the domestic currency side, it uses the capital control costs for the FX side.

$$ER^K = E\left[\frac{z + Q\ (1-\delta)}{Q}\right]$$

the steady state value of the rental rate is calculated as;

$$z_{ss} = R_{ss}^K + \delta - 1 \tag{5.106}$$

Since the firms set prices equal to the nominal marginal cost multiplied by the steady state mark-up rate;

$$P = \left(1 + \mu^H\right) MC$$

The steady state real marginal cost is obtained as;

$$mc_{ss} = \frac{1}{1+\mu^H} \tag{5.107}$$

Given that the steady state investment adjustment cost is zero, by using the capital production function, we derive the model consistent steady state investment output ratio as:

$$K = (1-\delta)K + \left[1 - \Phi^I\left(\frac{I}{I}\right)\right] I$$

$$\frac{I_{ss}}{Y_{ss}} = \delta \frac{K_{ss}}{Y_{ss}} \tag{5.108}$$

Since we can write the capital demand by using the first order condition in cost minimization problem of the intermediate goods producers as;

$$K = \alpha\left(\frac{mc}{z}\right) Y$$

the steady state capital output ratio is defined as;

$$\frac{K_{ss}}{Y_{ss}} = \alpha\left(\frac{mc_s}{z_{ss}}\right) \tag{5.109}$$

Then from the equilibrium in the goods market, $C = Y - I - G$, with the zero steady state trade deficit assumption, the model consistent investment-output ratio, export and import to output ratios and the steady state output level can also be derived. The steady state level of the net foreign assets and trade deficit can be derived as follows:[148]

[148] See also Lane and Milesi-Firetti (2002) for derivation of steady state equilibrium without country risk premium.

$$\frac{SB^*}{PY} = I^*\Phi^{CRP}\Phi^{CC}\left\{-\frac{SP^X}{PY}X + \frac{SP^*}{PY}M + \frac{SB^*}{PY}\right\}$$

or, equivalently;

$$b_t^* - \Phi^{CRP}\Phi^{CC}b_{t-1}^* = I^*\Phi^{CRP}\Phi^{CC}\left(-\frac{X}{Y} + \frac{M}{Y}\right) + (I^* - 1)\Phi^{CRP}\Phi^{CC}b_{t-1}^*$$

This equation can also be simplified as;

$$\left(b_t^* - b_{t-1}^*\right) + \left(1 - \Phi^{CRP}\Phi^{CC}\right)b_{t-1}^* = I^*\Phi^{CRP}\Phi^{CC}\left(-\frac{X}{Y} + \frac{M}{Y}\right) + (I^* - 1)\Phi^{CRP}\Phi^{CC}b_{t-1}^*$$

and, finally, in the steady state;

$$b_{ss}^* = \frac{I_{ss}^*\Phi_{ss}^{CRP}\Phi_{ss}^{CC}}{\left((I_{ss}^* - 1) + \Phi_{ss}^{CRP}\Phi_{ss}^{CC} - 1\right)}\left(\frac{X_{ss}}{Y_{ss}} - \frac{M_{ss}}{Y_{ss}}\right) \tag{5.110}$$

This result imply that, if we assume that the steady state net foreign debt to GDP ratio is a positive figure, then the country should run trade surplus in the long term. Since the import share in the output is given, the steady state export ratio can be derived as:

$$\frac{X_{ss}}{Y_{ss}} = \alpha^M + \frac{\left((I_{ss}^* - 1) + \Phi_{ss}^{CRP}\Phi_{ss}^{CC} - 1\right)}{I_{ss}^*\Phi_{ss}^{CRP}\Phi_{ss}^{CC}}b^{*ss} \tag{5.111}$$

Considering the leaving entrepreneur consume her wealth, the steady state consumption to output ratio is derived as:

$$\frac{C_{ss}^T}{Y_{ss}} = 1 - \frac{I_{ss}}{Y_{ss}} - \frac{G_{ss}}{Y_{ss}} \tag{5.112}$$

The share of import in the consumption, investment and exports is given by α^M, and the export share is calculated by adding the steady state net export (trade balance) ratio. Then, we have the following equilibrium condition which is used in derivation of the log-linear form of the domestic goods market equilibrium:

$$\left(1 + \alpha^M + tb_{ss}\right)Y_{ss} = C_{ss}^T + I_{ss} + X_{ss} + G_{ss} \tag{5.113}$$

5.4. Calibration

In parameterization of the model, we try to be consistent with the literature and the characteristics of the Turkish economy. Functional forms of the most of our model equations are similar to Alp and Elekdağ (2011). While Alp and Elekdağ (2011) estimate Calvo parameters, price indexation, habit formation, investment adjustment cost, export demand elasticity, export demand inertia and policy rule parameters, they calibrate the other parameters in line with the relevant literature and characteristics of Turkey. In this study, although we generally rely on the parameters of Alp and Elekdağ (2011), we fine tuned some parameters to be consistent with our steady state assumptions or our functional forms of the equations,

Since (i) the time preference parameter (β) determines the steady state level of the deposit and policy rate, and (ii) these rates are determined by the steady state levels of the foreign interest rate, country risk premium and capital control cost, we calibrate (β) consistent with the steady state levels of the foreign interest rate, capital control cost, and country risk premium. It is calibrated as 0.985 which implies 4.5 % annual steady state real interest rate. When we exclude capital control cost, it declines to 0.99. We set (σ_C) and (σ_H) as 1 and 2 respectively which are the priors of the Smets and Wouters (2003).

The steady state mark-up rate is assumed to be 0.15. Although it is common to choose; the depreciation parameter (δ) as 0.025 and the share of capital in production (α) as 0.33, following Alp and Elekdağ (2011) and by taking the emerging country characteristics, we calibrate (δ) as 0.035, (α) as 0.40. The capital to net worth ratio (K/N) ratio is set as 2.0[149] which is also consistent with the literature.

Two of the main characteristics of the emerging country economies are the existence of indexation in pricing and higher persistence. While the widely used parameters for the indexation parameters (λ) and Calvo parameters (θ) are in between 0.60 and 0.80 which imply less rigidity in price settings, considering more persistence and indexation in Turkish and emerging country cases, following estimations of Alp and Elekdağ (2011), for domestic goods inflation; we set

[149] Alp and Elekdağ (2011) shows that while the leverage ratio (which is defined as the ratio of the total assets to equity) in Turkish case was 2.97 in 2000, it declined to 2.01 in 2007. They take the 2007 value.

indexation parameter (λ_H) as 0.31 and Calvo parameters (θ^H) as 0.46. For imports; while (θ^M) and (λ_M) are set as 0.55 and 0.48 respectively. They do not have a detailed export inflation equation. Considering their priors for others, we calibrate (θ^X) and (λ_X) as 0.55. The habit persistence parameter (h) is calibrated as 0.90 in the consumption function. The estimated domestic inflation parameters of Alp and Elekdağ (2011) imply a full pass through from marginal cost to inflation which is significantly higher than the literature. In addition, high habit persistence parameter results in significant rigidity in consumption. Therefore, while we keep their estimated parameters for our base line case, we also take their priors for alternative case to compare the implications of the supportive policy tools under different parameters. In alternative case, while we set 0.55 for indexation parameters (λ) and Calvo parameters (θ) in all inflation equations, habit persistence parameter (h) is calibrated as 0.80 in consumption function.

Following Alp and Elekdağ (2011)'s estimate the capital adjustment cost parameter (χ) is calibrated as 3.6254 which is also consistent with the BGG. The external risk premium of the entrepreneurs, the country risk premium and the degree of the financial dollarization have critical roles in an open economy transmission mechanism. Since the share of FX credits in credit markets in Turkey is around 40 %, it is assumed that the entrepreneurs foreign exchange loans share in total loans (α^{DF}) is 0.40.

While we rely on Alp and Elekdağ (2011) for the steady state external finance premiums (Φ_{ss}^{FRP}) which is 1.03 in annual terms, the elasticity of the external risk premium with respect to the firm leverage (φ^{FRP}) is set as 0.043 to be consistent with the functional form of the external finance premium, the steady state external finance premium and the capital to net worth ratio. On the other hand, in order to include the impacts of the existing external debt stock in emerging country case, following Roger et al. (2009), while the steady state external debt stock to GDP is set as 0.40, the steady state country risk premium (Φ_{ss}^{CRP}) is calibrated as 1.005 which implies around annual 2 % risk premium. While Alp and Elekdağ (2011) and Glocker and Towbin (2011) calibrate the elasticity of the country risk premium (φ^{CRP}) 0.01 and 0.02 respectively, we calculate the consistent elasticity of the

country risk premium as 0.05 by taking the functional form of the country risk premium and its steady state value into account. In addition, in order to allow capital control cost as a policy tool, the steady state capital control (Φ_{ss}^{CC}) and steady state macro prudential (Φ_{ss}^{CC}) costs are assumed to be 1.005 which is 2 % in annual.

The steady state government expenditures to GDP ratio is calibrated as 10 %. The steady state investment ratio is calculated consistent with the depreciation ratio and other interest rate variables. It is around 20 %. The steady state consumption is the residual value. These steady state values are consistent with the trends in Turkish economy. The steady state import to GDP ratio is 24 %. Although it is above 25 % in recent years, we assume that it is a transitory trend.

Since the rest of the world block is used just to produce correlated external shocks to be in line with the reality, we need some rough parameters for the equations. We assume that, estimated U.S. parameters can provide important information for the rest of the world block. Heidari (2010) estimates the coefficients; (β_{yf}) as 0.77, (β_{if}) as 0.06, ($\alpha_{\pi f}$) as 0.72, (α_{yf}) as 0.24, (ρ_{if}) as 0.77, ($\rho_{\pi f}$) as 1.37, and ρ_{yf} as 0.74. While we round his aggregate supply and aggregate demand parameters, we optimize the policy rule parameters assuming the rest of the world central bank uses inflation targeting strategy. We calculate (ρ_{if}) as 0.70, ($\rho_{\pi f}$) as 2.20, and ρ_{yf} as 0.90 which are similar to the estimated values. In fact, the rounded parameters imply that there is less rigidity in the rest of the world than the home country which is a consistent assumption for the developed countries.

The other important domestic parameters in the model are the coefficients of the lag of the shocks. The coefficients of the AR(1) processes are set as 0.80 in line with the literature, which produce enough persistence. The calibrated parameters and values are provided in Table 5.2. The calibrated steady state interest rates, leverage ratio and consistent elasticity of the external finance and country risk premium are given in Table 5.3. The consistent steady state variables are provided in Table 5.4.

Table 5.2. Calibrated Parameters and Values

Parameter	Description	Baseline Values	Alternative Values
h	Habit persistence	0.90	0.80
μ^H	Mark-up in domestic pricing	0.15	
σ_C	Relative risk aversion	1.00	
σ_H	Inverse elasticity of work effort	2.00	
α	Capital share in production	0.40	
δ	Depreciation rate	0.035	
χ	Capital adjustment cost	3.63	
ϑ	Survival rate of entrepreneurs	0.97	
λ_H	Indexation in domestic pricing	0.46	0.55
λ_M	Indexation in import pricing	0.48	0.55
λ_X	Indexation in Export pricing	0.55	0.55
θ^H	Calvo parameter for domestic pricing	0.31	0.55
θ^M	Calvo parameter for import pricing	0.55	0.55
θ^X	Calvo parameter for import pricing	0.55	0.55
ρ_M	Elasticity of substitution for imports	1.00	
ρ_X	Export demand elasticity	0.25	
h_X	Exports demand inertia	0.88	0.75
α^M	Import share	0.24	
α^{DF}	SS. Degree of dollarization	0.40	

Table 5.3. Calibrated Steady State Values and Consistent Elasticities

Paramet	Description	With Capital Control and Macro prudential	With Macro prudential	Only policy tool
ϕ_{ss}^{KN}	SS. Capital to net worth ratio	2.0	2.0	2.0
Φ_{ss}^{FRP}	SS. External finance premium	1.007	1.007	1.007
Φ_{ss}^{CRP}	SS. Country risk premium	1.005	1.005	1.005
Φ_{ss}^{CC}	SS. Capital control cost	1.005	1	1
Φ_{ss}^{MP}	SS. Macro prudential cost	1.005	1.005	1
I_{ss}^{*}	SS. Foreign interest rate	1.005	1.005	1.005
α^{DF}	SS. Degree of dollarization	0.40	0.40	0.40
b_{ss}^{*}	SS. External debt stock	0.40	0.40	0.40
φ^{FRP}	Elast. of external finance premium	0.043	0.043	0.043
φ^{CRP}	Elast. of country risk premium	0.05	0.05	0.05

Table 5.4. Calculated Consistent Steady State Values

Parameter	Description	Capital Control and Macro prudential	With Macro prudential	With only policy tool
$I_{ss}^{D*} = I_{ss}^{D} = I_{ss}^{CB}$	FX/TL Deposits and Policy rates	1.015	1.010	1.010
I_{ss}^{IB}	Domestic currency interbank rate	1.020	1.015	1.010
I_{ss}^{IB*}	FX interbank rate	1.015	1.010	1.010
β	Time preference	0.985	0.990	0.990
r_{ss}^{K}	Return on capital	1.026	1.021	1.018
z_{ss}	Rental rate	0.061	0.056	0.053
mc_{ss}	Marginal cost	0.870	0.870	0.870
C_{ss} / Y_{ss}	Consumption / GDP	0.699	0.681	0.668
G_{ss} / Y_{ss}	Government expend / GDP	0.100	0.100	0.100
K_{ss} / Y_{ss}	Capital stock / GDP	5.733	6.259	6.623
I_{ss} / Y_{ss}	Investments / GDP	0.201	0.219	0.232
X_{ss} / Y_{ss}	Exports / GDP	0.264	0.256	0.256
M_{ss} / Y_{ss}	Imports / GDP	0.240	0.240	0.240
C_{ss}^{H} / Y_{ss}	Consumption share in production	0.553	0.542	0.532
I_{ss}^{H} / Y_{ss}	Investments share in production	0.159	0.174	0.185
G_{ss}^{H} / Y_{ss}	Govern. expend. share in production	0.079	0.079	0.079
X_{ss}^{H} / Y_{ss}	Exports share in production	0.209	0.204	0.204
tb_{ss}	Trade balance	0.024	0.016	0.016

5.5. Monetary Policy Strategies and Welfare Implications

The efficiency and effectiveness of a monetary policy tool is broadly determined by its contribution to the objective function of a central bank. We examine the efficiency and effectiveness of the alternative monetary policy tools through their contribution to the objective function of the central banks. The model is solved and simulated through Dynare (2011). We assume that the economy faces with two groups of shocks with the same intensity. The first group of shocks includes the domestic shocks: inflation, consumption and productivity shocks. The second group of shocks includes the external shocks: foreign inflation, foreign demand and country risk premium shocks. We analyze the effects of the

dollarization on the efficiency of the alternative operating frameworks through comparing their performance under 0.01 % and 40 % dollarization cases.

Alp and Elekdağ (2011) estimate the coefficients of the reaction function of the CBRT with the actual data. They estimate the persistence parameter as 0.73, the coefficient of inflation gap as 1.5, the coefficient of output gap as 0.02, and the coefficient of the change in exchange rate as 0.17. On the other hand, Roger et al. (2009) work with a calibrated model. They note that, though higher coefficients could result in lower loss function, they search for the optimum parameters in a restricted range. While their search region for the coefficient of the inflation ranges from 1.05 to 2.4, the coefficient of the output ranges from 0.25 to 1.6. Following the relevant literature, they set the policy inertia parameter as 0.7.

In our approach, the optimal parameters of the reaction functions are found by the brute force method. In other words, we search for the minimums of the loss functions for different combinations of the parameter values within a restricted range with the 0.10 increments. We assume that, there is some policy inertia to represent the central bank's gradual reactions to the changes in the related variables. Following Alp and Elekdağ (2011) and the relevant literature, we prefer 0.70 for the interest rate smoothing. We also assume that central bank prefers 0.70 for the macro prudential and capital control tools smoothing parameters, by taking the cost or practical difficulties of the adjustments into account. Since our earlier trials resulted in significantly higher coefficient for the inflation than Roger et al (2009) and Alp and Elekdağ (2011), our search for the optimal parameters is performed in the following ranges:

$$1.5 \le \rho_{\pi} \le 3.5 \;\; ; \;\; 0.0 \le \rho_{y} \le 1.5 \; ; \; 0.0 \le \rho_{q} \le 1.0 \;\; ; \;\; 0.0 \le \rho_{l} \le 1.0 \; ; \; 0.0 \le \rho_{tb} \le 1.0$$

$$-0.5 \le \rho_{q,mp} \le 0.5 \;\; ; \;\; 0.0 \le \rho_{l,mp} \le 1.0 \;\; ; \;\; 0.0 \le \rho_{tb,mp} \le 1.0$$

$$-0.8 \le \rho_{q,cc} \le 0.1 \;\; ; \;\; 0.0 \le \rho_{l,cc} \le 1.0 \;\; ; \;\; 0.0 \le \rho_{tb,cc} \le 1.0$$

All shocks are assumed to have a zero mean with a 1 standard deviation. Therefore, the response of a variable to a shock can be interpreted as a percentage deviation from the steady state. In addition, equal standard deviations imply that the importance and probability of each type of shocks are equal. On the other hand, in simulations, "periods" is selected as 1000. It implies that each simulation involves a 1000 period run. Dynare (2011) automatically replicates the 1000 period run for

each kind of shock 50 times and delete the first 100 observation to eliminate the effects of the initial seeds. Then, the output includes the moments of each variable.

In welfare analysis;

(i) We firstly search for the optimal coefficients of the interest rate rule under the base line "single goal, single tool" framework. In this case, the central bank's objective is to minimize the volatilities of the inflation and output. The relative weight of the output gap (λ_y) is set as 0.50.

(ii) Then, we search for the optimal coefficients of the interest rate rule under the "multiple goals, single tool" framework. In this case, the central bank's objective is to minimize the volatilities of the inflation, output, loan and trade balance. While the relative weight of the output gap (λ_y) is set as 0.50, the relative weights of the loans (λ_l) is 0.05 and trade balance (λ_{tb}) are set as 0.20. Since the volatility of the loans is significantly higher than the other variables, we preferred a small weight for it.

(iii) Under the alternative "multiple goals, multiple tools" operating frameworks, we firstly add the macro prudential tool to the policy tool set to target the volatilities of the inflation, output, loan and trade balance. We assume that, the macro prudential tool is specifically used for the stability of the loans and trade balance in line with the Timbergen principle.

(iv) Then, we include the capital control tool in addition to the interest rate and macro prudential tools for the financial stability goal in our policy tool set.

For the efficiency analysis of the alternative monetary policy operating frameworks; in addition to the weighted sum of the volatilities of inflation, output, loans and trade balance (Loss-2), we also provide the weighted sum of the volatilities of the inflation and output (Loss-1) even though the policy tools target to minimize the weighted sum of the volatilities of all goal variables. The results of the optimized coefficients and loss values (i) with the base line parameters are given in Table 5.5, (ii) with the alternative pricing and habit persistence parameters are given

in Table 5.6. Although the base line parameters result in significantly larger volatilities, the basic conclusions for the alternative policy frameworks do not change. For that reason, we only discuss the alternative parameters which are more close to the literature.

The main observations are summarized as follows (Table 5.6):

(i) The interest rate alone can not reduce, in fact increases a bit the loss values when the financial stability goal is included in the objective function. While Loss-2 increases from 150 to 153 in 0.01 % dollarization case, it increases from 174 to 176 in 40 % dollarization case. In addition, Loss-1 also slightly increases relative to "single goal, single tool" operating framework. Therefore, this result is consistent with the widely accepted view that, the interest rate alone is a poor tool to deal with multiple goals as the Tinbergen rule implies.

(ii) The macro prudential tool significantly reduces Loss-1 and Loss-2. While the macro prudential tool reduces Loss-2 from 174 to 78 in 40 % dollarization case, it reduces Loss-2 from 150 to 50 in 0.01 % dollarization case. Although its impact on inflation and trade balance is not significant, the macro prudential tool reduces the volatilities of loan and output significantly.

(iii) Loss-1 and Loss-2 significantly declines when the capital control is also included in the policy tool set in addition to the interest rate and macro prudential tools. It effectively in reduces the volatilities of the loans, output and trade balance. The effectiveness of the capital control increases when the dollarization deepens. When the capital control is added to the policy tool set, while Loss-2 declines from 50 to 39 in 0.01 % dollarization case, it declines from 78 to 42 in % 40 dollarization case.

(iv) Although the losses increase with the increase in dollarization, when the capital control cost is used, the impact of dollarization diminishes to the negligible level.

(v) We should note that, "multiple goals" framework increases the volatility of inflation even though supplementary policy tools are used.

However, the increase in the volatility of inflation is significantly lower than the decline in the volatility of output.

Table 5.5. Monetary Policy Rule Coefficients and Welfare Loss for Alternative Monetary Policy Strategies with Base Case Parameters

Coeff. and Loss Values	% 1 Dollarization Case				% 49 Dollarization Case			
	Goals (π ; y)	Goals (π ; y ; l ; tb)			Goals (π ; y)	Goals (π ; y ; l ; tb)		
	$\hat{i}^{CB}$	$\hat{i}^{CB}$	$\hat{i}^{CB} + \hat{\phi}^{MP}$	$\hat{i}^{CB} + \hat{\phi}^{MP} + \hat{\phi}^{CC}$	$\hat{i}^{CB}$	$\hat{i}^{CB}$	$\hat{i}^{CB} + \hat{\phi}^{MP}$	$\hat{i}^{CB} + \hat{\phi}^{MP} + \hat{\phi}^{CC}$
ρ_i	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
ρ_π	3.3	3.2	3.2	3.3	3.3	3.1	3.3	3.3
ρ_y	0.1	0.1	0.1	0.1	0.2	0.1	0.1	0.1
ρ_l		0.2				0.1		
ρ_{tb}		0.2				0.4		
ρ_{mp}			0.7	0.7			0.7	0.7
$\rho_{q,mp}$							-0.2	
$\rho_{l,mp}$			0.4	0.5			0.8	0.6
$\rho_{tb,mp}$			0.4				0.3	
ρ_{cc}				0.7				0.7
$\rho_{q,cc}$				-0.6				-0.8
$\rho_{tb,cc}$				0.7				0.6
var $\hat{\pi}$	28	109	60	78	33	94	67	70
var $\hat{y}$	748	698	188	87	566	541	223	99
Loss-1	**402**	**458**	**154**	**122**	**316**	**365**	**179**	**120**
var $\hat{l}$	3707	4214	480	580	6678	7077	1077	828
var $\hat{tb}$	20	19	26	10	19	18	32	8
Loss-2	**591**	**673**	**183**	**153**	**652**	**772**	**239**	**163**
var $\hat{q}$	8501	7959	6272	1256	7016	6653	6846	756

Table 5.6. Monetary Policy Rule Coefficients and Welfare Loss for Alternative Monetary Policy Strategies with Alternative Parameters

Coeff. and Loss Values	% 1 Dollarization Case				% 49 Dollarization Case			
	Goals $(\pi\ ;\ y)$	Goals $(\pi\ ;\ y\ ;\ l\ ;\ tb)$			Goals $(\pi\ ;\ y)$	Goals $(\pi\ ;\ y\ ;\ l\ ;\ tb)$		
	$\hat{i}^{CB}$	$\hat{i}^{CB}$	$\hat{i}^{CB} + \hat{\phi}^{MP}$	$\hat{i}^{CB} + \hat{\phi}^{MP} + \hat{\phi}^{CC}$	$\hat{i}^{CB}$	$\hat{i}^{CB}$	$\hat{i}^{CB} + \hat{\phi}^{MP}$	$\hat{i}^{CB} + \hat{\phi}^{MP} + \hat{\phi}^{CC}$
ρ_i	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7
ρ_π	3.2	3.2	3.3	3.2	3.1	3.2	3.3	3.3
ρ_y	0.1	0.2	0.1	0.1	0.1	0.2	0.2	0.1
ρ_{tb}		0.2				0.3		
ρ_{mp}			0.7	0.7			0.7	0.7
$\rho_{q,mp}$			-0.1				-0.3	
$\rho_{l,mp}$			0.5	0.5			0.5	0.6
$\rho_{tb,mp}$			0.6				0.5	
ρ_{cc}				0.7				0.7
$\rho_{q,cc}$				-0.7				-0.8
$\rho_{tb,cc}$				0.7				0.6
var $\hat{\pi}$	6	9	13	20	8	10	11	20
var $\hat{y}$	162	160	54	15	128	127	65	16
Loss-1	**87**	**89**	**40**	**28**	**72**	**73**	**43**	**28**
var $\hat{l}$	1186	1223	136	190	1984	2005	635	260
var $\hat{tb}$	15	15	18	5	15	15	17	5
Loss-2	**150**	**153**	**50**	**39**	**174**	**176**	**78**	**42**
var $\hat{q}$	3062	3001	3156	458	3062	2724	2877	338

The financial accelerator mechanism is one of the key factors in the transmission mechanism. The financial accelerator mechanism works mainly through the firms' external risk premium which is a function of the leverage ratio. When the dollarization increases, the impact of a change in real exchange rate on the net worth of the entrepreneurs signifies. The main function of the supplementary tools is to smooth out the effects of the domestic and external shocks on the loan supply and exchange rates. These tools simply differentiate the interest rate for the

residents and non-residents. While the macro prudential tool enables the central bank to change the TL loan rate without changing the policy rate, the capital control tool enables the central bank to change the exchange rate without changing the policy rate, in addition to its impact on the FX loan rate.

For example, when only the policy rate is used, in case of an external shock which increases the country risk premium; (i) currency depreciates through the uncovered interest rate parity condition, (ii) depreciation weakens the firms' balance sheet (which increases the firms' credit risk premium), reduces the loan demand and increases inflation, (iii) central bank increases the interest rate to contain the inflationary pressures, (iv) while the depreciation increases the exports, increase in interest rate and firms' risk premium reduces consumption and investment, and therefore (v) while inflation increases, output declines. However, when the supplementary tools are reduced; (i) while the macro prudential tool can reduce the impact of an increase in the firms' risk premium on TL loan rate, (ii) the capital control can reduce the impact of an increase in the country risk premium on exchange and FX loan rates.

Our results are also consistent with the results of Towbin and Glocker (2011) which have a similar model and Unsal (2011). Though, the macro prudential tool is transferred to the interbank lending rate in our setting, Towbin and Glocker (2011) assume that, the cost of the macro prudential cost is distributed among the deposit and interbank rates. They do not include the capital control as a policy tool. In addition, they do not allow partial dollarization, but compare the non-dollarization case with the full dollarization case to analyze the impact of the dollarization. The loan stock is also a proxy for the financial stability in their model. The shocks and their intensities are different than ours, therefore, their loss values are significantly different. They find that; under "single goal" operating framework, the loss value declines from 23.2 to 17.0 when the macro prudential tool (which is required reserves) is added to the policy tool set to target the loan stock. When the financial stability is included in the objective function, their loss function declines from 40.2 to 21.4 as the macro prudential tool is included in the policy tool set. Unsal (2011) compares the performances of the standard Taylor rule and Taylor rule supplemented by the generic macro prudential and capital control tools. She reaches

similar results and shows that, the sum of the volatility of the output and inflation declines especially when the macro prudential tool supplements the interest rate rule.

To conclude this chapter, our results support that; (i) "single goal, single tool" operating framework is not efficient in open economies, (ii) "multiple goals, single tool" can not improve the effectiveness of the monetary policy, and (iii) macro prudential and capital controls can improve the flexibility and efficiency of the monetary policy even under the "single goal, multiple tools" framework in addition to their significant contributions under the "multiple goals, multiple tools" framework. The coordinated use of the supplementary policy tools and policy rate improves the social welfare through reducing the volatilities of the output, loan stock and trade balance. Our last but not the least conclusion is that; the social welfare improves under the "multiple goals, multiple tools" operating framework, therefore, the financial stability and external stability objectives do not contradict with, in fact supports the price stability and output stability objectives as long as the central bank use supplementary tools coherently.

The shocks and their impacts on the main economic variables under the hybrid monetary policy strategy which also includes the capital control and macro prudential tools are given in the Figures 5.5 – 5.10.[150] The descriptions of the variables used in these graphs are provided in Table 5.7. The contributions of the supplementary tools in cases of the risk premium, productivity and foreign inflation shocks are provided in Figures 5.11 – 5.13. In these figures, while the dashed lines show the responses of each variable under the base line "single goal, single tool" operating framework, solid lines shows the responses under the "multiple goals, multiple tools" operating framework.

[150] Hybrid monetary policy stands for the use of all policy tools at the same time.

Table 5.7. Descriptions of the Variables in Figures 5.5 – 5.12

Parameter	Description
a	Productivity shock
enf_shk	Domestic Inflation shock
eta_c	Domestic consumption shock
eta_rp	Country risk premium shock
eta_yf	External demand shock
eta_inff	Foreign inflation shock
i_cb	Central bank policy rate
i_mp	Macro prudential cost rate
i_cc	Capital control cost rate
i_IBav	Average of TL and FX interbank rate
q	Real exchange rate
tb	Trade balance
b_f	External debt stock ratio to GDP
crp	Country risk premium
frp	Firms' external finance premium
l	Loan stock
n	Firms' net worth
Q	Real price of capital
i	Investments
c_t	Total consumption
y	Domestic output
inf_m	Imported goods inflation
enf	Total consumer goods inflation

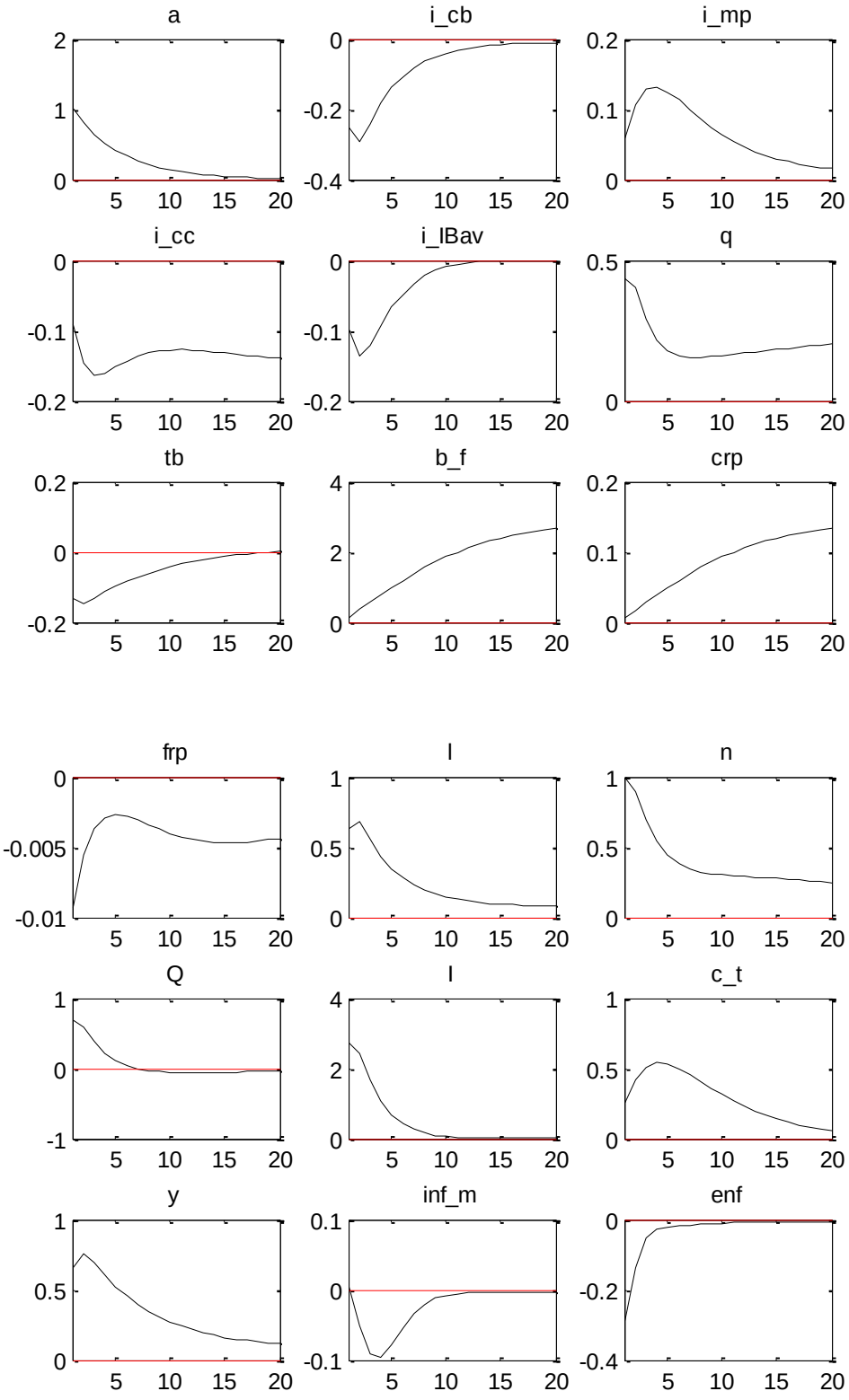

Figure 5.5: Productivity Shock

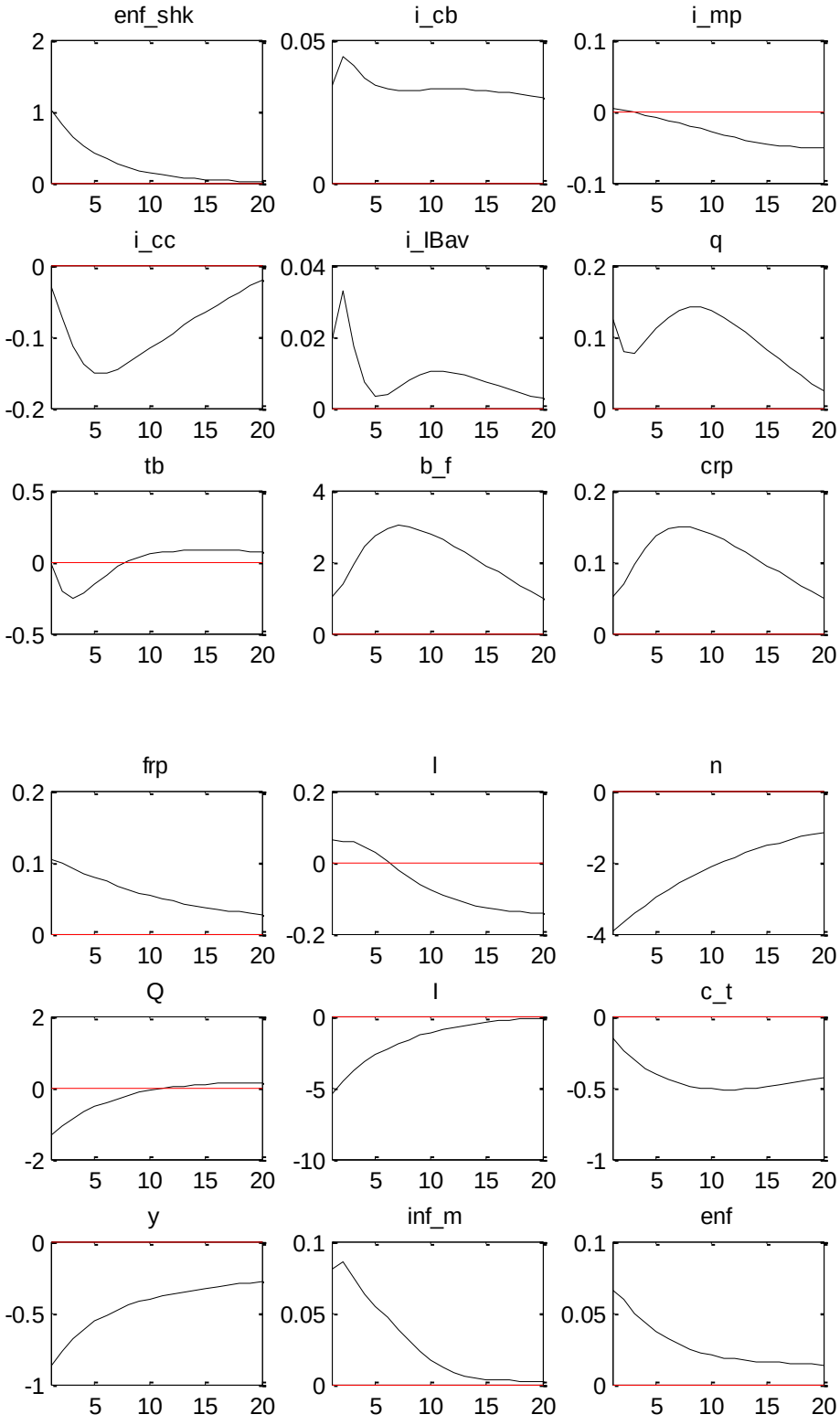

Figure 5.6: Domestic Inflation Shock

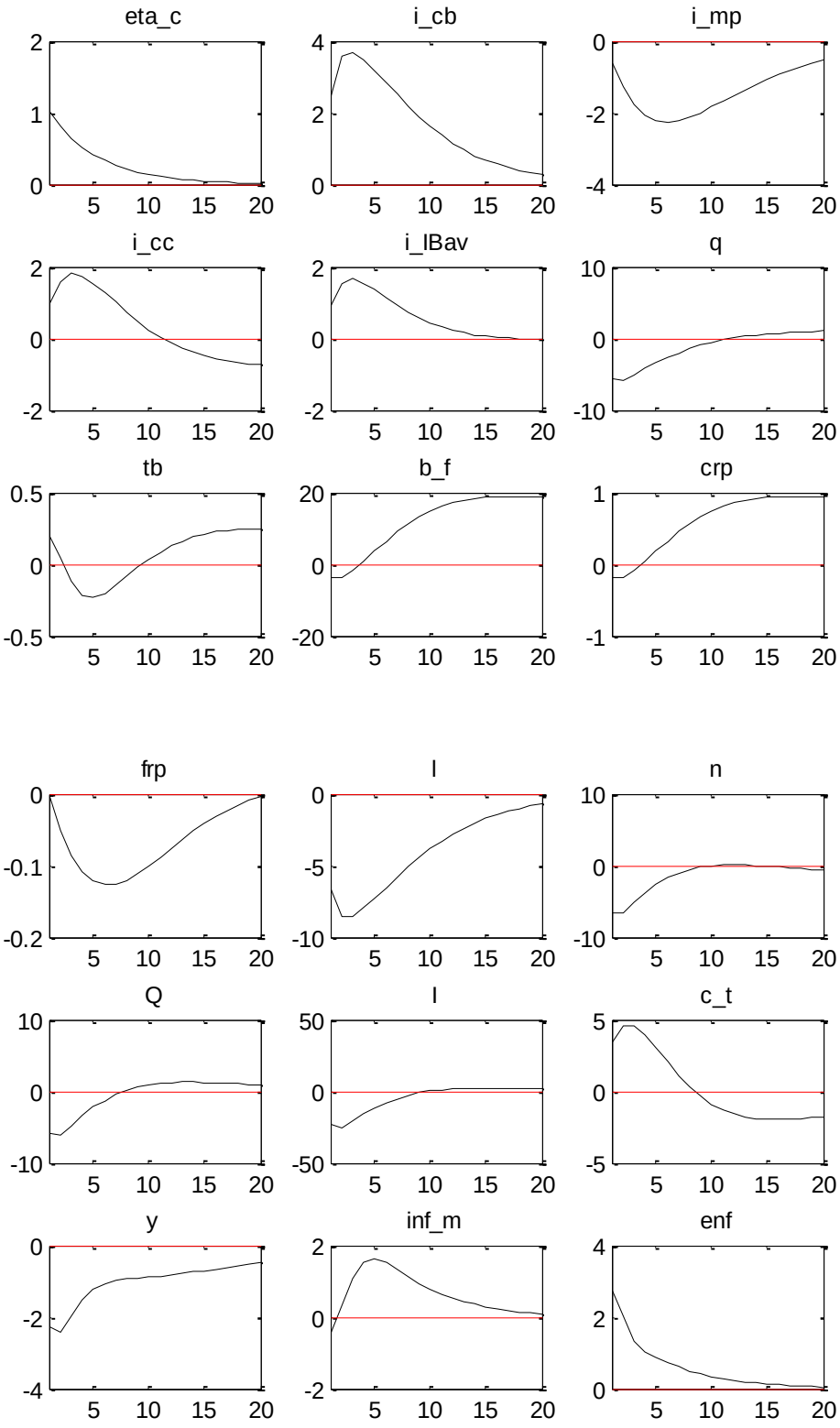

Figure 5.7: Domestic Demand Shock

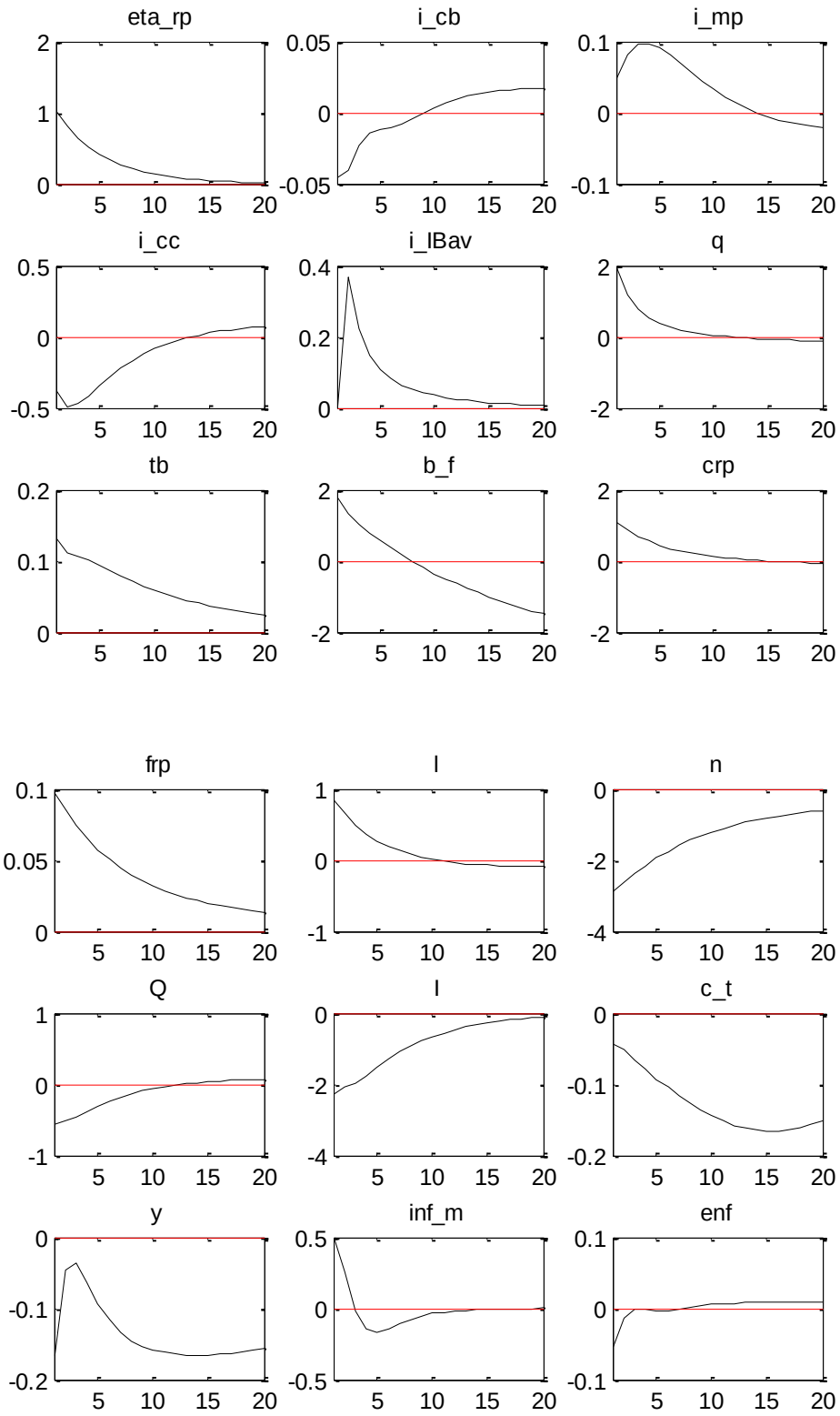

Figure 5.8: Country Risk Premium Cost

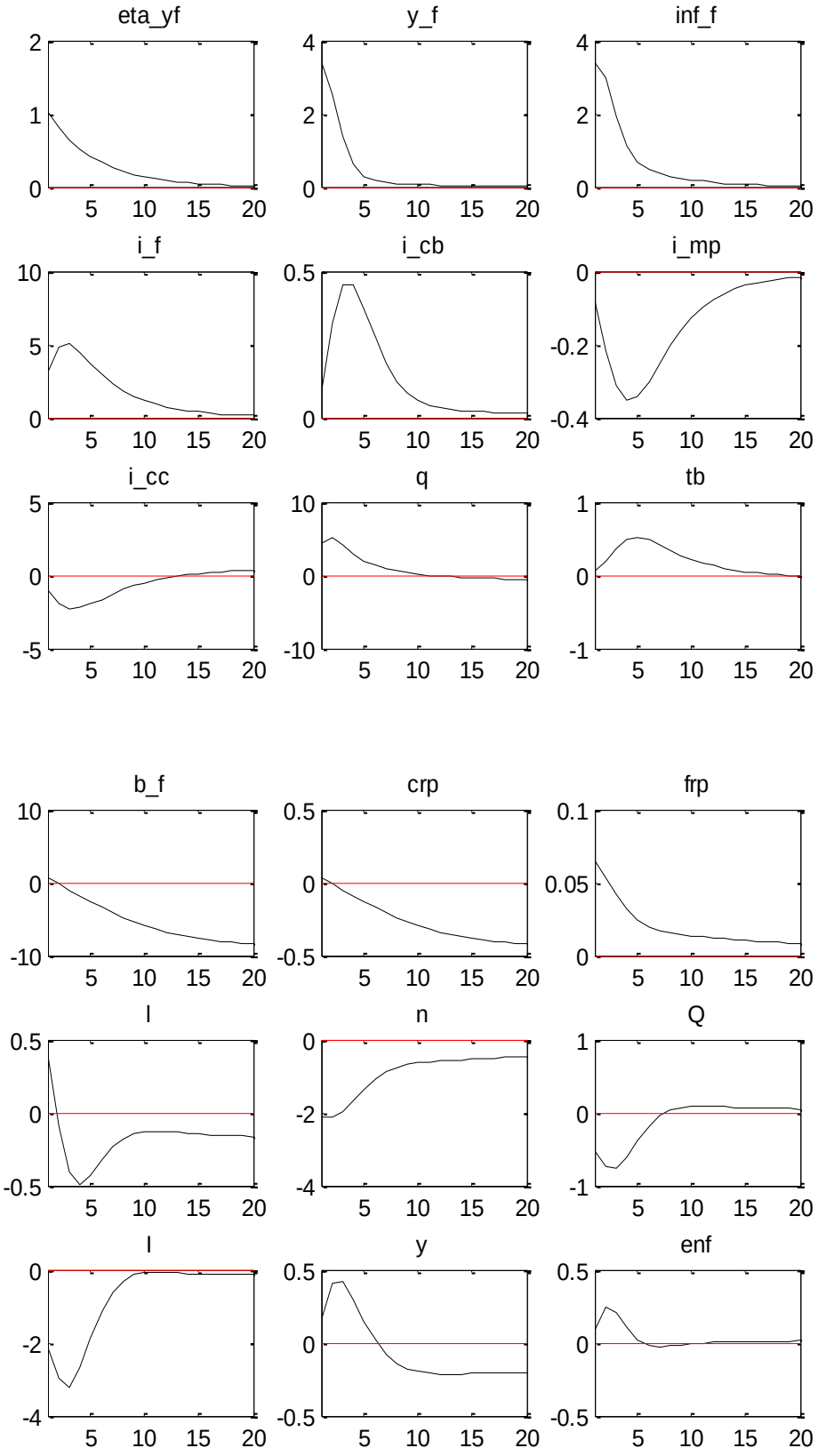

Figure 5.9: External Demand Shock

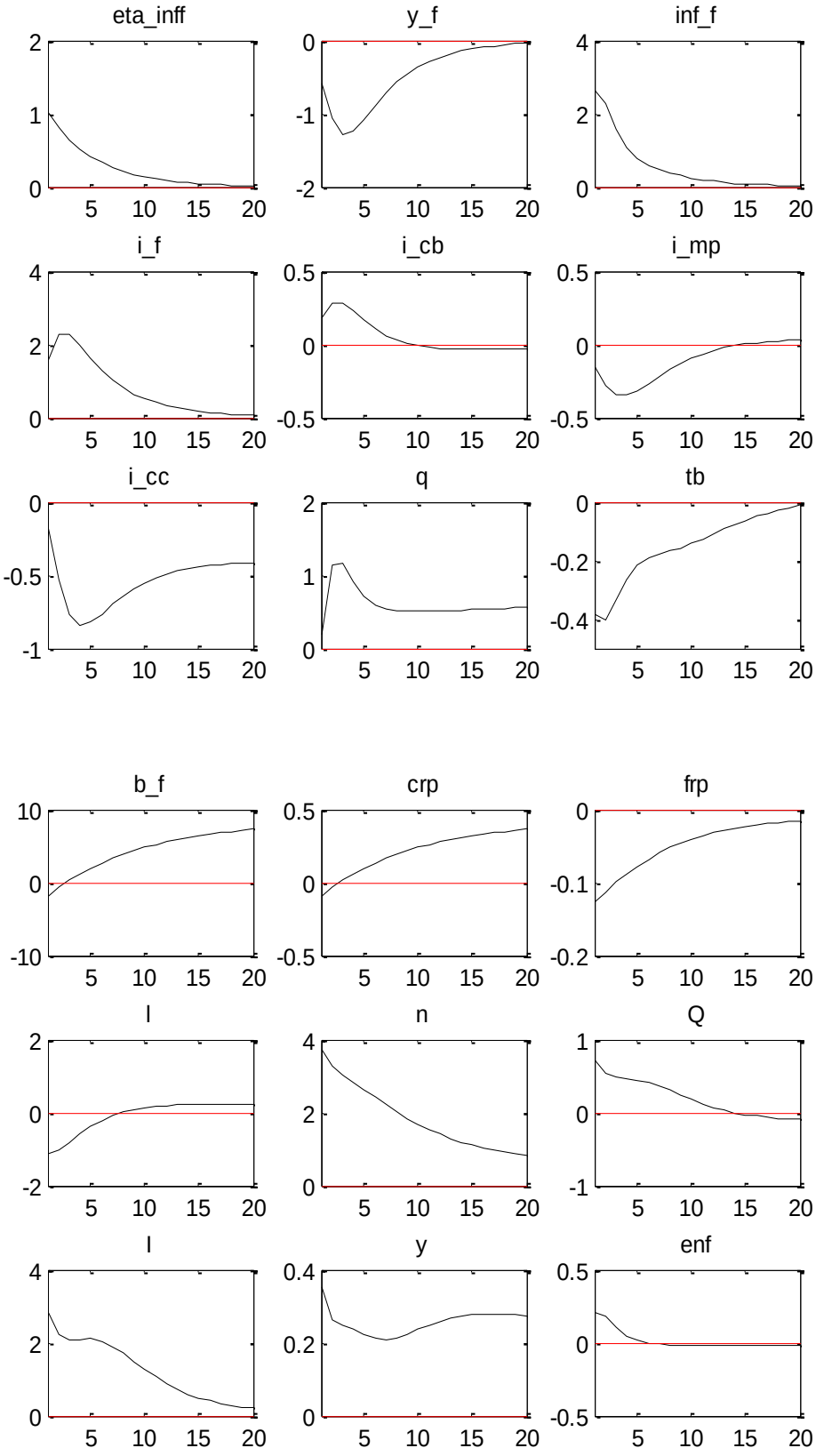

Figure 5.10: Foreign Inflation Shock

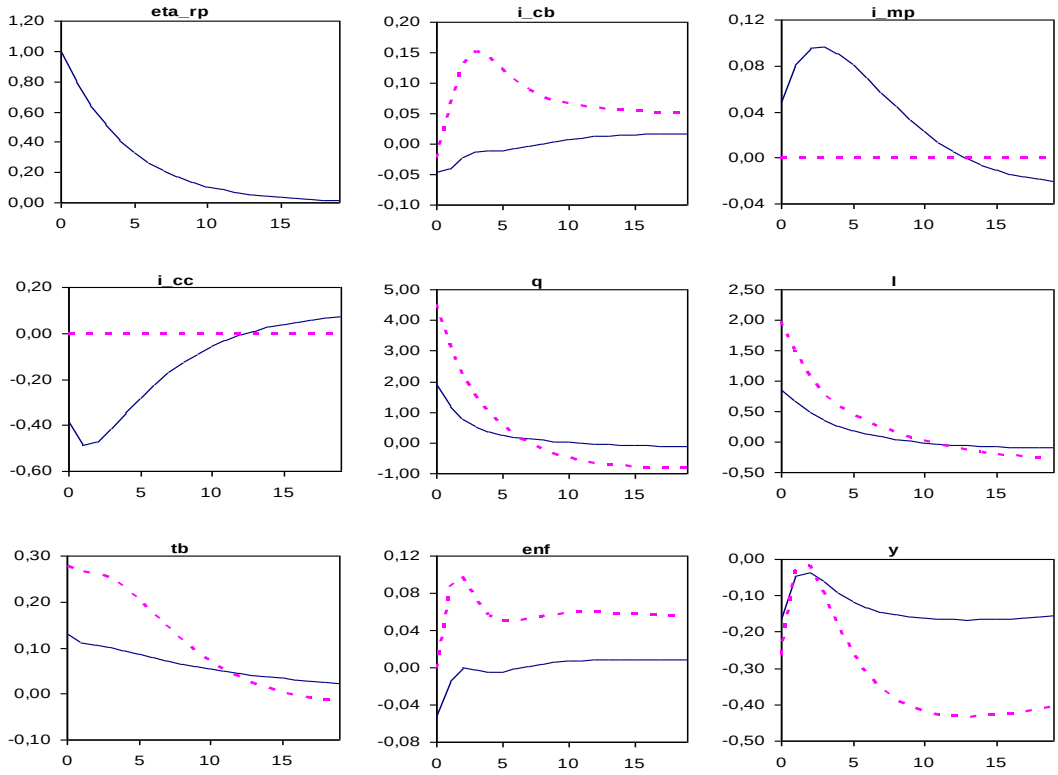

Figure 5.11: Country Risk Premium Shock and Volatilities Under Alternative Policy Frameworks

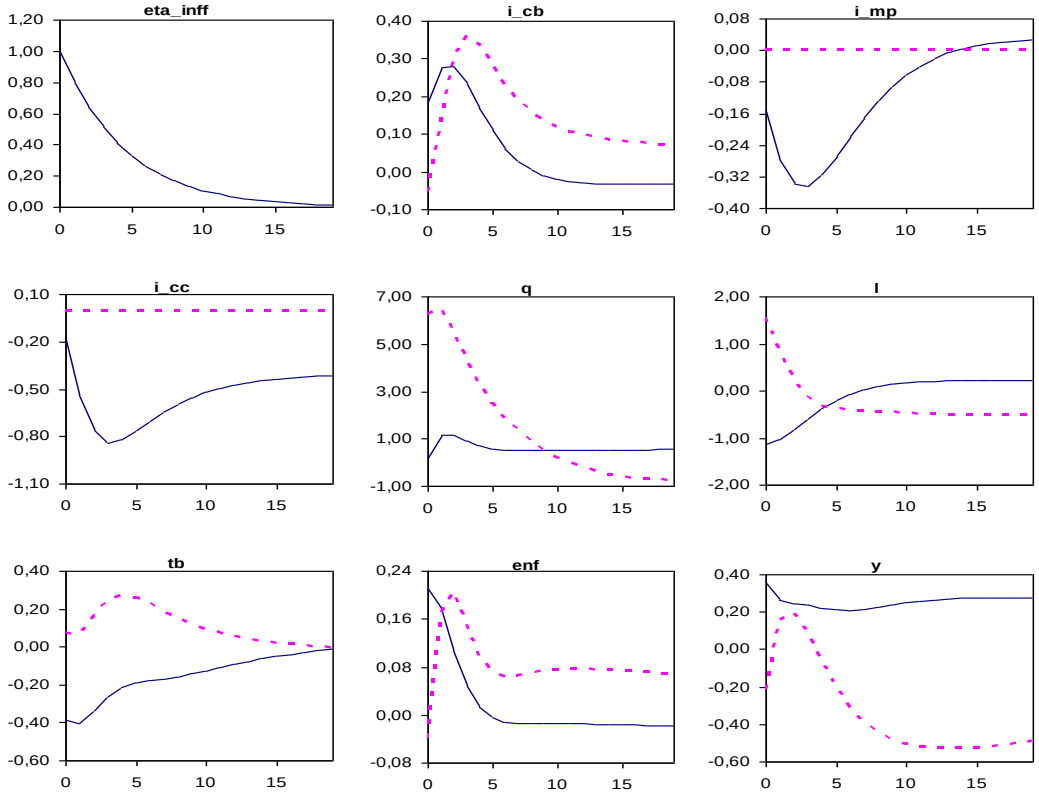

Figure 5.12: Foreign Inflation Shock and Volatilities Under Alternative Policy Frameworks

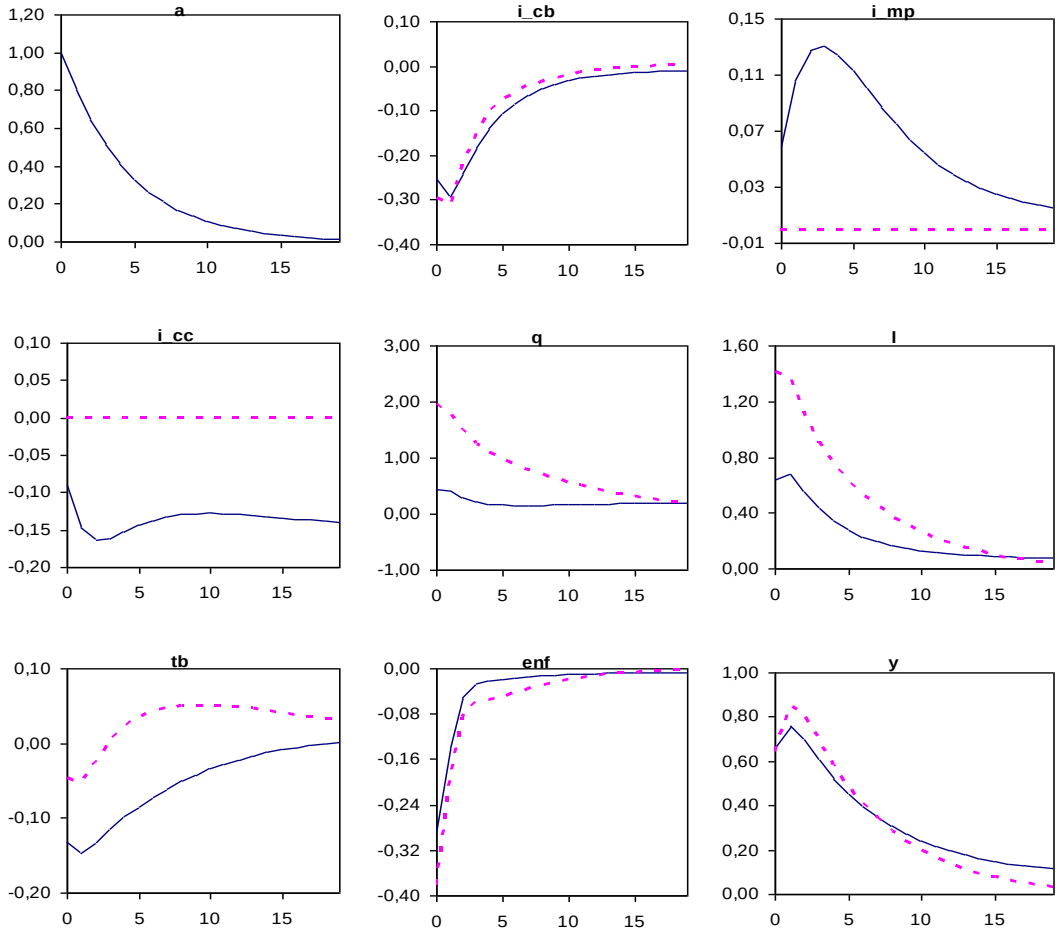

Figure 5.13: Productivity Shock and Volatilities Under Alternative Policy Frameworks

CHAPTER 6

CONCLUSION

The ultimate objective of the economic policies is to achieve high and sustainable growth rates. Since late 1970s, it has been widely accepted that the monetary policy can best contribute to the economic growth through providing price stability. This consensus shifted the central banking focus on price stability through the flexible inflation targeting strategy within the "single goal – single tool" operating framework since 1990s. However, the history suggests that in addition to the price stability, financial stability is another pre-condition of a high and sustainable economic growth. Though the success of the price stability oriented inflation targeting strategy is widely appraised, the financial imbalances built up in a low inflation environment during the pre-global crisis period and the cost of the global crisis highlighted; (i) the inefficiencies of the "single goal – single tool" monetary policy operating framework on the financial stability side, and (ii) the need for the supplementary policy tools to increase the flexibility of the conventional inflation targeting framework to deal with the financial imbalances. Within this perspective, this study investigates whether the conventional flexible inflation targeting strategy within the "single goal – single tool" operating framework can be improved through including the financial stability in the objective function and the macro prudential and capital control instruments in the policy tool set in a "multiple goals – multiple tools" operating framework in Turkish case.

The literature review in Chapter 2 provides some robust theoretical support and empirical evidence on; (i) the inefficiency of the short term interest rate to target the financial and economic imbalances, and (ii) the effectiveness of the coordinated use of the macro prudential tools such as required reserves, capital adequacy and liquidity ratios, and capital controls whenever necessary. According to the proponents of the active participation of the central banks in reducing macroeconomic and financial imbalances, the monetary policy should focus not only on short run inflation, but should also target these imbalances by considering their

longer run impacts on the volatilities of the inflation and output. The growing literature also supports that, the inefficiency of the "single goal, single tool" monetary policy operating framework is more apparent in emerging countries. Since the capital flows work pro-cyclically, the international liquidity conditions and consequential capital flows problem limit the flexibility and effectiveness of the monetary policy. Therefore, since these countries are also prone to large volatilities in inflation and output as a result of the significant impact of the exchange rate volatility on the prices and balance sheet of the private sector, the active use of the supplementary policy tools can increase the flexibility and effectiveness of the monetary policy as long as they are used counter-cyclically and coherently.

The analytical studies generally support that, targeting the financial imbalances, output and inflation altogether do not conflict with each other in the longer term, as long as the central bank independence and main price stability objective are maintained. In other words, maintaining price stability as a main goal, central banks can (and should) include financial (including exchange rate) stability explicitly in their objective functions. Therefore, to be consistent with the Tinbergen principle, central banks should also widen the policy tool set consistent with the additional targets to increase the flexibility and effectiveness of the policy rate.

The macroeconomic developments and structure of the credit and financial markets discussed in Chapter 3 provide a solid ground to reach some conclusion on the necessity for the supplementary policy tools in Turkish case. After year 2001, as a result of the price stability oriented monetary, prudent fiscal and effective banking system micro prudential polices, the economic performance has significantly improved relative to the economic performance of the earlier decade. However, while (i) the initial conditions for an explicit inflation targeting framework were successfully satisfied in just 4 years, (ii) the inflation rate was reduced from 54.2 % to 8.2 % during 2002 – 2005 after a long high and chronic inflation period, and (iii) the average growth rate increased up to 7.2 % in 2002 – 2006; the CBRT could not be successful to contain the level and volatility of the inflation at low levels thereafter. During 2006 – 2011, while the inflation rate fluctuated between 6.3 % and 10.4 %, average growth rate declined to 3.6 % which was significantly lower than the average growth rate of other emerging countries. In addition, the volatility of the growth rate significantly increased.

On the monetary policy side, the main challenge that the CBRT faced with during the last 10 years has been heavy foreign capital inflows. While the heavy foreign capital inflows; (i) supported the economic growth through easing the credit conditions by improving the liquidity conditions and increasing the loan supply, and (ii) the disinflation process by appreciation, it reduced the effectiveness of the short term interest rate on the domestic economic activity and loan markets. While the capital inflows which are induced by prudent domestic policies and global liquidity conditions enhanced the virtuous cycle in the economy during 2000s, it also caused significant output and inflation volatilities during the reversals.

In addition to the decline in macroeconomic performance in the second half of 2000s, Turkey has also built up significant macroeconomic imbalances that will likely to endanger these achievements through increasing the volatilities in financial markets and growth rates in the near future. In this period, while the average current account deficit to GDP ratio exceeded the 5 % threshold level significantly as a result of the decline in the private savings, the external debt stock increased to very high level. Therefore, the dependence of the economic performance to the foreign capital increased. The imbalances built up during the recent years also suggest that, it may be too early to reach a sustainable "success story" on growth performance.

Although, pull factors stemming from the domestic policies can have significant effects on the capital flows, the terms and conditions of the external resources are mainly determined by the international liquidity conditions. The high shares of the FX loans and external resources in the total loan supply in Turkey point out that; (i) the CBRT has a weak control over the domestic credit market and demand through only the short term policy rate within a "single goal, single tool" policy framework, and (ii) the CBRT should have more room to "lean against the wind" and conduct counter-cyclical policies to reduce the volatilities of inflation, growth, and to contain financial risks.

In fact, the main features of the financial system and structure of the credit markets are key factors that determine the effectiveness of the alternative policy tools, and the efficiency of the monetary policy operational framework of a country. In Chapter 3, we also conclude that; (i) the banking system has a dominant role in the domestic TL and FX credit markets, (ii) while there is a well developed government securities market, the private sector securities markets are not

developed, (iii) since they prefer deposits as the main investment instrument, households are not very active in the securities markets, (iv) the domestic credit market is highly dollarized, and (v) non-residents are also key players in credit and securities markets, therefore, the CBRT has to consider the reactions of the non-residents. This financial structure suggests that, capital controls and other supplementary policy tools used on the assets and liabilities of the banking system are likely to be very effective.

In fact, the analytical and econometric evidence on the determinants of the loan and deposit rates supports that the supplementary tools can effectively and counter-cyclically be used to increase the flexibility of the monetary policy in Turkey. The analytical discussions in Chapter 4 show that; (i) the main determinants of the loan and deposit rates are the policy rate, required reserve system and capital adequacy and liquidity ratios, and (ii) the required reserve system can significantly affect the loan rates through its direct cost effect and indirect liquidity effect. In the empirical part of this chapter, we find that, % 1 change in the TL required reserves changes the TL loan rate by 50 basis points through its liquidity and direct cost effects. In this part, we also find that, when the liquidity effect outweighs the direct cost effect, in contrast to theoretical explanations, the cost of the TL required reserves can not be transmitted to the TL depositors. Therefore, TL deposits and open market operations funding are not close substitutes. The analysis of this chapter also implies that the coordinated use of the capital adequacy and liquidity ratios and required reserves can reinforce the effects of each tool to change the monetary policy stance.

Although it is based on the calibrated parameters, since the DSGE model used in Chapter 5 relies on realistic calibrated parameters and represents the main features of the Turkish economy, it provides more complete and concrete analysis on the efficiency and effectiveness of the supplementary policy tools. The efficiency and effectiveness of a monetary policy tool is broadly determined by its contribution to the objective function of a central bank. We examine the efficiency and effectiveness of the alternative monetary policy tools through their contribution to the objective function of the central bank for two cases: Loss-1 and Loss-2. Loss-1 is the weighted sum of the volatilities of the inflation and output, and Loss-2 is the weighted sum of the volatilities of the inflation, output, loan stock and trade balance.

The results show that; macro prudential and capital control tools can significantly reduce the volatilities of the output and loan without significantly distorting the volatility of the inflation in a "multiple goals, multiple tools" operating framework. In fact, the results suggest that, capital control and macro prudential tools are very effective and efficient tools to reduce the volatility of the output even though central bank does not include the loan and trade balance in her objective function explicitly. In addition, the effectiveness of the capital control increases when the financial dollarization deepens. For example, under the "multiple goals" operating framework, if the firms' balance sheet is 40 % dollarized, while the Loss-1 is 72 when the interest rate rule is used, it declines to 43 when the interest rate and macro prudential rules are used together, and it declines to 28 when the interest rate, macro prudential and capital control rules are used altogether.

In fact, the simulation results of the DSGE model shows that; though Loss-1 which is a weighted sum of the volatilities of the inflation and output slightly increases when the loan and trade balance stability goals are included in the objective function in the "multiple goals, single tool" operating framework, it declines when these goals are included in the "multiple goals, multiple tools" operating framework. This result strongly implies that, the financial stability goal does not conflict with the inflation and output stability goals when the supplementary policy tools are used. Therefore, the results of the DSGE model analysis strongly support the use of the macro prudential tools and (to some extend) capital controls even under the conventional flexible inflation targeting regime without any explicit financial stability objectives. Including an explicit financial stability objective strengthens the arguments for an active and flexible use of these tools.

To conclude the study; (i) the interest rate policy alone is a poor tool to deal with the financial and external imbalances in Turkey, (ii) the consistent use of the macro prudential and capital control tools can significantly increase the flexibility of the interest rate for the inflation and output stabilization purposes, in addition to their significant contribution to the financial stability goal (which is represented by the loan and trade balance stability).

Therefore, we suggest that; (i) since the consistent use of the macro prudential tools in line with the Tinbergen principal requires a coherent coordination

among the related institutions which decide on each tools, the CBRT should have a leading role in the macro prudential policy decision making process, (ii) transferring the control of the tools related with the balance sheets of the banking system to the CBRT can improve the effectiveness and flexibility of the monetary policy, (iii) since including the macroeconomic risks such as external balance stability and loan stability in the objective function does not contradict with the flexible inflation targeting framework, the CBRT should also target these imbalances explicitly when she is empowered with the additional macro prudential tools, (iv) since the Resource Utilization Fund levy which is mentioned in Chapter 3 is a very flexible and effective capital control tax, the active use of this tool can enhance the effectiveness of the monetary and macro prudential tools to smooth out the effects of the external credit conditions on the domestic credit conditions, and (v) introducing a flexible reserve requirement system to the non-residents' money market transactions such as to the swap transactions can definitely reduces the volatility of the short term capital flow.

When the growing literature and suggestions of the international institutions, such as IMF, BIS and FSB on the macro prudential policies are considered, although it was a bit late, the tools used by the CBRT since the second half of 2010 are broadly consistent with the emerging trend in the central banking and with our conclusions. However, we should note that, Turkey had some unpleasant experience with the credibility problem under a "multiple goal – multiple tool" operating framework in 1990s. It was proved that, a "multiple goal – multiple tool" operating framework was ineffective when the monetary policy was not supported by the prudential and fiscal policies. The more flexible monetary policy framework requires credibility and coherent coordination with the fiscal and micro and macro prudential policies.

However, we should remember that, one of the principle functions of the monetary policy is managing the expectations in modern central banking. As the "flexibility" of the monetary policy framework increases; it is likely that, while its transparency diminishes, the "price" of the credibility or "cost" of the mistakes increases. In our central banking experience, we frequently observed that, it is easier to communicate with the markets through simple operational frameworks. We frequently noted that "simple is beautiful". In this context, though our results and

analysis support the rule based coordinated use of the macro prudential and capital control tools, we should note that, we opt for simplifying assumptions. We assume that central bank can control and adjust these costs in terms of interest rates. Although the interest rate is a transparent and observable variable by the public, it is very difficult to know or to estimate the exact impacts and interest rate equivalents of the most of the supplementary policy tools (excluding taxes, such as taxes on all types of loans which have observable impacts similar to the policy rate). Therefore, an active use of the supplementary policy tools may also increase the risk premium and macro economic volatilities, which in fact may reduces the effectiveness of the monetary policy through uncertainty. With the similar reasoning, we have also some doubts on the efficiency of an active use of the corridor system as a supplementary tool. Therefore, in order to reach a robust conclusion, two points should also be clarified in future research: (i) whether a more flexible monetary policy operating framework increases the risk premium and weakens the expectation management role of the monetary policy, and (ii) how an active use of the corridor system affects the frictions in the financial system through increasing in risk premium which can reduce the effectiveness of the monetary policy.

REFERENCES

Adrian, T. and H. S. Shin. (2008). "Financial Intermediaries, Financial Stability and Monetary Policy", prepared for the Federal Reserve Bank of Kansas City Symposium at Jackson Hole, August 2008.

Adler, G. and C. E. Tovar. (2011). "Foreign Exchange Intervention: A shield Against Appreciation Winds", IMF Working Paper, WP/11/165.

Adolfson, M., S. Laseen, J. Linde, and M. Villani. (2005). "Bayesian Estimation of an Open Economy DSGE Model with Incomplete Pass-Through" Sveriges Riskbank Working Paper Series 179, March 2005.

Alexander, W. E., T. J. T. Balino, and C. Enoch. (1996). "Adopting Indirect Instruments of Monetary Policy." Finance and Development, Marc 1996: 14 – 17

Alp, H. and Elekdağ. (2011). "The Role of Monetary Policy in Turkey during the Global Financial Crisis." June 2011.

Alper, K. and S. T. Tiryaki. (2011). "Zorunlu Karşılıkların Para Politikasındaki Yeri", TCMB Ekonomi Notları 2011/08, Nisan 2011.

Altunbaş, Y., L. Gambacorta, and D. Marques-Ibanez. (2009). "An Empirical Assessment of the Risk-taking Channel." ECB.

Angeris, A. and P. Arestis (2008). "Assesing Inflation Targeting through Intervention Analysis." Oxford Economic Papers, Vol. 60(2): 293 – 317.

Aydın, H. A. (2007). "Interest Rate Pass-Through in Turkey." TCMB Working Paper No:07/05, June 2007.

Ball, L., and N. Sheridan. (2005). "Does Inflation Trageting Matter." in The Inflation Trageting Debate, The University of Chicago Press, Chicago and Londan, 2005.

Bank of England, "The transmission mechanism of Monetary Policy.", The Monetary Policy Committee Report.

Barro, R. and D. Gordon. (1983). " A Positive Theory of Monetary Policy in a Natural Rate Model." Journal of Political Economy, 91(4): 589 – 610.

Basçı, E. and Hakan Kara. (2011). "Finansal İstikrar ve Para Politikası." TCMB, Çalışma Tebliği No: 11/08, Mayıs 2011.

Basçı, E., Ö. Özel, Ç. Sarıkaya. (2007). "The monetary transmission mechanism in Turkey: new developments." TCMB Working Paper No: 07/04, June 2007.

Baqueiro, A., A. D. de Leon, and A. Torres. (2002). "fear of floating or fear of inflation? The role of the exchange rate pass-through" BIS Papers No. 19.

Benes, J, M. C. Branco, and D. Vavra. (2007) "A Simple DGE Model for Inflation Targeting." IMF Working Paper, WP/07/197.

Berentsen, A., and C. Monnet. (2008) "Monetary Policy in a Channel System." Journal of Monetary Economics, V. 55(6): 1067 – 1080.

Berentsen, A., A. Marchesiani, and C. J. Waller. (2010). "Channel System: Why is there a Positive Spread?" Institute for Empirical Research in Economics, University of Zurich, Working Paper Series, No. 517, November 2010.

Bernanke, B. S., and M. Gertler. (1995). "Inside the Black Box: The Credit Channel of Monetary Policy Transmission." Journal of Economic Perspectives, V. 9, N. 4, Fall 1995: 27 – 48.

Bernanke, B. S., M. Gertler, and S. Gilchrist. (1999). "The Financial Accelerator in a Quantitative Business Cycle Framework." in the Handbook of Macroeconomics, vol. 1C, ed. J. Taylor and M. Woodford, Chapter 21. North-Holland.

Bernanke, B.S., and M. Woodford. (2005). "Introduction." in The Inflation Targeting Debate, The University of Chicago Press, Chicago and London, 2005.

Bindseil, U. (2004). "The Operational Target of Monetary Policy and The Rise and Fall of Reserve Position Doctrine." European Central Bank Working Paper Series No. 372, June 2004.

Bindseil, U., J. Jablecki. (2011.a). "A structural Model of Central Bank Operations and Bank Intermediation." ECB Working Paper Series, No. 1312, March 2011.

Bindseil, U. and J. Jablecki. (2011.b). "The Optimal Width of the Central Bank Standing Facilities Corridor and Banks' Day-to-Day Liquidity Management." ECB Working Paper Series No. 1350, June 2011.

BIS. (2008). "Transmission mechanism for monetary policy in emerging market economies." BIS Papers No 35, January 2008.

Blanchard, O. G. Dell'Ariccia, and P. Mauro. (2010). "Rethinking Macroeconomic Policy." IMF Staff Position Note, SPN/10/03, February 2010.

Blinder, A.S. (1998). Central Banking in Theory and Practice. The MIT Press, Cambridge, Massachusettes, London England, 1998.

Blinder, A.S. (2010). "How Central Should the Central Bank Be?" CEPS Working Paper No. 198, January 2010.

Boivin, J., T. Lane, and C. Meh. (2010). "Should Monetary Policy Be Used To Counteract Financial Imbalances?" Bank of Canada Review, Summer 2010: 23 – 36.

Boivin, J., M. T. Kiley, and F. S. Mishkin. (2010). "How has the Monetary Transmission Mechanism Evolved over Time?" NBER Working Paper No. 15879, April 2010.

Borio, C. E. V. (1997). "Monetary Policy Operating Procedures in Industrial Countries." BIS Working Papers, No. 40, March 1997.

Borio, C. E. V., and I. Shim. (2007). "What can (macro-)prudential policy do to support monetary policy?." BIS Working Papers, No. 242, December 2007.

Borio, C. and H. Zhu. (2008). "Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?" BIS Working Papers, No 268, December 2008.

Borio, C., and P. Disyatat. (2009). "Unconventional monetary policies: an appraisal." BIS Working Papers, No 292, November 2009.

BRSA. (2006.a). "Regulation on Measurement and Evaluation of Capital Adequacy of Banks."http://www.bddk.org.tr/WebSitesi/english/Legislation /8826sermayeyeterliligi.pdf

BRSA. (2006.b). "Regulation on Measurement and Evaluation of Liquidity Adequacy of Banks." http://www.bddk.org.tr/WebSitesi/english/Legislation /8840likidite.pdf

BRSA. (2010). "From Crisis to Financial Stability (Turkish Experience)." Working Paper (Revised Third Edition), September 3, 2010.

Brooks, P.K. (2007). "The Bank Lending Channel of Monetary Transmission: Does It Work in Turkey?" IMF Working Paper, WP/07/272, December 2007.

Buzeneca, I., and R. Maino. (2007). "Monetary Policy Implementation: Results from a survey." IMF Working Paper, WP/07/7, January 2007.

Calvo, G. (1983). "Staggered Price Setting in a Utility Maximizing Framework." Journal of Monetary Economics, 12(3): 383-398.

Calvo, G. A., and C. A. Reinhart. (2000). "Fear of Floating." NBER Working Paper 7993, November 2000.

Calvo, G. A., A. Izquierdo, and L. F. Mejia. (2004). "On the Emprirics of Sudden Stops: The Relevance of Balance-Sheets Effects." NBER Working Paper 10520, May 2004.

Caruana, J. (2010). "Macroprudential policy: working towards a new consensus." Remarks at the high-level meeting on "The emerging Framework for Financial Regulation and Monetary Policy" jointly organized by the BIS's Financial Stability Institute and the IMF Institute, Washington DC, 23 April 2010.

CBRT. (1995 – 1999). Annual Reports.

CBRT. (2005). "Zorunlu Karşılıklar Hakkında Tebliğ, Sayı: 2005/1".

CBRT. (2010). "Monetary Policy Exit Strategy." http://www.tcmb.gov.tr/yeni/announce/2010/ExitStrategy.php

CBRT. (2010). "Kasım 2000 ve Şubat 2001 Krizlerindeki Türkiye Cumhuriyet Merkez Bankası Likidite Yönetimi ve Döviz İşlemlerine İlişkin Bilgi Notu" http://www.tcmb.gov.tr/yeni/duyuru/2003/DUY2003-43.php

Celasun, M. (2002). "2001 Krizi, Öncesi ve Sonrası: Makroekonomik ve Mali Bir Değerlendirme." İktisat Bölümü, Bilkent Üniversitesi, Ağustos 2002.

Christensen, I. and A. Dib.(2006). "Monetary Policy in an Estimated DSGE Model with a Financial Accelerator." Bank of Canada Working Paper 2006-9, March 2006.

Committee on the Global Financial System. (2010). "Macroprudential instruments and frameworks: a stocktaking of issues and experiences." CGFS Papers No 38, May 2010.

Cordero, J. A., and J. A. Montecino. (2010). " Capital Controls and Monetary Policy in Developing Countries." Center for Economic and Policy Research, April 2010.

Committee on International Economic Policy and Reform. (2011). "Rethinking Central Banking." September 2011.

Curdia, V. and M. Woodford (2010). "Credit Spreads and Monetary Policy." Prepared for the FRB-JMCB research conference, January 21, 2010.

Davies, G. (2002). History of Money: From Ancient Times to the Present Day. University of Wales Press, Cardiff.

Deane, M, and R. Pringle. (1995). The Central Banks. Viking Penguin, US.

Derviş, K. (2001). "Türkiye'nin Güçlü Ekonomiye Geçiş Programı: Hedefler, Politikalar ve Uygulamalar." Mayıs 2001.

Dib, A. (2010). " Capital Requirement and Financial Frictions in Banking: Macroeconomic Implications." Bank of Canada Working Paper 2010-26, October 2010.

Dynare. (2011). S. Adjemian, H. Bastani, M. Juillard, F. Mihoubi, G. Perendia, M. Ratto and S.Villemot, "Dynare: Reference Manual, Version 4," *Dynare Working Papers*, 1, CEPREMAP

Edwards, S. (2001). "Does the Current Account Matter?" NBER Working Paper No 8275, May 2001.

Edwards, S. (2002). "The Great Exchange Rate Debate After Argentina." NBER Working Paper No. 9257, October 2002.

Edwards, S. (2004). "Thirty Years of Current Account Imbalances, Current Account Reversals, and Sudden Stops." IMF Staff Papers, Vol. 51, Special Issue.

Edwards, S. (2006). "The Relationship Between Exchange Rates and Inflation Targeting Revisited." NBER Working Paper 12163, April 2006.

Eichengreen, B., and R. Hausmann. (1999). "Exchange Rates and Financial Fragility." NBER Working Paper 7418, November 1999.

Erceg, C. D., Henderson, and A. Lewin. (2000). "Optimal Monetary Policy with Staggered Wage and Price Contracts." Journal of Monetary Economics, 46(2): 281 – 313.

Erdem, F. P. (2011). "Business Cycless in Emerging Market Economies: The Role of External Factors." Phd Thesis, Middle East Technical University, September 2011.

Ersel, H. and F. Özatay (2008). "Inflation Targeting in Turkey." Economic Research Forum, Working Paper Series, Working Paper No 445, October 2008.

European Central Bank. (2000). "Monetary policy transmission in the Euro Area." ECB Monthly Bulletin. July 2000: 43 – 58.

Eyzaguirre, N., M. Kaufman, S. Phillips, and R. Valdes. (2011). "Managing Abundance to Avoid a Bust in Latin America." IMF Staff Discussion Note, SDN/11/07.

Feinman, J.N.(1993). Reserve Requirements: History, Current Practice, and Potential Reform. Federal Reserve Bulletin, June 1993.

Fletcher, K., C. Keller, P. K. Brooks, D. Lombardo, and A. Meier. (2007). "Turkey: Selected Issues" IMF Country Report No. 07/364

Florian, D. and C. Montoro (2009) "Development of MEGA-D: ADSGE Model for Policy Analysis" Banco Central de Reserva del Peru, May 2009.

Freedman, C. and I. Otker-Robe. (2010). "Important Elements for Inflation Targeting for Emerging Economies." IMF Working Paper, WP/10/113.

FSB-IMF-BIS Joint Report (2011). “Macroprudential policy tools and frameworks”, October 2011.

FSB-IMF-BIS Joint Report (2011). “Macroprudential policy tools and frameworks – Update to G20 Finance Ministers and Central Bank Governors.”

Gali, J. and M. Gertler. (2007). “Macroeconomic Modeling for Monetary Policy Evaluation.” Journal of Economic Perspectives – Volume 21, November 4, Fall 2007: 25 – 45.

Gambacorta, L. (2009). “Monetary policy and risk-taking channel.” BIS Quarterly Review, December 2009: 43 – 53.

Gelain, P., D. Kulikov. (2009). “An Estimated Dynamic Stochastic General Equilibrium Model for Estonia.” Bank of Estonia Working Paper Series 5/2009.

Gelain, P., D. R. Palenzuela, and B. Vilagi. (2010). “An Estimated Euro-Area DSGE Model with Financial Frictions: Empirical Investigation of the Financial Accelerator Mechanism.” January 2010.

Gelain, P. (2010). “The External Finance Premium in the Euro Area – A Useful Indicator for Monetary Policy?” ECB Working Paper Series, No 1171, April 2010.

Georg, C., and M. Pasche. (2008). “Endogenous Money – On Banking Behaviour in New and Post Keynesian Models.” Jena Economic Research Papers, 2008-065, October 2008.

Gerlach-Kristen, P., and B. Rudolf. (2010). “Macroeconomic and interest rate volatility under alternative monetary operating procedures.” BIS Working Papers, No 319, September 2010.

Gilchrist, S., A. Ortiz, and E. Zakrajsek. (2009). “Credit Risk and the Macroeconomy: Evidence from and Estimated DSGE Model.”Prepared for the FSB/JMCB conference “Financial Markets and Monetary Policy” held at the Federal Reserve Board, Wsahington D.C., June 4-5, 2009.

Glocker, C., and P. Towbin. (2011). “Reserve Requirements for Price Stability and Financial Stability – When Are They Effective.” International Journal of Central Banking, vol. 8(1), pages 65-114, March.

Goldstein, M. (2002). “Managed Floating Plus.” Policy Analysis in International Economics 66, Institute for International Economics, March 2002.

Goodfriend, M. (2007). “How the World Achieved Consensus on Monetary Policy.” NBER Working Paper 13580, November 2007.

Goodhart, C.A.E. “Some New Directions for Financial Stability.” Per Jacobsson Lecture.

Goodhard, C. (1988). The Evolution of Central Banks. The MIT Press Cambridge, Massachusetts London, England.

Gray, S. (2011). “Central Bank Balances and Reserve Requirements” IMF Working Paper, WP/11/36, February 2011.

Heidari, H. (2010). “An estimated Small Open Economy New-Keynesian Model of the Austrilaian Economy” Romanian Journal of Economic Forecasting 4 - 2010:7 – 15.

Herrera, H. V., Y. R. Batecourt, C. Varela, and N. Rodriguez. (2010). “Effects of reserve requirements in an inflation targeting regime: the case of Colombia.” BIS Working Papers No 54:133 – 169.

Ho, C. (2008). “Implementing monetary policy in the 2000s: operating procedures in Asia and beyond.” BIS Working Papers, No 253, June 2008.

IMF. (2011). “Assessing Reserve Adequacy.” February 14, 2011.

Ishii, S., J. I. Canales-Kriljenko, R. Guimaraes, C. Karacadag. (2006). “Official Foreign Exchange Intervention.” Occasional Paper, No. 249. IMF, Washington DC, 2006.

Justiniano, A. and B. Preston (2009). “Can Structural Open-Economy Models Account for the Influence of Foreign Disturbances.” CAMA Working Paper 12/2006, April 2006.

Kara, H. and F. Öğünç. (2005). “Exchange Rate Pas-Through in Turkey: It is Slow, but is it Really Low?” CBRT Working Paper no: 05/10, April 2005.

Kara, A. H. (2006). “Turkish Experience With Implicit Inflation Targeting.” CBRT Working Paper No: 06/03, September 2006.

Kara, A. and F. Öğünç. (2011). “Döviz Kuru ve İthalat Fiyatlarının Enflasyona Etkisi” TCMB Ekonomi Notları, Sayı:2011-14, Eylül 2011.

Kibritçioğlu, A. (2002). “Causes of Inflation in Turkey: A Literature Survey with Special Reference to Theories of Inflation”. Forthcoming in: *Inflation and Disinflation in Turkey*, ed. by Kibritçioğlu, A., L. Rittenberg, and F. Selçuk, Aldershot: Ashgate, pp. 43-76 .

Kneeshaw, J. T., and P. Van den Bergh. (1989). “Change in Central Bank Money Market Operating Procedures in the 1980s.” BIS Economic Papers No. 23, January 1989.

Kynland, F. and E. C. Prescott. (1977). "Rules Rather Than Discretion: The Inconsistency of Optimal Plans." Journal of Political Economy, 85(3): 473 – 91.

Lane and Milesi-Firetti (2002). "External Wealth, the Trade Balance, and the Real Exchange Rate." European Economic Review, vol. 46(6):1049 – 1071, June.

Leigh, D. and M. Rossi. (2002). "Exchange Rate Pass-Through in Turkey." IMF Working Paper, WP/02/204.

Lim, C. H., and L. Papi. (1997). "An Econometric Analysis of the Inflation in Turkey." IMF Working Paper No. 170, WP/97/170, December 1997.

Lim, C., F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyit, T. Wezel, and X. Wu. (2011). "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences." IMF Working Paper, WP/11/238.

Lin, S. and H. Ye. (2007). "Does inflation targeting really make a difference." Journal of Monetary Economics, Vol. 54(8): 2521 – 2533.

Loayza, N. and K. Schmidt-Hebbel. (2002). "Monetary Policy Functions and Transmission Mechannisms: An Overview." Monetary Policy: Rules and Transmission Mechanisms, edited by Loayza and Klaus Schmidt-Hebbel, Santioago, Chile:1-20.

Lucas, R. E. (1972). "Expectations and the Neutrality of Money." Journal of Economic Theory 4:103 – 124.

Mishkin, F. S. (1995). "Symposium on the Monetary Transmission." Journal of Economic Perspectives, Volume 9-4, Fall 1995: 3 – 10.

Mishkin, F. S. (2007). "Will Monetary Policy Become More of a Science." NBER Working Paper no. 13566, October 1997.

Mishkin, F. S. (2009.a). "How did We Get Here?" in Monetary Policy Strategy, The MIT Press, Cambridge, Massachusetts / London, England,2009.

Mishkin, F. S. (2009.b). "What Should Central Banks Do?" in Monetary Policy Strategy, The MIT Press, Cambridge, Massachusetts / London, England,2009.

Mishkin, F. S. (2010). "Monetary Policy Strategy: Lessons from the Crisis." Prepared for the ECB Central Banking Conference, "Monetary Policy Revisited: Lessons from the Crisis." Frankfurt, November 18 – 19, 2010.

Mohanty, M. S., and M. Klau. (2004). "Monetary policy rules in emerging market economies: issues and evidence." BIS Working Papers No. 149, March 2002.

Mohanty, M. S., and P. Turner. (2006). "Foreign exchange reserve accumulation in emerging markets: what are the domestic implications?" BIS Quarterly Review, September 2006: 39 – 52.

Monetary and Economic Department. (2008). "Transmission mechanisms for monetary policy in emerging economies." BIS Papers, No. 35.

Montoro, C. and R. Moreno. (2011). "The Use of Reserve Requirements as a Policy Instrument in Latin America." BIS Quarterly Review, March 2011, 53-56.

Moron, E. and D. Winkelried. (2005). "Monetary policy rules for financially vulnerable economies." Journal of Development Economics 76 (2005): 23 – 51.

N'Diaye, P. (2009). "Countercyclical Macro Prudential Policies in a Supporting Role to Monetary Policy." IMF Working Paper, WP/09/257.

Nier, E. W., J. Osinski, L.I. Jacome, and P. Madrid. (2011). "Towards Effective Mocroprudential Policy Frameworks: An Assesment of Stylized Institutional Models." IMF Working Paper, WP/11/250.

Obstfeld, M., and K. Rogoff. (1995). "The Mirage of Fixed Exchange Rates." Journal of Economic Perspectives, 9(4): 73 – 96.

Obstfeld, M., J. C. Shambaugh, and A. M. Taylor. (2003). "The Trilemma in History: Tradeoffs among Exchange Rates, Monetary Policies, and Capital Mobility." De Nederlandche Bank Staff Reports, No. 94/2003.

Onder, T. (2005). "Para Politikası: Araçları, Amaçları ve Türkiye Uygulaması", Uzmanlık Yeterlilik Tezi", TCMB, Aankara, Nisan 2005.

Ostry, J. D., A. R. Ghosh, K. Harbermeier, L. Laeven, M. Chamon, M. S. Qureshi, and D. B. S. Reinhardt. (2010). "Capital Inflows: The Role of Controls." IMF Staff Discussion Note, SDN/10/04.

Ostry, J. D., A. R. Ghosh, K. Harbermeier, L. Laeven, M. Chamon, M. S. Qureshi, and A. Kokenyne. (2011). "Managing Capital Inflows: What Tool to Use?" IMF Staff Discussion Note, SDN/11/06.

Ozatay F. and G. Sak. (2002). "Banking Sector Fragility and Turkey's 2000-01 Financial Crisis." Brookings Trade Forum 2002, Brookings Institution Press, Washington, ed by S. M. Coolins and D. Rodrik, pp. 121 – 173.

Ozatay, F. (2011). "Finansal Krizler ve Türkiye." 3. Baskı, Doğan Egmont Yayıncılık ve Yapımcılık Tic. A.Ş. Şişli – İstanbul, Nisan 2011.

Ozdemir, B. K. (2009). "Retail Bank Interest Rate Pass-Through: The Turkish Experience." International Research of Finance and Economics, Issue 28 (2009).

Palley, T. I. (2004) "Asset-based Reserve Requirement: Reasserting Domestic Monetary Control in an Era of Financial Innovation and Instability." Review of Political Economy, V. 16, No. 1: 43 – 58.

Quiros, H.R., and H.R. Mendizebal. (2009). "Asymetric Standing Facilities: An Unexploited Monetary Policy Tool."

Roger, S., J. Restrepo, and C. Garcia. (2009). "Hybrid Inflation Targeting." IMF Working Paper, WP/09/234, November 2009.

Reinhart, C.M., and Vincent R. Reinhart. (1997). "On the Use of Reserve Requirements in Dealing with Capital Flow Problems." International Journal of Finance and Economics, Vol. 4 No.1, January 1999, pp. 27 – 54.

Ritz, R. A. (2010). "How do Banks Respond to Increased Funding Uncertainty." Department of Economics Discussion Paper Seies, Number 481, March 2010.

Sarno, L., and M. P. Taylor. (2001). "Official Intervention in the Foreign Exchange Market: Is It Effective and, If So, How Does It Work?" Journal of Economic Literature, V. XXXIX (September 2001): 839 – 868.

Schmitt-Grohe, S. and M. Uribe. (2003). "Closing small open economy models." Journal of International Economics 61 (2003) 163 – 185.

Serdengeçti, S. (2002). "Şubat 2001 Krizi Üzerine Düşünceler: Merkez Bankası Açısından Çıkarılacak Dersler." erc/ODTU VI. Uluslararası Ekonomi Konferansı Açılış Konuşması, 11 Eylül 2002. http://www.tcmb.gov.tr/yeni/evds/konusma/tur/2002/METU_Eyl111.htm

Smant, D. J. C. (2002). "Bank credit in the transmission of monetary policy: A critical review of the issues and evidence." Erasmus University, Rotterdam, March 2002.

Smets, F. and R. Wouters. (2003). "An Estimated Stochastic Dynamic General Equilibrium Model of Euro Area." Journal of the European Economic Association, 1(5): 1123 – 75.

Smets, F. and R. Wouters. (2007). "Shocks and Frictions in US Business Cycles, A Bayesian DSGE Approach." American Economic Review, 97(3): 586 – 606.

Svensson, L. E. O. (2009). "Flexible inflation targeting – lessons from the financial crisis." Speech at the workshop "Towards a new framework for monetary policy? Lessons from the crisis", organised by the Nethelands Bank, Amsterdam, 21 September 2009.

Taylor, J. B. (2000). "Low inflation, pass-through, and the pricing power of firms." European Economic Review 44(2000): 1389 – 1408.

Tinbergen, J. (1952). "On the Theory of Economic Policy." Amsterdam: North-Holland.

Towbin, P., and S. Weber. (2011). “Limits of Floating Exchange Rates: The Role of Foreign Currency Debt and Import Structure.” IMF Working Paper No. 42, WP/11/42, February 2011.

Tovar, C. E. (2009). “DSGE Models and Central Banks.” Economics, The Open Access, Open Assessment E-Journal, Vol. 3, 2009-16, May 2009.

Unsal, D. F. (2011). “Capital Flows and Financial Stability: Monetary Policy and Macroprudential Responses.” IMF Working Paper, WP/11/189.

Van Rijkeghem, C. and M. Ucer. (2009). “The Evolution and Determinants of the Turkish Private Saving Rate: What Lessons for Policy.” ERF Research Report Series No. 09.01.

White, W. R. (2009). “Should Monetary Policy “Lean or Clean”?” Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute Working Paper No. 34.

Whitesell, W. (2006). “Interest rate corridors and reserves.” Journal of Monetary Economics 53 (2006): 1177 – 1195.

Woodford, M. (1999). “Revolution and Evolution in Twentieth-Century Macroeconomic.” Prepared for the conference on “Frontiers of the Mind in the Twenty-First Century.” Library of Congress, Washington, June 14 – 18, 1999.

Woodford, M. (2010). “Financial Intermediation and Macroeconomic Analysis.” Unpublished note.

Woodford, M. (2011). “Inflation Targeting and Financial Stability.” Revised text of a talk given as a keynote address at a conference, “The Future of Central Banking, at the Einaudi Institute for Economics and Finance, Rome, September 30, 2010.

White, W. R. (2009). “Should Monetary Policy “Lean or Clean”. Federal Reserve Bank of Dallas, Globalization and Monetary Policy Institute, Working Paper No. 34, August 2009.

Whitesell, W. (2006). “Interest rate corridors and reserves”. Journal of Monetary Economics 53 (2006) 1177 – 1195.

APPENDIX A

CURRICULUM VITAE

PERSONAL INFORMATION

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EDUCATION

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Ph.D.	Middle East Technical University, Turkey Economics	2012
MA	Michigan State University, U.S.A Economics	1995
BS	Middle East Technical University, Turkey Industrial Engineering	1987

WORK EXPERIENCE

Year	Place	Enrollment
2011- Present	Central Bank of Turkey Workers Remittances Department	Executive Director
2004-2011	Central Bank of Turkey Markets Department	Ass. Exec. Director
1989-2004	Central Bank of Turkey Open Markets Operations Division	Officer–Director

FOREIGN LANGUAGES

Advanced English

PUBLICATIONS

1. Çufadar A. and Yörükoğlu M. "Capital flows to Turkey: financial implications and policy responses", BIS Papers, 44, 467-489 (2009)

AWARDS

Highest Scholarship, Master of Arts Program in Economics,
Michigan State University, April 1995.

APPENDIX B

TURKISH SUMMARY

Giriş

Tarihsel olarak merkez bankalarının temel hedefleri; fiyat istikrarı, üretim istikrarı ve finansal istikrar olmuş, ancak hedeflerin amaç fonksiyonundaki ağırlığı iktisat teorisi ile ekonomik ve finansal yapıdaki gelişmelere göre değişmiştir. Para politikasının operasyonel çerçevesi de yine amaçlara ve finansal yapıdaki gelişmelere göre evrilmiştir. Merkez bankacılığının yakın tarihi, para politikası operasyonel çerçevesine ilişkin çalışmalar için önemli bilgiler içermektedir.

1980 öncesi dönemde ekonomi politikaları, Keynesçi görüşlere göre şekillenmiş, bu çerçevede merkez bankaları; fiyat istikrarı, tam istihdam, kurlarda istikrar, ekonomik kalkınmanın desteklenmesi gibi birbiriyle çelişme potansiyeli taşıyan birden çok hedefe ulaşmayı amaçlamış, bu amaçlara ulaşmak için; açık piyasa işlemleri ya da reeskont politikası aracılığı ile kısa vadeli faiz oranlarının kontrolünün yanı sıra zorunlu karşılıklar, likidite oranı, faiz oranlarına ve kredi genişlemesine doğrudan tavan konulması gibi birçok aracı da aynı anda kullanmayı tercih etmiş, bir anlamda, "çok amaçlı, çok araçlı" karmaşık bir operasyonel yapı oluşturmuşlardır.

Ancak, 1970'lerde rasyonel beklentiler ve zaman tutarsızlığı teorilerinin ortaya çıkması, merkez bankalarının parasal koşulları manüpile ederek üretimi kalıcı bir şekilde etkileyemeyeceği görüşünü desteklemiş, 1980'lerden itibaren, merkez bankalarının üretime en iyi katkıyı fiyat istikrarını sağlayarak yapabileceği genel kabul görmeye başlamıştır. Bu dönemde, söz konusu teorilerin de işaret ettiği üzere, etkin bir para politikası için; (i) bekleyişlerin kritik önemi, (ii) bekleyişlerin yönetilebilmesi için etkili bir nominal çapanın gereği, nominal çapanın ikna edici olması için de merkez bankalarının; (iii) inandırıcı ve (iv) şeffaf olması gerektiği konularında uzlaşılmıştır. Bu çerçevede, özellikle 1990'lı yıllarla birlikte, merkez bankaları, fiyat istikrarına yoğunlaşmış, etkin para politikasının gerekleri ile uyumlu

olan enflasyon hedeflemesi stratejisi tüm dünyada yaygın olarak kullanılmaya başlanmıştır.

Enflasyon hedeflemesinin temel özelliği, temel hedefin fiyat istikrarı olması, temel operasyonel araç olan kısa vadeli faiz oranının temel hedefle uyumlu bir şekilde ayarlanarak enflasyon hedefine ulaşılmaya çalışılmasıdır. Diğer bir özelliği ise, "imkânsız üçlü" ile açıklandığı üzere dalgalı kur rejimi çerçevesinde kurların piyasa koşulları tarafından belirlenmesidir. Çin gibi kapalı ekonomilerin global ekonomi ile entegre olmaya başlamasının yarattığı arz etkisinin de katkısı ile enflasyon hedeflemesi stratejisi çerçevesinde, 2008 – 2009'deki global krize kadar dünya genelinde düşük enflasyon, yüksek ve az dalgalı büyüme hedeflerine ulaşılmış, enflasyon hedeflemesi stratejisinin etkinliği genel kabul görmüştür.

Ancak, "tek araç" olarak kullanılan kısa vadeli faiz oranı, düşük enflasyon ortamında finansal dengesizliklerin oluşmasını önlemede yetersiz kalmıştır. Özellikle gelişen ülkelerde, sermaye hareketleri; kısa vadeli faiz oranının ekonomik aktivite üzerindeki etkisini sınırlandırmış, sermaye girişleri, bir yandan yerel paranın değer kazanmasına ve likidite artışı sonucu aşırı kredi genişlemesine, diğer yandan da cari işlemler açığının artmasına yol açmıştır. Bu ekonomik dengesizlikler, sermaye hareketlerinin tersine dönmesi halinde, bir yandan enflasyonun artması, diğer yandan da likidite ve kredi koşullarının kontrolsüz bir şekilde sıkılaşarak üretimin daralması ve finansal krizlerin ortaya çıkması olasılıklarını artırmıştır. Kısaca, sermaye hareketleri, gelişen ülke merkez bankalarının kısa vadeli faiz oranlarını önemli ölçüde sermaye hareketleri tarafından belirlenen iş çevrimlerini dengeleyici araç olarak kullanma potansiyelini azaltmıştır. Dolayısıyla, "tek amaçlı, tek araçlı" operasyonel yapının yetersizliği gelişen ülkelerde daha belirgin hale gelmiştir.

Diğer yandan, global kriz, fiyat istikrarının üretimdeki istikrarın ön şartı olduğunu, ancak finansal istikrarın da hem etkin merkez bankacılığının hem de üretimdeki istikrarın ön şartı olduğunu göstermiştir. Dolayısıyla, gerek global kriz esnasında karşılaşılan devasa maliyet ve gerekse kriz sırasında ve sonrasında gelişmiş ülke merkez bankalarınca yaratılan likiditenin gelişen ülkelere yönelik sermaye hareketlerini artırmasının yarattığı potansiyel riskler, finansal istikrara verilen önemi artırmıştır. Bu çerçevede, özellikle gelişen ülke merkez bankaları, "tek amaçlı, tek araçlı" klasik enflasyon hedeflemesi operasyonel çerçevesini gözden

geçirme ihtiyacı duymuşlar; (i) fiyat istikrarından ödün vermeyecek, ancak finansal istikrarı da gözetecek daha esnek bir operasyonel yapı, (ii) Tinbergen kuralının bir gereği olarak, çok amacın, çok araç gerektirmesi dolayısıyla da kısa vadeli faiz oranı aracını destekleyecek yeni araçlar arayışına girmişlerdir.

Ancak, etkin para politikasının temel fonksiyonlarından birisi bekleyişlerin yönetimidir. Bu rolün etkin bir şekilde yerine getirilmesinin ön şartları ise; şeffaflık, hesap verebilirlik, kredibilite, bağımsızlık ve etkin iletişimdir. Bu çerçevede, merkez bankaları, yeni stratejilerinin başarılı olabilmesi için öncelikle alternatif ya da destekleyici ilave politika araçlarının etkinliği ve bunların kullanımının sosyal refaha olumlu katkı yapacağı konusunda kamuoyunu ve piyasaları ikna etmesi gerekmektedir.

Bu çerçevede, bu çalışmanın amaçları; (i) modern merkez bankacılığında para politikası operasyonel çerçevesinin temel ilkeleri konusunda temel bilgileri özetlemek, (ii) Türkiye koşullarında klasik enflasyon hedeflemesinin yetersizliklerinin temel nedenlerini irdelemek ve (iii) hem fiyat hem de finansal istikrarı gözetecek daha etkin bir para politikası operasyonel çerçevesinin olabilirliğini araştırmaktır. Bu çalışma ile; (i)zaman serisi analizi kullanılarak, zorunlu karşılık uygulaması ile kredi faiz oranlarının etkili bir şekilde yönlendirilebileceği, (ii) Dinamik Stokastik Genel Denge (DSGD) modeli kullanılarak, Türkiye gibi ekonomilerde, esnek enflasyon hedeflemesi stratejisi altında, makro ihtiyati tedbirler ve yabancı sermaye kontrollerinin, temel politika aracı olan kısa vadeli faiz oranının esnekliğini ve etkinliğini artırabilecekleri, böylece, merkez bankası amaç fonksiyonuna belirgin bir katkı sağlayabilecekleri gösterilerek literatüre katkı sağlanması amaçlanmıştır.

Para Politikası Araçları Hakkında Temel Bilgiler

Çalışmanın ikinci bölümünde, aktarım mekanizması, para politikası operasyonel çerçevesi ile makro ihtiyati tedbirler ve sermaye kontrolleri irdelenmiş, etkin bir para politikası operasyonel çerçevesinin temel ilkeleri ile merkez bankalarının kısa vadeli faiz oranları dışında parasal koşulları nasıl etkileyebileceği tartışılmıştır.

Etkin para politikası operasyonel çerçevesinin önemli ön koşullarından birisi aktarım mekanizmasının iyi anlaşılmasıdır. Bir ekonomide aktarım mekanizması,

finansal ve ekonomik yapı, kurallar ve finansal piyasalardaki aksaklıklar tarafından belirlenmektedir. Dolayısıyla, aktarım mekanizması her ülkenin kendi yapısına göre farklılıklar gösterebilmektedir. Merkez bankaları, piyasaları ve ekonomik aktiviteyi asıl olarak kısa vadeli politika faiz oranları aracılığı ile etkilemektedir. Ancak, yatırım ve tüketim kararları, dolayısıyla ekonomik aktivite, asıl olarak uzun vadeli faiz oranları tarafından belirlenmektedir.

Etkin çalışan piyasalarda, uzun vadeli faiz oranları basitçe, merkez bankasının mevcut kısa vadeli politika faiz oranı ve piyasaların gelecek dönemde merkez bankasınca tespit edilecek politika faiz oranlarına ilişkin öngörülerinin ağırlıklı ortalaması ile risk priminin toplamına eşittir. Merkez bankaları, uzun vadeli faiz oranlarını, mevcut faiz oranı kararlarının yanı sıra gelecek döneme ilişkin enflasyon öngörülerini piyasalarla paylaşarak, dolayısıyla politika faiz oranlarının yönü konusunda sinyaller vererek önemli ölçüde etkileyebilmektedir. Merkez bankaları, şeffaf, öngörülebilir ve kredibilitesi olan politika faizi kararları aldığı sürece, para politikası duruşu ve iletişimi ile uzun vadeli faiz oranlarını belirgin bir şekilde etkileyebilmektedirler. Böylece, uzun vadeli faiz oranları içindeki risk priminin payı ihmal edilebilir düzeylere düşerken, merkez bankalarının duruşu temel belirleyici olmaktadır. Ancak, özellikle kriz dönemlerinde ya da merkez bankalarının kredibilitesinin azaldığı dönemlerde piyasalardaki aksaklıklar artmakta, politika faiz oranı ile uzun vadeli faiz oranları arasındaki ilişki zayıflayabilmekte, iki faiz oranı arasındaki fark risk primindeki artışa bağlı olarak yükselebilmektedir.

Diğer yandan, aktarım mekanizmasında önemli olan diğer iki değişken kur ve bekleyişlerdir. Özellikle dışa açık gelişen ülkelerde kurlar, üretim ve fiyatlar üzerinde doğrudan etkili olmaktadır. Kurlar, özellikle döviz yükümlülükleri nedeniyle özel kesimin bilançosu, dolayısıyla firmaların değerleri üzerinde de belirleyici olmakta, finansal hızlandırıcı mekanizmayı (financial accelerator mechanism) kuvvetlendirmektedir. Ayrıca, gelişmekte olan ülkelerde, gerek kurların, gerekse finansal hızlandırıcı mekanizmanın iş çevrimleri ile aynı yönde çalıştığı, dolayısıyla, iş çevirimlerini şiddetlendirerek ekonomik aktivitedeki oynaklığı artırdığı not edilmelidir.

Etkin bir para politikasının önemli bir önkoşulu; para politikası stratejisi ve aktarım mekanizması ile uyumlu bir operasyonel çerçevenin belirlenmesidir. Para politikası genel çerçevesi; stratejik taraf ve operasyonel taraf olmak üzere iki

bölümden oluşmaktadır. Merkez bankaları, stratejik tarafta, temel hedeflere (enflasyon, üretim, rekabet gücü, finansal istikrar gibi) ve bu hedeflere hangi strateji ile (enflasyon hedeflemesi ya da ara hedefleme) ulaşılacağına karar vermektedir. Daha sonraki aşamada ise bu strateji ile uyumlu operasyonel tarafa, diğer bir deyişle, operasyonel hedef (rezerv para, kısa vadeli faiz oranı ve kurlar) ve para politikası araçlarına (açık piyasa işlemleri, iskonto penceresi, zorunlu karşılıklar, likidite oranı, faiz oranı ve kredi sınırlaması gibi) karar vermektedirler.

Para politikasının temel işlevlerinden en önemlilerinden birisi bekleyişlerin yönetilmesidir. Kredibilitenin ön şartı ise şeffaflıktır. Bu çerçevede, para politikası operasyonları, merkez bankasının niyetleri hakkında net sinyaller vermelidir. Dolayısıyla, ilke olarak; para politikası operasyonel yapısı, diğer bir ifadeyle, temel operasyonel araçların neler olduğu, hangi yöntemlerle uygulanacakları, net ve şeffaf bir şekilde tanımlanmalı, piyasalar ve kamuoyu tarafından iyi anlaşılmalıdır. Piyasalar ve kamuoyu, herhangi bir araç kullanıldığında, bu aracın neden kullanıldığı ve aktarım mekanizmasını nasıl etkileyeceği konusunda net bir fikir sahibi olmalıdır. Enflasyon hedeflemesi uygulamasında, ağırlıklı olarak enflasyon temel hedef olarak seçilirken, kısa vadeli faiz oranı operasyonel hedef olarak seçilmekte, operasyonel hedefe ulaşmak için açık piyasa işlemleri, temel politika aracı olarak kullanılmaktadır. Kısa vadeli faiz oranının temel politika aracı olarak seçilmesi ile birlikte, açık piyasa işlemlerinin temel işlevi, piyasadaki likidite ihtiyacının tam yerinde karşılanmasını, böylece, kısa vadeli politika faiz hedefinin tutturulmasını sağlamaktır. Buna karşın, piyasa ekonomisi ile çelişmesi nedeniyle, günümüz merkez bankacılığında, doğrudan kredi faizi ya da kredi hacmi sınırlaması gibi doğrudan müdahale içeren politika araçlarına yer verilmemektedir. Zorunlu karşılıklar ise bankacılık sistemine yönelik dolaylı bir vergilendirme niteliği taşıması ve bankacılık sisteminin zorunlu karşılığa tabi tutulmayan alternatif yatırım araçları ve kuruluşlara karşı rekabet gücünü azaltması nedenleriyle 1980'lerden global krize kadar olan dönemde aktif olarak kullanılmayan bir araç niteliği kazanmıştır.

Şeffaflığın ve öngörülebilirliğin diğer bir gereği de operasyonel yapının, ikincil piyasa kısa vadeli faiz oranlarındaki oynaklığı en aza indirecek şekilde düzenlenmesidir. Bu çerçevede, merkez bankaları, hazır imkanlar (standing facilities) yolu ile politika faiz oranının biraz üzerinde borç verme faiz oranı, biraz altında da borçlanma faiz oranı ilan ederek, faiz koridoru sistemi oluşturmaktadır.

Merkez bankaları, teorik olarak hazır imkanların faiz oranlarını, politika faiz oranı ile eşitleyerek kısa vadeli faiz oranlarındaki oynaklığı hemen hemen tamamen giderme imkanına sahip olmakla birlikte, bankaların risk yönetimini geliştirmek ve para piyasalarının gelişmesini desteklemek için genellikle 2 ya da 3 puanlık bir koridor oluşturmakta, kısa vadeli faiz oranlarının, asıl olarak ilan edilen politika faiz oranı civarında, ancak her koşulda koridor içinde oluşacağı garantisini vermektedir. Böylelikle, koridor sistemi aynı zamanda finansal istikrara yönelik de işlev görmektedir.

Diğer yandan, merkez bankaları para politikası duruşunu, asıl olarak geleneksel strateji çerçevesinde politika faiz oranı ile belirlemekle birlikte, parasal koşulları, geleneksel olmayan bir strateji çerçevesinde, likidite yönetimi stratejisi ve operasyonel çerçevenin yapısı ile de önemli ölçüde etkileme olanağına sahiptir. Bu çerçevede; (i) koridor sistemi ile likidite risk priminin etkilenmesi, (ii) zorunlu karşılık sistemi ile bankaların maliyetinin ve likidite riskinin etkilenmesi, (iii) açık piyasa işlemleri teminat sistemi ile bankacılık sisteminin borçlanma kapasitesinin, dolayısıyla likidite riskinin etkilenmesi, ve (iv) uzun vadeli işlemler ile bankacılık sisteminin kısa vadeli likidite ihtiyacının değiştirilmesi ya da verim eğrisine müdahale edilmesi olmak üzere dört tür geleneksel olmayan yöntemden bahsetmek mümkündür.

Koridor sistemi, global krize kadar, merkez bankalarınca sadece kısa vadeli faiz oranlarındaki dalgalanmaları önlemek amacıyla kullanılmakla birlikte, para politikası aracı olarak bildiğimiz kadarıyla ilk defa Haziran 2006'da Türkiye Cumhuriyet Merkez Bankası (TCMB) tarafından, kurlardaki dalgalanmayı önlemeye yönelik olarak sınırlı bir şekilde kullanılmış, ancak 2010 yılından itibaren aktif bir araç haline getirilmiştir. Merkez bankaları, koridor aralığını değiştirerek bir yandan likidite risk primini etkileme, diğer yandan gelecek döneme ilişkin sinyal verme olanağına sahiptir. Koridor sisteminde; (i) koridor aralığının simetrik olarak artırılması, ortalamada gecelik faizlerin değişmemesine karşın, gecelik faizlerin oynaklığını artırarak likidite risk priminin artmasına, dolayısıyla parasal koşullarda sıkılaşmaya, (ii) yukarı yönlü asimetrik olarak artırılması, hem ortalama gecelik faiz oranlarını, hem de söz konusu faizlerin oynaklığını artırması nedeniyle, ortalama faizlerin ve likidite risk priminin aynı anda artmasına yol açması ve merkez bankasının ileride parasal koşulları kalıcı olarak sıkılaştırabileceğine yönelik bir

sinyal niteliği taşıması nedenleriyle, belirgin bir parasal sıkılaşmaya, ve (iii) aşağı yönlü asimetrik olarak artırılması ise oynaklıkta sınırlı bir atışa yol açmasına karşın, ortalama gecelik faiz oranlarının düşmesine neden olması ve merkez bankasının ileride parasal koşulları kalıcı olarak gevşeteceğine yönelik bir sinyal niteliği taşıması nedenleriyle, parasal gevşemeye yol açar.

Ancak, piyasada kalıcı likidite açığı olduğu ve merkez bankası politika faiz oranından fonlamaya devam ettiği sürece, aşağı yönlü asimetrik uygulama sınırlı bir parasal gevşemeye yol açarken, yukarı yönlü asimetrik uygulama belirgin bir parasal sıkılaşmaya yol açar. Aslında, özellikle yukarı yönlü asimetrik koridor uygulaması, kısa vadeli faiz oranlarının yabancı yatırımcılar ile yerleşikler açısından farklılaştırılmasına neden olur. Yabancı yatırımcıların likidite fazlasına sahip olmasına karşın, yerleşiklerin likidite açığı olması nedeniyle, bu tür bir uygulama, yerleşiklerin kısa vadeli fonlama maliyetini sınırlı olarak artırmakla birlikte, asıl olarak yabancıların kısa vadeli işlem getirilerinin belirgin bir şekilde artırılması, dolayısıyla, yerli paranın değer kazanması ya da değer kaybının azaltılması amacını güder.

Diğer yandan, koridor uygulamasının uzun dönemli kullanılması ve kısa vadeli faiz oranlarının oynaklığının bilinçli olarak artırılması, modern merkez bankacılığı ve enflasyon hedeflemesi stratejisi ile çelişir. Zira, bu uygulama, bir yandan şeffaflığı azaltarak yatırımcıların sağlıklı uzun vadeli yatırım kararları almasını engellerken, diğer yandan da para politikası kararlarının aylık ve öngörülebilir bir şekilde değil, günlük gelişmelere göre alındığını ima eder.

Zorunlu karşılıklar sistemi, bankacılık sistemini maliyet etkisi yoluyla doğrudan, likidite etkisi yoluyla dolaylı ve belirgin şekilde etkiler. Merkez bankaları, zorunlu karşılıklara piyasa faizi ödediği sürece, zorunlu karşılıkların doğrudan maliyet etkisi oldukça sınırlıdır. Merkez bankalarının zorunlu karşılıklara ödenilen faiz oranını artırması parasal gevşemeye, azaltması ise parasal sıkılaşmaya yol açar. Zira, zorunlu karşılıkların net maliyeti önemli ölçüde mevduat ve kredi faizlerine yansıtılmaktadır. Diğer yandan, zorunlu karşılık oranları belirgin şekilde değiştirildiğinde, likidite etkisi belirgin şekilde ön plana çıkar.

Bankacılık sisteminin net likidite açığı merkez bankalarınca finanse edilirken, net likidite fazlası yine merkez bankalarınca sterilize edilir. Dolayısıyla, merkez bankaları, her zaman nihai fonlayıcı ya da nihai borçlanıcı kurumlardır.

Piyasadaki net likidite açığı, likidite risk priminin temel belirleyicisidir. Net likidite açığı arttıkça, likidite risk primi de artacaktır. Dolayısıyla, net likidite açığının artması, parasal koşulların kısa vadeli politika faiz oranının ima ettiğinden daha sıkı, net likidite fazlasının artması ise parasal koşulların politika faiz oranının ima ettiğinden daha gevşek olması anlamına gelir. Bu çerçevede, merkez bankaları, kısa vadeli işlemlerle dengelediği net likidite durumunu değiştirerek parasal koşulları etkileme olanağına sahiptir.

Zorunlu karşılıkların belirgin bir şekilde artırılması, piyasadan likidite çekilişine yol açacak, likidite koşullarını sıkılaştıracaktır. Böylece, bankaların likidite risk primi artacaktır. Bu noktada, bankaların teminat verilebilir portföyleri önem kazanmaktadır. Zira, merkez bankaları, açık piyasa işlemleri için güvenilir kıymetleri, örneğin devlet tahvillerini teminat olarak kabul etmekte, teminat değerini belirlerken risklere karşı iskonto oranı (haircut) uygulamaktadır. Modern merkez bankacılığında, yukarıda bahsedilen koridorun manipüle edilmesi stratejisi haricinde, merkez bankaları, ortalamada piyasadaki likidite açığının politika faiz oranı ile karşılanacağı garantisini örtük olarak vermektedir. Dolayısıyla, teminatlar yeterli olduğu sürece, likidite açığındaki artışın likidite risk primini önemli ölçüde artırmaması beklenir. Ancak, borçlanılan tutarın teminatlara oranı arttıkça, bankalar, merkez bankasından borçlanılan tutarın sürdürülebilirliği konusunda tedirgin olacaklardır. Dolayısıyla, likidite riski belirgin şekilde artacağından, bir yandan daha güvenilir bir kaynak olarak görülen mevduat toplama yarışı, diğer yandan kısa vadeli fonlarla uzun vadeli yatırımların finanse edilmesi konusunda tedirginlik oluşacak, böylece hem mevduat faizi, hem de kredi faizi artacak, parasal koşullar belirgin şekilde sıkılaşacaktır.

Dolayısıyla, merkez bankaları zorunlu karşılık oranlarını değiştirerek, piyasadaki net likidite durumunu, böylece, parasal koşulları etkileme olanağına sahiptir.Yine merkez bankaları, açık piyasa işlemlerinde kullanılan teminatların türünü ve iskonto oranını değiştirerek teminat verilebilir portföyün değerini, dolayısıyla, bankaların açık piyasa işlemleri yoluyla borçlanma kapasitelerini etkileme olanağına sahiptir. Bu çerçevede, teminat iskonto oranının düşürülmesi ve teminat listesinin genişletilmesi, parasal gevşemeye işaret ederken, iskonto oranının artırılması ve teminat listesinin daraltılması, parasal sıkılaşmaya yol açacaktır.

Merkez bankaları, ayrıca uzun vadeli açık piyasa işlemleri yolu ile de parasal koşulları etkileme olanağına sahiptir. Öncelikle, uzun vadeli işlemler, bankacılık sisteminin kısa vadeli net likidite durumunu etkileyerek parasal koşulları değiştirmektedir. Ayrıca, tahvil alımı gibi daha uzun vadeli işlemler, bir yandan tahvil arz ve talebini etkilemesi, diğer yandan da merkez bankasının uzun vadeli faiz oranlarına ilişkin niyet beyanı niteliği taşıması nedenleriyle, verim eğrisine müdahale anlamına gelecek, parasal koşullarda belirgin bir değişikliğe yol açacaktır.

Diğer yandan, kur politikası, özellikle gelişen ülkelerde genel para politikası stratejisinin ayrılmaz bir parçasıdır. "imkansız üçlü" kavramı ile açıklandığı üzere, sermaye hareketlerinin serbest olduğu günümüz dünyasında, kurların ve faizlerin aynı anda hedef olarak seçilmesi ya da kontrol edilmesi mümkün değildir. Dolayısıyla, merkez bankaları ya kurları ya da kısa vadeli faiz oranlarını seçmek zorundadırlar. Nitekim, kısa vadeli faiz oranlarının operasyonel hedef olarak kullanıldığı enflasyon hedeflemesinin ön şartlarından birisi de dalgalı kur rejimidir. Ancak, gelişen ülkelerin kendine has özelliklerinden bazıları; döviz piyasalarının oldukça sığ olması, dolayısıyla, düşük hacimli arz ya da talep değişikliklerinin önemli oynaklığa yol açması, kurlardan enflasyona geçişkenliğin yüksek olması ve özel kesimin önemli ölçüde döviz yükümlülüğünün bulunmasıdır. Dolayısıyla, kur hareketleri enflasyon, bekleyişler ve ekonomik aktivite üzerinde belirgin bir öneme sahiptir. Bu nedenlerle, gelişen ülke merkez bankaları, kurlardaki aşırı dalgalanmalara karşı duyarlı davranmakta, genellikle dalgalı kur rejimi uyguladıklarını beyan etmelerine karşın, sıklıkla kurlara doğrudan ya da ihale gibi yöntemlerle dolaylı olarak müdahale etmektedirler. Zira, kurlardaki aşırı dalgalanmaların ekonomi üzerindeki etkilerinin tek başına politika faiz oranı ile dengelenmeye çalışılmasının optimal olmayabileceği değerlendirilmektedir.

Ancak, merkez bankalarının döviz piyasalarında sıklıkla müdahale etmesi; (i) enflasyon hedefi yerine kurların nominal çapa olarak ön plana çıkması ve (ii) özel kesimin döviz riski almasını teşvik ederek ahlaki tehlike, risklerini artırmaktadır. Ayrıca, kurlara zamansız müdahale yapılması, merkez bankasını hedef yapmakta, merkez bankasını daha fazla müdahaleye zorlamakta, sonuçta da genellikle oyunu piyasalar kazanmakta, dolayısıyla müdahaleler oynaklığı artırabilmektedir. Bu nedenlerle, merkez bankalarının döviz piyasası işlemlerinde; döviz arzı ya da talebi yaratarak kurlardaki aşırı oynaklığı engelleyen, net bir kur düzeyi hedeflemeyen,

şeffaf ve öngörülebilir ihale yöntemi benzeri uygulamaların tercih edilmesini desteklemekteyiz. Literatürde de belirtildiği üzere, kur düzeyi hedefi ima eden doğrudan müdahalelerin ise kurların ekonomik temellerin ima ettiğinden belirgin şekilde sapması ve bunun da piyasalar üzerinde belirgin olumsuz etkiler yapması halleri ile sınırlı tutulmasını önermekteyiz.

Yukarıda bahsedilen para politikası araçlarının yanında, büyük ölçüde başka kamu otoritelerinin kontrolünde olan ve özellikle bankacılık sisteminin kredi verme ve bilanço büyütme kapasitelerini etkileyen çok sayıda makro ihtiyati araçlar bulunmaktadır. Bunların başında; sermaye yeterliliği oranı, likidite oranı, döviz açık pozisyonu oranı gelmektedir. Makro ihtiyati araçlar, asıl olarak sistemik riske yönelik olarak ön plana çıksa da genel kredi piyasası koşullarının yanında, istenildiğinde kredi piyasasının hedeflenen belirli bir kesimini de etkileyebilmektedir. Dolayısıyla, makro ihtiyati tedbirler, önemli ölçüde para politikası araçları ile benzer bir işlev görmekte, piyasanın belirli bir kısmını etkileme kapasiteleri nedeniyle, ekonominin genelini etkileyen faiz oranı gibi para politikası araçlarından daha esnek bir yapı gösterebilmektedir. Dolayısıyla, makro ihtiyati araçlar, para politikasını tamamlayıcı bir işlev görmekte, para politikası faiz oranının değiştirilmeden kredi koşullarının genelinde ya da hedeflenen bölümlerinde sıkılaşmaya ya da gevşemeye yol açabilmektedir. Diğer yandan, sermaye kontrolleri, genel olarak piyasa mekanizmasını aksatması nedeniyle tercih edilmemesine karşın, özellikle sermaye girişlerinin yoğunlaştığı ve diğer araçların yetersiz kaldığı dönemlerde, sermaye girişlerini sınırlandırmak için kullanılan etkin bir araç niteliğindedir. Bu çerçevede, koordineli bir şekilde kullanılması halinde, makro ihtiyati tedbirler ile sermaye kontrolleri; iş çevrimlerine karşıt ve etkili bir şekilde kullanılma, para politikasının esnekliğini artırma potansiyeline sahiptirler.

Makro ihtiyati araçlar ile sermaye kontrolleri, potansiyel olarak çok etkili araçlar olmakla birlikte, para politikasını etkili bir şekilde destekleyebilmeleri için, bu araçların koordineli olarak kullanılması şarttır. Özellikle, siyasi etkilerin yoğun, ortak karar alma kültürünün zayıf olduğu gelişen ülkelerde, merkez bankalarının, karar alma mekanizmasında ön planda olması, gerektiğinde bankacılıkla ilgili bazı temel makro ihtiyati araçların kontrolünün merkez bankalarına devredilmesi fikirlerini destekliyoruz.

Türkiye Özeli

Türkiye ekonomisinin ve para politikası operasyonel yapısının yakın tarihi, 2002 öncesi ve sonrası olarak iki dönemde incelenerek, her iki döneme ilişkin önemli dersler çıkarılmalıdır. Ekonomi açısından 1990'lı yılları, "kısır döngü" dönemi olarak adlandırmak mümkündür. Bu dönemin temel özellikleri; politik istikrarsızlık, yüksek bütçe açıkları, tarım, bankacılık ve sosyal güvenlik sistemine ilişkin yapısal reformlarda gecikme ve yapısal reformlar için yetersiz kamuoyu desteği olarak sıralanabilir. Bu özellikler, çok yüksek ve dalgalı enflasyona, çok yüksek reel faizlere, düşük ve oynak ekonomik büyümeye, bütçe açıklarının artmasına ve yüksek borç stoku sarmalına yol açmıştır. Ancak, bu kısır döngünün temel nedeni olarak bütçe açıkları gösterilse de dönemin genelinde gözlenen faiz dışı dengenin aşırı bozulmamış olmasını, hatta 1994 sonrası faiz dışı dengede dikkate değer bir iyileşme olduğunu dikkate alarak, biz, ekonomik istikrarsızlığın ve zayıf ekonomik performansın temel nedenlerini; politik istikrarsızlık, kırılgan bankacılık sistemi ile para ve maliye politikalarının kredibilitesinin az olmasının yarattığı risk primi oynaklığına bağlamaktayız. Para ve maliye politikalarının kredibilitesinin az olmasının ise kırılgan politik ortamdan kaynaklandığını düşünmekteyiz. Üstelik, 1990'lı yıllarda özellikle Meksika, Güneydoğu Asya, Rusya, Arjantin Brezilya gibi gelişen ülkeler kaynaklı dışsal şoklar ile 1999 yılında yaşanan Gölcük ve Bolu depremlerinin, kırılganlıkların etkisini önemli ölçüde şiddetlendirdiğini, bu nedenle, diğer dönemlerin performansları ile 1990'lı yıllardaki ekonomik performans karşılaştırılırken, bu faktörlerin de dikkate alınması gerektiğini not etmekteyiz.

1990'lı yıllardaki kısır döngüyü kırma için, 2000 yılı başında öngörülebilir kur rejimi çerçevesinde iddialı bir istikrar programı uygulanmaya başlanmıştır. Ancak, istikrar programı; başta bankacılık sistemi ile ilgili olanlar olmak üzere yapısal reformlarda gecikme, kırılgan bankacılık sistemi, dış ticaret hadlerinde bozulma ve dışsal şoklar gibi nedenlerle 2000 Kasım ve 2001 Şubat aylarında peş peşe gelen likidite ve kur krizleri ile başarısızlıkla sona ermiştir.

1990'lı yılların genelinde, kırılgan bankacılık sistemi, mali baskınlık ve sıklıkla yaşanan dışsal şoklar, TCMB'yi birbiriyle çelişen değişkenleri hedeflemeye zorlamış, TCMB, karmaşık bir ara hedefleme stratejisi uygulamıştır. Bu döneme genel olarak bakıldığında; (i) enflasyonun mümkün olduğunca düşürülmesinin, reel kurlar aracılığı ile rekabet gücünün korunmasının, Hazinenin borçlanmasını en az

maliyetle sürdürebilmesi için finansal piyasalarda istikrarın korunmasının hedeflendiği, (ii) reel kur ile rezerv paranın ya da net iç varlıkların aynı anda ara hedef olarak seçildiği, ve (iii) açık piyasa ve döviz işlemlerinin aynı anda temel para politikası araçları olarak kullanıldığı, ayrıca para politikası kararlarının şeffaf olarak alınmadığı görülmektedir.

Kur çapasına dayalı istikrar programının 2001 yılında çökmesi, iktisat politikalarında köklü değişikliklere yol açmış, bütçe disiplinine odaklı maliye politikaları, fiyat istikrarına odaklı para politikası ve başta bankacılık sistemine yönelik olmak üzere gerçekleştirilen yapısal reformlar sonucu, ekonomi "kısır döngü"den çıkarak "iyi döngü" dönemine girmiştir. TCMB, 2002 yılından başlayarak enflasyon hedeflemesi ile uyumlu çok etkin bir para politikası operasyonel çerçevesi oluşturmuş, 2002 – 2005 döneminde örtük enflasyon hedeflemesi, 2006 ve sonrasında ise açık enflasyon hedeflemesi stratejisine geçmiştir. Bu çerçevede, TCMB, operasyonel hedef olarak kısa vadeli faiz oranını kullanmaya başlamıştır.

2002 yılı, Türkiye'nin ekonomi tarihindeki önemli dönüm noktalarından birisidir. Ortalama büyüme 1990'lı yıllar ile 2000'li yılların başında % 3,4 ile % 5 civarında olan tarihsel ortalama büyüme oranının altına düşmüş, ortalama enflasyon 73,4'e sıçramıştır. Ancak, 2002 – 2011 döneminde, ortalama büyüme % 5,4'e çıkarken, enflasyon % 8 civarına gerilemiştir. 2000'li yıllara ilişkin asıl çarpıcı gelişme; söz konusu dönemi, 2006 öncesi ve sonrası olarak iki bölümde incelediğimizde ortaya çıkmaktadır. 2002 – 2006 ortalama büyüme % 7,2 ile % 6,8 olan gelişen ülkeler ortalamasının üzerine çıkmış, oynaklık çok düşük seviyelere gerilemiştir. Buna karşın, 2007 – 2011 döneminde, politik istikrara ve bütçe disiplinin korunmasına karşın, Türkiye'nin ortalama büyüme hızı, % 3,6 ile hem % 5 civarındaki tarihsel ortalamasının, hem de % 6,3 olan gelişen ülkelerin ortalama büyüme hızının belirgin şekilde altına düşmüş, büyüme hızındaki oynaklık 1990'lı yıllardaki seviyeye yükselmiştir. Üstelik, 2002 – 2005 döneminde hedeflerin belirgin şeklinde altında kalan enflasyon oranları, 2006 yılından başlayarak çoğunlukla hedeflerin üzerinde gerçekleşmiş, zaman zaman çift haneli düzeylere çıkmıştır.

Diğer yandan, Türk ekonomisindeki dengesizlikler, özellikle 2000'li yılların ikinci yarısında belirgin şekilde artmıştır. 1990'lı yıllarda % 22 civarında olan yatırımların GSYİH'ye oranı, 2002 – 2006 döneminde % 19,3, 2007 – 2011

döneminde % 20 olarak gerçekleşirken, 1990'lı yıllarda % 21 civarında olan tasarrufların GSYİH'ya oranı, 2002 – 2006 döneminde % 15,9'a, 2007 – 2011 döneminde ise % 14'e gerilemiştir. Bu çerçevede, 1990'lı yıllarda sadece % 1 civarında olan cari işlemler açığının GSYİH'ye oranı, 2002 – 2006 döneminde % 3,4'e, 2007 – 2011 döneminde ise büyük bir sıçrama göstererek % 6,1'e yükselmiş, yapısal bir sorun haline gelmeye başlamıştır. Böylece, doğrudan yatırımlar hariç tutulduğunda, Türkiye'nin 2001 yılında sadece 90 milyar ABD doları civarında olan net finansal dış borç stoku, 2011 yılında 296 ABD dolarına yükselmiştir. Net dış borç stokunun artması, gelecek dönemde yapısal cari işlemler açığı oluşacağına, ekonominin dışsal şoklara çok daha duyarlı hale geleceğine ve ekonomide önemli istikrarsızlıklar oluşabileceğine işaret etmektedir. Üstelik, cari işlemler açığındaki artışı, sadece dış ticaret hadlerindeki bozulmaya bağlamak mümkün değildir. Zira, dış ticaret hadlerinde asıl bozulma 2000 – 2005 döneminde yaşanmış, bozulmanın hızı sonraki dönemde belirgin şekilde azalmıştır.

2000'li yılların ikinci yarısında ekonomik performanstaki zayıflamanın temel nedenleri olarak; global krizi, Avrupa Birliği ülkeleri ile sıkı ticaret ilişkisini ve dış ticaret hadlerindeki bozulmayı öne çıkarmak mümkündür. Hatta, sağlıklı bankacılık sistemi ile etkin ve güvenilir para politikasının, ekonominin dışsal şoklardan daha olumsuz etkilenmesini önlediği de ifade edilebilir. Ancak, ekonomideki olumsuz gelişmelerin olduğu dönemde, tarihsel olarak en yüksek yabancı sermaye girişinin olduğu, yabancı sermaye girişlerinin dez-enflasyon sürecine ve büyümeye belirgin katkılar yaptığı da gözden kaçırılmamalıdır.

Yabancı sermaye girişlerinin yoğun olduğu dönemlerde; (i) Türk Lirası (TL) değerlenmiş, (ii) TL'deki değerlenme enflasyonun düşmesine yol açmış, (iii) TCMB; (a) gerek enflasyondaki düşüşü dikkate alarak ve gerekse yoğun sermaye girişlerini azaltmaya yönelik olarak politika faizini düşürmüş, böylece parasal koşullar doğrudan gevşemiş, (b) diğer yandan da TL'nin değerlenmesini önlemeye ve döviz rezervlerini artırmaya yönelik döviz alımları yaparak TL likiditesinin artmasına neden olmuş, böylece parasal koşullar dolaylı olarak gevşemiş, (iv) Parasal koşulların dolaylı ve doğrudan gevşemesi, kredilerin kontrolsüz bir şekilde çok yüksek oranlı artmasına, dolayısıyla, iç talepte şişkinliğe neden olmuş, (v) böylece enflasyon oranının düştüğü bir ortamda, ekonomi dengesiz bir şekilde büyüyebilmiştir.

Yabancı sermaye girişlerinin azaldığı ya da çıktığı dönemlerde ise; (i) TL hızla değer kaybetmiş, (ii) TL'deki değer kaybı enflasyonun artmasına yol açmış, (ii) TCMB; (a) gerek enflasyondaki artışı dikkate alarak ve gerekse yoğun sermaye çıkışlarını azaltmaya yönelik olarak politika faizini artırmış ya da gerektiği kadar düşürememiş, böylece parasal koşullar doğrudan sıkılaşmış, (b) diğer yandan da TL'nin değer kaybını önlemeye yönelik döviz satışları, TL likiditesinin azalmasına neden olmuş, böylece parasal koşullar dolaylı olarak sıkılaşmış, (iii) Parasal koşulların dolaylı ve doğrudan sıkılaşması, ekonomik aktivitenin azalmasına yol açmış, (iv) ekonominin yavaşladığı bir ortamda enflasyon artabilmiştir.

Sonuç olarak, ekonomideki dengesizliklerin ve büyüme hızındaki oynaklığın temel nedenlerinden birisi, uygulanan tutarlı maliye ve para politikaları ile güçlü bankacılık sistemi sonucu ülkeye duyulan güvenin artışı ve olumlu global likidite koşulları sonucu, sermaye girişlerinin artması olmuştur. Yabancı sermaye hareketleri, kısa vadeli politika faizinin, iş çevirimlerini dengeleyecek şekilde kullanılmasını sınırlandırmıştır. "Tek amaçlı, tek araçlı" para politikası operasyonel yapısının sermaye hareketleri karşısında yeteri kadar esnekliğe sahip olmaması ve ekonomideki dengesizliklerin artması, TCMB'yi fiyat ve üretimdeki istikrarın yanında, kredileri ve cari işlemler açığını da amaç fonksiyonuna almaya zorlamış, temel para politikasının yeterli esnekliğe sahip olmaması ise destekleyici araç arayışına yol açmıştır. Nitekim, TCMB, 2010'nun ikinci yarısından itibaren "çok amaçlı, çok araçlı" bir operasyonel yapı oluşturmuştur. Bu dönemde, TCMB, bir yandan, zorunlu karşılık sistemini, diğer yandan da koridor sistemini ve likidite yönetimi stratejisini destekleyici araçlar olarak kullanmaya başlamıştır.

TCMB, zorunlu karşılık sisteminde; (i) Eylül 2010'da zorunlu karşılıklara faiz ödenmesine son vermiş, böylece doğrudan maliyet etkisi ile parasal duruşunu sıkılaştırmaya çalışmış, (ii) Aralık 2010'dan itibaren zorunlu karşılık oranlarını hızla artırarak, hem doğrudan maliyet, hem de dolaylı likidite etkisi ile piyasaları yönlendirmeye çalışmış, (iii) daha sonra ise ekonomik aktivitenin zayıflama riskine karşı, bir yandan TL zorunlu karşılıkları sınırlı olarak düşürerek, diğer yandan da zorunlu karşılıkların döviz cinsi tutulmasına izin vererek, her ne kadar döviz rezervlerinin artırılması ön plana çıkartılsa da, zorunlu karşılık sisteminin sıkılaştırıcı etkisini yumuşatmaya yönelmiştir.

Aynı dönemde, TCMB, yabancı sermaye girişlerini azaltmak amacıyla, 2010 son çeyreğinde, özellikle yabancı yatırımcılar için efektif faiz oranını düşürmek için faiz koridorunun alt sınırını belirgin şekilde düşürmüş, 2011 yılında döviz çıkışlarının artması üzerine ise, bu defa koridorun alt ve üst sınırlarını belirgin şekilde yükselterek yukarı yönlü asimetrik bir yapıya geçmiştir. TCMB, koridor sisteminin etkinliğini artırmak amacıyla, likidite yönetimi stratejisinde de farklı uygulamalara geçmiş; 2011 ikinci yarısında, önce piyasaları politika faiz oranı ile yetersiz fonlayarak, ikincil piyasa gecelik faiz oranlarının hızla yükselmesine izin vermiş, daha sonra fonlamasının önemli bir kısmını politika faiz oranı yerine 1 aylık ihalelerle ilan ettiği politika faiz oranı üzerinden değil, daha yüksek faiz oranları ile fonlamaya başlamıştır. Böylece, efektif faiz oranlarının bankalar açısından bir ölçüde, yabancı yatırımcılar açısından ise belirgin şekilde yükselmesini, dolayısıyla, parasal koşulların sıkılaşmasını sağlamıştır. Diğer yandan, Bankacılık Düzenleme ve Denetleme Kurumu (BDDK) da 2011 yılı ortalarında sermaye yeterlilik oranı hesaplamasında bazı kalemler için sıkılaştırmaya giderek para politikası stratejisini desteklemiştir.

Destekleyici politika araçlarının etkinliği, finansal piyasaların yapısına bağlıdır. Öncelikle, alternatif politika araçlarının etkinliği tartışmalarında, Türkiye'deki kredi arzının sadece TL kredilerden oluşmadığı, önemli ölçüde TCMB'nin kontrolü dışındaki döviz cinsi kredilerden de oluştuğu not edilmelidir. Gerek bankacılık sistemi ve gerekse firmalar, yurtdışından döviz cinsi borçlanarak döviz cinsi kredi arzını artırabilmektedir. Ayrıca, yabancı yatırımcıların TL cinsi yatırım araçlarına yönelik yatırımları da TL kredi arzını dolaylı olarak önemli ölçüde etkilemektedir. Nitekim, son 10 yıllık dönemde, Türkiye'deki kredi arzının yaklaşık % 40'ı dış kaynaklıdır. Böyle bir finansal yapı, yapısal olarak TCMB'nin kısa vadeli faiz oranları ile ekonomik aktivite üzerindeki etkisinin sınırlı olduğuna işaret etmektedir.

Türkiye'deki mali piyasaların temel özeliklerini aşağıdaki gibi sıralamak mümkündür: (i) bankacılık sisteminin Türkiye'de finansal piyasalar içindeki payı % 90 civarındadır, dolayısıyla bankacılık sisteminin tabi olduğu kurallara tabi olmayan alternatif kredi ve tasarruf kuruluşları bulunmamaktadır, (ii) özel sektör tahvil piyasası gelişmemiştir, dolayısıyla, özel kesim için bankacılık kesimi ve yurtdışı haricinde, alternatif borçlanma araçları sınırlıdır, (iii) hane halkı yatırım aracı olarak

mevduatı tercih etmektedir, (iv) yabancı portföy yatırımcıları, tahvil ve para piyasalarında gittikçe artan bir paya sahiptir, ve (v) bankacılık sisteminin döviz açık pozisyonu oldukça sınırlı iken, firmaların önemli ölçüde döviz yükümlülüğü vardır. Bu finansal yapı; (i) işlemlerin banka dışı kesime kayma imkânının sınırlı olması nedeniyle, bankacılık sistemi varlık ve yükümlülüklerine, (ii) yabancı sermayenin kredi piyasaları üzerindeki ağırlığı nedeniyle, yabancı sermaye girişlerine yönelik kullanılacak araçların, piyasalar üzerinde oldukça etkili olabileceğine işaret etmektedir.

Zorunlu Karşılık Sisteminin Etkinliği: Türkiye Örneği

Literatürde, TCMB politika faiz oranı ile TL mevduat ve TL kredi faiz oranları arasındaki ilişkiye ilişkin çalışmalar bulunmaktadır. Johansen VEC (vector error correction) yöntemi ile yapılan bu çalışmalarda, gerek uzun ve gerekse kısa vadede, politika faiz oranı ile her iki faiz oranı arasında istatistikî olarak anlamlı ve kuvvetli ilişkiler bulunmuştur. Bizim çalışmanın bu bölümünde, zorunlu karşılık sisteminin kredi ve mevduat faiz oranları üzerindeki etkileri araştırılmıştır. Türkiye'deki zorunlu karşılıklara 2002 – 2010 döneminde genel olarak politika faiz oranına endeksli faiz ödenmiş, bu uygulamaya Eylül 2010'da son verilmiştir. Dolayısıyla, zorunlu karşılık oranlarının maliyetinin ve likidite etkisinin paralel hareket etmesi nedeniyle, zorunlu karşılıkların doğrudan maliyet etkisi ayrıca irdelenememiş, zorunlu karşılık uygulamasının likidite etkisine odaklanılmıştır. Zorunlu karşılık oranları artırıldığında; (i) artan zorunlu karşılık tutarı kadar bankaların mevduat dışı kısa vadeli borçlanma ihtiyaçları da artacağından, bankaların likidite açıklarının artması ile birlikte bankaların mevduat ve kredi faiz oranlarını artırma baskısı ile karşılaşmaları ve (ii) bu baskının borçlanma oranının teminat verilebilir menkul kıymet portföylerine oranı arttıkça yükselmesi beklenmelidir. Diğer yandan, Türkiye'de bankalar, likidite açıklarını asıl TCMB açık piyasa işlemleri ya da diğer kuruluşlarla gerçekleştirdiği repo işlemleri ile finanse etmekte, teminat olarak menkul kıymet portföylerini kullanmaktadırlar. Bankaların likidite ihtiyacı baskısı, bankaların, repo işlemlerinin teminat olarak kullanılabilir toplam portföylerine oranı ile ölçülmüş, bu ölçü likidite oranı olarak adlandırılmıştır.

Finans teorisi, bankaların, likidite sıkışıklığı hissetmemeleri halinde, zorunlu karşılıkların doğrudan maliyetini mevduat oranına yansıtacaklarına işaret etmektedir. Bu çerçevede, likidite baskısının olmadığı ortamda, zorunlu karşılıkların artırılması, mevduat faiz oranını düşürücü yönde etkilerken, kredi faiz oranını etkilemeyecektir. Ancak, likidite etkisi çalışmaya başladığında, zorunlu karşılık oranları ile kredi ve mevduat faiz oranı arasında aynı yönlü ilişki ortaya çıkması beklenmektedir.

Çalışmamızda, tüketici ve ticari kredilerin ağırlıklı faiz oranının uzun dönemli eşitliğinde, politika faiz oranının katsayısı 0,6, likidite oranının katsayısı ise 0,21 olarak tahmin edilirken, kısa dönemli ilişkide, likidite oranının 0,05 olarak tahmin edilmiş, katsayılar istatistikî olarak anlamlı bulunmuştur. Dolayısıyla, bu sonuçlar, TCMB'nin politika faiz oranını değiştirmeden, zorunlu karşılık oranını değiştirerek kredi koşullarını etkili bir şekilde değiştirebileceğini göstermiştir.

Buna karşın, vadeler itibariyle ağırlıklı mevduat faiz oranının uzun dönemli eşitliğinde, politika faiz oranının katsayısı 0,95 ve istatistikî olarak anlamlı, likidite oranının katsayısı ise 0,01, ancak istatistikî olarak anlamsız tahmin edilirken, kısa dönemli ilişkide, likidite oranının katsayısı 0,05 olarak tahmin edilmiş, istatistikî olarak anlamlı bulunmuştur. Dolayısıyla, bu sonuçlar, likidite oranının, mevduat faiz oranı üzerinde uzun vadede etkili olmadığını göstermiştir. Bu aslında, beklentimizle çelişmemektedir. Zira, muhtemelen zorunlu karşılıkların maliyetinin mevduat faizi üzerindeki düşürücü etkisinin, likiditenin yükseltici etkisini dengelediği değerlendirilmektedir.

Çalışmada, ayrıca Türkiye'deki döviz mevduat faiz oranı ile yurt dışı faiz oranı ve ülke risk primi ölçüsü olan kredi iflas değişim oranı (CDS) arasındaki ilişkiye bakılmış, döviz mevduat faiz oranları ile diğer değişkenler arasında uzun vadede aynı yönlü, güçlü ve istatistiksel olarak anlamlı ilişki bulunmuştur. Dolayısıyla, döviz cinsi mevduat faiz oranının asıl olarak yurtdışı likidite ve ülke risk primi tarafından belirlendiği tespit edilmiş, döviz cinsi kredi faiz oranına ilişkin yayınlanmış veri olmaması nedeniyle bir inceleme yapılmamakla birlikte, mevduat faiz oranı belirleyicilerinin döviz cinsi kredi faiz oranı üzerinde de etkili olabileceği yorumu yapılmıştır.

DSGD Modeli: Makro İhtiyati ve Sermaye Kontrolü Araçlarının Etkinliği

Politika araçlarının etkinliği, merkez bankası amaç fonksiyonuna katkıları ile ölçülmektedir. Bu çerçevede, DSGD modelleri, alternatif politika araçlarının etkinliğini ve aktarım mekanizması üzerindeki etkilerini anlaşılabilir bir şekilde inceleme fırsatı yaratmaktadır. Çalışmamızda, kalibre edilmiş parametreler ile literatürde yaygın olarak kullanılan küçük açık ekonomi DSGD modeli kullanılmıştır. Kullanılan parametreler Türkiye'nin özellikleri ile uyumludur. Modelde; hane halkları, bankacılık sistemi, girişimci, sermaye malları üreticileri, ara mal üreticileri, perakendeciler, ithalatçılar ve ihracatçılar ile dış âlem yer almaktadır. Modelde davranışlar, log-lineer eşitliklerle temsil edilmekte olup, finansal hızlandırıcı mekanizmaya ve firmaların borçlanmalarında dolarizasyona izin verilmiştir. Eşitlikler, literatürde standart olarak kullanılan eşitlikler olmakla birlikte, basit bir bankacılık sistemi tarafımızdan eklenmiştir. Altı tür dışsal şok; bir gecikme değerli ardışık bağımlı olarak varsayılmıştır. Bunlar; (i) enflasyon şoku, (ii) tüketim şoku, (iii) üretkenlik şoku, (iv) ülke risk primi şoku, (v) dış âlem talep şoku, ve (vi) dış âlem enflasyon şokudur.

Bankacılık sistemi, mevduat ve kredi bankalarından oluşmakta, TL mevduat bankaları, hane halkından topladığı mevduatı, mevduat faiz oranına merkez bankasınca eklenen makro ihtiyati maliyeti ekleyerek TL kredi bankasına borç vermekte, kredi bankası da borçlandığı tutarı, risk primi ekleyerek girişimciye kredi vermektedir. Mevduat faiz oranı, her zaman politika faiz oranına eşit olup, merkez bankası ayrıca makro ihtiyati maliyeti bir politika aracı olarak kullanabilmekte, bu maliyeti artırarak ya da azaltarak, politika faiz oranını değiştirmeden, TL kredi faiz oranını etkileyebilmektedir.

Döviz mevduat bankası, hem hane halkından döviz mevduatı toplayarak, hem de yurtdışından döviz borçlanarak fon bulmaktadır. Döviz mevduat faiz oranı, yurtdışından borçlanma maliyetine eşittir. Yurtdışından borçlanma maliyeti ise, yurtdışı faiz oranı, ülke risk primi ve sermaye kontrolü maliyetinin toplamına eşittir. Döviz mevduat bankası, topladığı bu fonları, döviz kredi bankasına borç vermekte, döviz kredi bankası da borçlanma maliyeti üzerine risk primi ekleyerek girişimciye kredi vermektedir. Dolayısıyla, merkez bankası, sermaye kontrolü maliyetini değiştirerek, döviz mevduat, yurtdışı borçlanma ve böylece, döviz cinsi kredi faiz oranlarını etkileyebilmektedir.

Sonuç olarak, merkez bankasının üç politika aracı bulunmaktadır: (i) politika faiz oranı, (ii) makro ihtiyati maliyet, ve (iii) sermaye kontrol maliyeti. Çalışmada, merkez bankasının (i) "tek amaçlı, tek araçlı" operasyonel yapı çerçevesinde; sadece politika faiz oranını kullanarak, % 100 ağırlıklı enflasyon ve % 50 ağırlıklı üretim oynaklığını en aza indirdiğinde, (ii) "tek araçlı, çok amaçlı" operasyonel yapı çerçevesinde; sadece faiz oranını kullanarak, ilave olarak % 0,05 ağırlıklı kredi ve % 20 ağırlıklı dış ticaret oynaklıklarını en aza indirdiğinde, ve (iii) "çok araçlı, çok amaçlı" operasyonel yapı çerçevesinde; önce politika faizi ve makro ihtiyati maliyeti aynı anda, sonra da her üç aracı da aynı anda kullanarak, tüm hedeflerdeki ağırlıklı oynaklığı en aza indirdiğinde oluşan toplam kayıplar hesaplanmıştır. Tüm denemelerde, ağırlıklı enflasyon ve üretim oynaklığı Kayıp-1 olarak adlandırılırken, tüm hedeflerin ağırlıklı oynaklığı Kayıp-2 olarak adlandırılmıştır.

Türkiye şartları ile daha uyumlu olan % 40 dolarizasyon varsayımı altında, "tek amaçlı, tek araçlı" operasyonel yapıda, Kayıp-1, 72 olarak bulunmuş, tüm enflasyon, üretim, krediler ve ticaret dengesinin ağırlıklı oynaklığı (Kayıp-2) 174 olmuştur. "Çok amaçlı, çok araçlı" operasyonel yapıda, politika faiz oranı ve makro ihtiyati tedbir birlikte kullanıldığında, Kayıp-1 43'e, tüm hedefleri içeren kayıp değeri (Kayıp-2) 78'e düşerken, üç aracın birlikte kullanıldığında, Kayıp-1 değeri 28'e, Kayıp-2 değeri ise 42'ye inmiştir.

Sonuç

Bu çalışma sonucunda aşağıdaki sonuçlara ulaşılmıştır:

(i) Merkez bankaları, asıl olarak kısa vadeli faiz oranını temel araç olarak kullanmakla birlikte, parasal koşulları çok sayıdaki araç ve strateji ile etkileme olanağına da sahiptir.

(ii) "Çok amaçlı, çok araçlı" ya da "tek amaçlı, çok araçlı" operasyonel yapılar, klasik enflasyon hedeflemesi operasyonel çerçevesi olan "tek amaçlı, tek araçlı" operasyonel yapıya göre belirgin şekilde verimlidir.

(iii) Çalışmamızın sonuçlarına göre, destekleyici araçlar olan makro ihtiyati tedbirler ve sermaye kontrolleri, sermaye hareketleri ve dolayısıyla iş çevrimlerinin tersine kullanılarak, hem fiyat ve üretimdeki oynaklığın azaltılmasına, hem de finansal istikrara önemli katkılar sağlayabileceklerdir.

(iv) Dolayısıyla, Türkiye gibi yoğun sermaye hareketlerine maruz kalan gelişen ülkeler, öncelikle makro ihtiyati tedbirleri ve gerek görüldüğünde sermaye kontrollerini aktif olarak kullanarak, temel para politikası aracı olan kısa vadeli faiz oranını daha esnek ve verimli olarak kullanma olanağına kavuşabilirler. Bu çerçevede, Türkiye gibi gelişen ülkelerde destekleyici araçların aktif olarak kullanılmasını desteklemekte ve önermekteyiz.

(v) Ancak, iki önemli ön şart dikkate alınmalıdır: (i) şeffaflık ve (ii) koordinasyon. Para politikası uygulamasında basitlik, şeffaflığı ve piyasalarla iletişimi kolaylaştıran önemli bir faktördür. Bizim merkez bankacılığımız esnasında edindiğimiz en önemli tecrübelerden birisini; "basit, güzeldir" şeklinde betimlemekteyiz.

(vi) Operasyonel çerçeve karmaşıklaştıkça, bir yandan operasyonların piyasalarca anlaşılması zorlaşırken, diğer yandan da piyasalarla iletişim güçleşir. Diğer yandan, çalışmamızda, makro ihtiyati ve sermaye kontrolü araçları, basitleştirilmiş halleri kullanılmış, merkez bankalarınca kontrol edilebildiği ve faiz oranı karşılıklarının hesaplanabildiği varsayılmıştır. Hâlbuki, gerçek hayatta, faiz oranının aktarım mekanizması üzerindeki etkisi ve etkinin süresi önemli ölçüde ölçülebilir ve tahmin edilebilir olmakla birlikte, bu araçların faiz oranı karşılıkları, aktarım mekanizması üzerindeki etkisinin boyutunu ve dolayısıyla etkileme süresini ölçmek kolay değildir. Üstelik, bunların etkisinin piyasalarca ve kamuoyunca anlaşılması çok daha zor olacaktır.

(vii) Dolayısıyla, operasyonel yapının bir yandan karmaşıklaşması, diğer yandan da sonuçlarının öngörülebilirliğinin zorlaşması, para politikasının şeffaflığını ve kredibilitesini azaltabileceği, ekonomik aktörlerin karar alma süreçlerinde risk primini artırarak fayda yerine zarar verebileceği de dikkate alınmalıdır. Dolayısıyla, merkez bankaları, ilave araçları kullandığında, kullanılan araçların aktarım mekanizması üzerindeki etkileri konusunda kamuoyunu ikna etmelidirler. Bu çerçevede, karmaşık yapının para politikası

kredibilitesi üzerindeki yaratabileceği olumsuz etkiler başka çalışmalarla incelenmelidir.

(viii) Diğer yandan, "çok araçlı" bir yapı, araçlar arasında çok sıkı bir koordinasyon gerekmektedir. Merkez bankalarının bu araçlara ilişkin karar mekanizmalarında etkin olmalarının, araçların verimliliğini artıracağı not edilmelidir.

APPENDIX C

TEZ FOTOKOPİ İZİN FORMU

ENSTİTÜ

Fen Bilimleri Enstitüsü	
Sosyal Bilimler Enstitüsü	X
Uygulamalı Matematik Enstitüsü	
Enformatik Enstitüsü	
Deniz Bilimleri Enstitüsü	

YAZARIN

Soyadı : Çufadar

Adı : Ali

Bölümü : İktisat

TEZİN ADI (İngilizce) : Monetary Policy Operating Framework for Financial and Price Stability: The Case of Turkey

TEZİN TÜRÜ : Yüksek Lisans [ ] Doktora [X]

1. Tezimin tamamı dünya çapında erişime açılsın ve kaynak gösterilmek şartıyla tezimin bir kısmı veya tamamının fotokopisi alınsın. [ ]
2. Tezimin tamamı yalnızca Orta Doğu Teknik Üniversitesi kullanıcılarının erişimine açılsın. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) [ ]
3. Tezim bir (1) yıl süreyle erişime kapalı olsun. (Bu seçenekle tezinizin fotokopisi ya da elektronik kopyası Kütüphane aracılığı ile ODTÜ dışına dağıtılmayacaktır.) [X]

Yazarın imzası ..... Tarih .....