AN EVALUATION OF THE TRILEMMA: GLOBAL CONSTRAINTS ON MONETARY POLICIES OF DEVELOPING COUNTRIES IN THE POST BRETTON WOODS ERA

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF SOCIAL SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

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IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
THE DEPARTMENT OF ECONOMICS

JULY 2016

Approval of the Graduate School of Social Sciences

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ABSTRACT

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July 2016, 131 pages

This study investigates monetary policy independence of developing countries in the context of the trilemma concept in the post Bretton Woods Era. Throughout the thesis, multidirectional effects of financial flows on monetary policies of developing countries are described and limits on effectiveness of the policy rate tool are discussed. As empirical evidence shows, global factors restrict central bank independence in developing countries and the policy rate tool is not effective enough in influencing long-term interest rates in these economies. Under the current institutional framework, developing countries can not easily pursue independent monetary policies by just letting exchange rates float.

Keywords: Trilemma, monetary policy independence, financial flows, developing countries

ÖZ

İMKANSIZ ÜÇLEME ÜZERİNE BİR DEĞERLENDİRME: BRETTON WOODS SONRASI DÖNEMDE GELİŞMEKTE OLAN ÜLKELERİN PARA POLİTİKALARI ÜZERİNDEKİ KÜRESEL KISITLAR

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Temmuz 2016, 131 sayfa

Bu çalışma Bretton Woods sonrası dönemde gelişmekte olan ülkelerdeki para politikası bağımsızlığını imkansız üçleme çerçevesinde incelemektedir. Tez boyunca finansal akışların gelişmekte olan ülkelerin para politikaları üzerindeki çok yönlü etkileri tarif edilmiş ve politika faizi aracının etkinliğinin sınırları tartışılmıştır. Ampirik verilere gore gelişmekte olan ülkelerin merkez bankası bağımsızlığı küresel faktörler tarafından kısıtlanmaktadır ve bu ülkelerde politika faizleri uzun dönemli faizler üzerinde yeterince etkin değildir. Güncel kurumsal çerçeve altında gelişmekte olan ülkeler sadece kurları serbest bırakarak kolaylıkla bağımsız para politikası yürütemezler.

Anahtar Kelimeler: imkansız üçleme, para politikası bağımsızlığı, finansal akışlar, gelişmekte olan ülkeler

To Ebru

ACKNOWLEDGMENTS

The author wishes to express his deepest gratitude to his supervisor Yrd. Doç. Dr. Hasan Cömert for his guideness, advice, criticism and encouragements throughout the research.

The author would like to thank to the members of the thesis jury Prof. Dr. Hakan Mıhçı and Yrd. Doç. Dr. Kağan Parmaksız for their valuable suggestions.

The author would also like to thank Arş. Gör. Ahmet Benlialper for his suggestions regarding empirical analyses.

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LIST OF ABBREVIATIONS

CPI	Consumer Price Index
ECB	European Central Bank
FED	Federal Reserve
GDP	Gross Domestic Product
IMF	International Monetary Fund
OECD	Organization for Economic Co-operation and Development
OLS	Ordinary Least Squares
VAR	Vector Autoregression
US	United States
DC	Developing Countries
AC	Advanced Countries
EME	Emerging Market Economies
GFC	Global Financial Crisis
IT	Inflation Targeting
SVAR	Structural Vector Autoregression
PLS	Panel Least Squares

CHAPTER 1

INTRODUCTION

Monetary authorities have generally been restricted by the famous monetary trilemma which points to the impossibility of independent monetary policy, fixed exchange rates and capital openness simultaneously. Under the Gold Standard, central banks' task was rather simple because national currencies were directly convertible to gold, which was seen as a guarantee for a stable monetary system. The 19th century witnessed unprecented capital mobility associated with a world monetary system; however independent monetary policy was out of agenda of policy makers. After the collapse of the Gold Standard, hyperinflation problems and currency crises occurred and need for a new world monetary system arised. The Bretton Woods was an answer to existing economic disorder and turmoil.The rationale behind the system was similar to the Gold Standard regarding exchange rate stability, but the Bretton Woods was completely different from the Gold Standard in capital mobility, which was restricted by extensive controls. In the Bretton Woods System, dollar was the base currency and it was convertible to gold at a fixed amount. Democratically elected governments were trying to meet employment and wage demands of rising working class movements; thus they needed national sovereignity and independent monetary policies. However, the Bretton Woods could not be a long-lasting monetary system, in particular due to rising cross border capital flows and the system collapsed in 1973 with the abolishment of convertibility of dollar to gold by US authorities. In the post Bretton Woods Era, capital controls were lifted and exchange rates were let floating among advanced economies. Starting with the 1980s, financial integration has accelerated and capital transactions among central economies have reached to unprecented levels. Developing

countries (DCs) have followed advanced economies and opened their economies to volatile capital flows. Changing institutional framework shaped international macroeconomics and restricted sovereignity of national entities in DCs regarding economics and other aspects.

This study aims to discuss consequences of abovementioned institutional changes to monetary policy independence of DCs in the context of the trilemma. The following question has motivated the research of the thesis: Can DCs pursue independent monetary policies under open capital accounts even though they adopt floating exchange rate regimes? Discussing this question requires a detailed evaluation of the trilemma, investigating monetary transmission mechanism in DCs, discussing effectiveness of monetary policy tools of DCs and testing empirically for central bank independence, which are done throughout the thesis.

Chapter 2 defines and discusses the trilemma concept within a historical background. The Mundell-Fleming model is the starting point of the study because most of the supporters of the trilemma implicitly use this simple model in explaining current international macroeconomics. What Mundell-Fleming model says is that on the one hand, an open economy with fixed exchange rates has to follow international interest rates; on the oher hand flexible exchange rates give autonomy to national interest rate settings. In the same way, the framework of the trilemma implies external shock absorbation capacity of flexible exchange rates under open capital accounts. By using different techniques many scholars point to the bindingness of the trilemma and underline benefits of capital flows. After reviewing the general framework, Chapter 2 discusses some important challenges to the trilemma. The quadrilemma concept, developed by Aizenman (2011), emphasizes exchange rate and financial stability concerns of DCs and usage of foreign exchange reserves for these purposes. The

dilemma challenge of Rey (2015) undermines the validity of the trilemma by claiming that financial flows have had decisive power on domestic monetary policies.

A common problem in the trilemma literature is the definition of monetary policy independence. The bulk of the literature evaluates independent monetary policy as interest rate independence because interest rates are belived to be effective in influencing domestic targets according to the conventional wisdom. In Chapter 3, after reviewing the literature of conventional monetary transmission mechanism, the discussion focuses on the effectiveness issue. Is the policy rate tool of central banks of DCs effective enough? As findings of the chapter indicate, monetary transmission channels of DCs are exposed to the influence of domestic and global factors simultaneously. Besides national monetary authorities, financial flows exert influence on three specific channels of monetary transmission in DCs: long-term interest rates, exchange rates and credit growth. Accelarating capital inflows overvalue domestic currencies, depress risk premiums, inflate asset prices and expand credit growth through various channels. By elaborating on these channels, Chapter 3 points to limitations of short-term interest rates in influencing exchange rates and credit growth in DCs.

After figuring out global influences on domestic transmission channels in Chapter 3, Chapter 4 examines global constraints on short-term interest rates of central banks in emerging market economies (EMEs). Thirteen EMEs (Brazil, Indonesia, Mexico, Chile, Korea, Colombia, Peru, Poland, Czech Republic, Hungary, Turkey, South Africa and Israel), pursuing inflation targeting (IT) monetary policies, are chosen for the empirical work because these open economies use short-term interest rates as the sole policy instrument. Moreover, IT EMEs follow flexible exchange rate regimes and according to the trilemma, they have enough room for pursuing independent monetary policies. Policy responses of thirteen EMEs are analyzed over 2002-2016 by using a

modified Taylor Rule, which contains international interest rates and exchange rates beside inflation and output gaps. Structural Vector Autoregression (SVAR) technique is used in estimations. Empirical findings shed light on harsh global constraints on short-term interest rates of EMEs, which restrict independence of their central banks. One of the contributions of this study is employing Structural Vector Autoregression technique in evaluating policy responses of central banks and deriving the influential role of international interest rates in policy rate settings of IT EMEs.

The effectiveness issue in Chapter 3 is discussed for long-term interest rates in Chapter 5 in the light of empirical findings. Four representative EMEs (Korea, South Africa, Israel and Colombia) are chosen and determinants of long-term interest rates of these economies are examined over 2003-2016. According to estimation results, US long-term interest rates and inflation expectations are two important factors influencing long-term interest rates of EMEs; on the other hand the influence of short-term interest rates on long-term interest rates is quite low. The empirical evidence in Chapter 5 shows that global constraints prevent traditional interest rate channel from working effectively in DCs. When this finding is combined with the effectiveness discussion in Chapter 3, one can easily see that transmission channels of DCs are highly exposed to global constraints and taking effective monetary decisions is hard for a developing country unless comprehensive measures are taken.

In the light of abovementioned findings, global factors restrict central bank independence of DCs and decrease effectiveness of their policy rate tools by influencing long-term interest rates, exchange rates and credit growth independently. Therefore, the channels by which capital openness hit independent monetary policy are manifold. Even though a developing country may achieve to set its policy rates independently, monetary transmission channels might not be free of global constraints and thus policy rates might not be effective. Without implementing extensive

measures, such as capital controls, pursuing independent monetary policy is not easy for a developing country under the current institutional framework.

CHAPTER 2

THE TRILEMMA

2.1 Introduction

Impossible trinity has attracted attention of many scholars throughout history. International macroeconomics, global finance and monetary issues are all related to three well-known objectives: stable exchange rate systems, monetary policy independence and open capital markets. Policy makers have cared about these objectives while deciding on which policy to follow.

Roots of importance of exchange rate stability go back to the Gold Standard Era. At that times price stability was tied directly to exchange rate stability because national currencies were fixed to predetermined amounts of gold. Hyperinflation problems in the first quarter of the 20th century were due to collapse of the Gold Standard beacuse of war conditions. After World War II, the Bretton Woods System was established and dollar was put to the top of all other currencies. Any currency was convertible to dollar and dollar was convertible to gold at a fixed rate. After the collapse of the Bretton Woods exchange rates became flexible among advanced economies; however there were attempts like the Plaza Accord and the European Monetary System to stabilise strong currencies. Euro integration after 1999, contributed to exchange rate stability in advanced countries (ACs). Today although many DCs officially follow flexible exchange rates, the value and volatility of their currencies still matter for various reasons.

In this study, monetary policy independence is defined as a wider concept than central bank independence, which is related to the autonomy of central banks regarding their operational tools. Monetary policy independence also covers effectiveness of operational tools in influencing domestic monetary targets. Thus, independent monetary policy implies taking effective monetary decisions, which are independent from global factors. For example in the Bretton Woods Era, effective capital controls were preventing transmission of movements in international interest rates to domestic interest rates. Under the Gold Standard monetary policy independence was out of discussion; on the other hand in the mid 20th century, rising working class movements and domestic issues related to employment became vital and pushed monetary policy autonomy further to agenda of policy makers. In the post Bretton Woods Era, monetary policy independence has become crucial for limiting destabilizing effects of financial flows and defending domestic decision taking mechanisms against global forces.

Capital mobility defines free movement of capital at a global scale. In the Gold Standard Era, there were no restrictions on the movement of capital; however the Bretton Woods put strong controls on it. Starting with the 1980s, financial openness had risen and existing capital controls were removed, thereby open economy spreaded out globally.

The trilemma is the framework which combines abovementioned three policy rules; independent monetary policy, fixed exchange rates and capital openness. According to the trilemma, only two of three policy rules are feasible at the same time. In other words, floating exchange rates generate monetary policy independence under open capital accounts.

This chapter aims to investigate historical roots of the trilemma concept. In the first part, original Mundell-Fleming model is defined and discussed. Up to date discussions

on the trilemma are reviewed in the second part. In the third part, two specific challenges to the trilemma are presented. First one is about the importance of reserves (quadrilemma framework, which is developed by Aizenman (2011)) and the second one is related to dominance of capital openness on monetary policy independence regardless of exchange rate regimes (dilemma concept of Rey (2015)). The fourth part discusses some gaps within the trilemma literature together with abovementioned challenges to it. The last part concludes the chapter.

2.2 Origins of the trilemma: The Mundell-Fleming model

The Mundell-Fleming model is an extension of the IS-LM model to open economies. In the model, the IS relation defines the goods market equilibrium, but different from closed economy models, net exports (NX) is included in the equation:

$Y = C(Y - T) + I(i) + G + NX(Y, Y', \varepsilon)$; where Y' is the foreign output, Y is the domestic output, T is the tax, i is the domestic interest rate, G is the government expenditure, C is the consumption, I is the investment, NX is the net exports and ε is the exchange rate (domestic currency per unit of foreign currency) (1)

Integration of net exports, defined as exports minus imports ($X(Y', \varepsilon) - \varepsilon.IM(Y, \varepsilon)$), to the existing IS framework forms the basis of the Mundell-Fleming model. According to the Marshall-Lerner Condition, depreciation of domestic currency eventually improves net exports by increasing exports and decreasing imports enough to compensate for the rise in price of imports (Blanchard, 2011). For the dynamic analysis, the famous J curve shows changes in net exports as time passes after a depreciation shock: Net exports fall at first because of the rise in import prices, but after some time exports follow an upward trend and imports start to decline as a

response to the depreciation, by which net exports increase and eventually surpass its initial value (Blanchard, 2011).

The second component of the model, the LM relation, stands for the financial market equilibrium:

$M/P = Y.L\ (i)$; where M is the money demand and P is the price level (2)

Originality of the Mundell-Fleming model is coming from integration of the arbitrage or the uncovered interest parity equation (Hallwood & MacDonald, 2000) into the IS-LM framework:

$i = i' + (\varepsilon - \varepsilon^e)/\varepsilon^e$; where ε^e is the expected future exchange rate and i' is the foreign interest rate (3)

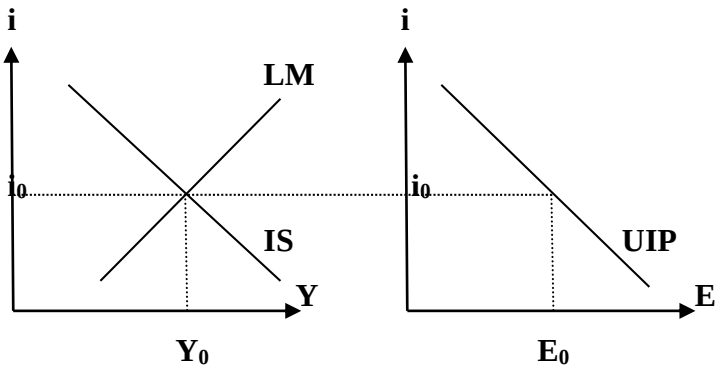

Figure 2:1 Uncovered interest parity with the IS-LM model

Uncovered interest parity, as displayed in Figure 2:1, states that if expected nominal depreciation of domestic currency is more than i – i', investors will move to foreign bonds, thereby demand for foreign currency will rise. Foreign currency will appreciate with respect to domestic currency and ε will rise until the new equilibrium. On the other hand, if expected nominal depreciation of domestic currency is less than i – i', investors will demand domestic currency, thereby domestic currency will appreciate with respect to foreign currency by pulling down ε until the new equilibrium.

According to Halwood & MacDonald (2000), four different assets; foreign bonds, domestic bonds, foreign money and domestic money, exist in the basic Mundell-Fleming model. Foreign bonds and domestic bonds are assumed to be perfect substitutes and their yields are equalized continuously; moreover expectations are assumed to be constant; therefore uncovered interest parity condition morphs to i = i' under perfect capital mobility and static exchange rate expectations (Halwood & MacDonald, 2000).

In addition to abovementioned three equations, the balance of payments (BoP) equilibrium can be added to the existing IS-LM framework. Balance of payments is at equilibrium when volume of net exports is consistent with volume of net capital outflows. The BoP curve is horizontal when capital is perfectly mobile.

BoP: Current Account + Capital Account + Balancing Item = 0 (4)

Mundell (1963) discusses effectiveness of monetary and fiscal policies under fixed and floating exchange rate regimes. Perfect capital mobility was assumed throughout his analysis. According to Mundell (1963), under flexible exchange rates purchase of domestic bonds increases money supply. As shown in Figure 2.2, the LM curve shifts to LM'. Rising money supply decreases interest rates and capital outflows cause

depreciation of domestic currency, which improves net exports by increasing trade competitiveness, according to the Marshall-Lerner Conditon; therefore interest rate rises until its initial value. Increasing net exports shifts the IS curve to IS'; thus monetary policy becomes totally effective under flexible exchange rates (Mundell, 1963).

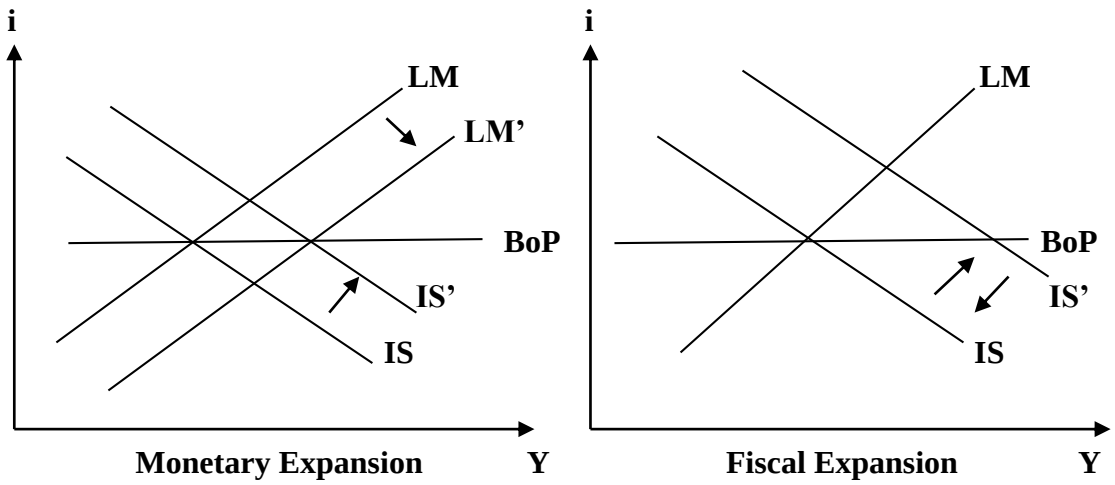

Figure 2:2 Effectiveness of monetary and fiscal policies under flexible exchange rates

For discussing effectiveness of fiscal expansion, a rise in government spending under flexible exchange rates is assumed. This will create excess demand for goods and tend to increase income, therefore the IS curve shifts to IS'. Rising income triggers money demand and pushes interest rate upwards. Rising interest rate attracts capital inflows, which cause currency appreciation. Overvalued currency pulls down exports and

enhances imports, thereby trade deficit occurs.The IS curve shifts backwards to its original position where income and interest rate stay unaltered (Mundell, 1963).

For effectiveness of monetary policy under fixed exchange rates, a rise in money supply is assumed. Subsequently, the LM curve shifts to LM'. In order to prevent exchange rate depreciation associated with capital outflows, central bank sells foreign currency and purchases domestic currency to decrease money supply back to its original level by leaving both income and interest rate unaltered, i.e. the LM curve shifts back to its original position as shown in Figure 2.3 (Mundell, 1963).

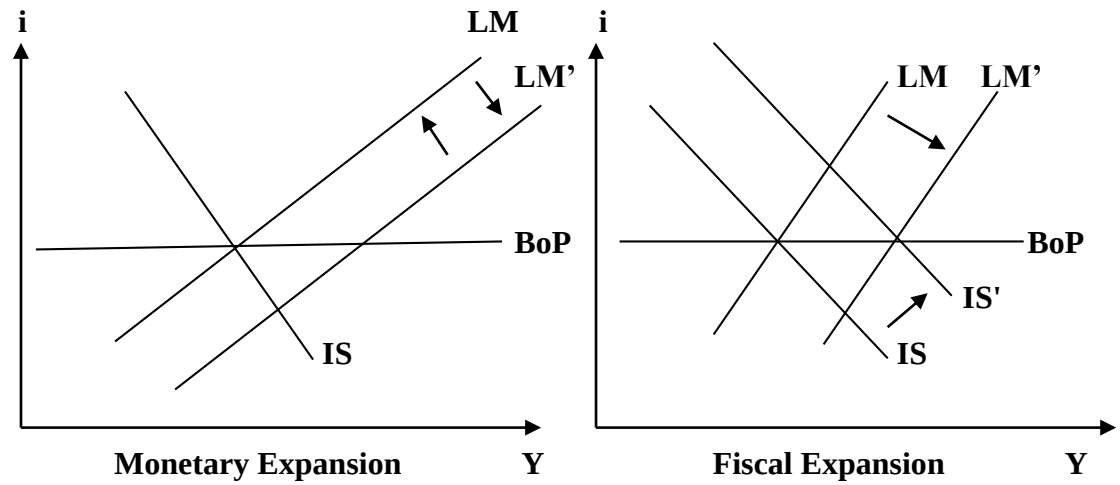

Figure 2:3 Effectiveness of monetary and fiscal policies under fixed exchange rates

For effectiveness of fiscal policy, an expansion in government spending is assumed under fixed exchange rates. Income rises and pushes interest rate upwards which will

attract capital inflows. The IS curve shifts to IS'. To keep exchange rates unaltered central bank intervenes by accumulating reserves, i.e. central bank buys foreign exchange and sells domestic currency and thereby money supply rises. The LM curve shifts to LM'. In the end, income rises and interest rate stays at the international level; therefore fiscal policy is totally effective under fixed exchange rates (Mundell, 1963).

According to Fleming (1962), expansionary monetary policy is more effective under flexible exchange rates than it is under fixed exchange rates. Any rise in money supply pulls back interest rates, which push investment and consumption upwards and thereby income level rises. Rising income deteriorates trade balance by increasing imports; however at the same time falling interest rates trigger capital outflows and causes currency depreciation, which stimulates income further under flexible exchange rates. If exchange rates were fixed, rise in income and employment would be less (Fleming, 1962).

The basic Mundell-Fleming model implies that an open economy with fixed exchange rates has to follow its base country's (or international) interest rates. If it is not the case, for instance under a rise in base country's interest rates which is not matched with home country's interest rates, investors will move towards base country's bonds and trigger depreciation of domestic currency. Commitment to fixed exchange rates will force central bank to defend its currency by using reserves. If the home country is small and fully open then either reserve will melt down or domestic interest rates will rise to the level of foreign interest rates; therefore independent monetary policy will not be feasible.

The basic Mundell-Fleming model is closely related to the discussion on the trilemma because it explains how the bulk of the trilemma literature, which will be reviewed in the next part, oversimplifies the complex nature of current international

macroeconomics, in which capital mobility is not perfect and expectations are not stable. Under imperfect capital mobility exchange rate flexibility does not generate fully effective monetary policies because depreciation or appreciation of domestic currency changes the position of the balance of payments curve, which is not horizontal anymore (Halwood & MacDonald, 2000).Furthermore, expectations of market players are volatile and they are exposed to influences of global factors; therefore expected depreciation term in the uncovered interest parity equation (3) may not be zero even under fixed exchange rate regimes. Moreover, as will be discussed in Chapter 3, in open floating DCs, financial flows influence output level through exchange rate and credit channels; therefore financial flows can move IS curve independently and change domestic interest rates, but this can not be evaluated as a sign of independent monetary policy. Overall, assumptions of the basic Mundell-Fleming model are not valid for the current world economy; thus discussing the trilemma concept within the basic Mundell-Fleming framework is not correct; however this is very common in the literature as the next part shows.

2.3 Discussions on the trilemma

The macroeconomic trilemma can be simplified to a triangle in which financial openness, monetary policy independence and exchange rate fixity represent three corners. Basicly the model says that only two of three policy rules are feasible at the same time.

Each edge of the triangle, as shown in Figure 2:4, represents different time and policy choices. In the Gold Standard Era, exchange rates were fixed to certain gold points and capital was mobile. Accordingly, monetary policy autonomy was out of discussion. **I** represents the Gold Standard Era. In Bretton Woods Era, capital controls were common and monetary policy independence was gained through managing capital

accounts while exchange rates were fixed. **II** represents the Bretton Woods Era. After Bretton Woods, capital controls were removed and exchange rate flexibility became widespread. **III** represents the post Bretton Woods Era.

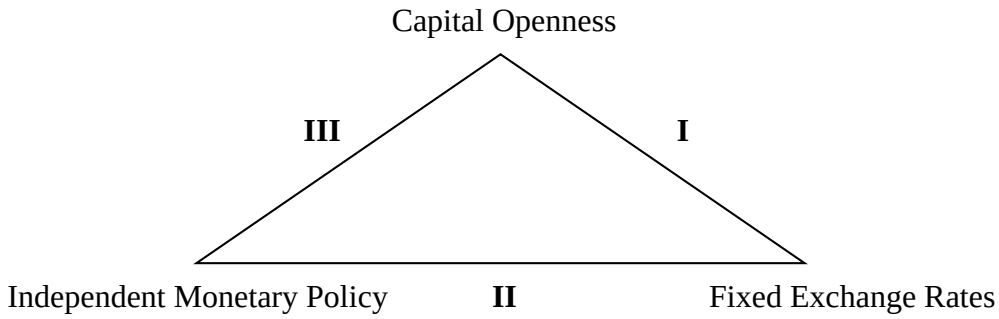

Figure 2:4 The trilemma

The trilemma is a simple model which intends to explain the international macroeconomic framework; therefore there exists a striking question that has been asked by many economists: Is it really binding? Obstfeld, Shambaugh &Taylor (2005) answer the question positively. Their work covers nearly 140 years and three eras: The Gold Standard (1870-1914), the Bretton Woods (1959-1970) and the modern era (1973-2000). In the first era, their data covers only ACs while in the second and third eras, increasing number of DCs are included in the analysis. Monetary policy independence is measured by home country's nominal short term interest rate deviations from its base country. If the slope term and the explanatory power of the

regression[1] are high, home country will be expected to follow base interest rates tightly. In other words, there will be little room for monetary policy independence. If not, one may conclude that local factors affect domestic interest rates more than base country's interest rates, i.e. monetary policy autonomy exists.

According to Obstfeld *et al.* (2005), the Gold Standard and the modern eras are similiar in capital mobility whereas the Bretton Woods Era was a special period in which capital flows were limited. Domestic factors forced policy makers to defend their room for maneuver; hence monetary policy autonomy existed in the Bretton Woods. In fact, this was an implication of the trilemma because in order to gain monetary policy autonomy, one will have to either let exchange rates float or limit capital transactions. Regression results indicate that floating with capital controls provides the highest independence for monetary policy whereas pegging with open markets provides the least. Pegging with capital controls and floating with capital mobility provide intermediate levels of autonomy for monetary policy. In general, pegs show little independence (Obstfeld *et al.*, 2005). In the Gold Standard Era, level coefficent (ϒ) is found out to be positive but it is lower than the modern era's coefficient whereas adjustment speed (Ø) of the Gold Standard Era is higher than the modern era. Obstfeld *et al.* (2005) claim that pegs in the modern era enjoyed higher levels of monetary policy independence than pegs of the Gold Standard Era. In Bretton Woods, both ϒ and Ø were low which show the existence of monetary policy independence. According to Obstfeld *et al.* (2005), pegs are not always handcuffed because in reality their exchange rates move within narrow bands instead of being exactly fixed. On the other hand, non-pegs[2] are not totally insulated from base country's monetary policies

[1] $\Delta R_{i,t} = \alpha + \beta \Delta R_{bi,t} + Ø\ (c + R_{i,t-1} - ϒ\ R_{bi,t-1}) + u_{i,t}$; where $\Delta R_{i,t}$ represents country i's and $\Delta R_{bi,t}$ stands for its base country's nominal short term interest rate differences. Ø is the adjustment speed of the long run relationship and ϒ is the long run level coefficent whereas β shows short-run relationship between interest rates.

because of the fear of floating[3]. Therefore, according to Obstfeld *et al.* (2005), non-pegs of the modern era suffer from lack of monetary policy autonomy when compared to non-pegs of the Gold Standard Era; however in the modern era more than a few advanced economies enjoy monetary policy autonomy, which is generated by non-pegging.

Hosny, Kisher & Bahmoni-Oskooee (2015) develop analysis of Obstfeld *et al.* (2005) further with a new econometric method; time-varying parameters (TVP). This new method captures changes in exchange rate regimes and capital control statutes within periods. Hosny *et al.* (2015) use the same time periodization (Gold Standard, Bretton Woods and post Bretton Woods) and the same measurement of policy rules (Shambaugh's criteria for exchange rate regimes, IMF's classification of capital controls and interest rate deviations between home and base countries for measuring monetary policy independence) with Obstfeld *et al.* (2005). Especially in the post Bretton Woods Era, countries have moved from pegging to non-pegging and from non-pegging to pegging frequently and openned up their economies to capital flows at different times. When a country swings between pegging and non-pegging, fixed coefficent method may become dysfunctional. Hosny *et al.* (2015) check for stability of fixed coefficents and find out that this method is suffering from structural breaks; therefore they employed the TVP method[4]. Originality of the regression is coming

[2] Non-peg concept refers to all exchange rate regimes except pegging.

[3] Calvo and Reinhart (2002) check reserve interventions and interest rate variations of floaters and find out that floaters actually keep their exchange rates within certain bands by reserve usage and interest rate policies.

[4] $\Delta R_t = \alpha_t + \mu_t \Delta R_{t-1} + \beta_t \Delta BR_{t-1} + \theta_t ECT_{t-1} + e_t$; where $\alpha_t = \alpha_{t-1} + v_t$, $\mu_t = \mu_{t-1} + u_t$, $\beta_t = \beta_{t-1} + \eta_t$, $\theta_t = \theta_{t-1} + \delta_t$ where R_t is the home and BR_t is the base country's nominal interest rates. ECT is the error

from the dynamic structure of its coefficents. Hosny *et al.* (2015) support the trilemma with their results: Closed non-pegs show highest monetary policy independence while open pegs suffer most from lack of monetary policy autonomy. This finding implies that floating exchange rates and capital controls generate independent monetary policy and it is in line with the trilemma framework.

Bleaney, Lee & Lloyd (2012) test the trilemma for open credible pegs. They state that evidence for existence of monetary policy independence for open pegs in the literature may be occuring due to the non-credibility of their peg regimes. Their main contribution is distinguishing credible pegs from non-credible ones. According to Bleaney *et al.* (2012), credibility implies that expected nominal exchange rate depreciation in the uncovered interest rate parity equation (3) is equal to zero; if not, i will not be equal to i', which may cause an illusion about the existence of independent monetary policy, although monetary authorities may be trying to maintain exchange rate stability under rising devaluation expectations or an increase in risk premium[5]. Bleaney *et al.* (2012) consider hard pegs (currency unions or currency boards) and low inflation pegs (countries whose inflation differential with their base countries is less than 5% in the current and the previous years) as credible pegs. They insert a dummy, which controls for open pegs, into the Error Correction Model (ECM). They estimate the model for general pegs, credible pegs and for different categorizations of exchange rate regimes (IMF's and Shambaugh's classifications) and different capital control measurements (IMF's and Chinn-Ito's (2008) classifications). Results show that credibility matters, i.e. credible pegs lose monetary policy independence significantly.

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correction term which indicates long run relationship between base and home country's interest rates. β is the short-run coefficent and θ is the adjustment speed in the long run.

[5] This point is quite important for the inaccuracy of using the basic Mundell-Fleming model in empirical discussions on the trilemma.

When Chinn-Ito measurement is employed, full loss of monetary policy independence is observed (Bleaney *et al.*, 2012). Therefore, the trilemma is valid for open credible pegs; however this is not a complete proof of the bindingness of the trilemma because constraints regarding other two corners remain unproved.

Aizenman, Chin & Ito (2013) attempt to test the linearity of trilemma variables, that means weighted sum of indexes of exchange rate stability, financial openness and monetary policy independence add up to a constant[6]. R^2 of regressions are very high for ACs, EMEs and least developed economies; therefore they conclude that there is a linear relation between three policy objectives. In other words, there is a trade off among abovementioned three indexes, i.e. a rise in one of three variables will be balanced by a fall in the weighted sum of other two variables (Aizenman *et al.*, 2013).

Klein & Shambaugh (2013) examine sharpness of corners of the trilemma in order to find out whether partial capital controls or intermediate levels of exchange rate flexibility improve monetary policy independence. For measuring monetary policy independence, authors use a similiar regression with Obstfeld *et al.* (2005)[7]. Klein & Shambaugh's results support the trilemma, i.e. open peg countries lack monetary policy autonomy most while closed pegs and open non-pegs preserve some of it and closed floaters enjoy highest level of monetary policy autonomy. Furthermore, Klein & Shambaugh (2013) claim that any type of floating (including soft pegs) provides

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[6] $1 = \alpha_j\ MI_{i,t} + \beta_j\ ERS_{i,t} + c_j\ KAOPEN_{i,t} + \varepsilon_{i,t}$; where MI is the index of monetary policy independence, calculated by the correlation of base and home country's interest rates. ERS is the index of exchange rate stability, formed by using annual standard deviations between monthly exchange rates of home and base countries. KAOPEN represents the degree of capital openness which is developed by Chinn & Ito (2008).

[7] $\Delta R_{i,t} = \alpha + \beta\ \Delta R_{bi,t} + \mu_{i,t}$; where $\mu_{i,t} = \Delta\ (\%E_{i,t} + \rho_{i,t} + \tau_{i,t} + u_{i,t})$ where $\%E_{i,t}$ represents percentage change of expected exchange rates of home country with respect to base country while ρ stands for the risk premium in uncovered interest rate parity equation and τ is the tax imposed on capital inflows.

some level of monetary policy independence; however only strongest types of capital controls genetare monetary policy autonomy; therefore exchange rate stability corner of trilemma can be rounded while capital openness corner remains sharp.

Klein & Shambaugh (2013) also examine whether interest rate independence is operational in improving responses to domestic monetary targets by using the Taylor's monetary policy rule. They take the first difference of the original equation[8]. The rational behind the model is as follows: Consider positive growth change together with rising inflation. If local interest rate is rising (when base interest rates are constant), monetary policy independence exists, i.e. local interest rates respond to domestic needs instead of base country's interest rates. Klein & Shambaugh (2013) check responses of domestic interest rates to changes in domestic targets for different country groups under different exchange rate regimes. According to their results, open pegs do not respond to changes in domestic economy in both ACs and EMEs. Soft pegs respond to domestic shocks in both country groups and the response is higher in EMEs; therefore exchange rate flexibility is vital for EMEs (Klein & Shambaugh, 2013).

In a complementary study, Klein (2013) analyzes effectiveness of partial capital controls. After the global financial crisis (GFC), EMEs implemented temporary capital controls in order to insulate their economies from the financial turmoil. Were they successful? According to Klein (2013), temporary capital controls failed in preventing appreciation of currencies, supporting growth and stemming financial imbalances. On the other hand, long standing capital controls were substantially successful. Klein (2013) examines Brazil and South Korea for temporary capital controllers, China and India for long standing capital controllers. In countries implementing long standing controls, financial markets are shallow and controls are effective; however countries

[8] $\Delta R_{i,t} = \gamma \Delta Y_{i,t} + \sigma \Delta \pi_{i,t}$; where R is interest rate, Y is output and π is inflation.

pursuing temporary capital controls have deeper financial markets because they were once financially integrated; hence financial players in these countries can get rid of restrictions with innovations easily. According to Klein (2013), another reason for the difference between effectiveness of temporary and long standing controls may be the dominance of bussiness cycles; for instance under capital inflows, strong appreciation trends and high returns may be surpassing limited restrictions on capital flows (Klein, 2013).

In a recent interesting study, Wu (2015) develops an index for measuring de facto monetary policy domestic activism, by which monetary policy independence is measured. Wu (2015) examines OECD countries over 2002-2009 with considering euro-zone as a single region. With the help of the new index, Wu (2015) finds out that although 17 of the 18 central banks in his analysis state that their objective is to maintain price stability, in reality they react to real domestic output volatility and high average of CPI inflation according to cross sectional data, but to high levels of financial stress according to time series analysis. In his analysis, Wu (2015) uses a modified version of the Taylor Rule[9] in order to check sensitivity of domestic long-term interest rates to domestic factors. First modification in Taylor's Rule is the usage of long-term interest rates instead of short-term interest rates[10] in order to capture changes in short-term interest rates and central banks' smoothing operations. Secondly, the regression is estimated for announcement days of macroeconomic indicators because at normal times interest rates may be influenced by many other

[9] $\Delta R_{i,t} = \theta_{i,\pi} (\pi_{i,t} - E_{t-1}(\pi_{i,t})) + \theta_{i,y} (Y_{i,t} - E_{t-1}(Y_{i,t})) + \varepsilon_{i,t}$; where $R_{i,t}$ is the domestic long-term interest rates, $\pi_{i,t}$ is the inflation of country i at time t, $Y_{i,t}$ is the output of country i at time t and E_{t-1} stands for expectations at time t-1.

[10] The Taylor Rule discusses responses of short-term interest rates to inflation and output gaps; inserting long-term interest rates is theoretically incorrect since long-term interest rates do not need to respond to inflation and output gap changes.

factors, but at least at these days explanatory variables of the regression are main determinants of $\Delta R_{i,t}$ if the central banks are committed to abovementioned domestic objectives.

Another contribution of Wu (2015) is to the trilemma discussion. Wu derives three indexes representing monetary policy independence, exchange rate stability and capital openness; $mpda_{i,t}$, $ers_{i,t}$ and $kaopen_{i,t}$ respectively; mpda is the index of de facto domestic monetary policy activism, ers and kaopen are the indexes of Aizenman et al. (2013). All three indexes are normalized to take values in [0, 1] interval. Wu (2015) defines a trilemma efficiency frontier and assigns the value of 2 to it (since 1 is the highest value for all three indexes, 2 is the maximum value for a feasible policy mix according to the trilemma). Wu (2015) calculates the distance operator[11] for each country and time period. No significant positive distance is observed, therefore the trilemma is found out to be binding for all OECD countries over 2002-2009. On the other hand, negative significant distances are observed for some countries in some periods; Korea in 2003 and over 2006-2008; Mexico in 2003 and 2008; Poland in 2002 and 2003 and Turkey over 2006-2008 (Wu, 2015). Hence, inefficient configurations are possible, though all three policy goals are desirable. What may be the reason behind the inefficiency? Wu regresses standardized distance index on GDP per capita, financial stress index (Balakrishann *et al.* (2009) and Cardarelli *et al.* (2010)) and gross government debt. Results indicate that inefficient trilemma configurations are likely to occur in less developed countries (lower GDP per capita) with high financial stress (Wu, 2015).

Farhi & Werning (2012) examine effectiveness of capital controls and flexibility of exchange rates under volatile capital flows. They support the Mundell-Fleming model

[11] $dis_{i,t} = mpda_{i,t} + ers_{i,t} + kaopen_{i,t} - 2$

in importance of exchange rates; moreover they find out that optimal capital contols are useful even if exchange rate is free floating because capital controls contribute to macroeconomic stability. According to Farhi & Werning (2012), optimal capital controls are the followings: under sudden stops temporarily subsidizing inflows and taxing outflows and under capital inflows temporarily taxing inflows and subsidizing outflows. Contrary to Farhi & Werning (2012), Devereux & Yetman (2014) point to costs of capital controls which are found out to be welfare reducing. The reason behind that is explained through risk sharing reducing nature of capital controls; on the other hand Devereux & Yetman (2014) find out that capital controls strengthened independent monetary policy under the zero lower bound[12]. According to Devereux & Yetman (2014), in the presence of the global liquidity trap, independent monetary policy is feasible only under capital controls even if exchange rates are freely floating.

2.4 Challenges to the trilemma

Financial integration of DCs to world economy pressures the trilemma in several ways. Moderate and radical criticisms share this common ground. Monetary policy autonomy of ACs and DCs from 1970 to 1990 under different exchange rate regimes was examined by Frankel, Schmukler & Serven (2004). Monetary policy independence is defined as the ability of a country in setting its nominal interest rates freely[13]. Frankel et al. (2004) find out that pegging restricted monetary policy autonomy more than floating and average domestic interest rates were higher for floaters in the whole period. On the other hand according to their analysis, in the 1990s

[12]After the GFC, ACs reduced nominal interest rates to almost zero level and following that, DCs cut their interest rates sharply.

[13] $R_{i,t} = f_i + \beta R_t^* + \gamma X_{i,t} + \varepsilon_{i,t}$; where f is the country fixed effects, X is the control variable for foreign and domestic inflation rates, R is the local and R* is the base country interest rate.

both ACs (except US, Germany and Japan) and DCs moved towards full transmission of foreign interest rates regardless of their exchange rate regimes. Frankel et al. (2004) find out that in the long-run financial openness hinders monetary policy independence, though in the short-run floating provides temporary autonomy, i.e. floaters adjust their interest rate to world interest rate slower than pegs; therefore floaters enjoy monetary policy independence in the adjustment process[14].

Starting with the GFC, issues related to financial stability have become widely recognized. In this part two important challenges to the trilemma are discussed: the quadrilemma and the dilemma. The quadrilemma is based on the importance of international reserves. Aizenman (2011) claims that emerging economies are trying to relax the trilemma by holding large amount of reserves. This critique can be classified as a moderation of the trilemma; on the other hand the dilemma is a more radical challenge because Rey (2015) is clear about the impossibility of independent monetary policy in an open economy.

2.4.1 Importance of reserves

Since the 1990s, reserve hoarding in EMEs has reached to incredible levels; by 2007 two third of worldwide reserves belonged to EMEs (Aizenman, 2011). According to him, there are two factors behind this trend; the trade and the financial factor. The trade factor is also known as the merchantilist view. As Rodrik (2006) explains, DCs hold reserves in order to prevent appreciation of their currencies that will pull back their trade competitiveness. The financial factor consists of sudden stops and capital flights against which reserves have been seen as self insurance (Aizenman, 2011). Financial

[14] In the long run analysis the Bound Test of Pesaran et al. (2001) is applied to the following regression: $\Delta R_t = \text{lags}\ (\Delta R_t) + \text{lags}\ (\Delta R_t^*) + \text{lags}\ (\Delta X_{i,t}) - \delta\ (R_{t-1} - f_0 - \beta\ R_{t-1}^* - \gamma\ X_{t-1}) + u_t$

factors have become more important in a world of financial instabilities and crises, which hit EMEs severely (Rodrik, 2006).

Obstfeld *et al.* (2010) hold double drain responsible for reserve accumulation. Double drain is the union of internal and external drains. Internal drain is related to domestic banking sector's illiquidity problem, which is a result of run from bank deposits to currency whereas external drain stands for capital flights. Obstfeld *et al.* (2010) define the mechanism behind reserve accumulation as follows: In case of sudden stops and capital outflows, domestic capital flight to abroad is financed with withdrawals from domestic banks, i.e. bank depositors take their money to safe heavens and cause depreciation of domestic currency. At the same time, dollar demand rises and central bank intervenes to meet money demand of markets by using its reserves. Central bank intervention is not only preventing depreciation of domestic currency but also solving illiquidity problems of the domestic banking sector; in other words central bank is playing its lender of last resort role. Along with double drain, Obstfeld *et al.* (2010) find out positive correlations between reserve accumulation and financial openness, financial development and exchange rate stability. Financial dept and openness matter even if exchange rate regime is free floating. Main motivation behind reserve hoarding is to prevent banking sector crisis and excess depreciation of domestic currencies (Obstfeld *et al.*, 2010).

According to Aizenman *et al.* (2010), starting with the 1990s financial openness and exchange rate stability have risen (due to euro-zone integration) in ACs, whereas monetary policy independence has declined. On the other hand in EMEs, financial integration has risen while exchange rate stability has been declining and monetary policy independence has remained trendless. According to Aizenman *et al.* (2010), evidence sheds light on EMEs' willingness for middle ground positions in the trilemma

configuration, i.e. they demand some level of exchange rate stability and financial openness without losing their monetary policy autonomies.

Financial integration has unintended consequences for DCs. Financial vulnerabilities rise and DCs become defendless to financial crises. Hoarding reserves may be a way out of this trouble. Reclining upon his data, Aizenman (2011) offers the quadrilemma concept, which consists of classical trilemma components plus international reserves. According to him, countries do not face with binary choices under the trilemma; in fact they decide on the degree of financial openness and the degree of monetary policy independence while maintaining exchange rate stability; therefore most of the time they decide where to stand inside the trilemma triangle (Aizenman, 2011). International reserves ease this trade off by supporting exchange rate stability and contribute to monetary policy independence by enhancing financial stability.

2.4.2. Irreconcilable duo

Is the trilemma framework binding in the globally financialized world? Is there any room for independent monetary policy in an open economy, even if exchange rates are freely floating? According to Rey (2015), the answer lies in global factors because there is a global financial cycle in capital flows, asset prices, leverage of global banks and credit growth.

In her influential paper, Rey (2015) finds out positive correlations between gross capital inflows and outflows mainly among Europe, US, Latin America, Emerging Asia and Central and Eastern Europe; moreover negative correlations between gross capital flows and the global risk measure VIX (Chicago Board Options Exchange Volatility Index) are also observed. Similar results are observed for credit growth, leverage and leverage growth: all are negatively correlated with VIX. Rey (2015) also

claims that risky asset prices all over the world can be explained by a single global factor; furthermore this global factor is also negatively correlated with VIX.

In order to figure out determiants of VIX, Rey (2015) estimates a recursive VAR model with seven endogenous variables: US GDP, US GDP deflator, global credit, global credit inflows, European banks' leverage, Federal Funds Rate (FFR) and VIX[15]. European banks' leverage is defined as the transmittor of US dollar liquidity to world markets. According to regression results, when FFR falls global risk (VIX) falls substantially. Following the decline in VIX, European banks' leverage rises and so does gross credit flows. This mechanism is cyclical since rising credit inflows pulls down spreads in host countries and decreases measured risk, by which VIX is further depressed (Rey, 2015).

Relying upon Rey's empirical findings one can say that US monetary policy has been transmitted to worldwide financial markets through cross border capital flows and leverage of global banks. Rising capital inflows trigger credit booms, which are thought as main determinants of financial crisis. Since domestic credit growth is highly influenced by global conditions and in particular by US monetary decisions, independent monetary will not be feasible regardless of exchange rate regimes unless capital flows are controlled (Rey, 2015). Rey offers to implement targeted capital controls, macroprudential policies and limiting credit growth and leverage in order to restrict the global influence on domestic monetary policies. According to Rey (2015), gross capital flows should be monitored closely while taking precautionary measures.

[15] The ordering of variables is as written above and 2-lag VAR is estimated.

2.5 Some gaps within the trilemma literature

In the abovementioned trilemma literature, article of Obstfeld *et al.* (2005) has a central position; however their empirical work suffers from serious methodological problems. First one is the ommitted variables problem. In their regression, home countries' short-term interest rates are regessed on base countries' short-term interest rates and on a constant, but other relevant variables such as inflation gap, output gap or changes in exchange rates are not taken into consideration. In 2015 article of Obstfeld, changes in inflation and real GDP growth are integrated into the model[16]; however the model is not theoretically consistent because according to the conventional Taylor Rule, central banks respond to inflation and output gaps, not to inflation and output growth. Secondly, Obstfeld *et al.* (2005) implicitly assume that short-term interest rates have always been the main policy tool of central banks; however this assumption is not true for the Bretton Woods Era, in which central banks used several tools from credit controls to capital restrictions. Moreover, deciding on which interest rate is important in monetary transmission is not easy because central banks can not control all maturities of interest rates. Obstfeld (2015) underlines the same problem in his recent article and analyzes long-term interest rates independently.

The most critical problem in the trilemma literature is restricting monetary policy independence to interest rate independence. This restriction may be valid under IT monetary policy since short-term interest rate is the only operational tool under this framework. Even under IT regimes, effectiveness of the policy rate tool is controversial, as will be discussed in Chapters 3 and 5. In his recent paper, Obstfeld (2015) defines independent monetary policy as the ability of reaching particular

[16] $\Delta i_{j,t} = \alpha + \beta \Delta i_{bt} + \gamma X_{j,t} + u_{j,t}$; where X is the control variable for real GDP growth and change in inflation.

domestic goals. Obstfeld (2015) implicity accepts that interest rates are not enough for reaching domestic targets. This is an obvious moderation of the trilemma, but Obstfeld (2015) prefers to define the situation as a trade off among financial and macroeconomic stabilities. In the absence of effective macroeconomic tools, authorities intentionally miss monetary targets and focus on financial stability issues (Obstfeld, 2015). Even at this point, Obstfeld (2015) thinks that independent monetary policy is feasible, but it may not be implementable because of the financial imbalances. According to Obstfeld (2015), the reason behind the tension is the financial trilemma which states that only two of financial stability, integration to world financial system and national control over financial policies are feasible at the same time.

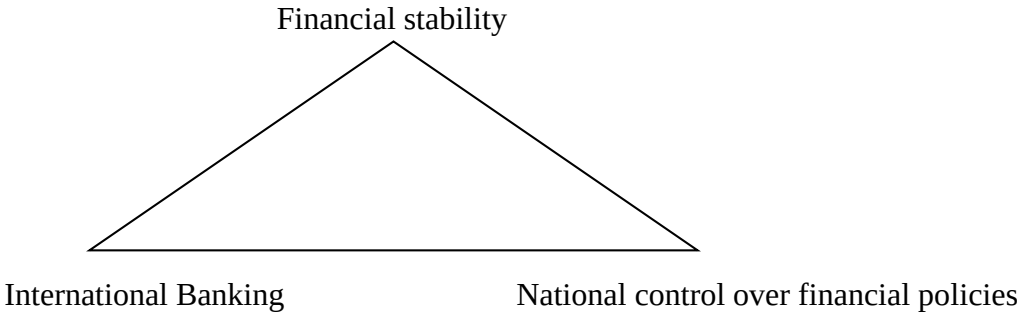

Figure 2:5 The financial trilemma

Schoenmaker (2013) modelled the financial trilemma, as shown in Figure 2:5, through a game theoretical approach and derived that if financial stability is desired within the international banking system, international cooperation should be attained because national financial policies will not be enough. There is a geographic mismatch and the

problem is arising from the contradiction between global nature of international banking and national character of supervision and financial policies. According to Schoenmaker (2013), international banking has both stabilizing and destabilizing effects on domestic financial markets. On the one hand, since global banks are operating on a large scale of countries, they can diversify risk through spreading their operations to different countries; on the other hand during times of crises, international banks trasmit financial distress from centers of crises to other countries. Schoenmaker (2013) points to the contagion of subprime mortgage crisis from the US banks to European banks during the GFC.

Whatever regulatory measures are taken by small open ecenomies in their jurisdictions financial stability will not be attained unless international cooperation is established (Schoenmaker, 2013) or external funding and financial flows are limited until a calm financial system is established (Eichengreen, 2002). If the financial trilemma is thought to be embedded in the monetary trilemma[17] then the trilemma will converge to the dilemma for DCs because pursuing independent monetary policy with financial stability objective will not be feasible under financial integration. Financial integration tears down capital controls and opens DCs to financial flows, which exert influence on exchange rate and credit growth channels, as will be discussed in Chapter 3. However, without eliminating global constraints on exchange rates and credit growth, national control over financial policies will not be possible[18]. Since DCs target

[17]To see this one can assign each corner of the financial trilemma to the corners of the monetary trilemma as follows: international banking-capital openness, national control over financial policies-independent monetary policy and financial stability-exchange rate stability.

[18] National financial policies should influence balance sheets of firms/banks and control the rate at which credit grows for a sound financial environment; however balance sheets are vulnerable to exchange rate changes and credit growth is sensitive to global risk perception, as will be discussed in Chapter 3. If national authorities do not have strong tools to control these channels, they can not control domestic financial markets.

financial stability objective and capital openness together, they can not control their financial policies according to the financial trilemma. But without controlling national financial sectors, policy decisions of DCs will not be effective; thus independent monetary policy will not be feasible.

Regarding Aizenman's works, I think that the discussion on international reserves is an important contribution to the trilemma literature since it sheds light on current pressures on monetary policies of EMEs; but Aizenman does not explain the mechanism by which international reserves contribute to monetary policy independence clearly. Aizenman probably thinks that the impact of capital flows on domestic interest rates can be cleared away by reserves, but sterilization is not costless as Rodrik (2006) explains: Central banks sterilise external borrowings of private sector by selling domestic government bonds. At the same time central banks invest in US government bonds by borrowing foreign currency from domestic financial markets. Rodrik (2006) defines the spread between cost of external borrowing and yields of US government bonds as the cost of reserve holding and his calculations show that cost of reserves is nearly 1% of overall GDP of DCs. According to Rodrik (2006), there is a trade off between financial globalization and avoiding cost of reserves, and capital account management techniques may be implemented to reduce the cost by pulling down short-term liabilities. Although both capital management techniques and reserve holdings are interventions to free markets, authorities prefer to intervene in foreign exchange markets instead of restricting capital inflows (Rodrik, 2006).

Another explanation for reserves' contribution to monetary policy independence may be through financial stability. According to Rodrik (2006), countries having high reserve/short-term debt ratio are less prone to sudden stops and capital reversals; however reserve accumulation is not the only way for increasing reserve/short-term debt ratio. Reducing external borrowings is another policy option which has not been

prefered by policy makers (Rodrik, 2006). If reserves are contributing to financial stability, they may relax financial pressures and lessen the burden on monetary policy. If this is the case, the mechanism by which reserves contribute to financial stability should be explicitly shown.

In addition, there is a tension between Aizenman's 2011 and 2013 papers. In 2013 paper, Aizenman, Chinn & Ito prove the linearity of trilemma variables and find out that weighted sum of trilemma variables add up to a constant. They also test the role of international reserves and derive the conclusion that adding international reserves to the regression does not change results significantly. That means, without international reserves classical trilemma variables have a meaningful relation: A rise in one of three is balanced with the fall of weighted sum of other two. On the other hand in 2011 paper, Aizenman develops the quadrilemma configuration, which gives a central position to international reserves.

Lastly, Rey's (2015) article may be the most interesting one in the whole trilemma literature, but she presents only a partial proof for her assertive claims. Rey (2015) discusses the relation between US monetary policy and financial flows, which is a vital contribution; on the other hand she does not mention how financial flows exert influence on domestic monetary transmission channels of DCs. Without showing ineffectiveness of domestic monetary decisions under financial flows, the dilemma will not be proven. Another missing point in Rey's article is about exchange rates. Rey (2015) considers credit growth, asset prices and interest rates but does not talk about exchange rates, which are most influential asset prices for DCs.

2.6 Conclusion

The trilemma literature is very large however there are interesting common points in various analyses. Firstly, almost all researchers measure monetary policy independence by interest rate deviations between home and base country's interest rates; but there is enough evidence for suspecting of this measurement. Since the GFC, EMEs have not restricted their policies to short-term interest rate movements. Secondly, everyone accepts that financial stability issues pressure the trilemma in several ways. In other words, everyone recognizes the source of problems, however offered solutions are different. Rey (2015) is certain that the trilemma is turning into a dilemma; on the other hand Aizenman (2011) is hopeful about the stabilizing role of international reserves while Obstfeld (2015) is trying to throw financial stability concerns out of the trilemma. Thirdly, importance of exchange rate flexibility is the common point of supporters of the trilemma; although in the current world economy difference between pegging and floating has become blurred. In fact, pure floating is a theoretical concept which is hardly seen except a few strong currencies. Fear of floating literature shows the unwillingness of DCs in adapting free floating exchange rates. On the other hand, effectiveness of capital controls is at least controversial. Different sorts of interventions are debatable; however limiting capital integration is out of discussion most of the time. Some scholars claim that partial capital controls are not effective whereas some others point to advantages of temporary capital controls.

An overall evaluation of challenges to the trilemma shows that links between domestic monetary policy, exchange rates and financial flows demand more work. Problems arising from financial instability and exchange rate volatility should be examined in detail. For this purpose, the research will focus on domestic monetary transmission mechanisms and their evolution in the post Bretton Woods Era. Changes in DCs'

monetary transmission channels under financial globalization will be the discussions of the next chapter.

CHAPTER 3

GLOBAL CONSTRAINTS ON MONETARY TRANSMISSION CHANNELS OF DEVELOPING COUNTRIES

3.1 Introduction

Capital openness and financialization rose rapidly after the collapse of the Bretton Woods System. Since then DCs have been exposed to volatile capital flows, which have threatened stability of their economies. During the 1990s, DCs followed exchange rate pegging in which they followed stronger currencies and used exchange rates as nominal anchors. Rising capital transactions made defending currency peggs harder and currency crisis occured[19]. In the course of the 2000s, many DCs moved to IT monetary regimes in which price stability was declared as the primary goal of independent central banks. Short-term interest rates were the only operational tools and exchange rates were let floating. According to supporters of IT, this simple task of central banks would have smoothed domestic economies while free floating exchange rates would have been absorbing foreign shocks. However as can be seen from the experience of the latest financial crisis, IT framework was not enough for maintaining financial stability; thus monetary authorities in advanced and developing countries used some new tools in order to protect their economies from the financial turmoil. During the crisis, unconventional monetary policies (quantitative easing by the FED and credit easing by the ECB) were implemented in ACs while some

[19]According to Mishkin (1998), four main problems occured under exchange rate pegs; loss of monetary policy autonomy, transmission of shocks in base countries to home countries, speculative attacks to domestic currencies and low accountability of central banks.

nonorthodox policies, including capital controls, were followed in the developing world. Since the GFC, financial stability has been integrated into objectives of central banks besides price stability and to achive this goal, macroprudential policies have been introduced.

The aim of this chapter is to discuss influences of financial flows on domestic transmission mechanisms of DCs in the post Bretton Woods Era. This is directly related to the trilemma discussion because monetary policy independence covers effectiveness of policy tools, as defined in Chapter 2. If financial flows are influencing domestic transmission channels more than central banks then independent monetary policy will not be feasible.

The outline of the chapter is as follows: In the first part, traditional monetary transmission mechanism is described. In the second part, how this mechanism works in DCs is discussed and important channels of transmission are underlined. In the third part, global constraints on credit growth and exchange rates of DCs are discussed. The last part concludes the chapter.

3.2 Conventional monetary transmission mechanism

The monetary transmission mechanism consists of channels which transmit monetary decisions of central banks to real economy targets such as output, employment and inflation. In the conventional view, central banks control short-term interest rates and influence real economy targets through affecting prices and quantities of financial sector assets (Cömert, 2013). Bolivin *et al.* (2010) divide the transmission mechanism into two parts: neoclassical channels (which assume perfect financial markets) and the credit channel, in which financial markets are imperfect.

According to Bolivin *et al.* (2010), the neoclassical transmission mechanism consists of three channels: investment (or interest rate), consumption and trade (or exchange rate) channels. Direct interest rate channeland Tobin's q[20] form the investment channel, which works as follows: A rise in policy rates increases long term interest rates as expected short-term interest rates rise. Higher long-term interest rates imply higher capital costs, thereby investment falls. When short term interest rates rise, Tobin's q falls and stock prices of a firm declines and investments fall.

How do changes in short-term interest rates affect consumers? George *et al.* (1999) point to three channels. First one is the savings and debts channel. A rise in interest rates increases savings and decreases consumption; at the same time rising interest rates increase the debt burden on households by pulling down disposable income for spending. Second channel is the financial wealth channel. Through asset prices interest rates affect consumers' wealth; for instance rising house prices increases the wealth of houseowners. Third one is the exchange rate channel. Appreciation of domestic currency increases the value of holdings of consumers; moreover cheaper imports encourage people to consume more foreign produced goods. Last channel is the expectations channel, in which changing expectations offuture policy rates influence saving and consumption behaviours of consumers. Overall, any rise in interest rates pulls down spending and consumption thereby decreases the aggregate demand.

The trade channel of the neoclassical transmission mechanism is also called as the exchange rate channel. The mechanism works as follows: Decline in domestic interest rates trigger domestic currency depreciation. As discussed in Chapter 1, the Marshall Lerner Condition states that exchange rate depreciations eventually increase net

[20] Tobin's q represents the overall value of a firm and is derived by dividing the market value of a firm by its replacement cost. If Tobin's q rises, investment will become cheaper because a small issue of stock will be enough for buying new equipment.

exports, but at first higher price for imported goods worsens the trade balance and as time passes imports decline and exports rise (the J-curve). In the end undervalued domestic currencies stimulate aggregate demand through improving the trade balance.

The credit channel has two critical components: bank-based channels and balance sheet channel (Bolivin *et al.*, 2010). Bank-based channel consists of bank lending and bank capital branches. An expansionary monetary policy increases reserves of banks and pushes up bank loans. This is important in particular for small firms which highly depend on financial supports of banks. Secondly, bank capital channel is related to values of bank assets. A contractionary monetary policy pulls down asset prices, which reduce the holdings of banks together with the payment capacity of borrowers; therefore bank loan portfolios are damaged. Quality of bank credits fall and this pulls down the value of bank assets. As a result, bank capital declines likewise the credit supply and aggregate demand.

The other component of the credit channel is the firms' balance sheet channel. A contractionary monetary policy pulls down asset prices and the net worth of a firm. Colleteral values fall and credit supply declines. Since firms are not able to borrow easily as before, spending and aggregate demand falls (Cömert, 2013). Secondly, the cash flow channel exists. Rising interest rates pull down cash flow of a firm and firm needs to find external funds. Because of rising external finance premiums, cost of capital increases and aggregate demand falls (Bolivin *et al.*, 2010).

To sum up, expansionary (contractionary) monetary policy stimulates (depresses) aggregate demand through increasing (decreasing) investment, consumption, net exports and credit growth. As aggregate demand exceeds (falls below) aggregate supply, price level rises (falls) and inflation rate increases (decreases).

How has the changing institutional framework in the post Bretton Woods Era influenced monetary transmission mechanisms? In ACs financial innovations, financial integration, deregulations and policy choices of central banks[21] triggered endogenous market forces to grow infinitely. Endogenous money supply theory together with evolution of institutions (Niggle, 1991) shed light on the current dominance of financial markets in advanced economies. According to Adrian & Shin (2010), financial institutions in the US had the ability to expand their balance sheets with their own will. Therefore, endogenous market forces have decreased the influence of central banks on credit markets in ACs. On the other hand, DCs have faced with different set of problems in the post Bretton Woods Era. Capital account liberalizations and abolishments of capital controls have made DCs vulnerable to destabilizing effects of volatile financial flows after the 1980s. Structural problems in DCs have come together with global constraints and made transmission channels work differently. Next part discusses different operational mechanism of transmission channels in DCs by focusing on specific transmission channels.

3.3 Which channels are important in monetary transmission of DCs?

Domestic policy makers and global factors simultaneously influence three channels of monetary transmission in DCs: long-term interest rates, exchange rates and credit growth. This part discusses how these three channels work in DCs and why they are important for pursuing effective monetary policies.

[21] For a deeper discussion on evolution of US monetary system after the 1980s, see Cömert (2013).

3.3.1 The interest rate channel

EMEs started issuing and selling long-term debt denominated in their national currencies by the 2000s (Turner, 2014). During this period, emerging market (EM) government bond market has enlarged in size, become more liquid and maturities got longer (Mehrota *et al.*, 2012). In post crisis period, the weight of international bond markets in external finance of EMEs has exceeded the weight of international banking (Turner, 2014). As Mehrota *et al.* (2012) report, domestic debt of EMEs has risen in all regions since 2000, though total government debt has unaltered or even declined. These developments have made long-term interest rates more important for monetary policies and financial stability concerns of EMEs.

3.3.2 Exchange Rates

Exchange rates are one of the most influential asset prices in DCs. Prices of tradable goods are directly affected by exchange rate changes. Many developing economies rely on trade earnings and competitiviness is vital for growth and development of their economies (Eichengreen, 2007). In addition, many DCs need imported goods for producing exported goods. For instance in Turkey, appreciation of exchange rates positively affects aggregate demand since imported goods are inputs in production of exported goods (Başçı *et al.*, 2007). Moreover, exchange rate stability is crucial for price stability because exchange rate pass-through is very influential in these economies (Filosa, 2001). Stability of exchange rates is vital for a DC because balance sheets of fims/banks are vulnerable to changes in exchange rates because of the currency mismatch. On the one hand, depreciation of domestic currency inflates liabilities because of the liability dollarization[22]; on the other hand overvalued

[22] Liability dollarization concept is used for firms/banks, whose liabilities are denominated in foreign

domestic currency triggers balance sheet expansions, which encourage asset price and credit booms (Adrian & Shin, 2010). Central bankers of EMEs are aware of these problesm and they fear of floating; thus they intervene in exchange rate markets though officially declared exchange rate regimes are free floating.

3.3.3 The credit channel

Credit channel influences price and financial stability objectives of DCs[23]. Outcomes of excessive credit growth (inflationary pressures and financial crises) are similar in advanced and developing countries but factors which trigger credit booms are different. In ACs, endogenous market forces trigger credit booms; however in DCs credit expansion is highly influenced by financial inflows, which cause currency appreciations, asset price inflations and balance sheet expansions. Channels by which financial inflows affect credit growth in DCs are manifold and they are discussed in detail in the next part.

3.4 Global constraints on credit growth and exchange rates of DCs

Financial flows are important components of world economy today. Amount of financial transactions among critical financial centers has reached to astronomical levels. Financial flows exert influence on DCs' policy choices and outcomes of these policies. Decline in US short-term interest rate may increase global liquidity and induce capital inflows to EMEs by which EM currencies appreciate. Policy makers of

currency and assets are denominated in domestic currency.

[23] After the GFC, cenral bankers in developing countries started intervening into credit growth. For instance in Turkey, since 2010 the Central Bank of Republic of Turkey (CBRT) has been evaluating credit growth as an important indicator and intervening in credit expansion with required reseve ratios in order to attain the annual credit growth target of 15% (Kara, 2012).

EMEs face with two options; either they let exchange rates appreciate or resist to inflows by hoarding foreign exchange reserves. In the first case, exchange rate appreciation may deteriorate current account balance, trigger asset price bubbles and credit booms, which are found to be strong determiners of financial crisis (Borrio & Disyatat, 2011; Schularic & Taylor, 2009; Mendoza & Terrones, 2008; Reinhart & Reinhart, 2009; Aliber & Kindleberger, 2012[24]). In the second case, EM central banks implement monetary sterilization and purchase foreign exchange from the market[25]. Afterwards central banks issue government bonds in order to pull money supply back to its initial level; however sterilization may give speculators the feeling that the central bank is trying to defend its currency and encourage speculative attacks by which capital inflows further accelarate. Capital inflows ease domestic borrowings and fuelconsumption and credit supply. Therefore, capital inflows directly influence exchange rates and induce domestic credit growth and asset price inflation in DCs. The influence mechanism is shown in Figure 3:1, which is an original contribution.

The diagram has two parts. First part shows the link from global factors to financial flows. As discussed in Chapter 2, Rey (2015) points to the influence of US monetary policy on financial flows; i.e. when VIX is low due to loose monetary policy in the US, financial flows bounce and European banks channel dollar liquidity to the rest of the world. Brune & Shin (2012) point to the risk taking channel in which low short-term interest rates in US money markets increase profability of global banks, which benefit from cheap dollar funding. Due to liquidity abundance, global banks take more

[24] In their influential book, Aliber & Kindleberger (2012) introduce an interesting pattern for the financial crises of the post Bretton Woods Era: capital inflows → overvaluation of currencies → credit expansion → financial boom → manias → panics →crashes. This also explains what happened in the latest GFC, which was triggered by the credit boom in the US mortgage sector.

[25] Most EMEs put their reserves in US long-term treasury bonds and by this way bond yields rise. Falling long term interest rates may trigger global credit boom (Borrio & Disyatat, 2011).

risk and increase lending to DCs' firms/banks. Since capital inflows induce appreciation of domestic currencies, balance sheets of domestic entities look stronger and global banks take more risk and lend more (Bruno & Shin, 2012). By this way monetary policy of the center economy and global risk together influence direction of global financial flows.

The second part of the diagram displays influences of financial flows on domestic credit growth through various links. Four of these channels are related to exchange rate appreciation. Firstly, during inflows domestic currency appreciates and over-valued currency lifts up asset prices. By marked to market prices, balance sheets of financial intermediaries expand and lending rises (balance sheet channel of Adrian & Shin (2010)). Second one is the financial accelerator mechanism. Appreciation of domestic currency pushes up collateral values of firms and banks become more willing to lend to confidential clients; thus lending rises. Thirdly, there exists the debt channel. EMEs accumulate foreign currency denominated debt (due to the original sin); therefore appreciation of domestic currency reduces the amount of debt burden on EMEs. Since debt falls, market players demand more borrowing, thereby credit expands. Fourth one is related to import prices. Over-valued domestic currency reduces import prices and exerts a downword pressure on inflation rates.

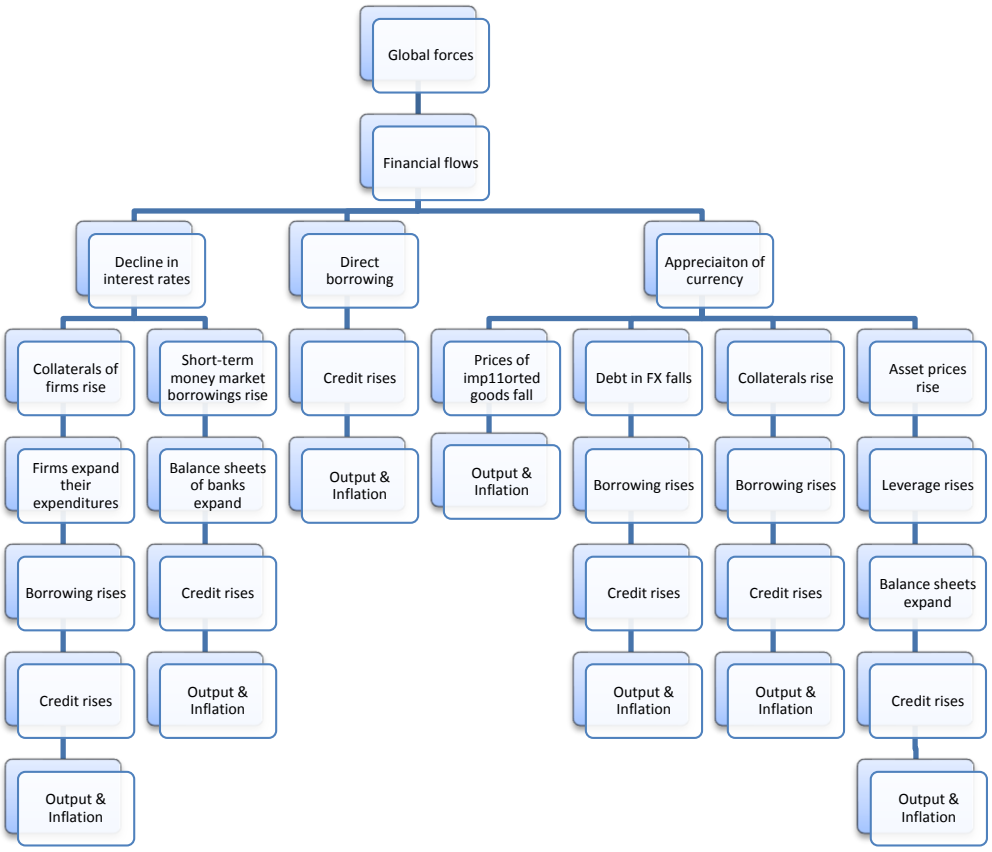

Figure 3:1 Impacts of financial flows on exchange rates and credit growth in DCs

Under financial inflows, foreign funding becomes cheaper. Lane & McQuade (2014) point to a critical channel in which international capital flows influence domestic credit growth: Banks can fund domestic credit demands with cross-border liabilities, i.e.

domestic banks facilitate direct funding from their foreign-owned affiliates or parent banks. Therefore, credit growth becomes unlinked from policy rates under cheap external finance. This means that without taking comprehensive measures, domestic monetary policy has less influence on credit growth if the capital account is open. For example, when capital flows resurged to EMEs after the GFC, short term-interest rates were at the zero lower bound in ACs. Thus, global banks benefited from loose monetary policy in the US and channeled dollar liquidity to the rest of the world. Through borrowing from global banks, local banks and borrowers enjoyed the liquidity abundance.

Financial flows pull down market interest rates in host countries since big firms/banks can find cheap external funds from global banks and provide loans at lower interest rates. According to Chandra & Ünsal (2014), under large capital inflows risk premiums decline and the link between lending rates and tightened monetary policy weakens because banks choose to use cheap foreign finance instead of increasing lending rates. This forces other domestic financial intermediaries to lower lending rates in order to compete with others. Falling maket interest rates may expand credit in two ways. Firstly, a decline in interest rates pulls down cost of short-term money market borrowings. Banks become more willing to issue credit because they can easily fund their lendings. Therefore, bank's balance sheet expands and credit rises. The other branch of this channel works through widening term spreads. When short-term interest rates fall, term spread widens and banks expand lending with the rise in their profability[26]. Secondly, decline in interest rates increases collateral values of firms. Since banks become more willing to lend, firms increase their expenditures and expand

[26] On the other hand, if inflowing capital is heavily investing on long-term government bonds, this mechanism may work in the opposite way.

their balance sheets. Final goals such as output and inflation are influenced by abovementioned channels together with some additional domestic factors.

3.5 Conclusion

In this chapter changing monetary transmission mechanisms in the post Bretton Woods Era are discussed. According to findings of the chapter, domestic credit growth and exchange rates in DCs are exposed to influence of capital inflows significantly although the conventional monetary transmission mechanism stresses the importance of short-term interest rates in determining real economy targets. Though one can not conclude that short-term interest rates are totally ineffective under capital openness, there is enough evidence for the existence of global constraints on monetary transmission channels of DCs. This chapter sheds light on the fact that influencing domestic targets by policy rates is not easy for a DC. In the next chapter, external constraints on policy rates of DCs will be discussed in order to derive a complete picture about the room for independent monetary policy in open DCs.

CHAPTER 4

TESTING FOR CENTRAL BANK INDEPENDENCE OF DEVELOPING COUNTRIES

4.1 Introduction

As discussed in Chapter 3, global factors highly influence domestic transmission channels in DCs and effectiveness of the policy rate tool of central banks is controversial. This chapter aims to test independence of central banks of DCs by analyzing determinants of their short-term interest rate responses. According to the trilemma, free floating open economies can pursue independent monetary policies; however in reality open floaters have been exposed to global pressures and hardly hit by rapid changes in the global atmosphere. Even changing expectations about FED/ECB's policy rates can easily push DCs into turbulence.

In this chapter, central bank independence of thirteen EMEs (Brazil, Chile, Colombia, Peru, Mexico, Korea, Indonesia, Poland, Czech Republic, Hungary, Turkey, Israel and South Africa[27]), implementing IT monetary policy, are investigated by the SVAR technique over 2002-2016. According to the conventional view, IT central banks have the ability to determine their policy rates independently; however findings of the chapter underscore harsh global constraints on policy rates of IT EMEs. According to all country results, ECB's policy rate explains the variation in central bank policy rates of thirteen EMEs more than inflation gap, output gap and exchange rates. Regional

[27] These countries are chosen due to data availability.

subgroup results are supporting overall results; Europe centered emerging economies follow ECB's policy rate closely. Policy rates of the non-European group (East Asian and Latin American EMEs) are responsive to changes in inflation gap in the short-run, but the impact of international interest rates surpasses the influence of inflation gap as time passes.

The outline of the chapter is as follows: The first part is the literature review of determinants of central bank policy rate responses of EMEs. The second part introduces the data and methodology of the empirical study of the chapter. In the third part, empirical results are presented and discussed. The last part concludes the chapter.

4.2 Literature Review

Taylor (1993) puts forward that short-term interest rates are determined by deviations of inflation from the targeted rate and the gap between the actual and potential levels of output:

$R_t = R_o + \lambda_1 \pi_t^{gap} + \lambda_2 Y_t^{gap}$; where R_t is the central bank policy rate, R_o is the equilibrium interest rate, π_t^{gap} is the inflation gap and Y_t^{gap} is the output gap (5)

The Taylor Rule forms the basis of discussions about determinants of policy responses of central banks; however it does not say anything about exchange rates explicitly. The conventional assumption is that exchange rates are implicitly included in the model through their effects on inflation. On the other hand, there are influential attempts in the literature, which modify the Taylor Rule in a way that exchange rates are directly included in the central bank response function.

Filosa (2001) adds exchange rate changes to policy responses of central banks of EMEs and underlines high exchange rate pass through as the reason behind it. Mohanty & Klaue (2004) discuss central bank responses of thirteen EMEs to exchange rate shocks besides changes in inflation and output gaps. According to their results, exchange rates are critical components of interest rate settings in EMEs because of the fear of floating. Moreover, high exchange rate pass through is observable among EMEs and policy makers want to maintain their trade competitiveness; therefore they respond to exchange rate shocks (Mohanty & Klau, 2004). According to Edwards (2006), countries with historically high inflation and high exchange rate volatility attach higher coefficients to exchange rates in their monetary rules. Eichengreen (2007) underlines that stable and competitive exchange rates are reinforcing growth performance of DCs. Aizenman *et al.* (2011) discuss policy responses of EMEs to changes in inflation gap, output gap and exchange rate shocks. As can be seen from their results, EMEs respond to exchange rate shocks and policy reaction is higher in non-IT EMEs. In a recent discussion on foreign exchange interventions of EMEs, the Bank of Thailand (BOT) says that they intervene in foreign exchange markets in order to discourage capital inflows and maintain competitiveness of Thailand (BOT, 2013). In their influential paper, Benlialper & Cömert (2015a) discuss the role of exchange rates in policy decisions of the CBRT over 2002-2008. According to their findings, inflation in Turkey is mainly determined by supply side factors such as global prices and variations in exchange rates; thus the CBRT benefits from appreciation of Turkish Lira in its fight to inflation. On the other hand, the CBRT responds aggressively to depreciations, which is called asymmetric exchange rate pegging by Benlialper & Cömert (2015a). Because of abovementioned reasons exchange rates can be added into the policy response function:

$$R_t = R_o + \lambda_1 \pi_t^{gap} + \lambda_2 Y_t^{gap} + \lambda_3 \Delta E_t; \text{ where } E_t \text{ is the exchange rate} \quad (6)$$

Variables in regression (6) capture domestic factors influencing policy responses; however policy decisions of central banks in EMEs are also influenced by foreign factors. Changing expectations of FED/ECB's policy rate infuence expectations of domestic market players and foreign investors in emerging markets; thus they exert pressure on central banks in policy rate settings. For instance, tapering expectations in 2013 hit fragile EMEs through currency depreciaitons and slowing down of capital inflows. As Rey (2015) empirically shows, US monetary decisions influence global risk perception and the direction of financial flows, which affect exchange rates and credit growth in EMEs to a great extend, as discussed in Chapter 3. Central banks in EMEs resist to destabilizing effects of volatile financial flows by using a wide set of tools, which include short-term interest rates. In order to measure the impact of global factors, Cömert *et al.* (2010) and Benlialper & Cömert (2015b) integrate FED's policy rates into central banks' response function:

$$R_t = R_o + \lambda_1 \pi_t^{gap} + \lambda_2 Y_t^{gap} + \lambda_3 \Delta E_t + \lambda_4 R_{int}; \text{ where } R_{int} \text{ is the FED/ECB's rate} \quad (7)$$

Regression (7), which is also employed by Benlialper & Cömert (2015b), is used in the empirical analyzes of this chapter because it includes all critical factors that may affect short-term interest rates of an IT emerging economy[28]. On the other hand, Benlialper & Cömert (2015b) employed unrestricted VAR model, in which FED/ECB's policy rates are taken as endogenous variables like other domestic factors. However, it is obvious that FED/ECB's policy rates are totally exogenous in the system because none of the variables in regression (7) can affect policy decisions of

[28] The model of Obstfeld et al. (2005) is not preferred because there is the omitted variable case since short term interest rates of the base country is the only explanatory variable in the model though many other domestic factors influence policy responses of central banks. Although the model of Obstfeld (2015) is stronger than the former one because of integrating inflation and output growth into analysis, it is not preferred because the model of Benlialper & Cömert (2015b) is using the Taylor Rule in a more formal way.

FED/ECB. In order to overcome this issue, SVAR technique is used in this chapter[29]. In the next part SVAR methodolody is discussed and data are described.

4.3 Methodology and data

4.3.1 Methodology

In VAR estimations of regression (7), each endogenous variable exerts some influence on other endogenous variables; however FED/ECB's policy rates are totally independent from shocks to policy rates of EMEs. In order to overcome this problem, SVAR technique with long run restrictions, which were first introduced by Blanchard & Quah (1989), is employed in the empirical analyzes.

The rationale behind the SVAR technique is as follows: Let Y_t denote k endogenous variables and e_t denote k orthogonal and uncorrelated disturbances in the unrestricted VAR model. The model can be transformed to $Ø(L)\ Y_t = e_t$ form where $Ø(L)$ is a polynomial consisting of lag operators, as shown by Francis *et al.* (2003). The VAR model can be written in the Moving Average (MA) representation: $Y_t = C(L)\ e_t$ where C(L) is the inverse of the polynomial Ø(L) (Francis *et al.*, 2003). By rewriting the MA form with k=2 (for simplicity):

$$\begin{pmatrix} Y_{1,t} \\ Y_{2,t} \end{pmatrix} = \begin{pmatrix} C_{11}(L) & C_{12}(L) \\ C_{21}(L) & C_{22}(L) \end{pmatrix} \begin{pmatrix} e_{1,t} \\ e_{2,t} \end{pmatrix} \tag{8}$$

[29] Although SVAR model is better than the unrestricted VAR model because of taking international interest rates fully exogenous, it has also some shortcomings. The most important disadvantage is the high number of required long-run restrictions, which may deprive us of some useful dynamics.

In matrix equation (8), setting $C_{12}(L) = 0$ means that the long run impact of the second disturbance $e_{2,t}$ on the first endogenous variable $Y_{1,t}$ is equal to zero, i.e. $Y_{1,t}$ is only affected by the shocks to the first disturbance in the long run (Francis *et al.*, 2003). Similarly, in our case estimated VAR model is converted into a SVAR model by imposing the following restriction matrix:

Table 4:1 The restriction matrix

C(1)	0	0	0	0	0
C(2)	C(3)	0	0	0	0
C(4)	C(5)	C(6)	0	0	0
C(7)	C(8)	C(9)	C(10)	0	0
C(11)	C(12)	C(13)	C(14)	C(15)	0
C(16)	C(17)	C(18)	C(19)	C(20)	C(21)

The matrix in Table 4:1 imposes the following long-run restrictions:

- Long run impacts of short-term interest rates, output gap, inflation gap and nominal effective exchange rates on ECB/FED's policy rate are zero, i.e. ECB/FED's rate is fully exogenous.
- Long run impacts of short-term interest rates, inflation gap and nominal effective exchange rates on output gap are zero.
- Long run impacts of short-term interest rates and inflation gap on nominal effective exchange rates are all zero.

- Long run impact of short-term interest rates on inflation gap is zero.

4.3.2 Data

Short-term interest rates are policy rates of central banks and the data are mostly taken from central banks' websites[30]. Data of South Africa, Poland, Czech Republic and Hungary are immediate central bank rates and they are taken from St. Louis FED's Database. Short-term interest rate data of Korea are immediate call money/interbank rates, which are available in St. Louis FED's Database[31].

Seasonally adjusted industrial production indexes are taken from the OECD's Database (indexes are assumed to be 100 at 2010), for Colombia and Peru total production indexes (manufacturing index for Peru) are used and the data are taken from their central banks' websites[32]. Monthly inflation data is defined as the annual growth rate of Consumer Price Indexes[33]. The data are taken from the OECD's Database (indexes

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[30] For policy rate of Turkey, average of overnight lending and borrowing rates are taken from the CBRT. For Peru, average of overnight deposit rate and rate of monetary regulation credits are taken for January 2002-September 2003. FED's policy rate is the effective Federal Funds Rate and ECB's rate is calculated as the average of deposit facility and marginal lending facility rates, which are available in St. Louis FED's Database and ECB's website respectively.

[31] For Korea, data series end at the beginning of 2005; therefore 3 month interbank rate data are used for the 2015-2016 period. They are also taken from St. Louis FED's Database.

[32] I did seasonal adjustment with X-12 Method. I calculated trends of industrial production indexes by HP Filtering and figured out output gap as the percentage deviation of industrial production indexes from their trends:
Output Gap = ((industrial production index/Trend of industrial production index)-1) x 100.

[33] Inflation targets are assumed as point targets (or converted to point targets) and taken from regular inflation reports of central banks. Under high deviation of inflation from the target rate, I used upper or lower bounds of tolerance bands as target rates. Yearly inflation targets are converted to monthly targets with the following formula:

are assumed to be 100 at 2010). Inflation data of Peru is taken from the Central Bank of Peru's website. Nominal effective exchange rate data are employed for exchange rates[34].

The data of each variable cover 2002M01-2016M01 period because the bulk of analyzed countries passed to IT monetary policy at the beginning of 2000s. Empirical results of regression (7) with SVAR method is presented in the next part. Firstly, the model is estimated for all thirteen EMEs. Secondly, in order to measure regional heterogeneities, the sample is divided into two subgroups: Europe centered and non-European EMEs.

4.4 Empirical Results

Several unit root tests are performed and the null of existence of unit root is rejected by at least two tests for each variable. Test results are in the Appendix.

4.4.1 Overall country results

Regression (7) is estimated for all thirteen EMEs over 2002-2016 with taking ECB's policy rate as a proxy for international interest rates because FED's rate has not been changing much since the GFC. The ordering of endogenous variables is as follows: ECB's rate, output gap, nominal effective exchange rates, inflation gap and short-term interest rates of EMEs. ECB's rate is the most exogenous and policy rate of EMEs is

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$\pi_{t,i} = \pi_{t-1,i} - ((\pi_t - \pi_{t-1})/12)$ and $\pi_{t,1} = \pi_t - ((\pi_t - \pi_{t-1})/12)$; where $\pi_{t,i}$ is the inflation rate at month i of year t, π_t is the inflation rate of year t. Inflation gap is calculated as follows:
Inflation Gap = Inflation-Inflation Target.

[34] Exchange rate data is in the form of monthly percentage change.

the most endogenous variable in the model. All possible orderings regarding other three variables are tried, but results did not change significantly. Three lags are included in the VAR model as Schwarz Information Criteria (SIC) offers[35]. The VAR model is stable according to AR Roots Test[36].

Table 4:2 LM Test for autocorrelation – thirteen EMEs

Lags	LM-Statistics	Probability (Chi-square with 25 degrees of freedom)
1	200.3987	0.0000
2	98.54460	0.0000
3	166.9534	0.0000
4	65.65203	0.0000
5	77.93942	0.0000
6	113.9101	0.0000
7	39.18099	0.0353
8	89.53281	0.0000
9	53.31574	0.0008
10	49.19396	0.0027

[35] Akaike Information Criteria (AIC) offers higher lags; thus SIC is preferred in order not to lose too much degree of freedom.

[36] Test result is in the Appendix.

According to the LM Test in Table 4:2 autocorrelation does not exist in the model. Long run restrictions, which are defined by the matrix in Table 4:1, are imposed to the unrestricted VAR model and Variance Decomposition (VDC) of policy rates is analyzed.

As can be seen from VDC results in Table 4:3 and Figure 4:1, the most influential determinant of variation in policy rate decisions of central banks is the lag of central bank policy rates. This finding is in line with the interest rate smoothing literature which discusses the reluctance of central banks in changing interest rates in a sharp and unexpected way. Cömert, Yeldan & Olçum (2010) investigate determinants of policy rates of the CBRT over 2002-2008 and find that lagged interest rate variable is the most important determinant of policy responses of the CBRT. According to their remarks, central banks smooth their interest rates in order to enhance their credibility because neither fundamentals of the economy nor possible outcomes of policy decisions are certain for them; thus they try to shape market expectations through small and gradual changes in policy rates in the financially globalized world.

Table 4:3 VDC table for policy rates of thirteen EMEs

Period	ECB interest rate	Output gap	NEER	Inflation gap	Interest rate
1	0.642	4.378	0.073	0.009	94.899
2	1.009	4.145	0.127	0.431	94.287
3	1.795	3.584	0.331	1.289	93.001
4	2.740	3.009	0.550	2.143	91.557
5	3.939	2.525	0.714	2.949	89.873
6	5.325	2.125	0.814	3.626	88.111
7	6.834	1.810	0.868	4.172	86.316
8	8.413	1.568	0.891	4.589	84.539
9	10.021	1.386	0.894	4.887	82.812
10	11.623	1.251	0.886	5.084	81.156
11	13.196	1.153	0.871	5.198	79.582
12	14.720	1.081	0.851	5.249	78.099
13	16.182	1.030	0.830	5.251	76.706
14	17.573	0.994	0.809	5.218	75.405
15	18.888	0.968	0.789	5.162	74.193
16	20.124	0.950	0.769	5.092	73.066
17	21.280	0.937	0.751	5.013	72.020
18	22.359	0.927	0.734	4.930	71.050
19	22.361	0.919	0.719	4.848	70.153
20	24.292	0.912	0.705	4.768	69.323

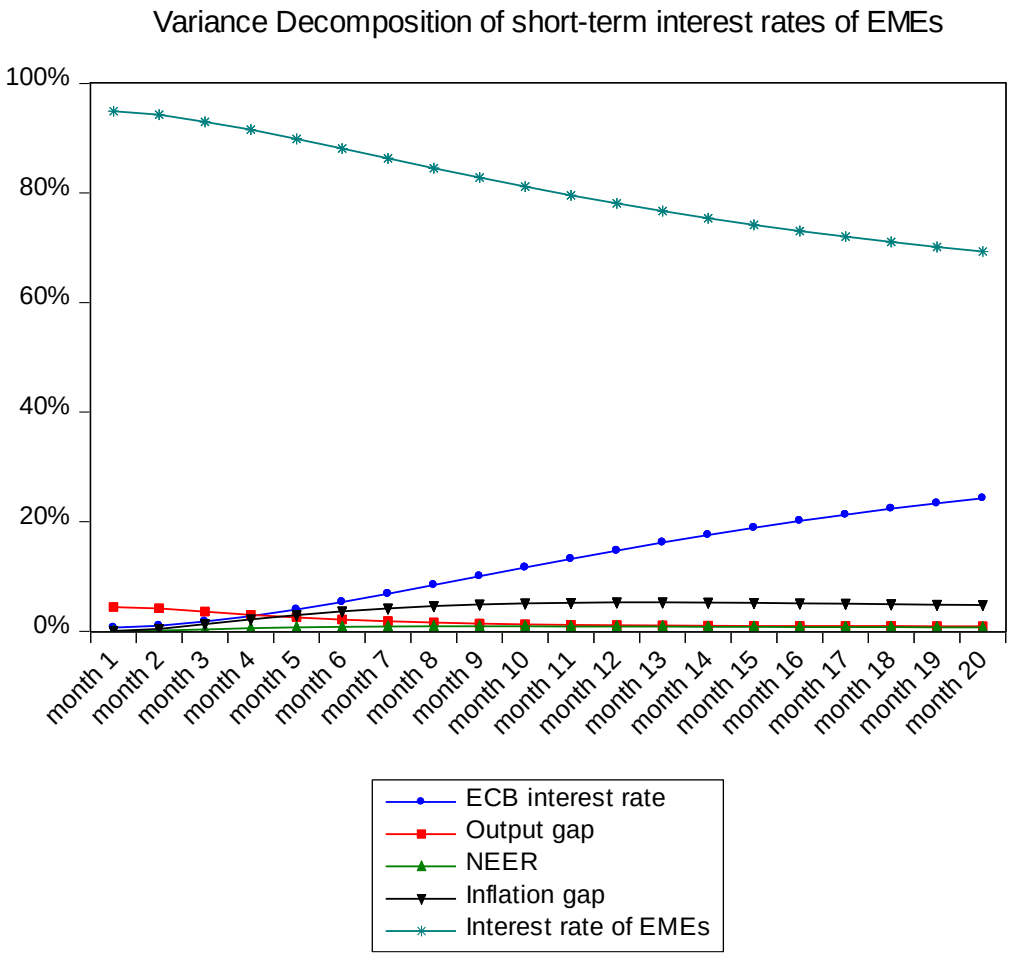

Figure 4:1 VDC graph of policy rates of thirteen EMEs

After five months, ECB's policy rate becomes the second important determinant of the variation in central bank policy rates of thirteen EMEs. At the end of 20th month, the impact of ECB's rate reaches 25%, whereas the influence of inflation gap is just below

5%; thus VDC results shed light on the high influence of international interest rates in explaining variation in local short-term interest rates[37].

Secondly, EMEs are divided into European (East European EMEs, Israel and South Africa) and non-European (East Asian and Latin American EMEs) subgroups in order to find out whether overall country results are driven by Europe centered EMEs, which may be highly responsive to policy rates of ECB.

4.4.2 Non-European group

This group consists of Brazil, Mexico, Chile, Peru, Korea, Colombia and Indonesia. International interest rates are proxied by ECB's rate over 2002-2016. Three lags are included in the VAR model, as offered by SIC. The ordering of variables is same with the former case[38]. The VAR model is stable according to AR Roots Test[39] and there is no autocorrelation in the model, as Table 4:4 indicates.

[37] VDC is also done with the unrestricted VAR model and the influence of ECB's rate is even higher than SVAR estimation results.

[38] Different orderings are tried but results do not change much.

[39] Test result is in Appendix.

Table 4:4 LM test for autocorrelation – the non-European group

Lags	LM-Statistics	Probability (Chi-square with 25 degrees of freedom)
1	152.3044	0.0000
2	109.2174	0.0000
3	115.8477	0.0000
4	61.07165	0.0001
5	73.45215	0.0000
6	78.20268	0.0000
7	43.00868	0.0140
8	65.82708	0.0000
9	51.26409	0.0015
10	36.02829	0.0712

Matrix in Table 4:1 is imposed to the model and VDC analysis of policy rates of the non-European group is done. As Table 4:5 and Figure 4:2 show, interest rate smoothing behavior of central banks is dominant in policy rate settings. Secondly, central banks of the non-European group highly respond to inflation gap but as time passes, the influence of inflation gap declines. The impact of international interest rates on policy rates of the non-European group becomes dominant after some time. At the end of 20th month, international interest rates become the second important determinant of policy rates of the non-European group; thus global constraints influence domestic policy decisions severely, but with some lag[40]

[40] In the unrestricted VAR model, global constraints are even more observable. International interest rates become the second influential determianant of variation in policy rates just after 4 months.

Table 4:5 VDC Table of policy rates of the non-European group

Period	ECB interest rate	Output gap	NEER	Inflation gap	Interest rate
1	1.833	0.881	3.926	23.681	69.679
2	2.242	0.650	4.025	27.599	65.483
3	2.899	0.401	2.631	31.877	62.192
4	3.895	0.248	1.804	33.901	60.152
5	5.243	0.185	1.305	34.968	58.298
6	6.860	0.192	1.012	35.290	56.646
7	8.642	0.242	0.830	35.136	55.149
8	10.504	0.318	0.714	34.639	53.824
9	12.374	0.404	0.639	33.917	52.665
10	14.198	0.490	0.592	33.061	51.659
11	15.939	0.570	0.565	32.140	50.786
12	17.571	0.641	0.552	31.206	50.029
13	19.080	0.703	0.550	30.297	49.370
14	20.462	0.755	0.554	29.434	48.795
15	21.716	0.797	0.564	28.633	48.290
16	22.849	0.832	0.576	27.900	47.844
17	23.867	0.860	0.590	27.236	47.448
18	24.781	0.881	0.604	26.641	47.093
19	25.601	0.898	0.618	26.109	46.774
20	26.338	0.911	0.632	25.635	46.484

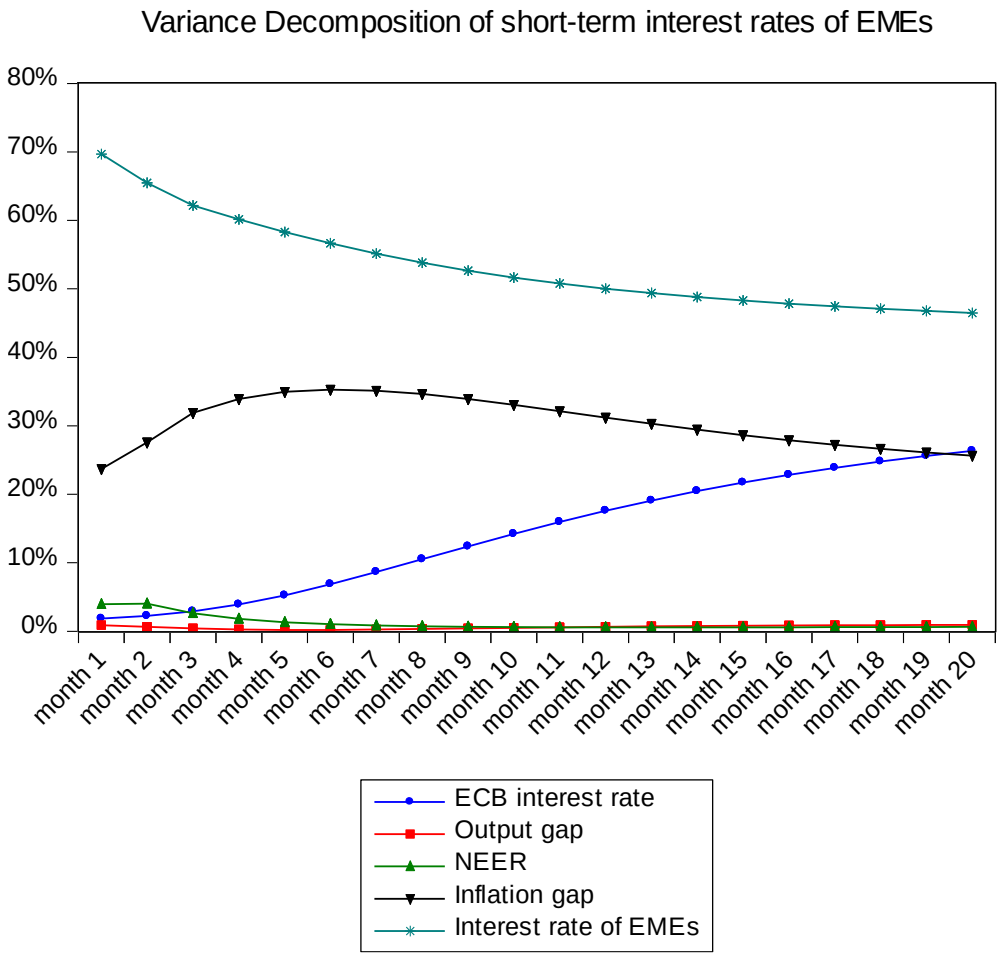

Figure 4:2 VDC Graph of policy rates of the non-European group

4.4.3 Europe centered group

The second group consists of Poland, Czech Republic, Hungary, Turkey, South Africa and Israel. Regression (7) is estimated with two lag VAR according to SIC41.

The ordering of endogenous variables is as follows: ECB's rate, output gap, nominal effective exchange rates, inflation gap and short-term interest rates of EMEs[42]. As AR Roots Test indicates, the VAR model is stable[43] and according to Table 4:6, autocorrelation does not exist in the model.

Table 4:6 LM test for autocorrelation – Europe centered group

Lags	LM-Statistics	Probability (Chi-square with 25 degrees of freedom)
1	173.4164	0.0000
2	112.3240	0.0000
3	95.71667	0.0000
4	34.30238	0.1016
5	49.46599	0.0025
6	68.88665	0.0000
7	40.33693	0.0269
8	44.19455	0.0103
9	69.12981	0.0000
10	40.05787	0.0288

[41] AIC offers higher lags, thus SIC is preferred in order not to lose too much degrees of freedom.

[42] Results are not sensitive to different orderings.

[43] Test result is in the Appendix.

Table 4:7 VDC table for policy rates of the Europe centered group

Period	ECB interest rate	Output gap	NEER	Inflation gap	Interest rate
1	1.916	3.971	2.374	19.243	72.496
2	3.489	4.314	2.700	14.101	75.396
3	5.243	4.316	2.492	10.968	76.980
4	7.066	4.173	2.197	8.858	77.706
5	8.904	3.942	1.958	7.357	77.839
6	10.751	3.679	1.780	6.261	77.530
7	12.618	3.411	1.641	5.443	76.887
8	14.505	3.155	1.529	4.819	75.993
9	16.404	2.918	1.434	4.333	74.911
10	18.302	2.705	1.353	3.946	73.694
11	20.187	2.515	1.283	3.633	72.383
12	22.045	2.348	1.222	3.375	71.010
13	23.867	2.202	1.168	3.160	69.603
14	25.643	2.076	1.119	2.978	68.183
15	27.365	1.968	1.076	2.823	66.768
16	29.027	1.875	1.037	2.689	65.373
17	30.625	1.796	1.002	2.571	64.006
18	32.156	1.728	0.969	2.468	62.678
19	33.619	1.670	0.940	2.377	61.394
20	35.013	1.621	0.913	2.296	60.157

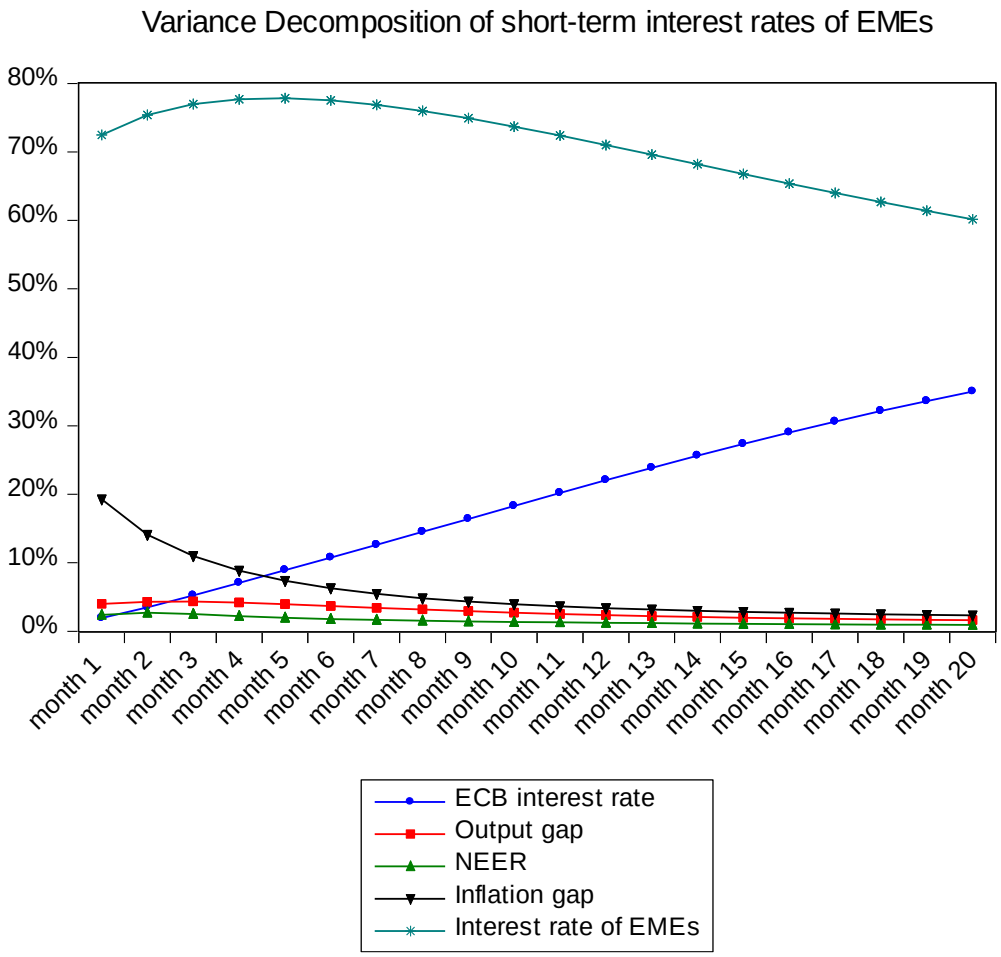

Figure 4:3 VDC graph for policy rates of the Europe centered group

The matrix in Table 4:1 is imposed to the model and the SVAR model is derived. As Table 4:7 and Figure 4:3 indicate, after five months from the shock, ECB's rate explains the variation in policy rates of Europe centered EMEs more than other domestic variables, except policy rate itself[44]. ECB's influence on the Europe

centered group reaches 35% after twenty months and is higher than its influence on thirteen EMEs. In first five months, inflation gap is the second important determinant of policy rates, thus ECB's rate affects domestic policy rates with some lag. VDC results present strong evidence for the global constraints on central banks of the Europe centered group.

4.5 Conclusion

In this chapter, central bank independence of thirteen IT EMEs is analyzed with the SVAR technique over 2002-2016. According to empirical findings, interest rate smoothing behavior is dominant in policy rates settings of EMEs. Secondly, central banks of EMEs respond significantly to changes in international interest rates though the trilemma states that open floaters have enough room for pursuing independent monetary policies[45]. Subgroup results indicate some heterogeneity; however global constraints on policy rates are observable for both groups though their influence varies. The non-European group responds to changes in international interest rates with some lag. In the short run, this group may be benefiting from central bank independence, as Obstfeld (2015) also underlines[46]; however after two years from the shock, ECB's interest rate becomes more influential than all domestic variables. Europe centered EMEs follow international interest rates closer than the other group. The reason may

[44] In unrestricted VAR results, ECB's rate is even more influential on policy rates of EMEs.

[45] Empirical findings are in line with the findings of Benlialper and Cömert (2015b) regarding the influence of international interest rates. Their findings were underlining high response of policy rates of the CBRT to both FED's and ECB's policy rates over 2002-2008.

[46] Obstfeld (2015) points to relatively higher short-term interest rate independence for EMEs than ACs; however long-term interest rate movements of both country groups are restricted by their base country's long-term interest rates.

be geographical closeness and depth of political relations between this group and the European Union. This subgroup contains Poland, Hungary and Czech Repuclic, which are members of the European Union. This may be thought of generating higher responses but these countries are not members of the euro-zone and they officially follow IT monetary policies.

Although supporters of the trilemma claim that floating generates significant independence for monetary policy, empirical findings of the chapter come out against the conventional wisdom since free floating EMEs face harsh global constraints. On the other hand, this chapter does not constitute a full proof of monetary policy dependence of open EMEs on central monetary policies because effectiveness of short-term interest rates in EMEs is controversial since financial flows exert influence on transmission channels of these economies regardless of policy rates, as discussed in Chapter 3. The next chapter will return to the effectiveness issue and empirically discuss global constraints on long-term interest rates of EMEs.

CHAPTER 5

EFFECTIVENESS OF POLICY RATES IN DEVELOPING COUNTRIES: GLOBAL CONSTRAINTS ON LONG-TERM INTEREST RATES

5.1 Introduction

Since the GFC central bankers all over the world have been implementing various techniques, including non-orthodox methods, in order to gain room for effective monetary policy. One of the concerns of central bankers in EMEs has been long-term interest rates, which have close relation with growth, long run investment and long-term credits such as mortgage rates. However, as discussed in Chapter 3, financial flows exert influence on monetary transmission channels of DCs; thus there is enough evidence to suspect from the traditional interest rate channel and indeed the mechanism by which long-term interest rates are influenced is still controversial.

This chapter aims to provide empirical evidence to the effectiveness issue regarding long-term interest rates and complement discussions in Chapters 3 and 4. For this purpose determinants of long-term interest rates of four selected EMEs (Korea, South Africa, Israel and Colombia) are discussed over 2003-2016 by two methods: Panel Least Squares (PLS) and SVAR. The outline of the chapter is as follows: The first part is the literature review of the role of long-term interest rates in EMEs, particularly in last two decades. In the second part, descriptive analyzes of long-term interest rates of four EMEs are given. The third part discusses empirical models used in the literature to figure out influences of determinants of long-term interest rates. The fourth part

describes the selected model and presents empirical findings. The last part concludes the chapter.

5.2 The role of long-term interest rates

Historically, long-term interest rate has been vital for central banks in influencing growth, long run investment and long-term asset prices (Turner, 2013). The bulk of the literature decomposes long-term interest rates into two main components. First one is the average of expected short-term interest rates and the second is the term premium[47] (Berk & Knot, 1999; Cömert, 2013; Miyajima, Mohanty & Yetman, 2014; Obstfeld, 2015; Turner, 2013). The term premium covers the risk of future changes in short-term interest rates by which long run investors may be damaged.

Traditional interest rate channel is believed to work in a rather simple way: central banks control short-term interest rates, by which they influence expected future short rates while term premium stays stable (Turner, 2013). On the other hand, there are at least two things that make us suspect of this mechanism: complex nature of expectations and high correlation between term premiums and global risk. Even the FED had to implement unconventional policies (balance sheet operations by which long-term government bonds were directly purchased at large scales) in order to pull down term premiums. Furthermore, strict commitment of the FED to price stability did not directly imply control over expectations and the FED had to use communication tools to impact expectations of market players (Turner, 2013). Two well known cases prove the lack of functionality of the traditional interest rate channel. Greenspan conundrum underlines the constancy of US long-term interest rates in mid

[47] $i^{long\text{-}term} = E\,(\Sigma\, i^{short\text{-}term}/n) + \tau$ where $i^{long\text{-}term}$ is the long-term and $i^{short\text{-}term}$ is the short-term interest rate and τ is the term premium. Bernanke (2013) also adds inflation expectations into the equation.

2000s while policy rates were climbing (Obstfeld, 2015). Secondly, Turner (2013) points to the rise of US long-term interest rates in 2013 whereas policy rates were unaltered (expectations about the FED's exit from large scale asset purchases made term premiums bound to zero level).

What about the situation in EMEs? Berk *et al.* (1999) discuss integration of international long-term bond markets with the help of financial innovations such as currency swaps since the mid 1980s. Obstfeld (2015) underlines co-movement of long-term interest rates of US and EMEs; and explains reasons of this by three factors; long run inflation targets of EMEs may be similar to US, expected real exchange rate changes may be small or term premiums may be highly correlated. According to Miyajima *et al.* (2012), on the one hand EM government bonds have become safe assets since 2008[48] because their yields fell when global risk was high; on the other hand the influence of US monetary policy on EMEs has risen. Miyajima *et al.* (2014) find out that long-term interest rates of Asian economies are highly responsive to changes in US term premium. According to a similar study, Colombian long-term interest rates are found to be affected by movements in US long-term treasury bond rates, especially after 2008 (Guarin *et al.*, 2014).

Turner (2014) pays attention to declining monetary policy independence of EMEs because of rising co-movement of long-term interest rates, but he does not explain the explicit mechanism of influence. Miyajima *et al.* (2014) give important clues for a possible mechanism through which global conditions may affect EMEs. EM local bond investors pay for two risks additional to domestic term premium[49]: currency

[48] The situtation has changed after 2013 since some fragile currencies overreacted to US tapering expectations and lost value.

[49] Domestic term premium is the premium paid for the risk of investing in long-term bonds instead of

risk[50] and country risk[51] or bond risk and these risks are highly correlated with global risk. EM local government bonds are risky papers because there is the default risk and volatility of EM currencies exacerbates the default risk because depreciation of domestic currency damages investments in local bonds unless currency risk is hedged; therefore floaters pay for currency premium, which is highly sensitive to capital inflows (Frankel *et al.*, 2004). What is more, flexible exchange rates expose domestic monetary targets to global factors through the balance sheet channel[52]. Hence flexible exchange rates exacerbate impacts of global factors on domestic monetary policies although supporters of the trilemma believe in external shock absorption capacity of exchange rate flexibility.

In post crisis period, decline in EM long-term interest rates was reinforced by low country and currency risk premiums because accommodative monetary policy of the FED pulled down global risk perception and encouraged capital inflows to EMEs, which not only appreciated domestic currencies but also strengthened the feeling that EM currencies would stay over-valued as long as US monetary easing continued (Miyajima *et al.*, 2014). On the other hand, tapering expectations in 2013 have changed expectations about EM currencies and triggered depreciations, which have been associated with capital reversals. Currency problems have pushed up country risks and increased long-term interest rates since some EMEs have been highly sensitive to

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investing on successive short-term bonds covering the same period.

[50] Currency risk is related to possible depreciations, which are common in EMEs.

[51] Country risk is the country default risk of EM bonds.

[52] As discussed in Chapter 3, over-valued currencies trigger balance sheet expansions and accelarate credit growth in DCs (Adrian & Shin, 2010).

changes in US monetary policy. Even an announcement of a future rise in FED's policy rates have affected the direction of capital flows and threatened domestic monetary targets in fragile economies.

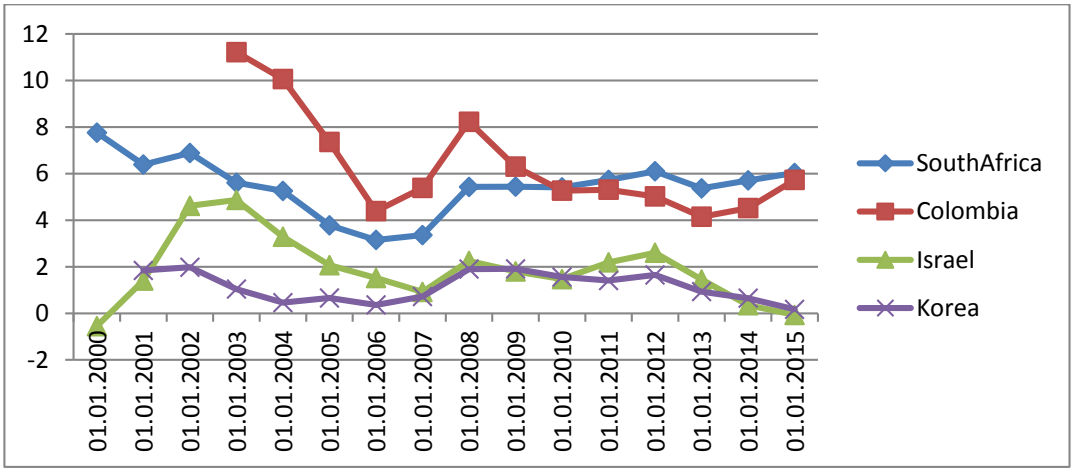
Besides monetary policy outcomes, current trend of low long-term interest rates may generate obstacles for financial stability issues in both ACs and EMEs. Bernanke (2013) discusses an interesting dilemma. On the one hand, low long-term interest rates are encouraging risk taking which may trigger financial fragilities; but on the other hand, keeping long-term interest rates low is still vital for growth, long run investment to real economy and economic recovery. Turner (2014) also highlights possible financial consequences of low long-term interest rates for EMEs. After the GFC, EM corporates issued debt in their domestic currencies and easily found external finance. Since domestic banks could not finance big corporations, they sought for new clients among small firms and extended lending to them. According to Turner (2014), if the direction of wind changes domestic banks and small firms may face serious liquidity problems[53]. Mehrota *et al.* (2012) underline problems regarding volatility of EM currencies; as they state holdings of foreign investors in domestic bond market has risen and some investors do not hedge currency risks because they expected over-valued local currencies as US monetary easing continued. When domestic currencies depreciate, foreign investors will face serious loses; moreover if investors preferred to hedge currency risks in domestic financial markets, financial risk would be only carried from one balance sheet to another in the same country. In addition, Turner (2014) underscores possible balance sheet problems because the weight of long-term bonds in balance sheets has risen after the GFC. Low long-term interest rates implied higher asset values and firms replaced their short-term debt with long-term ones since

[53] On the other hand becoming indebted in domestic currencies is good for EMEs since exchange rate risk falls, thus problems related to original sin lessen.

rates were quite low. Any rise in long-term interest rates will not only depress assets but also magnify liabilities (Turner, 2014).

5.3 Descriptive Analysis

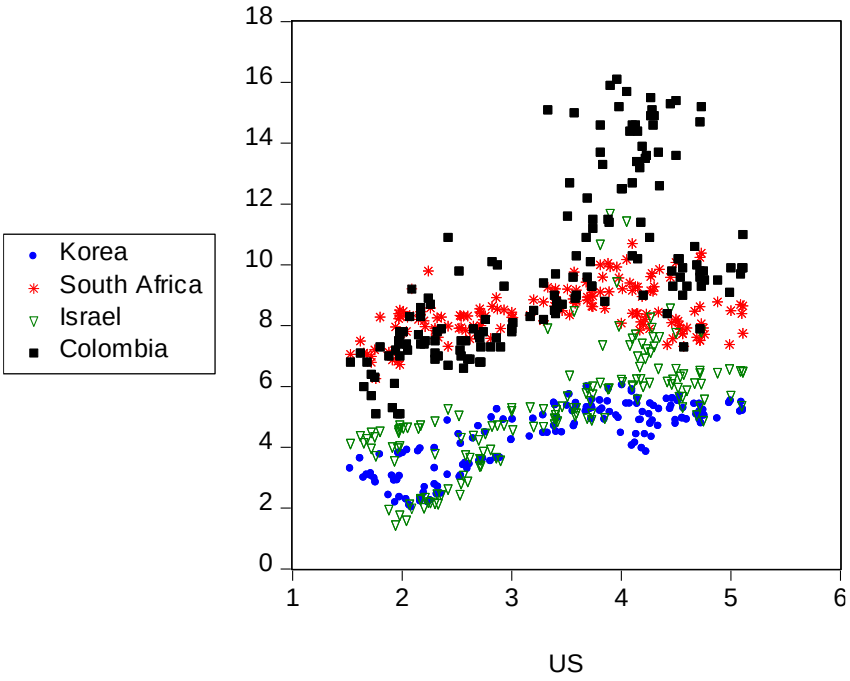
In this part four representative EMEs (South Africa, Colombia, Israel and Korea) are discussed due to data availability since long-term interest rate series are not long enough for EMEs. In Figure 5:1, long-term interest rate movements of four EMEs are shown since 2000.



Source: OECD's Database

Figure 5:1 Spread of long-term interest rates of Korea, South Africa, Israel and Colombia with respect to US

According to the graph, long-term interest rates of four EMEs converged to US long-term interest rates just before the GFC. After the crisis, two different patterns can be observed: South Africa and Colombia diverged from US long-term interest rates whereas Israel and Korea further converged to US rates. The case of Israel and Korea is a strong sign for the direct influence of US long-term interest on local long-term interest rates. For South Africa and Colombia, global constraints may be working through an indirect channel: Tapering news from the US may have increased risk premiums in these EMEs and pushed local long-term interest rates up; thus divergence pattern can not be evaluated as a sign of declining global constraints.



Source: OECD's Database

Figure 5:2 Scatter plot of long-term interest rates of Korea, South Africa, Israel and Colombia with respect to US

In order to see correlations among long-term interest rates of four EMEs and US, the scatter plot in Figure 5:2 is derived. According to the graph, long-term interest rates of four EMEs are positively correlated with US long-term interest rates and correlations are higher for Israel and Korea. For numerical analysis local long-term interest rates are regressed on US long-term interest rates and five year inflation expectations[54]. Estimated β^{OLS} values are 0.72, 0.64, 1.19 and 0.72 for Korea, South Africa, Israel and Colombia respectively[55].

Descritive analyses point to the presence of global constraints on long-term interest rates of EMEs; however an empirical model should be employed for a convincing proof.

5.4 Data and methodology

5.4.1 Data

Monthly long-term interest rates are 10 year government bond yields and the data are taken from OECD's Database. Monthly short-term interest rates are policy rates of central banks and for South Africa the data of immediate central bank rates in St. Louis FED's Database are employed. For Korea, immediate call money/interbank rates, which are available in St. Louis FED's Database, are used. For Colombia and Israel, policy rates are taken from their central banks' websites.

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[54] $i_t^H = \beta\, i_t^{US} + \gamma\, exp\_inf_t + u_t$ where i_t^H is the domestic long-term interest rate, i_t^{US} is the US long-term interest rate and exp_inf_t is the five year inflation expectations, which are calculated by the Moving Average Method.

[55] For South Africa first difference of the regression is estimated due to the unit root problem. OLS results are in the Appendix.

Monthly, seasonally adjusted industrial production indexes (calculated with the assumption of being 100 at 2010) of all countries (except index of Colombia, which is taken from the website of Colombian central bank) are taken from OECD's Database. Industrial production index is in the form of monthly percentage change. Monthly inflation data are annual growth rates of Consumer Price Indices (with the assumption of being 100 at 2010) and they are taken from OECD's Database. Monthly exchange rate data are nominal effective exchange rate indexes, which are taken from St. Louis FED's Database. Monthly VIX index is also taken from St. Louis FED's Database. Exchange rate and VIX indexes are in the form of monthly percentage change.

5.4.2 Methodology

In empirical analysis of determinants of long-term interest rates, different models have been used in several papers. Turner (2013) assumes that long-term interest rate of a country can be estimated by US long-term interest rates, domestic short-term interest rates and inflation rates of the home country[56]. According to OLS estimation results, US influence on long-term interest rates of EMEs is higher than the impact of local short-term interest rates; moreover the US influence rose from 2000-2005 to 2005-2012 periods.

In a recent paper, Guarin *et al.* (2014) predict that Colombian long-term interests are influenced by US long-term interest rates, Colombian exchange rates and sovereign risk premium of Colombia which is approximated by the value of credit default swap spreads[57]. According to their analysis, the coefficient of US long-term interest rate

[56] $i_t^H = \alpha + \beta\, i_t^{US} + \gamma\, i_t^{SR} + \emptyset\, inf_t^H + u_t$; where i_t^H is the home country's long-term interest rate, i_t^H is the US long-term interest rate, i_t^{SR} is the short-term interest rate of the home country and inf_t^H is the inflation rate of the home country. Pooled OLS is estimated for Brazil, Korea, Mexico, Malaysia, Poland, South Africa, Thailand and Turkey over 2002-2004 and 2005-2012.

rises in pre-crisis period, falls sharply during the GFC and increases modestly in post-crisis period. Furthermore, any positive shock to US long-term interest rates affected Colombian long-term interest rates positively over 2004-2007 and negatively during 2007-2009 due to safe heaven character of US Treasury bonds[58]. In post-crisis period, in particular after tapering expectations of 2013, long-term interest rates of Colombia became more responsive to US long-term interest rate shocks (Guarin *et al.*, 2014).

According to Miyajima *et al.* (2012), domestic long-term yields of EMEs are determined by US 10 year Treasury bond rates, VIX, domestic short-term interest rates, domestic GDP growth, inflation, and fiscal balance[59]. According to their results, domestic short-term interest rates have the highest influence on domestic long-term interest rates and US long-term interest rate is the second influential factor; moreover US influence rose after 2008. Secondly, authors estimate a dynamic Panel VAR[60] and measure responses of local long-term yields to domestic and external shocks. Miyajima *et al.* (2012) derive three important conclusions. Firstly, the influence of

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[57] $\Delta i_{tk}^{Col} = \alpha(k) + \beta(k)\,\Delta i_{tk}^{US} + \gamma(k)\,\Delta lcop_{tk-1} + \emptyset(k)\,\Delta cds_{tk-1} + a_{tk}$; where i_t^{Col} is the long-term interest rate of Colombia, i_t^{US} is the US long-term interest rate, $lcop_t$ is the log of Colombian exchange rates with respect to US dollars and cds_t is the value of credit default swaps spreads of Colombia. Moving Window Linear Regression (MWLR) method is employed over 2004-2013 with a particular focus on 2004-2007, 2007-2009 and 2009-2013 sub-periods.

[58] $\Delta Y_t = c + \Sigma A_i\,\Delta Y_{t-i} + \Sigma B_i\,\Delta X_{t-i} + \varepsilon_t$; where Y_t consists of domestic variables such as i_t^{Col}, lcop, cds, and X_t stands for external shocks such as i_t^{US} and VIX.

[59] $i = \alpha + \beta\ fcrate + \mu\ fcinf + \gamma\ fcgdp + \theta\ fcfisc + \delta\ us10 + \emptyset\ vix + u$; where i stands for local bond rates, fcrate is the local short-term interest rate, fcinf is the domestic inflation, fcgdp is the GDP growth, fcfisc is the fiscal balance and us10 is US 10 year Treasury bond rates. Fixed Effect Panel estimation is done for Brazil, Chile, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Poland, South Africa and Turkey over 2001-2011.

[60] $Y_{it} = c + \beta(L)Y_{it} + u_{it}$; where L is the lag operator and Y_i={vix, us10, fcfisc, fcrate, i}. The ordering is as follows: VIX, US long-term interest rate, fiscal balance forecasts, local short-term interest rates and local long-term interest rates.

VIX has declined in post crisis period. Secondly, US long-term interest rates' impact has risen after 2008 and lastly domestic interest rates have always been the most important determinant of domestic long-term bond yields.

In a recent study, Miyajima *et al.* (2014) investigate the influence of US monetary policy on five Asian economies: Indonesia, Korea, Malaysia, Thailand and Philippines over 2003-2013 by employing a Panel-VAR Model[61]. According to their results, US term premium affects domestic variables seriously. Domestic long-term interest rates respond most to US term premium changes: one percentage point change in US term premium causes 0.6 percentage point change in domestic long-term interest rates (Miyajima *et al.*, 2014).

Obstfeld (2015) predicts that domestic long-term interest rates are influenced by US long-term interest rates, change in real GDP and change in inflation of the home country[62]. Obstfeld (2015) estimates Pooled OLS for ACs and EMEs separately and finds that long-term interest rates of ACs follow their base countries' rates more than long-term interest rates of EMEs. Following that, Obstfeld (2015) examines dynamics of long run relationship between long-term interest rates of ACs and EMEs by the Bound Test[63]. Results are supporting pooled OLS estimation results: Long run relation

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[61] $Y_t = \Sigma A\ Y_{t-i} + B\ Z_t + \varepsilon_t$; where Y_t includes domestic variables which are industrial production, inflation, domestic 10 year government bond yields and bilateral nominal exchange rates, and Z_t represents the influence of US monetary policy.

[62] $\Delta i_{jt} = \alpha + \beta\ \Delta ib_t + \gamma\ X_{jt} + u_{jt}$; where i_{jt} is the long-term interest rate of country j at time t, ib_t is the base country's long-term interest rate at time t and $X_{j,t}$ stands for real GDP growth and changes in CPI inflation of country j at time t.

[63] Δi_{jt} = (lags of Δi_{jt}) + (lags of Δib_t) + (lags of X_{jt}) + θ ($i_{j\ t-1} - \xi ib_{t-1} - \omega X_{j\ t-1}$) + U_{jt}; where θ is the adjustment speed and ξ is the long run level coefficient.

is more precise for ACs and long run levels coefficient moves around 1 for both country groups.

Abovementioned analyses present empirical evidence for the presence of high US influence on long-term interest rates of EMEs; however none of the authors discussed effectiveness of short-term interest rates explicitly. Next part empirically discusses determinants of long-term interest rates of EMEs in the context of the effectiveness issue.

5.5 Empirical Results

Following the abovementioned literature, local long-term interest rates are assumed to be influenced by US long-term interest rates, VIX, industrial production, exchange rates, five year expected inflation[64] and local short-term interest rates:

$$i_t^{\text{long-term}} = \alpha_0 + \alpha_1\, i_t^{US} + \alpha_2\, VIX_t + \alpha_3\, \text{industrialproduction}_t + \alpha_4\, \text{neer} + \alpha_5\, \text{expectedinflation}_t + \alpha_6\, i_t^{\text{short-term}} + u_t \quad (9)$$

Determinants of long-term interest rates of Korea, South Africa, Israel and Colombia are analyzed by Panel Least Squares (PLS) and SVAR methods over 2003M01-2016M01. In PLS estimation, three month expectations of US long-term interest rates, VIX, industrial production, nominal effective exchange rates and local short-term interest rates together with five year inflation expectations are employed as explanatory variables[65]. Exchange rate, industrial production and VIX data are in

[64] Five year time horizon is chosen for inflation expectations, which are calculated by the MA method. Three year and one year horizons are also tried but results did not change significantly.

[65] Three month expectations are calculated by the Moving Average method. For example, VIX at April

monthly percentage change form. All variables are stationary according to at least two unit root tests. Test results are in the Appendix.

As PLS results indicate[66] coefficients of expected inflation, US long-term interest rates, local short-term interest rates and exchange rates are significant at 1% significance level. Signs of coefficients of US long-term interest rates, expected inflation and local short-term interest rates are positive and the sign of exchange rates is negative, as expected. The coefficient of VIX is significant at 5% significance level but its sign is negative[67]. As estimation results show, expected inflation has the highest coefficient (0.97); US long-term interest rates (0.63) and local short-term interest rates (0.29) follow it.

PLS findings point to the importance of inflation expectations among determinants of long-term interest rates of EMEs. There are two implications of this finding to the effectiveness discussion. Firstly, as discussed in Chapter 3, real targets (output & inflation) of DCs are open to the influence of financial flows; thus policy rates can not easily influence inflation rates. Moreover, as Benlialper & Cömert (2015a) discuss, inflation rates in DCs are mainly determined by supply side factors such as world commodity prices and variations in exchange rates. Secondly, central banks in DCs

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2003 is calculated as the average of VIX at January, February and March 2003. Advantages of this technique are manifold. Firstly, it overcomes possible endogeneity problems in the OLS estimation because lag values of independent variables are directly included in the regression. Secondly, it takes expectation of each variable into account because expectations channel is important in monetary transmission mechanism of EMEs. Besides this technique, one lag of variables are also estimated by PLS but results did not change much.

[66] PLS estimation results are in the Appendix.

[67]Long-term interest rates of EMEs are expected to rise when global risk is high due to higher risk premiums, but this finding may be related to high investment on EM government bonds after the GFC when global risk was rising. Miyajima et al. (2012) also find this result.

can not control expectations easily because expectations are unstable and unpredictable. In addition, US long-term interest rate is the second important determinant of EM long-term interest rates, which is an evidence for explicit global constraints on long-term interest rates of EMEs.

PLS estimates individual influences of explanatory variables on endogenous variable; however dynamics among explanatory variables should also be taken into account; therefore SVAR is also estimated. In SVAR estimation the following ordering of endogenous variables is preffered: VIX, i^{US}, industrialproduction, neer, expectedinflation, $i^{short\text{-}term}$ and $i^{long\text{-}term}$. First two variables are the most endogenous ones in the model[68] and the same ordering in Chapter 4 is used for domestic variables, except local long-term interest rates[69]. Other possible orderings are also tried but results did not change much[70]. Two lag VAR model is estimated as SIC offers. The model is stable according to AR Roots Test[71] and there is no autocorrelation in the model, as Table 5:1 indicates.

The following long-run restrictions are imposed to the unrestricted VAR model:

- Long-run impacts of all variables on VIX are zero.
- Long-run impacts of industrial production, exchange rates, inflation

[68] In i^{US}, VIX ordering, the influence of VIX is higher but the sum of influences of VIX and US long-term interest rate do not change, so do impacts other domestic variables.

[69] This ordering is similiar to the ordering of dynamic VAR model of Miyajima et al. (2014).

[70] When local long-term interest rate is put in the third place, the influence of inflation expectations fell and impact of local long-term interest rate increased. Influences of other variables did not change much.

[71] Test result is in the Appendix.

expectations, local short and long-term interest rates on US long-term interest rates in zero.

- Long-run impacts of expected inflation, exchange rates, local short and long-term interest rates on industrial production are zero.
- Long-run impacts of expected inflation, local short and long-term interest rates on exchange rates are zero.
- Long-run impacts of local short and long-term interest rates on inflation expectations are zero.

Long-run impact of long-term interest rates on short-term interest rates is zero.

Table 5:1 LM test for autocorrelation

Lags	**LM-Statistics**	**Probability (Chi-square with 49 degrees of freedom)**
1	301.5285	0.0000
2	215.4120	0.0000
3	101.7335	0.0000
4	102.5661	0.0000
5	111.5284	0.0000
6	102.0692	0.0000
7	108.0071	0.0000
8	54.49679	0.2734
9	65.64708	0.0562
10	62.48426	0.0934

Table 5:2 VDC table of local long-term interest rates of EMEs

Period	VIX	US long-term interest rates	Industrial production	Neer	Expected inflation	Local short-term interest rates	Local long-term interest rates
1	0.080	39.583	0.047	1.040	40.203	0.030	19.018
2	1.016	44.698	0.102	1.438	35.074	0.016	17.657
3	1.240	50.773	0.194	1.996	29.445	0.025	16.327
4	1.317	54.592	0.182	2.119	26.100	0.026	15.663
5	1.433	56.794	0.184	2.092	24.132	0.031	15.333
6	1.586	58.294	0.184	2.065	22.753	0.041	15.076
7	1.756	59.489	0.177	2.045	21.655	0.054	14.823
8	1.938	60.481	0.169	2.022	20.746	0.072	14.571
9	2.133	61.326	0.161	1.996	19.974	0.093	14.317
10	2.338	62.064	0.153	1.968	19.303	0.116	14.057
11	2.553	62.723	0.146	1.939	18.708	0.142	13.789
12	2.776	63.319	0.139	1.909	18.174	0.169	13.515
13	3.005	63.862	0.133	1.880	17.689	0.196	13.235
14	3.240	64.361	0.127	1.850	17.246	0.223	12.953
15	3.479	64.822	0.123	1.820	16.839	0.250	12.668
16	3.721	65.249	0.118	1.790	16.461	0.275	12.384
17	3.964	65.647	0.115	1.761	16.111	0.300	12.102
18	4.208	66.019	0.112	1.732	15.783	0.323	11.824
19	4.450	66.366	0.109	1.704	15.477	0.344	11.550
20	4.691	66.692	0.107	1.676	15.189	0.363	11.282

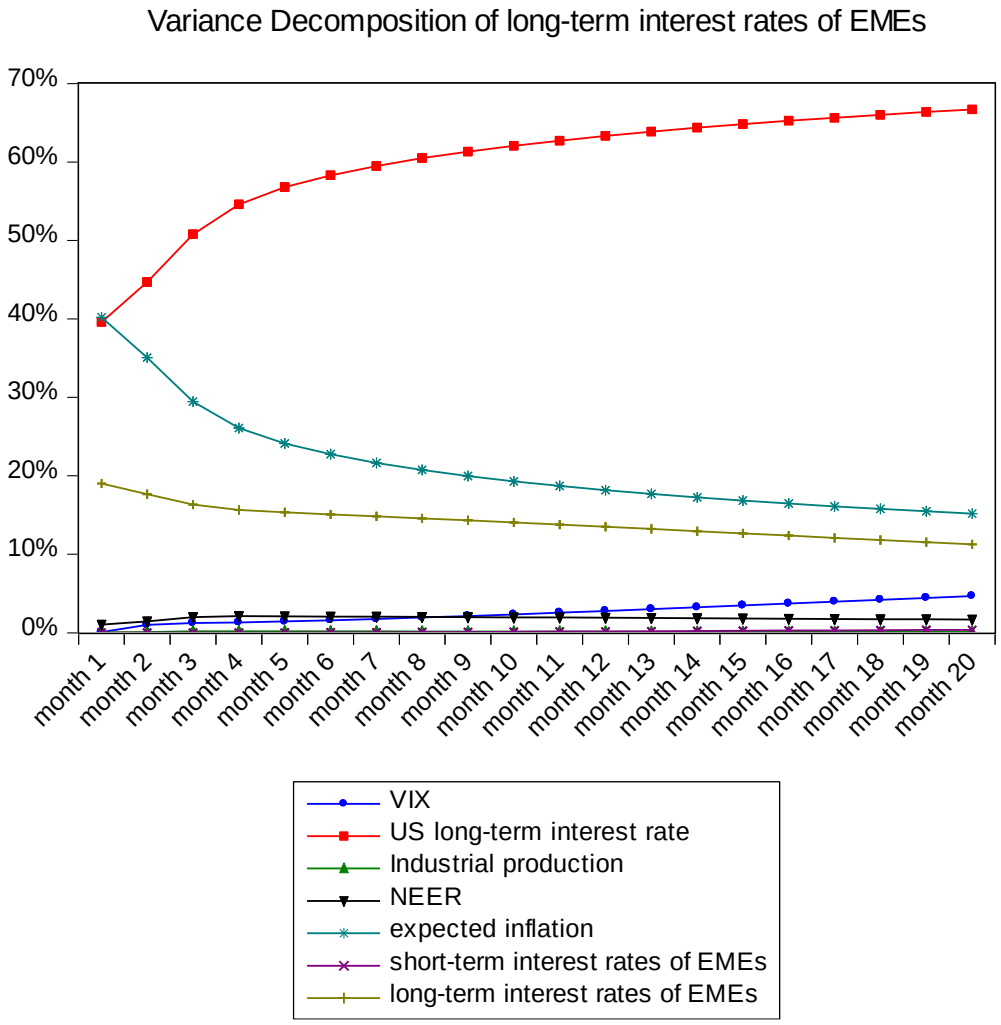

Figure 5:3 VDC graph of long-term interest rates of EMEs

As Table 5:2 and Figure 5:3 show, US long-term interest rate is the most important determinant of long-term interest rates of EMEs. Expected inflation is the second influential factor but its impact declines as time passes. The impact of short-term interest rate is almost insignificant. This result is in line with PLS estimation results. After eighteen months from the shock global factors (US long term interest rates +

VIX) explain more than 70% of the variation in local long-term interest rates; but the influence of domestic determinants, excluding long-term interest rate itself, stay below 5%[72]. Thus, long-term interest rates of EMEs are suffering from global constraints, which work through direct (US long-term interest rates) and indirect (inflation expectations) channels; moreover the influence of short-term interest rates on long-term rates is quite low.

5.6 Conclusion

In this chapter, determinants of long-term interest rates of EMEs are discussed with empirical findings, which shed light on significant global constraints on long-term interest rates of EMEs. According to PLS findings expected inflation is the most influential determinant of long-term interest rates of EMEs and US long-term interest rate follows it. As SVAR results indicate, the impact of US long-term interest rates on EM long-term interest rates is highest among other factors and the influence of domestic short-term interest rates is nearly insignificant. US long-term interest rates together with VIX explain more than 50% of the variation in long-term interest rates of EMEs after three months from the shock.

Difference between PLS and SVAR estimations may be due to dynamic relations among explanatory variables, which are taken into account in SVAR estimation. For instance, global influences may be exacerbating the imapact of expected inflation in PLS estimation, but this influence may be passing to US long-term interest rates and VIX in SVAR estimation. Overall, both results imply that long-term interest rates of

[72] In unrestricted VAR results US influence is a little bit lower and the influence of local long-term interest rate is higher; however impacts of other variables are nearly insignificant.

EMEs are under influence of global factors and this point is quite important for the effectiveness discussion.

Findings of the chapter are in line with findings of Turner (2013), Guarin *et al.* (2014) regarding high US influence on EM long-term interest rates; however Miyajima *et al.* (2012) found that influence of short-term interest rates is higher than the impact of US long-term interes rates. Moreover, findings of the chapter indicate that US influence on EM long-term interest rates rises as time passes and it is also underlined by Guarin *et al.* (2014). On the other hand, none of the authors found inflation as an important determinant of long-term interest rates, probably due to not taking expectations of inflation. Overall, empirical findings can be evaluated as strong empirical signs showing limitations of the short-term interest rates tool in influencing transmission channels and real economy targets in EMEs.

CHAPTER 6

CONCLUSION

Collapse of the Bretton Woods coincided with the rising dominance of neo-liberal ideology, which propagated one size fits all policy to all developing countries. Under structural transformation programs many developing countries removed existing capital controls, lifted regulations on their financial sectors and liberalised their capital accounts. Rising openness has gone hand in hand with severe financial, currency and debt crisis. Latin American debt crisis in the 1980s is defined as the first wave of crises of this era by Aliber & Kindleberger (2012). The 1990s witnessed exchange rate pegging monetary regimes in DCs, however these regimes could not resist to capital inflow bonanzas, speculative attacks and soon after they collapsed. The rising star of the 2000s was IT monetary policy framework, which was defining price stability as the sole objective of monetary authorities; however the latest GFC has proved the importance of financial stability concerns, which were not evaluated seriously by supporters of the IT regimes. After the GFC, developing countries witnessed an experimental period of time and a new policy framework is still missing.

In last three decades, changes in the institutuional framework influenced domestic monetary policies in developing world deeply. The trilemma was fitting well to the Bretton Woods times since capital movements were being restricted and arsenals of central banks were wider. Under this framework, independent monetary policy and exchange rate stability were attainable together. However after the collapse of the Bretton Woods, global factors have gained decisive power on domestic monetary policies of DCs. Exchange rate flexibility was thought as a shock absorber under open

capital accounts, but the experience showed that it had even more exacarbated global constraints and decreased effectiveness of domestic monetary decisions. Monetary decisions of central economies and direction of financial flows have become important determinants of national monetary targets. The trilemma may be morphing to a dilemma, as Rey (2015) rightly argued.

In this study, the trilemma concept was discussed and evaluated for DCs under institutional transformations of the post Bretton Woods Era. Chapter 2 presented a critical literature review of the Mundell-Fleming model and the trilemma framework. What Chapter 2 underlined was that supporters of the trilemma generally overlooked changes in the institutional framework since the Bretton Woods times and behaved as if the basic Mundell-Fleming model was explaining current international macroeconomics. Moreover they did not employ technical methods properly and oversimplified theoretical frameworks. Chapter 3 focused on monetary transmission mechanisms of DCs and derived an important original diagram, which figured out global influences on real economy targets of DCs. This diagram is contributing to the literature of monetary transmission mechanism, in particular for developing countries. Chapter 3 also emphasised problems related to effectiveness of the short-term interest rate tool of DCs in influencing domestic credit growth and exchange rates. In Chapter 4, high influence of international interest rates on policy rates of 13 EMEs were shown empirically and limitations on independent central banking in EMEs were discussed. Chapter 5 deepened the effectiveness discussion of Chapter 3 regarding long-term interest rates. According to empirical findings of Chapter 5, global factors restrict traditional interest rate channel through direct and indirect mechanisms. Direct influence worked through US long-term interest rates and expected inflation formed the indirect mechanism. Overall, there is enough evidence showing global constraints on the policy rate tool and transmission channels of DCs.

The findings of the thesis are in line with Rey's claims; however dilemma framework is not proven formally. There are two critical gaps which may be filled in future studies. First one is related to measuring monetary policy independence. The bulk of the literature uses short-term interest rate independence as a representative for monetary policy autonomy. This study also used policy rates for discussing central bank independence in DCs in Chapter 4; however there is enough evidence showing limits on the effectiveness of this tool. A new measurement, which also covers exchange rates and credit growth, should be developed for discussing the trilemma under open capital accounts. This measurement should take financial flows into consideration, as Chapter 3 indicates.

The second gap of this study is related to the effectiveness issue. In Chapter 5, ineffectiveness of policy rates in influencing long-term interest rates is discussed with empirical findings; but for a fulfilling proof, limits of short-term interest rates in determining exchange rates and credit growth should also be investigated. Constructing a new model, probably a modified version of the Mundell-Fleming model, in which credit growth is defined as a function of financial flows will be an important contribution to the trilemma discussion. Related to this point, defining a valid monetary tranmission mechanism for DCs will contribute to the discussions on the effectiveness issue.

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APPENDICES

A. GRAPHICAL DESCRIPTION OF DATA

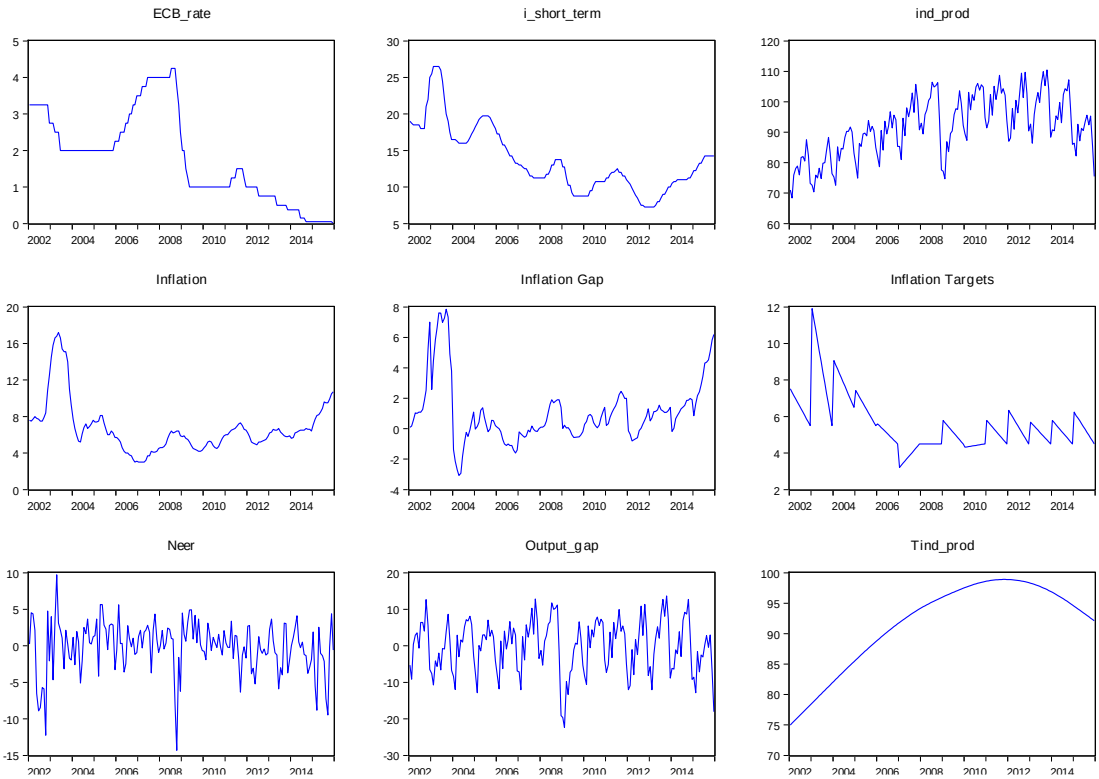


Figure A:1 Data for Brazil

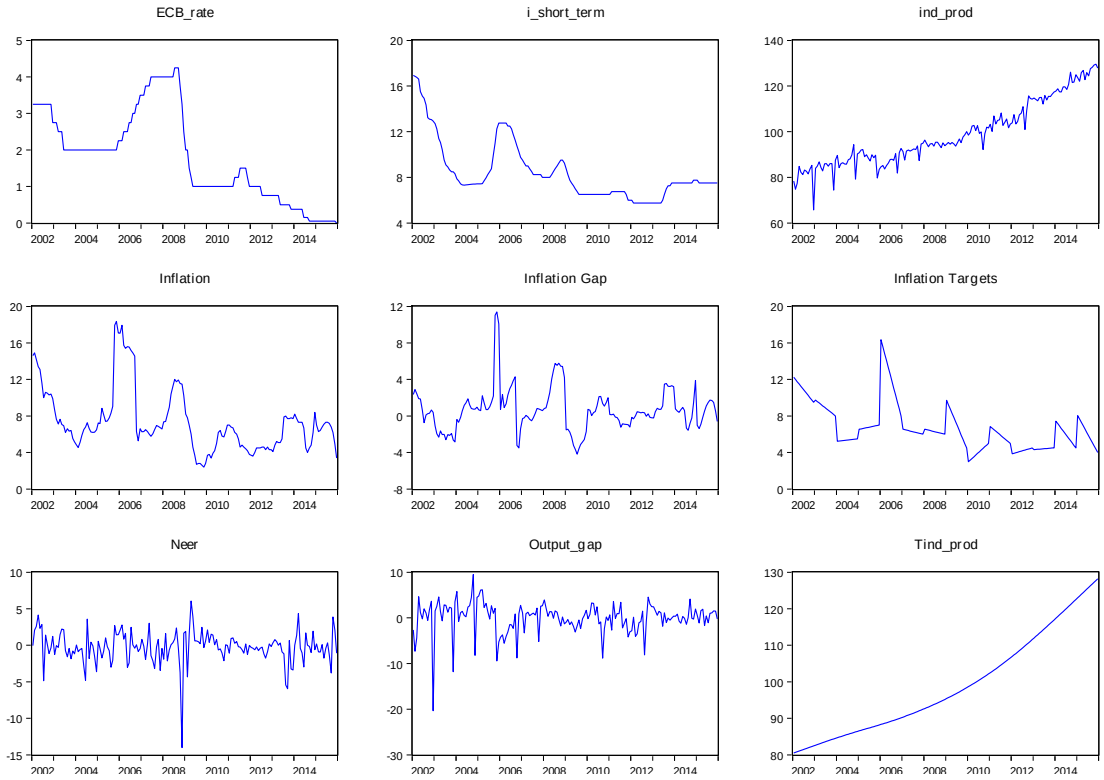
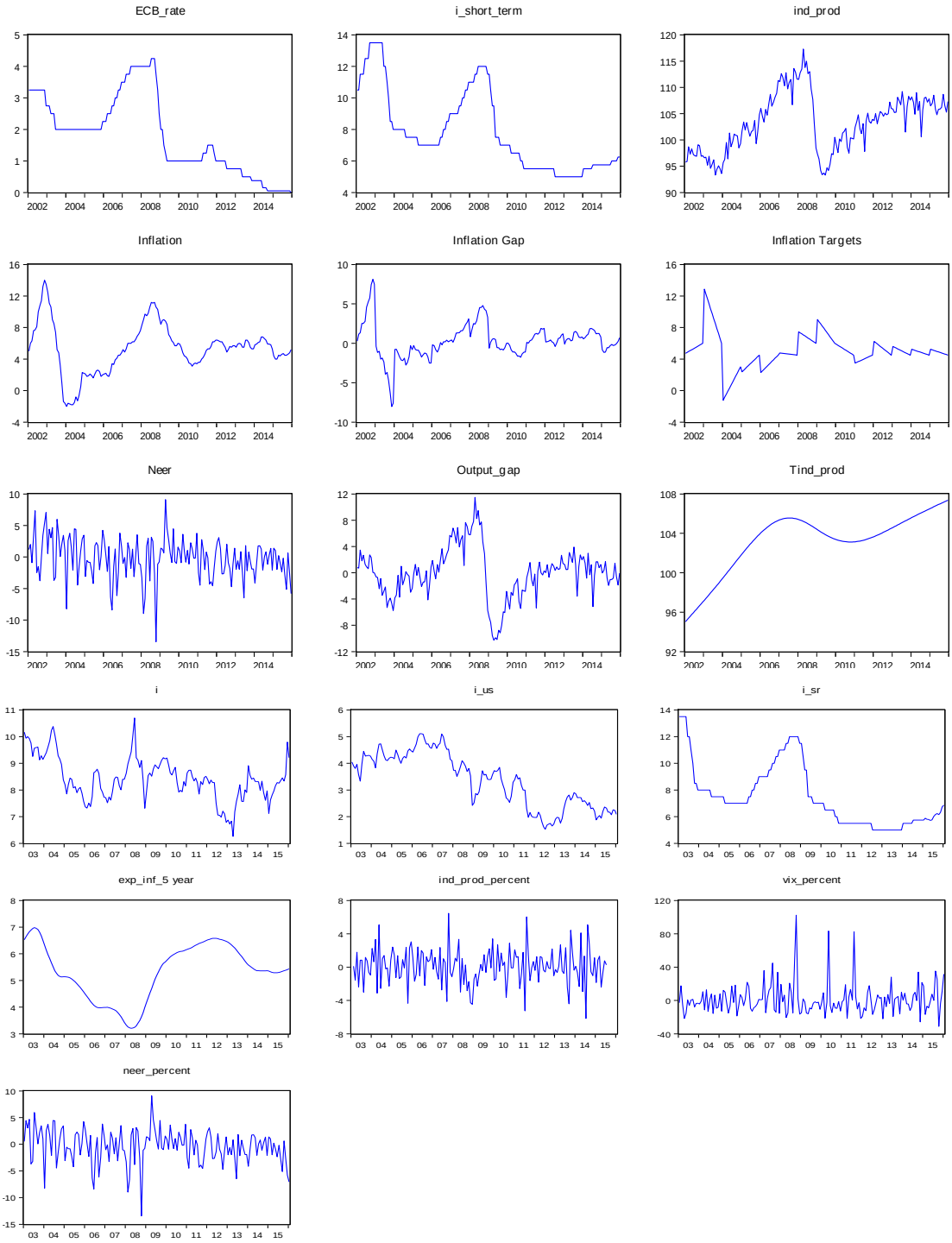


Figure A:2 Data for Indonesia



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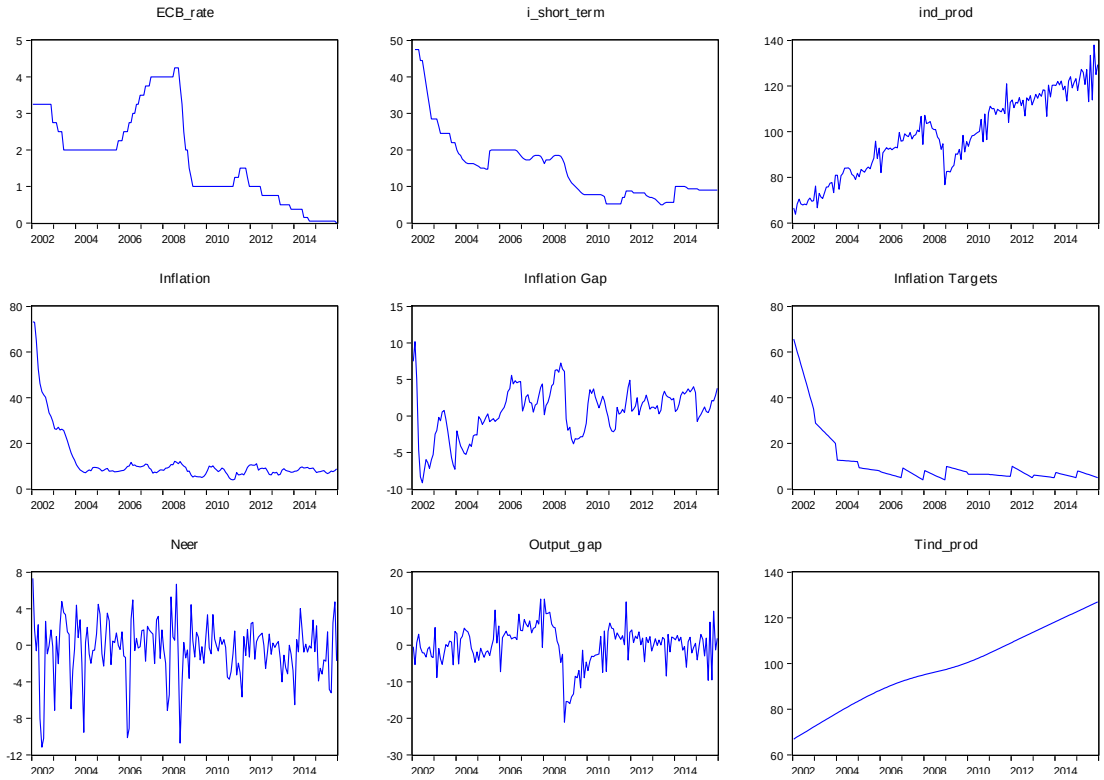
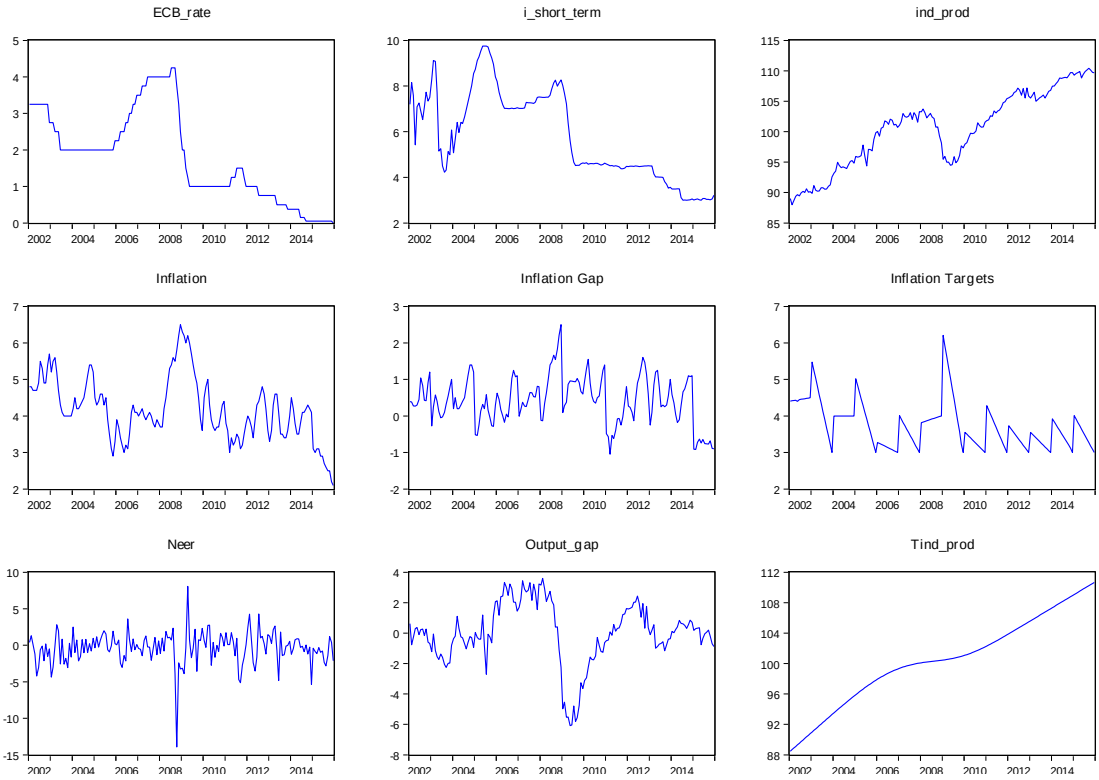


Figure A:4 Data for Turkey



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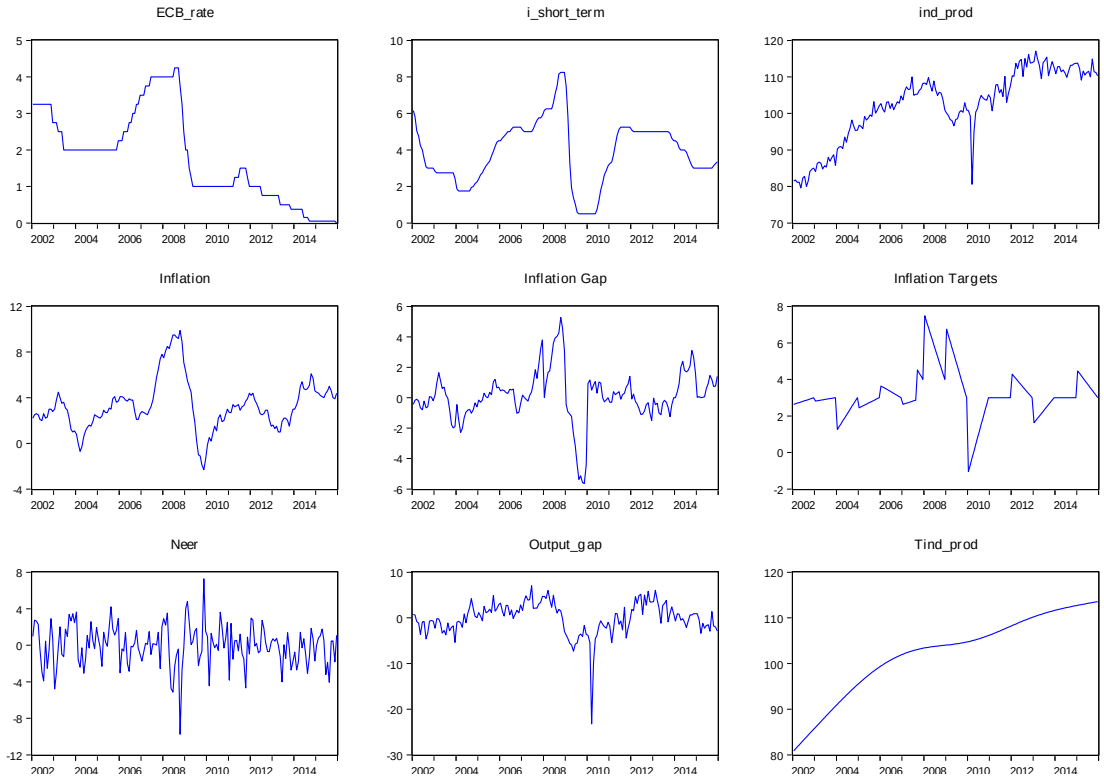

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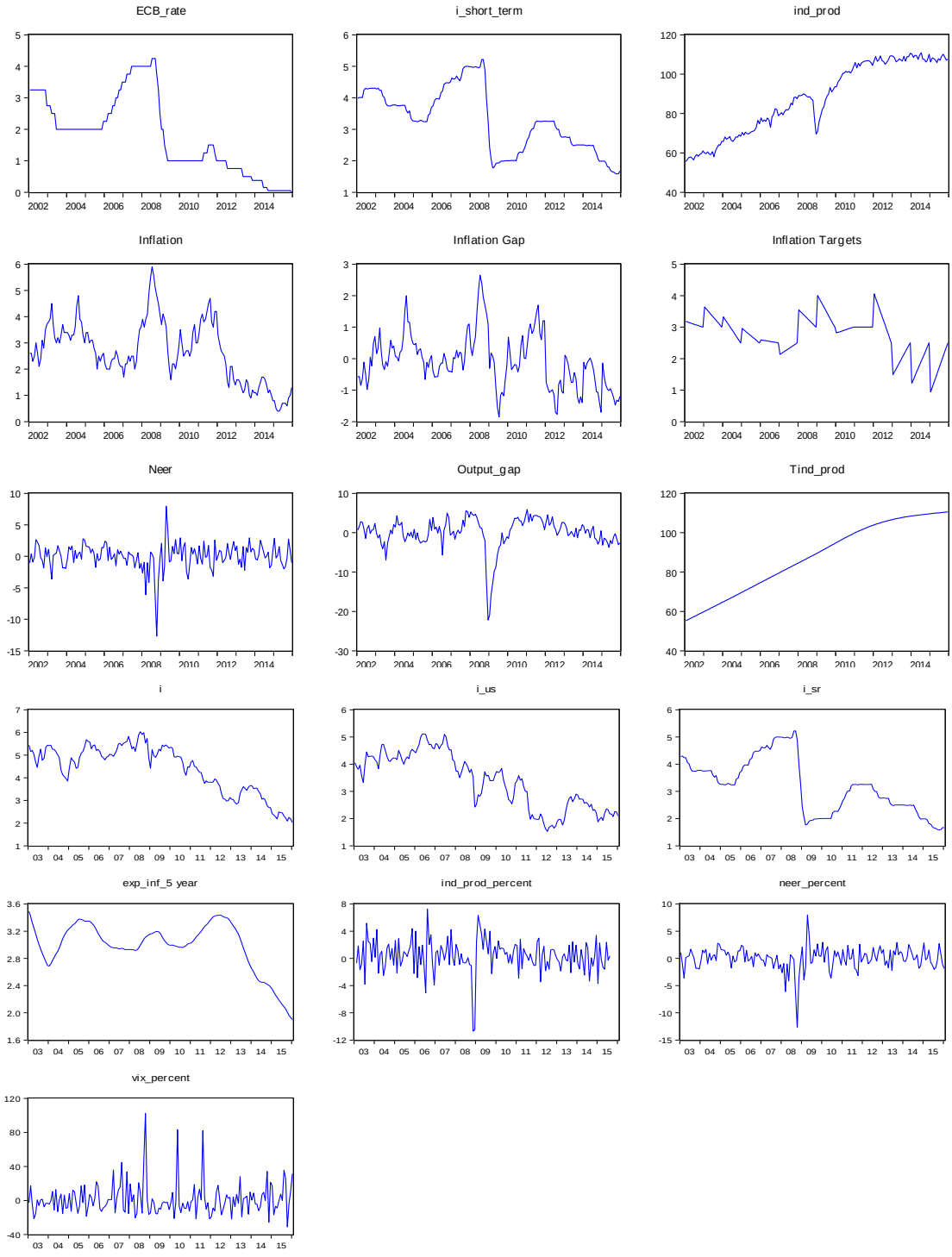

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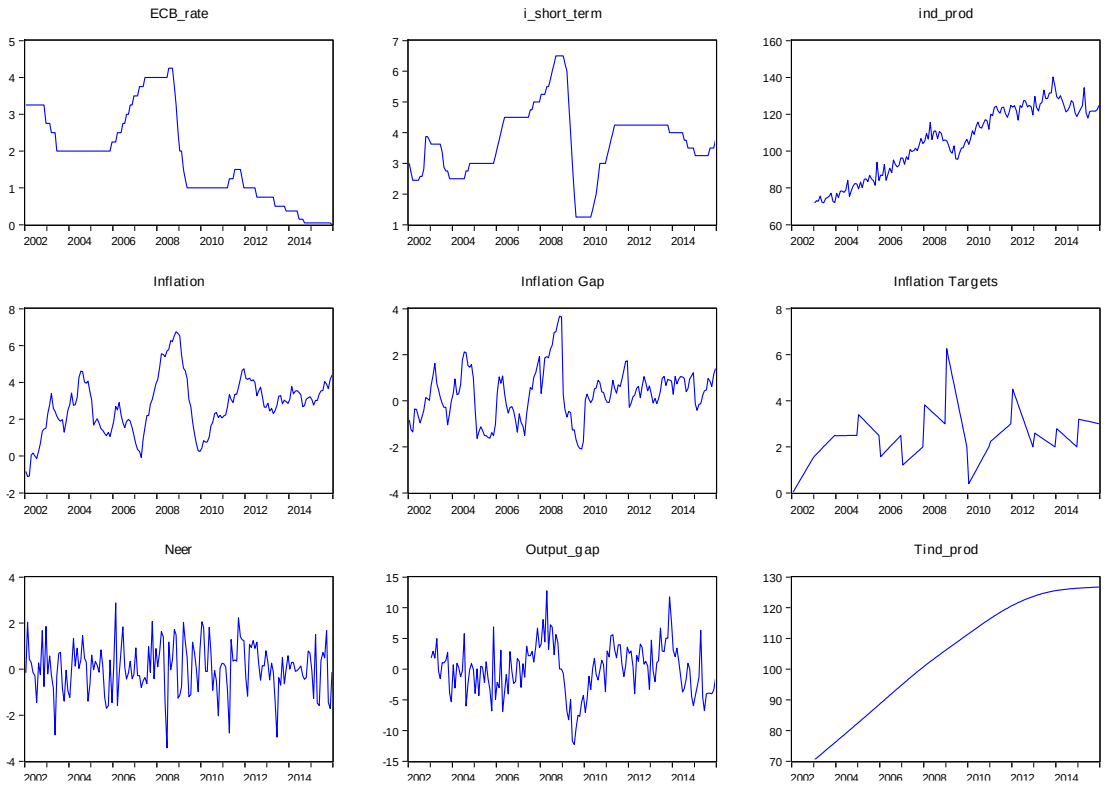

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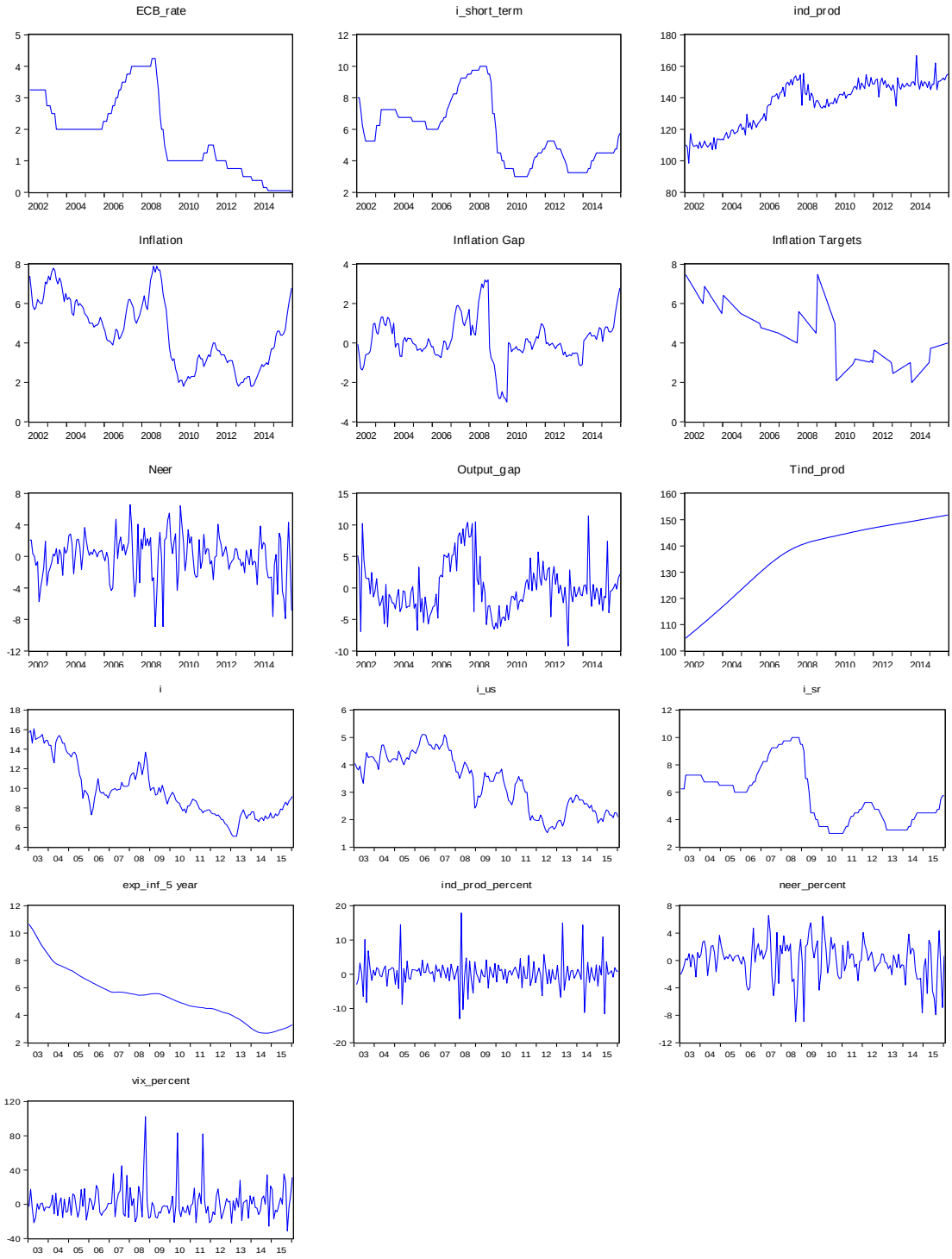

Figure A:9 Data for Colombia

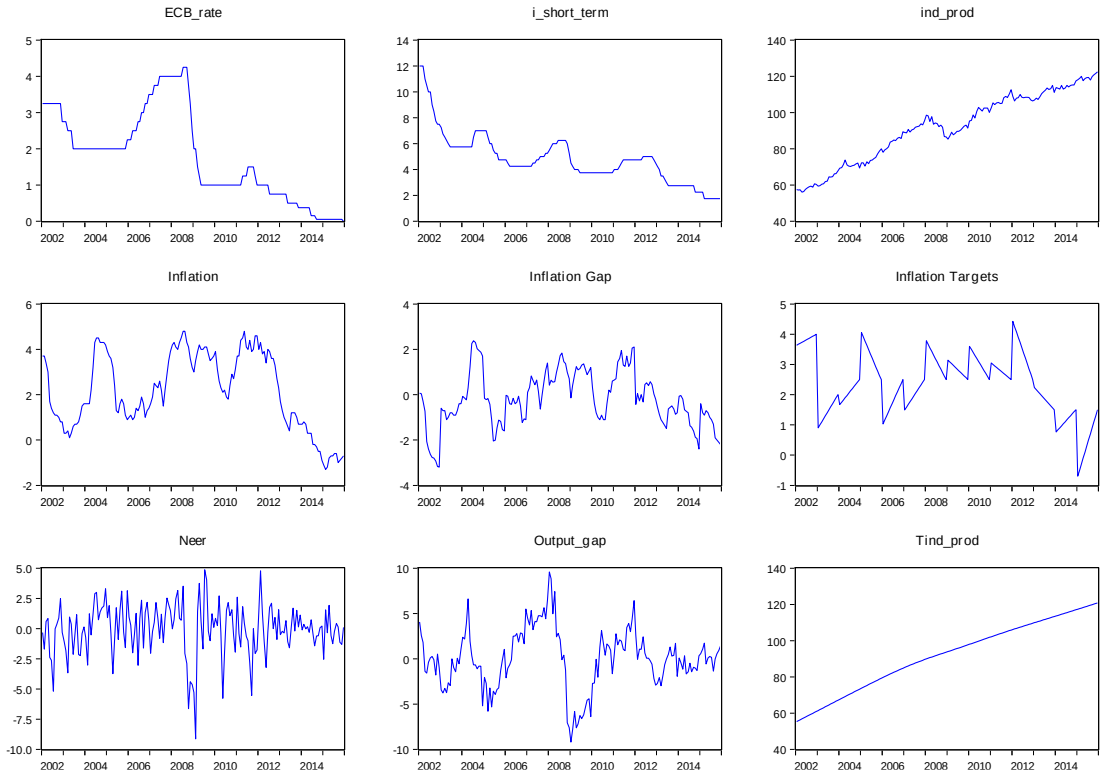

Figure A:10 Data for Poland

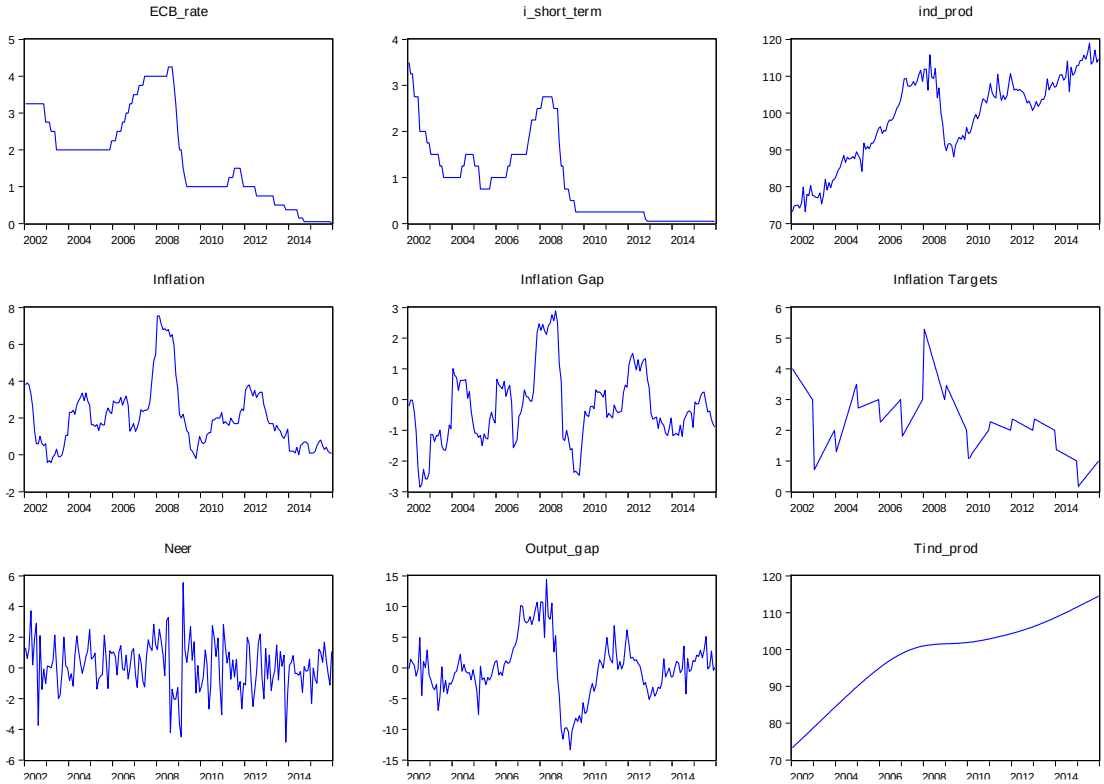

Figure A:11 Data for Czech Republic

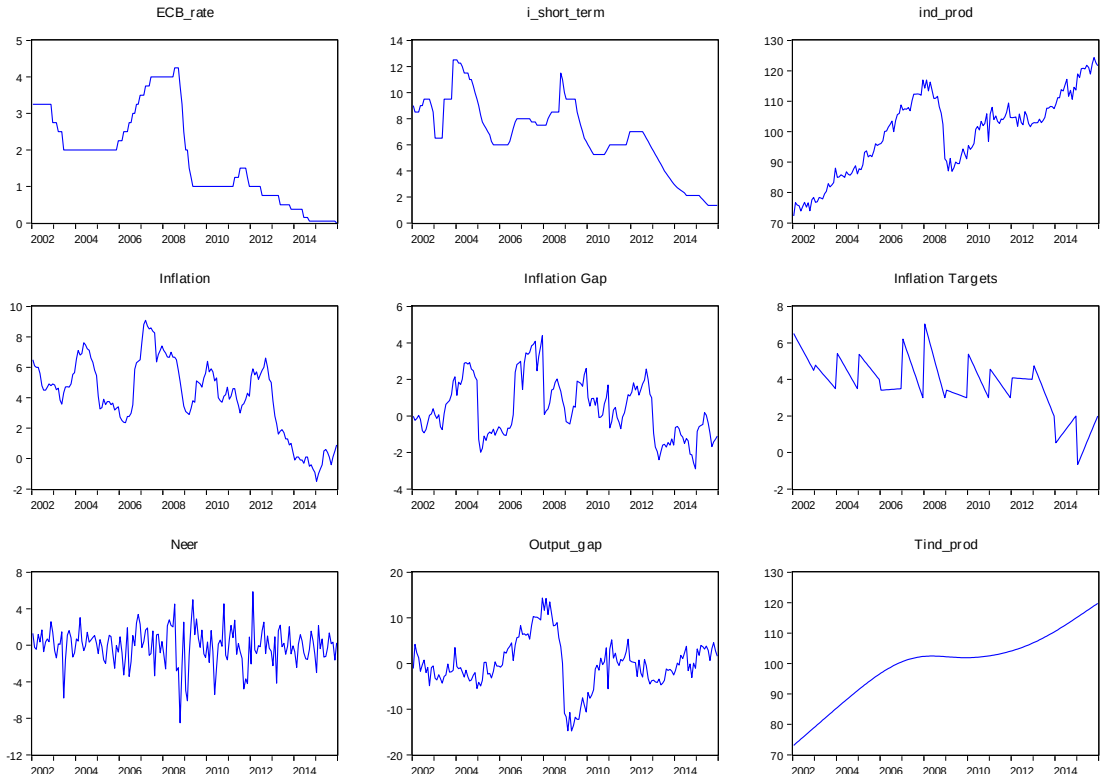

Figure A:12 Data for Hungary

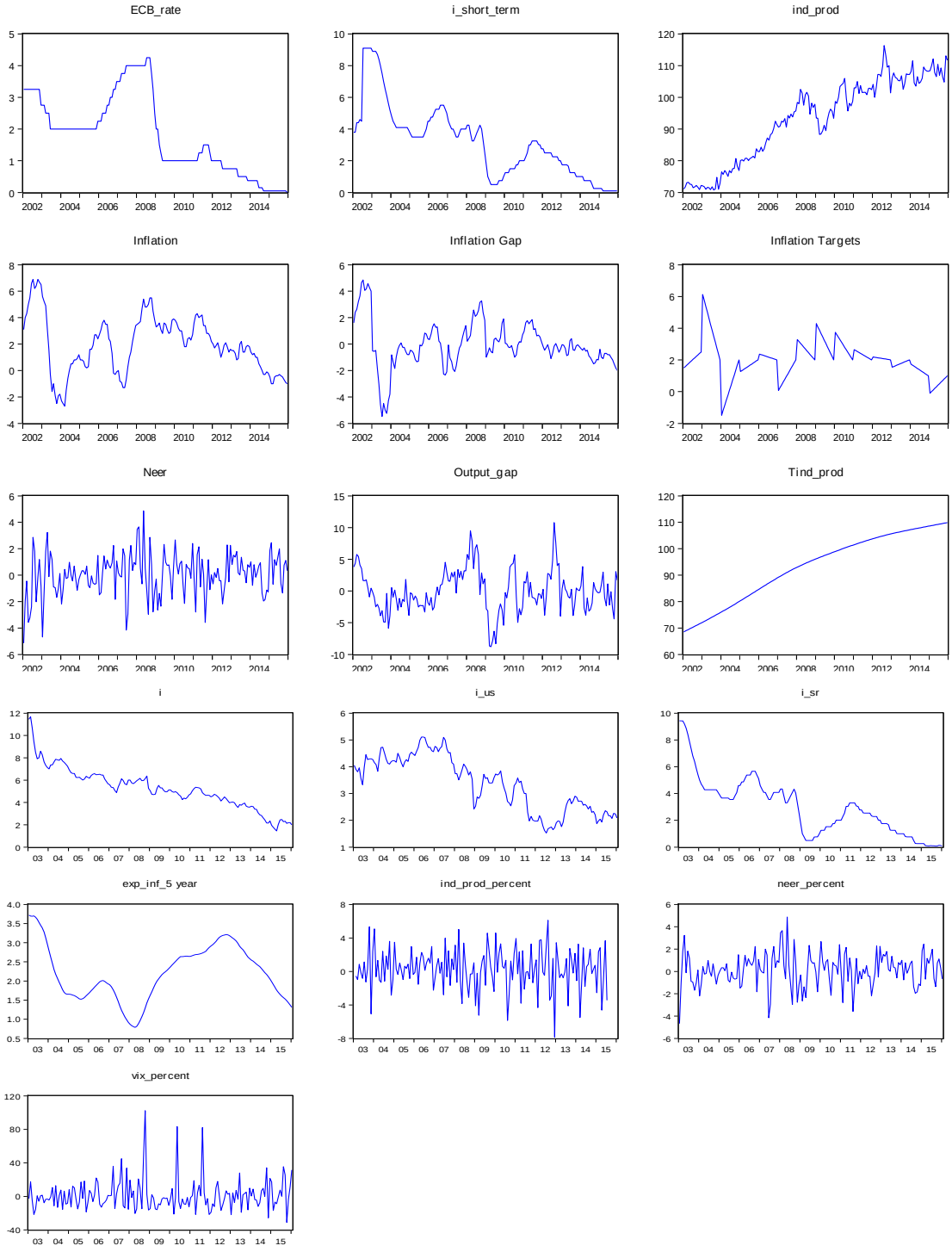

Figure A:13 Data for Israel

B. UNIT ROOT TEST TABLES

Table B:1 Unit root tests for variables in Chapter 4

Unit Root Tests / Variables	Levin, Lin & Chu test with individual intercept	Levin, Lin & Chu test with individual intercept & trend	ADF-Fisher test with individual intercept	ADF-Fisher test with individual intercept & trend	PP-Fisher test with individual intercept	PP-Fisher test with individual intercept & trend
ECB's rate	Fail to reject	Fail to reject	Reject	Reject	Reject	Reject
Output gap	Fail to reject	Fail to reject	Reject	Reject	Reject	Reject
Inflation gap	Fail to reject	Reject	Reject	Reject	Reject	Reject
Exchange rates	Reject	Reject	Reject	Reject	Reject	Reject
Policy rates	Fail to reject	Fail to reject	Reject	Reject	Reject	Reject

Table B:2 Unit root tests for variables in Chapter 5

Unit Root Tests / Variables	Levin, Lin & Chu test with individual intercept	Levin, Lin & Chu test with individual intercept and trend	ADF - Fisher test with individual intercept	ADF - Fisher test with individual intercept and trend	PP - Fisher test with individual intercept	PP - Fisher test with individual intercept and trend
US long-term	Reject	Fail to Reject	Reject	Reject	Reject	Reject
Local long-term	Fail to reject	Reject	Reject	Reject	Reject	Reject
Local short-term	Fail to Reject	Fail to Reject	Reject	Reject	Reject	Reject
Expected inflation	Fail to Reject	Fail to Reject	Reject	Reject	Reject	Reject
Industrial production	Fail to reject	Fail to Reject	Reject	Reject	Reject	Reject
Nominal effective exchange rate	Fail to Reject	Fail to Reject	Reject	Reject	Reject	Reject
VIX	Reject	Reject	Reject	Reject	Reject	Reject

C. VAR STABILITY ANALYSES

Table C:1 AR roots table for 13 EMEs

Root	**Modulus**
0.980592	0.980592
0.929556	0.929556
0.839026 – 0.103823i	0.845424
0.839025 + 0.103823i	0.845424
0.670259	0.670259
0.454695	0.454695
-0.321559 - 0.133697i	0.348246
-0.321559 + 0.133697i	0.348246
0.282617 – 0.193738i	0.342647
0.282617 + 0.193738i	0.342647
-0.035469 – 0.325248i	0.327177
-0.035469 + 0.325248i	0.327177
-0.323685	0.323685
-0.250454	0.250454
0.110796	0.110796

No root lies outside the unit circle. VAR satisfies the stability condition.

Table C:2 AR roots table for East Asian and Latin American EMEs

Root	Modulus
0.983017	0.983017
0.940260	0.940260
0.815624 – 0.144199i	0.828272
0.815624 + 0.144199i	0.828272
0.644788 – 0.097313i	0.652090
0.644788 + 0.097313i	0.652090
0.219512 – 0.337302i	0.402440
0.219512 + 0.337302i	0.402440
-0.389202	0.389202
-0.331411 – 0.152857i	0.364963
-0.331411 + 0.152857i	0.364963
0.193931 – 0.209039i	0.285143
0.193931 + 0.209039i	0.285143
-0.185887 – 0.012361i	0.186297
-0.185887 + 0.012361i	0.186297

No root lies outside the unit circle. VAR satisfies the stability condition.

Table C:3 AR roots table for East European, Middle Eastern and African EMEs

Root	Modulus
0.981049	0.981049
0.913722	0.913722
0.901259	0.901259
0.812271	0.812271
-0.518165	-0.518165
0.458759	0.458759
0.148517 – 0.375808i	0.404091
0.148517 + 0.375808i	0.404091
0.110495 – 0.035013i	0.115909
0.110494 + 0.035013i	0.115909

No root lies outside the unit circle. VAR satisfies the stability condition.

Table C:4 AR roots table for South Africa, Korea, Colombia and Israel

Root	Modulus
0.993736	0.993736
0.956472 – 0.066315i	0.958768
0.956472 + 0.066315i	0.958768
0.955229	0.955229
0.908752	0.908752
-0.258446 – 0.362208i	0.444959
-0.258446 + 0.362208i	0.444959
0.065691 – 0.412021i	0.417225
0.065691 + 0.412021i	0.417225
0.414871	0.414871
0.172044 – 0.376805i	0.414223
0.172044 + 0.376805i	0.414223
-0.107602	0.107602
0.063299	0.063299

No root lies outside the unit circle. VAR satisfies the stability condition.

D. OLS ESTIMATION RESULTS

Table D:1 Correlation analysis of long-term interest rates of Korea, South Africa, Israel and Colombia

	i_korea	D(i_southafrica)	i_israel	i_colombia
i_US	0.729 (0.043) [16.567]	0.64 (0.122) [5.286]	1.188 (0.055) [21.654]	0.723 (0.139) [5.216
Inf^{exp}	0.654 (0.051) [12.717]	-0.339 (0.347) [-0.977]	0.605 (0.083) [7.310]	1.325 (0.085) [15.544]
N	157	156	157	157
Adj. R^2	0.727	0.156	0.613	0.724

Table D:2 Panel Least Squares estimation results for long-term interest rates of Korea, South Africa, Israel and Colombia over 2003M01 – 2016M01

Variable	Coefficient	Std. Error	t-Statistics	Prob
US long-term interest rate	0.636	0.062	10.226	0.0000
Local short-term interest rate	0.295	0.027	10.864	0.0000
Expected inflation	0.976	0.037	26.400	0.0000
Industrial production	0.039	0.033	1.189	0.2348
Neer	-0.121	0.036	-3.345	0.0009
VIX	-0.012	0.006	-1.976	0.0486
Constant	-0.544	0.223	-2.435	0.0152

Number of observations: 628 $\mathbf{R^2}$ = 0.783

E. TURKISH SUMMARY

İmkansız üçleme temel olarak açık ekonomi, sabit kur rejimi ve bağımsız para politikası üçlüsünden en fazla ikisinin eş zamanlı olarak uygulanabilir olduğunu söyler. Altın standardında kurlar altına sabitlenmişti ve sermaye akımları üzerinde engellemeler yoktu. Ancak bağımsız para politikaları uygulanamıyordu. Bretton Woods döneminde kurlar altın tarafından kontrol edilen dolara endekslenmişti ve sermaye akımları kontrol ediliyordu; bu sayede bağımsız para politikalarından söz etmek mümkündü. Bretton Woods sonrası dönemde ise sermaye akımları üzerindeki kontroller büyük oranda kaldırıldı ve kurlar serbest bırakıldı. İmkansız üçlemeye göre bu koşullar altında bağımsız para politikaları uygulamak mümkün olmalıydı. Ancak günümüzde finansal küreselleşmenin geldiği noktada bu önermenin gelişmekte olan ülkeler için geçerlilik taşıyıp taşımadığı tartışmalıdır.Gelişmekte olan ülkeler açık piyasa koşullarında sadece kurlarını serbest bırakarak bağımsız para politikaları uygulayabilirler mi? Bu soru tez çalışmasını motive eden temel araştırma sorusudur. Bu soruya doyurucu bir yanıt verebilmek için imkansız üçleme literatürüne hakim olmak, literatürün belli başlı boşluklarını saptamak, gelişmekte olan ülkelerin parasal aktarım mekanizmalarını tartışmak, bu mekanizmaların Bretton Woods sonrası dönemdeki evrimini incelemek, gelişmekte olan ülkelerin merkez bankalarının bağımsızlığını ampirik veriler ışığında tartışmak ve gelişmekte olan ülkelerin parasal aktarım kanalları üzerindeki küresel kısıtları gözönüne almak gerekmektedir. Tezin genel taslağı bu akış üzerine kurulmuştur.

Bu çalışma boyunca para politikası bağımsızlığı kavramı önceden yapılmış çalışmalardan farklı bir şekilde ele alınmıştır. Literatürün büyük bir kısmında para politikası bağımsızlığı ulusal faizlerin uluslar arası faizlerden bağımsız hareket etmesini ifade eder. Ancak bu tanım birkaç açıdan sorunludur. Birincisi tanımın

arkaplanında yer alan kısa dönemli faizlerin temel politika aracı olduğu varsayımıdır. Bu varsayım enflasyon hedeflemesi uygulayan ülkeler için doğru olabilir ancak tüm ülkelere ve geniş bir zaman aralığına genişletilmesi teorik açıdan doğru değildir. Çünkü geçmiş dönemlerde merkez bankaları sermaye kontrollerinden kredi müdahalelerine kadar geniş bir araç yelpazesine sahiptiler. Bütün bu politika çeşitliliğini sadece faiz hadleri üzerinden tartışmak yanıltıcı olabilir. İkinci olarak günümüzde kısa dönemli faizlerin iç ekonomik hedefleri belirlemekte etkili olup olmadığı tartışmalı bir konudur. Başka bir deyişle, kısa dönemli faizleri istediği gibi hareket ettirebilen bir ülke bağımsız para politikası yürütemeyebilir. Bunun sebebi uluslar arası sermaye akımlarının ülkelerin parasal aktarım mekanzimaları üzerinde belirleyici şekilde etkide bulunmasıdır. Bu tartışma tezin ikinci ve dördüncü bölümlerinde detaylı bir şekilde yapılmaktadır. Temel olarak bu iki sebepten dolayı bu çalışmada bağımsız para politikası merkez bankalarının politika araç bağımsızlığının yansıra bu aracın etkinliğini de kapsayacak şekilde tanımlanmaktadır.

Çalışma giriş ve sonuç bölümleri ile birlikte toplam altı bölümden oluşmaktadır. İlk bölüm Mundell-Fleming modeline ve imkansız üçleme literatürüne yer vermektedir. Mundell-Fleming modeli tanımlandıktan sonra bu modelin imkansız üçleme açısından önemi tartışılmaktadır. Ardından imkansız üçleme üzerine güncel tartışmalara yer verdikten sonra imkasız dörtleme ve imkansız ikilik kavramları irdelenmektedir. Son olarak imkansız üçleme literatüründeki boşluklar eleştirel bir çerçevede tartışılmaktadır. İkinci bölüm gelişmekte olan ülkelerde kısa dönemli faiz aracının kredi ve kur kanalları üzerindeki etkinliğini tartışmaktadır. Bu bölümde geleneksel parasal aktarım mekanizması tartışıldıktan sonra gelişmekte olan ülkelerde aktarım mekanizmalarının Bretton Woods sonrası dönemde kazandığı özgün işleyiş değerlendirilmektedir. Bölümün ana bulgusu finansal akışların gelişmekte olan ülkelerin kur ve kredi genişleme kanallarını önemli şekilde belirlediğinin ortaya çıkarılmasıdır. Üçüncü bölüm 2002-2016 döneminde onüç gelişmekte olan ülkenin

merkez bankalarının bağımsızlıkları üzerindeki küresel kısıtları tartışmaktadır. Örneklem olarak seçilen enflasyon hedefleyici para politikası uygulayan ülkelerin kısa dönemli faiz hadlerini bağımsız bir şekilde değiştirebileceği kanaatine rağmen bu ülkelerin merkez ülkelerin para politikalarından ciddi oranda etkilendiği görülmüştür. Dördüncü bölüm gelişmekte olan ülkelerde uzun dönemli faiz oranları üzerindeki küresel etkileri tartışmakta ve kısa dönemli faizlerin uzun dönemli faizleri belirlemede etkisiz kaldığını göstermektedir. İkinci bölümde tartışılan etkinlik başlığının uzun dönemli faiz hadleri üzerinden ampirik ispatı bu bölümde yer almaktadır.

İlk bölüm genel hatlarıyla Mundell-Fleming modeli ve imkansız üçleme literatürünün eleştirel bir değerlendirmesini içermektedir. Temel Mundell-Fleming modeli IS-LM modelinin açık ekonomilere uyarlanmış şeklidir. Kapalı ekonomiler için kullanılan IS-LM modeline net ihracat, Garantisiz Faiz Oranı Hipotezi ve ödemeler dengesi eşitliği eklendiğinde temel Mundell-Fleming modeline ulaşılır. Net ihracat iharacatın ithalatı aşan bölümü olarak tanımlanır ve Marshall-Lerner şartına göre kurdaki değer kaybı sonuç olarak net ihracatı arttırır. Kur değişiminin net ihracat üzerinde zamanla yarattığı değişim J eğrisi tarafından gösterilir. J eğrisine göre kurdaki değer kaybı ilk başta ithal malların fiyatını arttırarak net ihracatı olumsuz etkiler ancak belirli bir süre sonra artan rekabet gücü dolayısıyla ihracat hacmi artar ve net ihracatı geliştirir. Garantisiz Faiz Oranı Hipotezi ulusal ve uluslarası faiz oranlarının arasındaki farkın kurdaki beklenen değer kaybı ile tanımlandığı eşitliktir. Bu hipoteze göre kurdaki beklenen değer kaybı ulusal ve uluslar arası faiz farkından fazla ise yatırımcılar uluslar arası piyasalara yönelerek ulusal para biriminin değer kaybetmesine sebep olur. Ödemeler dengesi net ihracat hacminin net sermaye çıkış hacmine eşit olduğu durumda dengededir. Kusursuz sermaye hareketliliği ve sabit beklentiler varsayımı ile ödemeler dengesi eğrisi tamamen yataydır ve Garantisiz Faiz Oranı Hipotezi ulusal faizlerin uluslar arası faizlere eşit olduğu denklemdir. Bu varsayımlar altında Mundell (1963) para politikasının serbest kur rejiminde tamamen etkili, sabit kur altında ise tamamen

etkisiz olduğunu iddia etmiştir. Benzer şekilde Fleming (1962) para politikasının sabit kura nazaran serbest kur altında daha etkili olduğunu öne sürmüştür. Temel Mundell-Fleming modelinin konumuz açısından önemi imkansız üçleme savunucularının uluslar arası makraoekomiyi örtük de olsa bu basit model üzerinden açıklamaya çalışmasıdır. Halbuki günümüz dünyasında ne sermaye hareketliliği kusursuzdur ne de beklentiler sabit ve kontrol edilebilirdir.

İmkansız üçleme savunucuları dayandıkları ampirik çalışmalarda genellikle inceledikleri ülkelerin kısa dönemli faizlerini merkez ülkenin kısa dönemli faizi ve bir sabit üzerine regres ederek ve merkez ülke faiz değişkeninin katsayısını yorumlayarak söz konusu ülkenin para politikası bağımsızlığını tartışmışlardır. Bu yöntemde eğer merkez ülke faiz değişkeni katsayısı 1'e yakınsa söz konusu ülkenin para politikası bağımsızlığı olmadığı, eğer 0'a yakınsa bağımsız para politikası izlediği sonucuna varılır. Bu yöntem en belirgin şekilde Obstfeld v.d. (2005) tarafından kullanılmıştır. Obstfeld v.d. (2005) yukarıda anlatılan katsayı analizini kısa ve uzun dönemde panel verisi ile yapmışlardır. Söz konusu çalışmada 140 yıldan uzun bir süre üç ayrı evreye ayrılarak incelenmiştir: Altın standardı, Bretton Woods ve modern dönem. Para politikası bağımsızlığı faiz hadlerinin korelasyonu, kur rejimi Shambaugh kriterleri ve sermaye açıklığı Chinn-Ito sınıflandırması ile ölçülmüştür. Bu çalışmanın bir diğer özelliği gelişmiş ve gelişmekte olan ülkelerin birlikte ele alınmış olmasıdır. Ancak basit korelasyona benzeyen bu yöntemin doğruluğu tartışmalıdır çünkü ülkelerin kısa dönemli faiz kararlarını belirleyen çok sayıda iç faktör vardır. Enflasyon açığı, çıktı açığı, kurlar v.b. merkez bankalarının faiz kararlarında etkili olurlar. Bu sebeple Obstfeld (2015) yakın zamanda yayınlanan makalesinde regresyon analizine enflasyon değişimi ve reel GSYİH büyümesini de eklemiştir. Obstfeld 2015 çalışmasında bağımsız para politikasını kısa dönemli faiz oranlarının bağımsızlığından ayırarak yurtiçi ekonomik hedeflere ulaşabilme becerisi olarak tarif etmiş ve gelişmekte olan ülkelerin imkansız üçlemeyi zorladıklarını kabul etmiştir. Ancak Obstfeld durumu

bağımsız para politikası tartışmasından çıkararak finansal istikrarsızlıklara bağlamıştır. Obstfeld'e göre finansal dengesizlikler altında gelişmekte olan ülkeler parasal hedeflerini bilerek kaçırarak finansal hedefleri yakalamayı tercih edebilirler. Bir başka deyişle, para politikası bağımsızlığı mümkün olmakla birlikte finansal istikrar uğruna feda edilebilir. Finansal istikrar arayışı tartışması Obstfeld'i finansal imkansız üçlemeye götürür. Schoenmaker (2013) tarafından formüle edilen bu yeni imkansız üçlemeye göre ülkeler uluslar arası bankacılık, finansal istikrar ve ulusal finansal politikaların kontrolü üçlüsünden ancak ikisini eş zamanlı olarak hayata geçirebilir. Ancak gerçekte finansal imkansız üçleme parasal imkansız üçlemeyi imkansız ikiliğe doğru evriltecektir. Çünkü sermaye açıklığı uluslar arası bankacılığı beraberinde getirir ve günümüzde gelişmekte olan ülkeler finansal istikrarı hedefledikleri için ulusal finansal politikalar üzerinde hakimiyet kurmaları finansal imkansız üçlemeye göre mümkün olmayacaktır. Ancak bu kontrolü sağlamadan bağımsız para politikası uygulamak mümkün değildir çünkü üçüncü bölümde detaylı bir şekilde tartışıldığı üzere finansal akımlar gelişmekte olan ülkelerin finansal piyasaları üzerine önemli etkide bulunurlar. Örneğin kredi genişlemelerini veya bilançoları kontrol edemeyen bir para politikasının bağımsız olma şansı yoktur. Bu sebeple kur rejiminden bağımsız olarak sermaye açıklığı altında bağımsız para politikası yürütmek mümkün olmayacaktır.

İmkansız üçlemeye iki temel karşı çıkış gelişmiştir: imkansız dörtleme ve imksansız ikilik. İmkansız dörtleme Aizenman (2011) tarafından uluslar arası rezervlerin imkansız üçleme değişkenlerine eklenmesi ile formüle edilmiştir. Aizenman (2011) gelişmekte olan ülkelerin imkansız üçlemenin ortalarında yer almaya çalıştığını iddia etmiştir. Başka bir deyişle, gelişmekte olan ülkeler finansal açıklığı arttırıp kur istikrarını korumaya çalışırlarken para politikası bağımsızlıklarını kaybetmek istememektedirler. Bu sebeple yüksek miktarda rezerv tutmakta ve kur basıncını bu şekilde aşmaya çalışmaktadırlar. Rezerv birikiminin bir diğer sebebi finansal istikrar

arayışıdır. Rodrik (2006) gelişmekte olan ülkelerin rezerv/kısa dönemli yükümlülükler oranını arttırmak ve bu şekilde finansal kırılganlıklarını azaltmak için rezerv birikimine yöneldiklerini söylemektedir. Kısacası Aizenman (2011) hem ticari hem de finansal gerekçelerden kaynaklı rezerv birikiminin imkansız üçleme içindeki orta pozisyonları kolaylaştırdığını ve durumun dörtlü bir imkansızlığa evrildiğini iddia etmektedir. İmkansız üçlemeye yöneltilen bir diğer eleştiri Rey (2015) tarafından formüle edilen imkansız ikiliktir. Rey (2015) günümüzün finansal küreselleşmesi altında finansal akışlarınhangi kur rejiminin uygulanacağından bağımsız olarak bağımsız para politikasını imkansız kıldığını iddia etmektedir. Rey (2015) etkileyici çalışmasında küresel risk faktörünün ABD para politikası ile bağlantısını göstermekte ve ABD para politikasından finansal akışlara bir bağlantı kurmaktadır. Buradaki köprü görevini Avrupa bankalarının kaldıraç oranları üstlenmektedir. Dünyanın büyük finansal merkezleri arasındaki brüt sermaye giriş ve çıkışları arasında pozitif ilişki vardır ve bu akımlar küresel risk faktörü ile negatif ilişkilidir. Bir başka deyişle küresel bir finansal döngüden bahsetmek mümkündür. Bu döngü altında ülkeler bağımsız para politikalarını ancak çeşitli sermaye kontrolleri ile uygulayabilirler (Rey, 2015). Rey (2015) imkansız üçlemeye iddalı bir eleştiri getirmekte ve genel kabulleri sorgulamaktadır ancak iddialarının altını dolduracak bütünlüklü bir ispat ortaya koyamamıştır. Sadece ABD para politikaları, küresel faktörler ve finansal akışlar arasıdanki ilişkiyi ampirik olarak gösteren Rey (2015) finansal akışların gelişmekte olan ülkelerin parasal aktarım mekanizmalarına nasıl bir etkide bulunduğunu tartışmamıştır. Bu çalışmanın ikinci bölümü Rey'in eksik bıraktığı iç aktarım mekanizmalarına odaklanmaktadır.

İkinci bölüm geleneksel parasal aktarım mekanizmaları tartışması ile başlamaktadır. Geleneksel anlayışa göre merkez bankaları kısa dönemli faiz hadlerini kontrol ederek finansal sektördeki varlık fiyatlarına ve miktarlarına etkide bulunur (Cömert, 2013). Faiz kanalı, kur kanalı ve kredi kanalı belli başlı parasal aktarım mekanizmalarıdır.

Bretton Woods sonrası dönemde gelişmiş ülkelerde piyasaların özgürleşen içsel faktörleri zamanla piyasaları belirlemeye başlamış ve merkez bankalarının politika araçlarının etkinliklerini zayıflatmıştır. Finansal piyasaları en derin olan ABD'de içsel faktörler o kadar belirleyici bir etkinlik kazanmıştır ki firmalar ve bankalar bilançolarını kendi istekleri ile genişletebilmekte ve kontrolleri işlevsizleştirebilmektedirler. Gelişmekte olan ülkelerde ise durum oldukça farklıdır. Bretton Woods sonrası dönemde gelişmekte olan ülkeler finansal hesaplarını serbestleştirdiler ve ekonomilerini istikrarsız sermaye akımlarına açtılar. Zaten yapısal sorunları olan bu ülkeler aynı zamanda finansal açıklığın getirdiği dış etkiye de maruz kalmaya başladılar. Kurumsal çerçevede ortaya çıkan bu değişim gelişmekte olan ülkelerin parasal aktarım mekanizmalarını oldukça farklılaştırdı ve aktarım kanallarını finansal akışların belirleyici etkisine maruz bıraktı.

Finansal akımlar gelişmekte olan ülkelerin kredi genişleme kanalı üzerinden reel ekonomi hedeflerine (çıktı, enflasyon, istihdam v.b.) çok yönlü etkide bulunur. Bunların dört tanesi kurun değerlenmesi üzerindendir. Değerlenen kur şirketlerin teminatlarını güçlendirerek kredi almalarını kolaylaştırır. Benzer şekilde değerlenen kur şirketlerin bilançolarını güçlendirerek bankaların kredi arzını arttırır (Adrian & Shin, 2010). Gelişmekte olan ülkeler genelde yabancı para birimlerinden borçlanırlar ve bu durum bilançoları kur değişimlerine hassas hale getirir. Kurdaki değerlenme firmaların ve bankaların borç yükümlülüklerini aşağı çekerek kredi arzını pozitif etkiler. Son olarak değerlenen kur ithal malların fiyatını düşürerek tüketimi ve enlasyonu tetikler. Finansal akışların gelişmekte olan ülkelerin reel ekonomi hedeflerini etkilediği bir diğer mekanizma doğrudan dış borçlanmadır. Küresel risk iştahının fazla olduğu dönemlerde gelişmekte olan ülkelerin büyük firma ve bankaları kolaylıkla ucuz yabancı paradan faydalanmakta ve bağlı bulundukları küresel bankalar veya dış ortaklarından borç temin edebilmektedirler. Bu sebeple içeride uygulanabilecek bir parasal sıkılaşmadan daha az etkilenirler. Finansal akımların

arttığı dönemlerde doğrudan dış borçlanma kanalı ile beslenen firma ve bankalar ülke içindeki kredi arzını arttırırlar. Büyük banka ve firmalar yurtdışındaki düşük faizlerin yardımıyla ülke faizlerinin de düşmesine aracılık ederler. Düşük faizden borç bulan küresel bankaların yerel ayakları ülke içinde de düşük faizden kredi vermeye başlar. Artan rekabet dolayısıyla piyasa faizleri aşağı yönlü hareket etmeye başlar. Düşen faizler kredi genişlemesini bankaların karlılığı ve şirketlerin teminatlarının güçlenmesi üzerinden pozitif yönde etkiler. Bütün bu etkileşim kanalları belirli bir takım iç mekanizmalarla birlikte gelişmekte olan ülkelerin çıktı, enflasyon ve istihdam gibi reel ekonomi hedeflerini belirler. Bunlara karşın geleneksel kavrayışa göre merkez bankaları sadece kısa dönemli faiz aracı ile piyasalara etkide bulunmaya çalışır. Ancak politika faizleri aracı da tam anlamıyla merkez bankaları tarafından kontrol edilemez. Bir başka deyişle merkez bankaları politika faizlerine karar verirken ekonomilerinin iç göstergelerinin yanı sıra önemli dış merkezlerin para politikalarını da dikkate alırlar.

Üçüncü bölüm gelişmekte olan ülkelerin kısa dönemli faiz aracı üzerindeki küresel kısıtları tartışmaktadır. Bu bölümde 2002-2016 döneminde onüç gelişmekte olan enflasyon hedefleyicisi ülkenin (Brezilya, Endonezya, Meksika, Şili, Peru, Kolombiya, Güney Kore, Polonya, Macaristan, Çek Cumhuriyeti, Türkiye, İsrail ve Güney Afrika) merkez bankası bağımsızlığı ampirik veriler ışığında tartışılmaktadır. Bu ülkelerin seçilmesinin sebebi enflasyon hedefleyicisi para politikasının kısa dönemli faizleri tek operasyon aracı olarak belirlemiş olmasıdır. Enflasyon hedefleyen merkez bankalarının politika faizleri enflasyon ve çıktı açıklarına cevap verir (Taylor, 1993). Gelişmekte olan ülkelerin merkez bankaları rekabet gücünü korumak, kurun enflasyon ve bilançolara yapacağı olumsuz etkileri önlemek için kur değişimlerini de önemser. Bu sebeple kurdaki değişimler faiz oranlarını belirleyen faktörlerin arasına eklenmiştir. Gelişmekte olan ülkelerin merkez bankaları sadece iç piyasalara değil merkez ülkelerin para politikalarına karşı da hassas olduklarından dolayı ECB faiz oranları da merkez bankası politika fonksiyonuna yerleştirilmiştir. Uluslar arası

faizlerin ECB faizleri ile tahmin edilmesinin sebebi FED faiz oranlarının 2008 sonrasında uzun bir süre sıfır alt limitinde sabit kalmış olmasıdır.

Üçüncü bölümde merkez bankalarının faiz oranlarını belirleyen faktörlerin etkileri Yapısal Vektör Otoregresyon (SVAR) modeli ile tahmin edilmiştir. Öncelikle tüm ülkeler teste tabi tutulmuş ve ECB faiz oranları merkez bankası faiz oranları üzerinde tüm diğer faktörlerden daha etkili çıkmıştır. Ardından örneklem Avrupa merkezli olan ve olmayan gelişmekte olan ülkeler şeklinde iki ayrı alt gruba bölünmüştür. Yapılan tahmin sonuçlarında Avrupa merkezli olmayan grup için enflasyon açığı faiz oranları üzerinde kısa vadede en etkili faktör olarak ortaya çıkmış; ancak yirminci ayın sonunda ECB faiz oranlarının etkisi enflasyon açığını geride bırakmıştır. Avrupa merkezli ülkelerde ise ECB faiz oranları üçüncü aydan itibaren en etkili değişken olarak bulunmuştur. Bu sonuçlara göre gelişmekte olan ülkelerin merkez bankaları üzerinde önemli oranda küresel kısıtın bulunduğu söylenebilir. Bununla birlikte Avrupa merkezli grubun toplam ülke sonuçlarını belirli oranlarda belirlediği ancak bu durumun gelişmekte olan ülkelerin merkez bankaları üzerindeki küresel kısıtların varlığını yadsıyamayacağı görülmüştür. Bu sonuçlar imkansız üçlemeye göre bağımsız para politikası izleyebilecek açık, serbest kur rejimi uygulayan enflasyon hedefleyicisi ülkelerin merkez bankalarının bağımsızlığının tartışmalı olduğunu göstermektedir. Ancak çalışmanın başında tanımlandığı şekliyle bağımsız para politikası merkez bankası bağımsızlığını içererek aşan bir kavramdır. Bu sebeple bağımsız para politikası üzerine yapılacak bir tartışmanın para politikası araçlarının etkinliğini de içermesi gerekir. Dördüncü bölüm kısa dönemli faizlerin etkinliğini uzun dönemli faizler üzerinden ampirik olarak tartışmaktadır.

Uzun dönemli faizlerin gelişmekte olan ülkeler açısından önemi 2000'li yıllarla birlikte artmıştır. Bunun sebebi gelişmekte olan ülkelerin 2000'lerle birlikte piyasaya daha fazla uzun vadeli devlet borç seneti sürmeleridir. 2008 küresel finansal krizi

sonrasında gelişmekte olan ülkelere sermaye girişleri tekrar yükselmiş ve uzun dönemli faizler gelişmiş olan ülkelerdeki gibi düşmüştü. Uzun dönemli faizlerin bu ortak hareketi tekil ülkelerin kısa dönemli faiz araçlarının etkinliğini tartışmaya açmıştır. Geleneksel faiz kanalı uzun dönemli faizlerin kısa dönemli faiz beklentilerinin ortalaması ve dönem primi tarafından belirlendiğini ileri sürmektedir. Literatürde ise uzun dönemli faizleri belirleyen denkleme ABD uzun dönemli faizlerini, nominal kur değişimlerini, enflasyonu, endüstriyel üretimi, küresel risk faktörünü de ekleyen birçok çalışma yer almaktadır. Bu çalışmalar ışığında uzun dönemli faizleri belirleyen faktörler kısa dönemli faiz oranları, ABD uzun dönemli faiz oranları, enflasyon beklentileri, kurdaki değişimler, endüstriyel üretim endeksi ve küresel risk faktörü olarak tahmin edilmiştir. Bu model iki ayrı ekonometrik teknik ile dört tane temsili gelişmekte olan ülke için (Güney Kore, Güney Afrika, İsrail ve Kolombiya) tahmin edilmiştir.

Birinci yöntem olan panel OLS tahmin sonuçlarına göre dört gelişmekte olan ülkenin uzun dönemli faizleri en fazla enflasyon beklentilerinden etkilenmektedir. Enflasyon beklentilerini ABD faiz oranları, onu da kısa dönemli faizler takip etmektedir. Küresel risk faktörü ve endüstriyel üretim endeksi dışında tüm değişkenler %1 anlamlılık derecesince anlamlı bulunmuştur, küresel risk faktörü ise %5 anlamlılık derecesince anlamlıdır; fakat endüstriyel üretim endeksi anlamlı değildir. Enflasyon beklentilerinin yüksek etkisi etkinlik tartışmasını iki açıdan işaret etmektedir. Birincisi gelişmekte olan ülkelerdeki enflasyon oranlarının uluslar arası koşullara karşı hassas oluşudur. Benlialper ve Cömert (2015) Türkiye'deki enflasyonun belirleyenlerini tartıştıkları çalışmalarında küresel mal fiyatlarını ve kur değişimini enflasyonu belirleyen iki önemli faktör olarak bulmuşlardır. Buna ek olarak beklenti kanalı da küresel gelişmlere oldukça açıktır. FED'in politika faizlerindeki değişim beklentisi, küresel risk beklentisi gibi uluslar arası faktörlerin gelişmekte olan ülkelerdeki beklentileri ciddi oranda belirlediği bilinmektedir. Bu sebeple hem enflasyon hem de beklentiler

küresel faktörlerin etkisine açıktır. Tüm bunlara ek olarak ABD uzun dönemli faiz oranlarının panel OLS tahminlerinde ikinci önemli etken olarak öne çıkması, doğrudan küresel kısıtların da etkili olduğunu göstermektedir.

İkinci yöntem olan Yapısal Vektör Otoregresyon sonuçlarına göre ise ABD uzun dönemli faiz oranları yurtiçi uzun dönemli faiz oranlarının en önemli belirleyeni olarak ortaya çıkmıştır. Ardından enflasyon beklentilerinin geldiği sonuçlara göre yurtiçi kısa dönemli faiz oranların etkisi neredeyse anlamsızdır. Ayrıca küresel risk faktörü ve ABD uzun dönemli faiz oranları bir arada yurtiçi uzun dönemli faiz oranlarındaki değişimin %50'sinden fazlasını açıklamakta, bu etki yirminci ayın sonunda %70'leri aşmaktadır. Bu sonuçlar panel OLS sonuçları ile uyumu olup, gelişmekte olan ülkelerin uzun dönemli faizleri üzerindeki küresel kısıtları resmetmektedir. Sonuçlara dayanarak kısa dönemli faiz aracının etkinliğinin bir hayli tartışmalı olduğu rahatlıkla söylenebilir. Yukarıdaki tartışmalar ışığında gelişmekte olan ülkelerin merkez bankalarının politika aracının bağımsızlığı ve etkinliği üzerinde küresel kısıtların olduğu sonucuna ulaşılabilir.

Tezdeki tartışma öncelikle Mundell-Fleming modeli ve imkansız üçleme literatürünün taranması ile başladı. Ardından bu literatürün temel boşlukları ve yöntemsel zayıflıklar üzerinde duruldu. İkinci bölümde Bretton Woods sonrası dönemde gelişmekte olan ülkelerin parasal aktarım mekanizmaları üzerindeki dönüşüm ele alındıktan sonra finansal akışların gelişmekte olan ülkelerde kredi ve kur kanallarında yarattığı etki tartışıldı. Bu bölümdeki bulgular kısa dönemli faiz oranlarının etkinliğinin tartışmalı olduğunu gösterdi. Ardından üçüncü bölümde gelişmekte olan ülkelerin merkez bankası faizleri üzerindeki küresel kısıtlat ampirik verilerle tartışıldı. 13 ülke için toplu ve farklı alt gruplar üzerinden yapılan analizlerde uluslar arası faiz oranlarının yurtiçi faiz oranları üzerinde gözle görülür bir etkisi olduğu gözlemlendi. Dördüncü bölümde kısa dönemli faizlerin etkinliği tartışması uzun dönemli faizler özelinde yapıldı. Panel

OLS ve Yapısal Vektör Otoregresyon sonuçlarına göre ABD uzun dönemli faiz oranları ve enflasyon beklentileri yurtiçi faiz oranlarının iki önemli belirleyini olarak ortaya çıktığı ancak kısa dönemli faiz oranlarının etkisinin oldukça sınırlı kaldığı gözlemlendi. Bu sonuçlar gelişmekte olan ülkelerin uzun dönemli faizleri üzerinde önemli küresel kısıtlar olduğunu göstermektedir.

Tez boyunca yürütülen tartışmalarda gelecek çalışmalarda kapatılabilecek iki önemli eksik ortaya çıkmaktadır. Birincisi gelişmekte olan ülkelerde para politikası bağımsızlığının nasıl ölçüleceği üzerinedir. Bu çalışmada para politikası bağımsızlığı literatürdekinden farklı bir şekilde tanımlanmış olmasına rağmen ampirik çalışmalarda kısa dönemli faizler üzerinden bir tartışma yürütülmüştür. Bu konuda bulunabilecek yeni bir ölçüm yöntemi literatüre ciddi bir katkı olacaktır. Bu çalışmanın işaret ettiği ikinci temel eksiklik gelişmekte olan ülkelerin parasal aktarım mekanizmalarının bütünlüklü bir çerçevesinin olmayışıdır. İkinci bölümde bu noktaya değinilmekle birlikte sadece belirli önemli kanalların altı çizilebilmiştir. Ayrıca dördüncü bölümde uzun dönemli faizler üzerine yapılan ampirik tartışma benzer şekilde kredi ve kur kanalları üzerine de yapılmalıdır. Finansal akımların kredi genişlemesi ve kur değişimleri üzerinde önemli etkide bulunduğu görülmekle birlikte bunlar ampirik olarak ispatlanmaya muhtaçtır. Örneğin kredi genişlemesi finansal akımların bir fonksiyonu şeklinde tanımlanabilirse, bu literatüre anlamlı bir katkı olacaktır. Ancak bu şekilde Rey'in haklı bir şekilde ortaya koyduğu imkansız ikilik iddiası güçlü bir ispata kavuşabilecektir.

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YAZARIN

Soyadı : Tercioğlu
Adı : Remzi Barış
Bölümü : İktisat

TEZİN ADI (İngilizce) : An evaluation of the trilemma: Global constraints on monetary policies of developing countries in the post Bretton Woods era

TEZİN TÜRÜ : Yüksek Lisans ☒ Doktora ☐

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