INFLATION TARGETING AND FINANCIAL DOLLARIZATION:
AN EMPIRICAL INVESTIGATION

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ABSTRACT

INFLATION TARGETING AND FINANCIAL DOLLARIZATION:
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This study investigates the implications of financial dollarization for inflation targeting framework. To this end, monetary policy rule, inflation targeting performance and international reserves equations are estimated for twenty four inflation targeting countries with different levels of financial dollarization. The results based on the panel data estimations indicate that monetary policy rule and behavior of accumulating international reserves are affected by the degree of financial dollarization. Furthermore, the study finds that inflation targeting performance is not affected by the level of financial dollarization. Consequently, the empirical analysis suggests that even if financial dollarization does not affect the inflation targeting performance, it does affect the monetary policy rule and the variables to be taken into account to reach the target.

Keywords: Inflation Targeting, Financial Dollarization

ÖZ

ENFLASYON HEDEFLEMESİ ve FİNANSAL DOLARİZASYON:
AMPİRİK BİR ÇALIŞMA

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Bu çalışma, finansal dolarizasyonun enflasyon hedeflemesi rejimi üzerine imalarını araştırmaktadır. Bu amaçla, farklı finansal dolarizasyon seviyelerini haiz enflasyon hedeflemesi uygulayan yirmi dört ülke için para politikası kuralı, enflasyon hedeflemesi performansı ve uluslararası rezervler denklemleri tahmin edilmiştir. Panel veri tahminlerine dayanan sonuçlar, para politikası kuralı ile uluslararası rezerv biriktirme davranışının finansal dolarizasyonun derecesinden etkilendiğini göstermektedir. Ayrıca, bu çalışma enflasyon hedeflemesi performansının finansal dolaizasyonun seviyesinden etkilenmediği sonucuna ulaşmıştır. Sonuç olarak, yapılan ampirik çalışma finansal dolarizasyonun enflasyon hedeflemesi performasını etkilemese de para politikası kuralını ve enflasyon hedefine ulaşmak için dikkate alınacak değişkenleri etkilediğini göstermektedir.

Anahtar Kelimeler: Enflasyon Hedeflemesi, Finansal Dolarizasyon

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To My Family

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CHAPTER I

INTRODUCTION

Inflation targeting regime has recently become a popular monetary policy framework to serve the pursuit of price stability. Today, more than twenty industrialized and emerging market countries have adopted inflation targeting regime following the pioneer New Zealand. These countries have implemented the regime not because it is a panacea nor does it suit well for all countries. All the same, it seems to lack the major drawbacks of the former main monetary policy strategies, namely both monetary targeting and exchange rate targeting on the grounds that it waives the role of formal intermediate targets through targeting inflation directly. Besides, it offers transparency and flexibility as its main tenets. Several studies on the inflation targeting regime have revealed that inflation targeting has contributed much to the reduction of inflation rates as well as inflation variability and to some extent to the macroeconomic improvement in the countries adopting the regime (Bernanke *et al.*, 1999; Batini and Laxton, 2005; Mishkin and Schmidt-Hebbel, 2007; and Lin and Ye, 2008).

On the other hand, inflation targeting regime has also been questioned extensively for its requirement or desire, if it is not a requirement, to satisfy preconditions before its implementation. These preconditions include the presence of flexible exchange rates and interest rates, a healthy and well-developed financial and banking system (absence of financial dominance), the absence of fiscal dominance (i.e., the conduct of domestic monetary policy should not be governed by fiscal needs), and the absence of high degree of financial dollarization (the absence of external dominance) (Truman, 2003 and Mishkin, 2004).

Although there does not exist a well defined and agreed list of preconditions to be fulfilled, there exists a debate whether satisfying the preconditions could play a significant role for the regime to work properly. Besides, there is also an argument that inflation targeting performance could differ in emerging market countries yet it might not be feasible for the emerging market countries to meet all the initial conditions when adopting the regime.

In this regard, financial dollarization, a common feature in many countries, particularly in many emerging market countries, is regarded as one of the concerns against the performance of inflation targeting regime because it could possess potentially adverse implications for the conduct of monetary policy, monetary and financial stability and overall economic performance (Balino *et al.*, 1999 and Levy-Yeyati, 2006).

Financial dollarization is defined as the holding by the country's residents of financial assets and/or liabilities denominated in the foreign currency (Levy-Yeyati, 2006). Thus, financial dollarization has pointed out different sides of the balance sheets of the economic agents by taking both asset and liability dollarization into account. While asset dollarization deals with the foreign currency assets of economic agents, liability dollarization deals with the external foreign currency liabilities which constitute the right-side column of the balance sheet. Once the asset dollarization was the only interest of the studies regarding dollarization, the liability dollarization has also begun to draw considerable attention of many economists yet it has produced results relevant for monetary policy (Reinhart *et al.*, 2003). Therefore, the economic implications of financial dollarization have been mostly centered on the incidence of balance sheet effects and thus fear of floating as argued by Calvo and Reinhart (2000) and Calvo (2006).

As a monetary policy framework, inflation targeting seems more complicated in a highly financially dollarized economy because the design and implementation

of the inflation targeting framework in a financially dollarized economy can differ in many ways (Armas and Grippa, 2005). First of all, it is possible to identify the key differentiating factors in terms of monetary transmission mechanism (Leiderman *et al.*, 2006). In this framework, monetary transmission mechanism might be questioned by considering the effect of financial dollarization on the mechanism through balance sheet effect. A monetary policy rule that increases interest rates so as to depress inflationary gap, leading an appreciation of the domestic currency, would yield a rise in net wealth by decreasing the values of foreign currency-denominated debt in terms of local currency. Therefore, the interest rate channel in the transmission mechanism and in turn the effectiveness of monetary policy would be undermined by a kind of balance sheet effect (Armas and Grippa, 2005). On the other hand, the increase in interest rate would not necessarily lead to an appreciation of the domestic currency in a highly financially dollarized economy. It is also possible that the rise in interest rate would result in depreciation of the domestic currency rather than appreciation by increasing risk premium, which represents the risk of default on domestic assets or external debt of the country.

Basically, the implications of financial dollarization for the implementation of inflation targeting regime have been originated by exchange rate considerations, particularly currency depreciations and in turn balance sheet effects. The depreciation of the domestic currency would increase the economic agents' debt burden denominated in the foreign exchange, thereby creating financial fragility for the economy (Levy-Yeyati, 2006). The deterioration of balance sheets and decline in net worth of firms would lead to a decline in investment and economic activity through adverse selection and moral hazard problems. Additionally, nonperforming loans of the firms would have an adverse effect on the banking sector even if banks are hedged themselves by lending in foreign currency (Mishkin, 2004). Furthermore, in the case of a commitment of government to back up the banking sector liabilities, government might monetize the debt, weakening the effectiveness of inflation targeting regime. Thus, the deterioration

of balance sheets following depreciation of the domestic currency, especially in emerging market economies, could increase the risk of a financial crisis (Mishkin, 2004). Consequently, the assumption under the conventional inflation targeting wisdom that states currency depreciation is expansionary might not be valid in financially dollarized economies. High level of financial dollarization could have a negative impact on output (Leiderman *et al*., 2006).

The devastating effects of the currency depreciation on the economy through balance sheet effects might encourage monetary authorities in financially dollarized economies to consider foreign exchange intervention as an additional policy instrument. As it was argued by Calvo (2006), switching from interest rate to fixing or pegging the exchange rate through foreign exchange intervention would be a convenient way to defend the exchange rate against depreciation particularly in (incipient) sudden stop periods. In this framework, accumulating international reserves would play a key role to reduce the vulnerabilities of financial dollarization. When the country is in international liquidity shortage, building up international reserves would cushion the destructive effects of sudden stop.

All in all, financial dollarization would have economic implications for the inflation targeting regime. An economy with a high level of financial dollarization is more vulnerable to exchange rate shocks through balance sheet effects, resulting in fear of floating and foreign exchange market intervention. Because exchange rate is expected to have a significant anchoring role, monetary authorities could implement the regime in a manner that is different from the prescriptions under the conventional inflation targeting wisdom (Leiderman *et al.,* 2006 and Chang, 2007). Therefore, it becomes noteworthy to examine the links between exchange rate movements, balance sheet effects, and inflation targeting as a monetary policy framework. Financial dollarization, despite theoretically stated as one of the limits to the successful adoption of inflation targeting by several studies, has evaluated empirically only in few works as an

impediment to the success of inflation targeting framework. Thus, this draws up the purpose of this study, which aims at filling some part of the gap in the field.

The purpose of the study is to evaluate empirically the implications of financial dollarization on the working and performance of inflation targeting framework. The database encompasses a sample of twenty four inflation targeting countries, which include both industrial and emerging market countries. Indeed, the countries in the sample are grouped under different degrees of financial dollarization.

The rest of the thesis is structured as follows. Chapter II briefly overviews the literature on inflation targeting as a monetary framework. The chapter is divided into three sections. In the first section, definition and central elements of inflation targeting are presented. Then advantages and disadvantages of inflation targeting are discussed. In the third section, preconditions of inflation targeting are reviewed, in which the financial dollarization is stated as one of them. In Chapter III, we try to investigate inflation targeting in financially dollarized economies. To this end, this chapter firstly provides basic concepts and definitions of dollarization. Then it gives a brief overview of the implications of financial dollarization on monetary policy. The last section of Chapter III is devoted to the implications of financial dollarization for inflation targeting regime. Chapter IV presents the empirical framework that analyses the implications of financial dollarization for the working and performance of inflation targeting by employing panel data techniques. Finally, Chapter V summarizes all the findings and concludes the thesis.

CHAPTER II

INFLATION TARGETING AS A MONETARY POLICY FRAMEWORK

Today there is a widespread and growing consensus among many economists that the primary goal of the monetary policy should be the pursuit of price stability.[1] The consensus about the importance of price stability, however, is a relatively recent phenomenon. In the 1960s and 1970s, most economists and policymakers were in favor of "activist" monetary policies, whose purpose was to maintain unemployment and output levels at their "full employment levels" all the time. Supporters of activist monetary policies kept a low level of unemployment "permanently" at the expense of some level of inflation because they believed that there was a long run trade-off between unemployment and inflation, which has been denoted by Phillips Curve in the literature. However, the severe recessions of 1973-74 and 1981-1982 revealed that these activist policies in the 1970s and 1980s did not succeed to deliver their benefits. In addition, they led to the generation of inflationary pressures. The result was that the activist policies failed to achieve their goals (Bernanke *et al.*, 1999).

Moreover, the widespread acceptance of the view that monetary policy cannot affect any real macroeconomic variables but only inflation in the long run although it can be used to moderate short-run fluctuations in the economy, has contributed much to focus on price stability rather than high real growth and low unemployment as the primary goal of monetary policy (Bernanke and Mishkin, 1997).

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[1] Alan Greenspan has provided a definition of price stability as a rate of inflation that is sufficiently low that households and businesses do not have to take it into account in making everyday decisions.

In addition, the increasing acceptance of the propositions that low levels of inflation can attribute to economic efficiency and growth in the long run and that there exist destructive effects of rapid inflation on economy is another reason for setting price stability as the primary goal of monetary policy.

As a consequence, because of the reduced confidence in activist policies and increased concern about the adverse effects of even moderate rates of inflation, many economists now accept that attaining and preserving price stability is the single most important goal of monetary policy (Bernanke *et al.*, 1999).

The choice of monetary regime, which will serve best the explicit goal of price stability, however has generated a debate among many economists. In recent years, one choice of monetary strategy, namely inflation targeting, has become increasingly popular as an alternative way to main monetary policy strategies, namely both monetary targeting and exchange rate targeting. This recent monetary framework relinquishes the role of formal intermediate targets and it targets inflation directly while the other two aim to provide price stability through intermediate targets.

As an alternative monetary strategy, monetary targeting aims to reach the ultimate policy objective -inflation- by controlling the money targets. This monetary policy strategy has grounded on the assumptions[2] that money multiplier and money velocity are predictable and hence; the central bank has full control of the nominal money stock. However, in practice, the long run relationship between money growth and nominal income growth is not stable and money targets have often been missed. In this framework, inflation targeting became an alternative to monetary targeting because in contrast to monetary targeting, inflation targeting regime does not require such a stable relationship

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[2] These assumptions are originated in the "quantity equation" identity by Irving Fisher, which states that the value of all economic transactions, that is, all nominal income generated in an economy has to be paid with money.

between money and inflation and all available information is used to determine the best settings for the instruments of monetary policy (Batini *et al.*, 2005).

Inflation targeting has also become an alternative to exchange rate targeting. Under exchange rate targets, the central bank aims to maintain the value of the domestic money in terms of another country or group of countries so that it can gain credibility from a foreign source (Batini *et al.*, 2005). However, it has also turned out that exchange rate targeting has some drawbacks. Particularly, exchange rate targets can encourage currency mismatch and speculative attacks and thereby leading to financial and banking crises. Therefore, most exchange rate targeting countries have abandoned this strategy and moved to inflation targeting (Batini *et al.*, 2005).

Consequently, many countries have adopted inflation targeting regime since the 1990s as a way to anchor inflation expectations. New Zealand was the pioneer to adopt an inflation targeting regime and soon it was followed by some other industrial countries. Australia, Canada, the United Kingdom, Sweden and Switzerland are among these industrial countries. The developing countries fighting against the inflation rates have also been encouraged and this framework was applied in Chile, Mexico, Korea, Thailand, South Africa and in 1999, Brazil (Table 1).

Table 1: Countries with Inflation Targeting Framework[3]

	Inflation Targeting Adoption Date		Inflation Targeting Adoption Date
Australia	1993: Q1	New Zealand	1990: Q1
Brazil	1999: Q2	Norway	2001: Q1
Canada	1991: Q1	Peru	2002: Q1
Chile	1999: Q3	Philippines	2002: Q1
Colombia	1999: Q3	Poland	1999: Q1
Czech Republic	1998: Q1	Romania	2005: Q3
Hungary	2001: Q3	South Africa	2000: Q1
Iceland	2001: Q1	Sweden	1993: Q1
Indonesia	2005: Q3	Switzerland	2000: Q1
Israel	1997: Q2	Thailand	2000: Q2
Korea	1998: Q2	Turkey	2002
Mexico	2001: Q1	United Kingdom	1992: Q4

Source: Batini et al., 2005 and National Monetary Authorities

II.1. Definition and Central Elements of Inflation Targeting

Inflation targeting is still lacking a clear cut definition. Definitions of inflation targeting range from the general to the detailed. Bernanke and Mishkin (1997) state that inflation targeting is characterized by the announcement of an official target range for the inflation rate at one or more horizons, and by explicit acknowledgements that low and stable inflation is the overriding goal of monetary policy. Accordingly, inflation targeting regime can be defined as the

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[3] The date indicates when countries, excluding Indonesia and Romania, de facto adopted inflation targeting.

public announcement of a *numerical target for inflation* in the medium run accompanied by the *institutional commitment* to reach the announced target (Bernanke, 1999).

In addition, an alternative characterization of inflation targeting is also available in the literature, which makes a distinction between strict inflation targeting and flexible inflation targeting. Svensson (2001) describes strict inflation targeting as the monetary policy framework which "completely disregards the real consequences of monetary policy in the short and medium term and focuses exclusively on controlling inflation at the shortest possible horizon". However, strict inflation targeting is not in practice in any central bank (Truman, 2003). On the other hand, Svensson (2001) defines flexible inflation targeting as the one in which "the primary goal of monetary policy is to achieve price stability in the form of an inflation target, but it is recognized that some weight should be given to stabilizing the business cycle and, consequently, stabilizing output movements around potential output."

In accordance with the definitions, inflation targeting framework is not merely a public declaration of a quantitative target for the inflation rate for the next year. For a monetary policy to be characterized as inflation targeting framework, it has to be based on some basic premises. Inflation targeting is mainly based on the statement that the main purpose of monetary policy in any country must be to attain and preserve a low and stable rate of inflation. There are also other generally agreed basic propositions and principles on which inflation targeting is based. These central elements are specified and listed in Mishkin (2002) as follows:

1- The announcement to the public of a medium term quantitative target for inflation in the form of either a point target or a target range.

2- The institutional commitment to the public that price stability is the primary goal of the monetary policy and other goals are subordinated to this goal even though there is room for additional secondary objectives.

3- All available information, not just monetary aggregates or the exchange rate, are used in policy setting.

4- There is increased transparency of the monetary policy strategy via communication with the public and the markets about the plans, objectives and decisions of the monetary authorities.

5- The existence of increased accountability of the central bank for attaining its inflation objectives and thereafter for preserving price stability.

One further point on inflation targeting needs to be emphasized. Inflation targeting involves *de facto* inflation forecast targeting although it seeks to achieve price stability by targeting inflation directly. Svensson (1998) stresses this point by stating that the inflation level is partially determined by the indexation to past inflation and current price and wage contracts and thus, the inflation forecast targeting works as an instrument rate for the internal decision process of inflation targeting framework.

II.2. Advantages and Disadvantages of Inflation Targeting

A number of industrial and developing countries have adopted inflation targeting framework as a monetary policy regime since the 1990s not because inflation targeting strategy is a panacea nor does it suit best for all countries. Motivations for an inflation targeting approach have been varied.

One of the reasons why inflation targeting has increased its popularity today, as mentioned above, is due to the poor performance of other nominal anchors like

exchange rate targeting or monetary targeting in meeting the objectives of the central banks. The countries, which relied on intermediate targets as monetary aggregates and exchange rates, had unsuccessful experiences such as exchange rate crises and money demand instability. Inflation targeting has seemed to lack some of the shortcomings of these alternative policy regimes. Besides, inflation targeting as a monetary policy regime can provide some benefits to the countries that have used it although there is no uniform approach for a thorough examination and evaluation of the inflation targeting regime.

One of the advantages of inflation targeting pointed out by several studies is that inflation targeting helps to gain credibility and achieve lower inflation expectations and lower inflation rates. Batini and Laxton (2005) find in their work that inflation targeting framework implies significant macroeconomic improvements with a larger reduction in the level and volatility of inflation. As a result of lower inflation expectations, the countries have achieved lower interest rates (Bernanke *et al.*, 1999 and Batini and Laxton, 2005).

In addition, the major advantages of inflation targeting regime have arisen from its main tenets, namely transparency and flexibility. Bernanke *et al.* (1999) describe transparency as the clear and timely communication of policy objectives, plans, and tactics while they define flexibility as the ability of central banks to react effectively to short-run macroeconomic developments within the broad constraints imposed by the inflation targeting framework.

Inflation target can be an effective way of increasing transparency because inflation targeting aims inflation directly by simplifying the central bank's communication strategy. Inflation targeting gives information to the public and the markets about the plans, aims, intentions and decisions of monetary authorities and thereby it improves communication with the public to reach the target. In addition, a variety of published materials, speeches, institutional arrangements can serve this communication process. Consequently, inflation

targeting provides transparency of the monetary policy (Bernanke *et al.*, 1999 and Bernanke and Mishkin, 2006).

With respect to flexibility, it can be stated that inflation targeting provides more flexibility since inflation level is partially determined by the current wage contracts and past inflation index. Inflation could still be under control if the inflation expectations can be governed appropriately. Thus, short deviations from the target will not yield much loss in the credibility of the monetary authority (Batini *et al.*, 2005). Consequently, the requirement of credibility, commitment and transparency by inflation targeting brings accountability of the monetary policy authority.

On the other hand, although there is an increasing number of countries adopting inflation targeting today for its pledge to achieve price stability and its other advantages, some criticism has also arisen against the implementation of inflation targeting regime because of the fact that it puts greater emphasis on inflation and hence it excludes other goals like output stabilization (Batini and Laxton, 2005 and Batini *et al.*, 2005). For instance, when a negative supply shock hits to the economy, inflation rate rises and output level declines. This situation induces a tightening of monetary policy to achieve a rigidly enforced inflation target. This results in the decline of output even further. However, Batini and Laxton (2005) find no evidence that inflation targeting unnecessarily restrains growth.

It is also argued that inflation targeting can be criticized due to its lack of full control of inflation. According to Svensson (2002), the central bank's imperfect control of inflation is the greatest problem with inflation targeting. Inflation can only be partially controlled by central banks due to lags in the transmission mechanism, the current state of the economy, the future shocks to the economy and the influence of other factors than monetary policy on inflation. It would be difficult to distinguish the effects of inflation targeting, as a monetary policy, on

inflation from the effects of shocks and other factors on inflation. As a consequence, there would be reduction in transparency and accountability of inflation targeting and hence, some potential benefits of inflation targeting would not occur.

II.3. Preconditions of Inflation Targeting

There is a considerable debate accompanied by the emergence of the inflation targeting regime that monetary authorities have to fulfill some requirements when they are planning to implement inflation targeting. It is argued that inflation targeting could not work well unless the preconditions are satisfied before the adoption of inflation targeting. Although there is not any agreed list of necessary preconditions to ensure the success of the framework, some authors stress these elements as desirable even if they are not requirements (Truman, 2003). Moreover, the debate on preconditions constitute the main part of criticisms on inflation targeting because it is not feasible for all potential inflation targeters, particularly for emerging market economies, to satisfy all initial conditions when adopting inflation targeting regime.

The main condition to be satisfied is stated as the central bank's de facto mandate to focus on price stability as the overriding objective of monetary policy and to pursue inflation target by its sufficient discretion and autonomy to set its monetary instruments accordingly (Carare *et al.*, 2002 and Truman, 2003).

Batini and Laxton (2005) categorize the preconditions into four main groups, which are stated as institutional independence, technical infrastructure, economic structure and, healthy financial and banking system. Additionally, transparent policies to build accountability and credibility are listed as desirable elements for the foundation of the framework (World Economic Outlook, 2001).

One of the preconditions regarded as essential is the existence of institutional elements such as the capability to have a deep knowledge of the monetary transmission process, a capacity to forecast inflation, the subordination of exchange rate objectives, and coordination of monetary and fiscal authorities (Truman, 2003).

Likewise, the absence of financial dominance, fiscal dominance and external dominance are of crucial importance for the success of any monetary policy framework. Mishkin (2004) explores that these issues gain additional importance for the emerging market economies who engage in inflation targeting. He states that emerging market economies differ from advanced economies for their weaker fiscal and financial institutions. The low credibility of monetary institutions, currency substitution and liability dollarization, and vulnerability to sudden stops of capital inflows witnessed in emerging market economies indicate a more complicated issue for monetary authorities in implementing inflation targeting.

The success of inflation targeting framework can be negatively affected by fiscal dominance. If the conduct of domestic monetary policy is dictated by fiscal needs, then it is risky for the country to adopt inflation targeting. The reason is that the unsustainable fiscal situation of the government necessitates direct central bank financing including revenues from seigniorage to finance the operations in the market, which in turn dominates the goal of price stability as the overriding goal of monetary policy. In this regard, the fiscal deficit, not the expansionary monetary policy, would be a cause for missing the inflation target (Truman, 2003).

Similarly, a sound financial system and a well developed financial market are also essential for the success of inflation targeting regime. Truman (2003) and Mishkin (2004) state that if the banking system is in a weak situation, financial institutions would be in need of liquidity injections from the central bank.

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According to this argument, the central bank could not raise interest rates to sustain the inflation target because the balance sheets of financial institutions and those of their borrowers would not be so strong to withstand the increases in interest rates. Accordingly, short term interest rates as the main instrument in inflation targeting framework could not be used for the fear of the collapse of the financial system. This situation could adversely affect the accountability of the monetary authority (Khan, 2003). Additionally, transforming the financial dominance into fiscal dominance by bailing out the weak financial system is another dimension of the argument to be taken into account (Truman, 2003).

Another precondition for the inflation targeting regime stems from the absence of dollarization, which is also a related argument with the financial stability. Mishkin (2004) states that not only does high degree of dollarization increase the risk of a financial crisis but also it creates a different impact of currency crises on the economy. Especially in emerging market economies, the balance sheets of households, firms and banks are substantially dollarized and hence the burden of long term debt denominated in dollar increases, which could trigger a financial crisis.

Calvo (1999) also notes that a high degree of (partial) dollarization may be a serious limitation to inflation targeting framework. Similarly, Leiderman *et al.* (2006) point out the absence of dollarization as a precondition of inflation targeting framework. They state that economy with a high degree of dollarization is more vulnerable to exchange rate shocks through balance sheet effects, which results in "fear of floating" and "foreign exchange market intervention". However, they conclude that high dollarization does not preclude the use of inflation targeting framework in spite of the fact that high degree of dollarization could change the inflation dynamics.

It is still an open question whether and to what extent countries need to satisfy certain preconditions before adopting inflation targeting (Truman, 2003). The

surveys have revealed that all the initial conditions were not in place prior to the adoption of inflation targeting. Moreover, the inflation targeting countries were prone to changes in exchange rates and commodity prices (Batini *et al.*, 2005). In this framework, Batini and Laxton (2005) conclude that while it appears to be necessary to have a clear agreement between the central bank and the government on the importance of price stability as the overriding goal of monetary policy, it is not necessary for emerging market countries to meet institutional, technical and economic preconditions for the successful adoption of inflation targeting. On the same line of thought, it is stated that the absence of these preconditions is not by itself an impediment to the adoption and success of inflation targeting (Batini *et al.,* 2005).

CHAPTER III

INFLATION TARGETING IN DOLLARIZED ECONOMIES

Dollarization has become a common feature in many countries; particularly in many emerging market economies. It is a result of the increased integration of capital markets with the rest of the world. In addition, financial and macroeconomic instability with high inflation can contribute to the emergence of dollarization (Balino *et al.*, 1999).

With its underlying drivers, dollarization has become a topic of interest to many central banks and economies around the world today on the grounds that it has many important economic implications, particularly for the conduct of monetary policy (Fischer, 2006). The vast literature on dollarization as well as the alternative strategies for the monetary policy framework has created a huge field to work on, thereby yielding a great number of studies.

Despite the great number of works that have already been done on the economic implications of dollarization, there are still gaps to be filled. In that regard, this study narrows down the field by investigating the implications of financial dollarization for the inflation targeting framework.

To this end, a proper evaluation of the relationship between financial dollarization and the inflation targeting has to begin with the alternative definitions of dollarization that have been driven from its different usages in the literature. Because we basically deal with financial dollarization and, in turn liability dollarization, in this work we should also make a clear definition of it. A

detailed literature survey on alternative definitions and types of dollarization is presented below.

III.1. Basic Concepts and Definitions of Dollarization

There are a lot of similar and related issues regarding the concept of dollarization, which yields to a growing and extensive literature on it. Dollarization[4] does not have a unique definition and it could address close but somewhat different issues. In addition, a lot of work has been done about motives behind the alternative definitions. However, this work does not intend to focus on the motives behind them.

As Reinhart *et al.* (2003) state, the definition of a dollarized economy has become quite elusive in recent years. Up to the late 1990s, the term "dollarized economy" was used in the literature for countries where domestic residents held foreign currency or financial assets denominated in foreign currency. In other words, the term "dollarization" has traditionally been referred to as the holding by residents of a significant share of their assets in the form of foreign-currency denominated assets (Balino *et al.*, 1999).

This traditional definition of dollarization has changed and the term "dollarization" has begun to be used alternatively, thereby becoming an ambiguous term since the late 1990s. After the Asia crises, the term dollarized economy has become to denote a country which replaces its own currency for foreign currency. Furthermore, at about the same time, a new term called "liability dollarization" has emerged in the literature (Reinhart *et al.*, 2003). Therefore, it becomes a complicated issue to speak of the existence of a unique definition of dollarization.

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[4] Before looking into alternative definitions, it is useful to mention that the term dollarization in the literature is applied to the use of any foreign currency and not the use of only US dollar.

The term "dollarization" is sometimes used to refer to official dollarization, full dollarization or de jure dollarization. The terms official dollarization, full dollarization and de jure dollarization are used interchangeably in the literature (Levy-Yeyati and Sturzenegger, 2003). Calvo (1999a) and Fischer (2006) define full dollarization as the abandonment of a country's own currency and the replacement of the national currency by a foreign currency. Therefore, in the case of de jure dollarization, the foreign currency is given legal tender status (Levy-Yeyati, 2006).

Another reference of dollarization is unofficial dollarization, partial dollarization or de facto dollarization. These three terms are also used interchangeably in the literature. Calvo (1999a) states that partial dollarization occurs when a foreign currency is used in any of the three classical roles of money, that is, as a unit of account, as a means of payment and as a store of value.

On the other hand, Reinhart *et al.* (2003) define a partially dollarized economy as one where households and firms hold a fraction of their portfolio in foreign currency assets and/or where the private and public sector have debts denominated in foreign currency. Therefore, the term de facto dollarization or unofficial dollarization refers to the cases where the foreign currency is used alongside with the national currency although the foreign currency does not have legal tender status (Levy-Yeyati, 2006).

Related to the partial dollarization phenomenon, one more term, namely financial dollarization, has become popular. This relatively recent term is also frequently used to address the same issue in the literature. Levy-Yeyati (2006) uses the term financial dollarization to denote the holding by the country's residents of financial assets and/or liabilities denominated in the foreign currency. Similarly, Arteta (2003) defines financial dollarization as the extensive presence of dollar assets and liabilities in the domestic banking system. Thus, the term dollarization seems to have widened the scope of its meaning by taking into

account both assets and liabilities of residents, which are denominated in foreign currency.

Financial dollarization has pointed out different sides of the balance sheets of the economic agents. Considering this point, Fischer (2006) distinguishes four types of dollarization: (i) asset dollarization, (ii) liability dollarization, (iii) medium of exchange dollarization (currency substitution), (iv) unit of account dollarization, which is sometimes called real dollarization. This classification of dollarization is not definite and it is also possible to find another type of classification of dollarization in the literature.

In this context, Balino *et al.* (1999) classify dollarization into only currency and asset substitution. According to them, dollarization refers to currency substitution when foreign-currency denominated assets are used for transactions purposes. On the other hand, dollarization can reflect asset substitution when the residents of a country hold foreign-currency denominated assets as stores of value.

Reinhart *et al.* (2003) also group dollarization in a partially dollarized economy into asset and liability dollarization by emphasizing the different sides of the balance sheets of the economic agents. According to Reinhart *et al.* (2003), the traditional literature on asset dollarization deals with the foreign currency assets of household and firms. On the other hand, the newer literature on liability dollarization deals with the right-side column of the balance sheet, which constitutes the external foreign currency liabilities of households, firms and the government.

Moreover, Calvo (1999a) and Levy-Yeyati (2006) stress the classification of asset and liability dollarization. Calvo (1999a) defines liability dollarization as the sum of dollar deposits and direct foreign borrowing. Levy-Yeyati (2006), on the other hand, states that while regarding to asset dollarization, the question

arises of whether and why residents save in a foreign currency; dollar debt is the subject of liability dollarization. As Reinhart *et al.* (2003) point out; the concept of liability dollarization has stressed the role of foreign currency borrowing by the private and public sectors.

As a consequence, asset dollarization and liability dollarization are of different nature. Once the asset dollarization was the only interest of the studies regarding dollarization, the relatively more recent phenomenon of liability dollarization has also begun to draw considerable attention of many economists.

A. Private Sector

ASSETS   LIABILITIES

Households

Foreign currency (FC) cash holdings

Foreign currency bank loans

FC bank deposits

FC assets held abroad (incl. bank deposits)

Firms

FC-linked government debt

FC bank loans

Domestic FC bonds

External FC debt (bonds and loans)

FC assets abroad

Banks

FC credit to households and firms

FC deposits (households, firms)

FC net credit to the government

External FC debt (bonds, loans)

B. Public Sector

FC-linked government

Central Bank

Reserve requirements on FC bank deposits

Net International Reserves

Government

Net FC bank

FC assets held abroad (incl. bank deposits)

FC-linked domestic debt

External FC debt

Figure 1: Foreign Currency Balance Sheet of a Partially Dollarized Economy

Source: Reinhart et al., 2003

III.2. The Implications of Financial Dollarization for Monetary Policy

Dollarization has become a major source of concern in academic and policy circles on the grounds that it has potentially adverse implications for the conduct of monetary policy, monetary and financial stability and overall economic performance (Balino *et al.*, 1999 and Levy-Yeyati, 2006).

There exists a conventional view that dollarization poses a challenge to monetary policy by making monetary policy more complex and less effective (Reinhart *et al.*, 2003). Levy-Yeyati (2006) states that the early literature on currency substitution models regarded dollarization as an obstacle for the conduct of monetary policy and he shows that financially dollarized economies have a more unstable demand for money, slower and more volatile output growth, more elastic price response to monetary shocks as the currency composition of liquid balances becomes more sensitive to devaluation expectations and hence a bigger propensity to suffer banking crises after a depreciation of the local currency.

As Reinhart *et al.* (2003) state, the new theoretical literature on liability dollarization also has produced results relevant for monetary policy. The economic implications of liability dollarization can be seen various yet the liability dollarization debate has mostly centered on the incidence of balance sheet effects and exchange rate pass-through to prices.

The implications of liability dollarization that are related with the incidence of balance sheet effects have originated by the currency imbalances. Calvo (1999a), Reinhart *et al.* (2003) and Fischer (2006) argue that liability dollarization makes the financial system and the economy more vulnerable to exchange rate shocks. In the event of sharp real exchange rate depreciation in a liability dollarized economy, the increase in the domestic currency value of dollar liabilities would be more than the increase in assets, thereby creating financial fragility for the economy (Levy-Yeyati, 2006).

If the local currency devalues in a financially dollarized economy, the local currency value of debt denominated in foreign exchange will increase. If borrowers operate in local currency, it is probable that they fail to repay their debts denominated in foreign currency. In this regard, even currency balanced banks hedging their foreign currency liabilities against large devaluation in the national currency by lending in dollars are not hedged in fact (Levy-Yeyati, 2006). The result is the deterioration of balance sheets of the banks with even a net long position in foreign exchange denominated assets, leading to a financial debacle (Fischer, 2006).

Moreover, the existence of the risk of no repayment and financially interconnected domestic producers can cause interest premiums on loans to every sector of the economy to increase. Therefore, in liability dollarized economies, large devaluation in the exchange rate would lead to sizable interest premiums (Calvo, 1999a). As a consequence, financial dollarization curtails the desirability of exchange rate fluctuations, which in turn could have implications for the conduct of the monetary policy.

On the other hand, Reinhart *et al.* (2003) find that although a level of dollarization seems to increase exchange rate pass-through, thereby supporting the claim that fear of floating would be a problem for highly financially dollarized economies, it does not appear to be a hindrance for monetary control and disinflation. Similarly, Armas and Grippa (2005) write that *"…financial dollarization does not preclude an independent monetary policy oriented at maintaining a low and stable inflation rate."*

The implications of financial dollarization on the inflation targeting framework are presented in detail below.

III.2.1. The Implications of Financial Dollarization for Inflation Targeting

As a monetary policy framework, inflation targeting seems more complicated in a highly financially dollarized economy because the design and implementation of the inflation targeting framework in a financially dollarized economy can differ in many ways (Armas and Grippa, 2005). As Armas and Grippa (2005) and Chang (2007) note that the monetary authorities implementing the inflation targeting regime have taken financial dollarization into consideration in their strategy for mitigating financial dollarization risks. On the other hand, whether inflation targeting strategy could successfully accommodate the characteristics and dynamics of dollarization is an open question (Leiderman *et al.*, 2006).

In an attempt to examine the implications of financial dollarization on inflation targeting, the conventional monetary transmission mechanism of inflation targeting should be examined and questioned firstly. It is possible to identify the key differentiating factors in terms of monetary transmission mechanism and monetary policy formulation in a highly financially dollarized economy (Leiderman *et al.*, 2005).

Under inflation targeting framework, the central bank reacts to increase in inflation by increasing interest rates. In the conventional mechanism, the rise in real interest rates leads to fall in aggregate demand in the economy via the decreases in consumption, investment and net exports. The disincentives for consumption expenditure arise through substitution effects. Also, investment expenditures decrease as the cost of investment finance rises with the real interest rates. Additionally, the movements in foreign exchange rate affect aggregate demand by changing the relative price of domestic goods vis-à-vis foreign goods. As higher interest rates lead to real appreciation of the domestic currency, domestic goods become relatively more expensive than foreign goods, in turn leading to a decrease in net exports. This conventional transmission

mechanism results in the elimination of the inflation gap and output gap in the countries without fiscal, financial and external dominance.

However, there could be some other cases where the conventional mechanism could not work properly. A highly financially dollarized economy could be stated as one of them, in which the conventional inflation targeting prescriptions are in question, since such an economy could be highly vulnerable to external shocks. Therefore, it is probable to find departures from the dominant theory of inflation targeting in these economies.

On the one side, an increase in the short term nominal interest rate so as to eliminate inflationary gap would still depress consumption and investment. However, appreciation of the domestic currency led by the increase in interest rate would decrease the value of foreign currency-denominated debt in terms of local currency, thus yielding a rise in net wealth. As a consequence, that would be one kind of balance sheet effect, which weakens the interest rate channel and in turn the effectiveness of the monetary policy (Armas and Grippa, 2005).

On the other hand, rising interest rates as the way to depress the inflation as an inflation targeting policy rule could not be so convenient in highly financially dollarized economies on the grounds that rising real interest rates could also lead to increase in risk premium, which could represent the risk of default on domestic assets or external debt of the country. Hence, it would be possible that the rise in real interest rate could result in real depreciation of the domestic currency rather than real appreciation of the domestic currency as it is the case in the conventional mechanism. This is quite a different dynamic than the conventional case.

Additionally, in a highly liability dollarized economy, currency depreciation adds further to the public debt by raising the value of foreign exchange denominated bonds in terms of domestic GDP. Thus, it could turn out to be a

much more complicated issue to use the interest rate as a policy rule in a way that is compatible with inflation targeting regime.

Basically, exchange rate considerations play a more significant anchoring role in financially dollarized economies. Exchange rate fluctuations, particularly currency depreciations, become a cause of concern because the difficulties of adoption of inflation targeting regime can arise from the balance sheet effects and exchange rate pass-through effects of the currency depreciations. As Leiderman *et al.* (2006) emphasize, exchange rate is expected to have a significant anchoring role in a highly dollarized economy than in a nondollarized economy. Therefore, it becomes noteworthy to examine the links between exchange rate movements, balance sheet effects, and monetary policy.

As Leiderman *et al.* (2006) state, the balance sheets of firms and banks in financially dollarized economies can be vulnerable to the nominal and real exchange rate fluctuations, which are generally accompanied by the inflation targeting framework.

In a highly liability dollarized economy, depreciation of the domestic currency, which could be seen in the flexible exchange rate regime, could increase the economic agents' debt burden denominated in the foreign exchange.

Consequently, exchange rate depreciation following an increase in the risk premium and/or a sudden stop, through balance sheet effects, can lead to negative impact on output in a highly liability dollarized economy (Leiderman *et al.*, 2006).

Mishkin (2004) writes that;

> Liability dollarization means that depreciations are particularly dangerous because they can trigger a financial crisis… These countries have much of their debt denominated in foreign currency

and when the currency depreciates, this increases the debt burden of domestic firms. Since assets are typically denominated in domestic currency and so do not increase in value, there is a resulting decline in net worth. This deterioration in balance sheets then increases adverse selection and moral hazard problems, which leads to financial instability and a sharp decline in investment and economic activity.

In addition, greater nonperforming loans of the firms can have adverse effects on the banking sector. Even currency balanced banks hedging themselves by lending in foreign currency, in fact are not hedged unless their borrowers are exporters and/or capable of gaining their income in foreign currency (Mishkin, 2004).

Furthermore, if there is a commitment of government to back up the banking sector liabilities, government liabilities will show an increase as well. If government chooses to monetize the debt, this will undermine the working of inflation targeting regime.

The resulting deterioration of the balance sheets of the households, firms and banks in a highly liability dollarized economy increases the risk of a financial crisis when the negative balance sheet effects dominate the positive effects of the depreciation of domestic currency on the economic activity (Armas and Grippa, 2005). However, this is somewhat a different result than it is usually expected in nondollarized economies under inflation targeting framework. Consequently, it turns out to be that because of financial dollarization, the assumption, on which the conventional inflation targeting wisdom is grounded, that exchange rate depreciation is expansionary could not be true all the time in the economies implementing inflation targeting regime.

Thus, the depreciation of national currency in highly financially dollarized economies is undesirable for its devastating effects on the economy as a whole. For this reason, it is likely for the monetary authority to react against currency devaluations not only for the concern of inflation targets although the inflation

targeting framework is generally accompanied with the flexible exchange rate regime. In addition, Leiderman *et al.* (2006) state that:

> It is plausible to argue that balance sheet effects give rise to contractionary devaluations and induce financial stress. That is, instead of real exchange rate depreciation having a positive impact on output, one would observe a negative impact…In turn, the potentially adverse impact of large exchange rate fluctuations is likely to induce fear of floating by the authorities and require that they closely target the exchange rate, even when the underlying shocks are transitory. To facilitate such targeting, the authorities may consider using direct foreign exchange market intervention as an additional policy instrument.

Chang (2007) has also pointed out that it is common to use foreign exchange intervention in Latin America to prevent excessive financial volatility, bubbles, and panics. He has made a distinction between the cases in which the exchange rate movements are considered in a standard inflation targeting regime and in the departures of the implementation of the regime.

Monetary policy instrument could respond to exchange rate movements in the conventional inflation targeting if the exchange rate movements are correlated with future inflation. Because of the various channels between exchange rate and inflation expectations, viewing exchange rate movements could be noteworthy in the implementation of the inflation targeting regime. The direct channel between exchange rate movements and inflation states that exchange rate shocks could affect the prices of imported goods in the consumer price index, thus having a direct effect on inflation. Furthermore, the reliance of the cost of imported intermediate inputs on the exchange rate movements could affect domestic production and in turn, the relation between inflation and output gap indirectly. Hence, to like any other variable, which are helpful to affect and predict the inflation, monetary policy rule of the conventional inflation targeting regime could respond to the fluctuations in the exchange rate. Responding to the exchange rate when it has information about the inflation forecasts does not

invalidate the inflation rate as an ultimate target of policy and it is consistent with the inflation targeting regime (Chang, 2007).

On the other hand, as Chang (2007) emphasizes, influencing interest rates could be used as a monetary policy rule not only when the movements in the exchange rate could signal the upcoming inflationary pressures but also to limit excessive volatility in the foreign exchange market and to calm financial markets. This has been the case for Latin American central banks, which have claimed a right to intervene in the foreign exchange market under the circumstances of the instability in the foreign exchange market and the financial system. Hence, if there exist concerns other than inflation target like balance sheet effects, then it would be probable that monetary policy could benefit from foreign exchange intervention alongside interest rates as an additional monetary policy instrument.

Calvo (2006) also argues that although using interest rate as policy rule is a good means for the implementation of the inflation targeting regime in normal periods, foreign exchange intervention as another policy rule could replace the interest rate in turbulence periods.

Particularly, how the monetary authority would act in turbulence periods is an interesting issue to investigate. When there is an incidence of financial market instability following a reversal of capital flows and/or (incipient) sudden stops in a highly dollarized economy, the central bank, in fact, would not have many options to carry out against a sudden stop for the fear of floating. The central bank could either allow exchange rate to float as in the way inflation targeting necessitates or it could intervene in the foreign exchange market by using interest rate. In the former option, firms go into bankruptcy through balance sheet effects, and the bankruptcy of the firms would create problems in the banking sector even if balance sheet imbalances in the banking sector do not seem to exist. The deterioration of the banking sector caused by the nonperforming loans leads to financial instability and crisis hereafter. The latter

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option of increasing interest rate so as to provide inflow of capital, on the other hand, could be a hindrance for the public debt to be sustainable especially in the countries witnessing large public debt. Moreover, the increase in interest rate would probably raise the risk premium of the country.

The argument developed by Calvo (2006) could shed light on the question what the central bank could do at that point. Calvo (2006) states that the central bank, in fact, could accumulate international reserves so that it could intervene in the foreign exchange market. When the economy as a whole witnesses a sudden curtailment of international credit, the international reserves of the central bank could be made available to the public by selling foreign exchange for domestic currency at an exchange rate lower than the one that would prevail if the central bank did not intervene. Thus, Calvo (2006) notes, *"[Foreign exchange intervention] is tantamount to fixing or pegging the exchange rate."* Consequently, he provides some rationale for switching from using interest rate to fixing or pegging the exchange rate by foreign exchange intervention particularly in turbulence periods by stating that:

> A central bank that follows inflation targeting may thus have strong incentives to peg the exchange rate during market turbulence, if tradable goods' prices are a major item in their price index and/or there is a large pass-through coefficient. Moreover, unless the pass-through coefficient is very close to unity, pegging will become even more attractive in the presence of domestic liability dollarization, because high exchange rate volatility is more likely to trigger serious financial turmoil, possibly driving the economy into a "bad" equilibrium.

In addition to Calvo (2006), Chang (2007) also puts emphasize on the role of international reserves when the economy as a whole witnesses a sudden curtailment of international credit. He asserts that international liquidity matters on the ground that it is a key factor on generating the crises. Since it is probable for the country to experience a crisis depending on the market expectations when its potential short term liabilities in international currency are greater than the liquidation value of its assets, that is, when the country is said to be in

international liquidity shortage, building up international reserve levels would be a step to reduce the vulnerabilities in this regard. Because international reserves could limit the destructive effects of sudden stop, countries could attempt at accumulating international reserves.

According to Armas and Grippa (2006),

> [The Peruvian Banco Central de Reserva], tries to prevent the balance sheet effect of large domestic currency depreciations, aiming at the same time to assure the availability of liquid funds in foreign currency for a contingent financial sector liquidity shortage. The latter type of policy involves the moderation of excessive exchange rate volatility, requiring commercial banks to have large reserves on their foreign currency liabilities, and maintaining a high level of Central Bank international reserves.

Moreover, Chang (2007) stresses another point to argue that whether the accumulating international reserves could undermine the premises of transparency and accountability under the inflation targeting regime.

All in all, monetary authorities in financially dollarized economies could implement the inflation targeting regime in a different manner than it is prescribed under the conventional wisdom. Under the conventional inflation targeting regime, neither foreign exchange rate intervention nor international reserves accumulation could play a significant role in the monetary policy. However, they could have some role in financially dollarized economies since these countries are very much concerned about the variability of the exchange rate and the stability of financial markets. Thus, it is possible to find the discrepancies between the conventional inflation targeting theory and practice. However, one could argue that defending the exchange rate against depreciation by foreign exchange intervention or reserves accumulation might not be the most proper response. In this regard, Armas and Grippa (2005), Calvo (2006) and Chang (2007) have strongly pointed out that it might be better for countries to aim at reducing financial dollarization and other financial fragilities.

CHAPTER IV

THE ECONOMETRIC FRAMEWORK

IV.1. The Model and Data Set

The purpose of the study is to evaluate possible effects of financial dollarization on the working of inflation targeting as a monetary framework. In order to investigate the existence of possible related links between financial dollarization and inflation targeting framework in the countries adopting inflation targeting regime, panel data techniques are employed. In this empirical analysis, both the industrial countries and developing countries, which are implementing inflation targeting regime, are included.

We first consider a Taylor[5] type monetary policy reaction function for the panel of inflation targeting countries as follows:

$$i_{it} = a + bi_{it-1} + \alpha \Pi^g_{it} + \beta y^g_{it} + \phi \Delta reer_{it} + \delta FF_t + cVIX_t + u_{it} \qquad (1)$$

where i_{it} is the policy interest rate, Π^g_{it} is the inflation gap, y^g_{it} is the output gap, $\Delta reer_{it}$ is the log of the real effective exchange rate, FF_t is the US Federal Reserve (FED) target interest rate and VIX_t is the Chicago Board Options Exchange (CBOE) Volatility Index VIX. In the equation, Δ is the first difference operator and the subscripts i and t stand for country and time, respectively.

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[5] Taylor rules are monetary rules that state how the interest rate policy instrument is determined in response to weighted deviations of the inflation rate and real output from some target (Taylor, 2003 and Orphanides, 2007).

In the conventional inflation targeting framework, the central bank increases short-term (policy) interest rate in the presence of a positive inflation gap ($\Pi_{it}^{g} = \Pi_{it}\text{-}\Pi_{it}^{t}$). A strict inflation targeting central bank is often defined as responding only to the deviations of forecasted/expected/realized inflation Π_t from the target Π_t^{t} at a given policy horizon. In this context, the short term nominal interest rate is expected to rise with the inflation rate gap. A positive inflation rate gap is expected to create a signal to monetary authority to increase the short term nominal interest rate through the conventional channel of the monetary policy transmission mechanism. Under a flexible inflation targeting regime, the central bank may be expected to change its policy rate also in response to an output gap ($y_t = Y_t - Y_t^{*}$) with Y* being the potential output. The short term nominal interest rate is expected to increase with the positive output gap. The actual output level, which is greater than the output level at the full employment level, would put pressure on the prices to move up. In this regard, short term nominal interest rate is expected to rise in order to create contractionary effect on the output level through aggregate demand.

Considering the implications of financial dollarization on inflation targeting framework, the reel effective exchange rate, the US Federal Fund Rate and CBOE Volatility Index (VIX) variables are also included in the model. In the conventional framework, neither of these variables is expected to significantly and systematically taken into account in the policy interest rate decisions under inflation targeting. As noted by Leiderman *et al.* (2006), the US Federal Fund Rate accounts for the interest rate parity, therefore absorbing the effects of external shocks. In order to prevent capital outflow and/or to attract and provide inflow of capital at the turbulence periods, the short term nominal interest rate is expected to react and to rise. In the same vein, the CBOE Volatility Index VIX, which is a measure of the volatility implied in the pricing options on US stocks, is also used as a proxy for investor risk appetite as well as US Federal Fund Rate to capture the effects of global liquidity conditions (Rozada and Yeyati, 2006). The short term nominal interest rate is expected to increase as the CBOE

Volatility Index VIX rises since increase in the volatility index would reflect the increased volatility market conditions and in turn, contradiction in the liquidity conditions.

The real effective exchange rate is also included in the model to take into consideration the implications of the movements in the foreign exchange in the implementation of the inflation targeting. Real depreciation of domestic currency would lead to deterioration of the balance sheets of the economic agents. Furthermore, in the aftermath of the balance sheet effects, which would lead to contraction in the production of firms with the accompanied upcoming bank failures, financial crisis would be on the way depending on the degree of dollarization and on the severity of the imperfections of the financial system. Therefore, large currency depreciations, primarily through balance sheet effects, could have a contractionary effect on the output level, which would be the opposite of the expectations in the conventional inflation targeting wisdom. Hence, because of fear of floating, monetary policy rule is expected to be affected by the changes in the real effective exchange rate. Consequently, the short term nominal interest rate is expected to increase so as to prevent the domestic currency to depreciate significantly or to mitigate the amount of the domestic currency depreciation. Moreover, it is also aimed to find out whether the coefficient of the change in real effective exchange rate differs significantly depending on the degree of financial dollarization.

In this analysis, the real gross domestic product (Y), CPI inflation rate (Π) and the Federal Funds rate data are obtained from International Monetary Fund (IMF) International Financial Statistics (IFS) data base. The output and inflation gaps are estimated using Hodrick-Prescott filter measuring trends. The source of the real effective exchange rate data is the Bank for International Settlements (BIS) data base. There is no data for the level of financial dollarization for all the countries in our sample. However, following Levy-Yeyati (2006), we use deposit dollarization (the ratio of deposit dollarization over total deposits) as a proxy for

financial dollarization. As Levy-Yeyati (2006) notes *"…deposit dollarization can be used as a sensible proxy for domestic loan dollarization, since they often mirror each other due to the presence of prudential limits on banks' foreign exchange positions."* The apparent high correlation between deposit and loan dollarization as depicted by Figure 2 supports this argument. The data for dollarization are from Levy-Yeyati (2006).
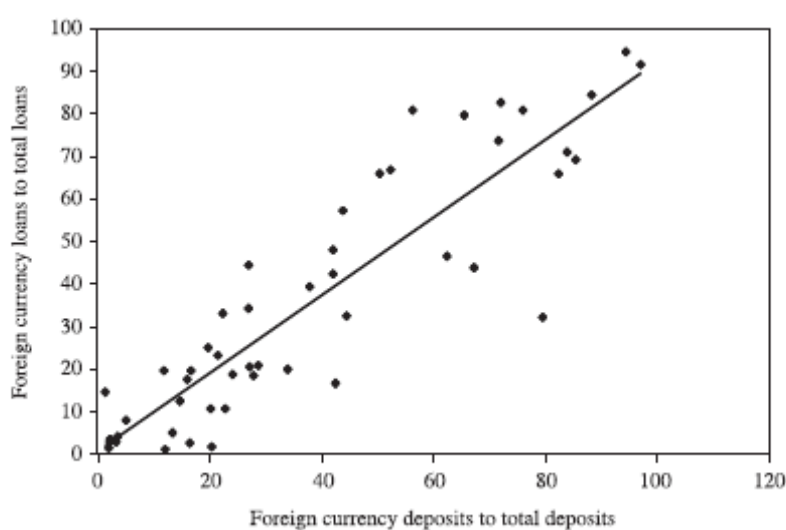
Figure 2: Deposit and Loan Dollarization

Source: Levy-Yeyati (2006)

By incorporating dollarization data to the model, it is basically aimed to investigate whether monetary policy rule in inflation targeting countries exhibits a different behavior in response to changes in the aforementioned explanatory variables depending on the level of dollarization.

In this thesis we aim also to investigate whether the foreign exchange reserve holdings of inflation targeting central banks change with the degree of dollarization. We consider the point by Calvo (2006):

> …FX Intervention could offer an effective remedy against excessive exchange rate volatility in the short run-which, by the way, provides a rationale for *the fear of floating* highlighted in Calvo and Reinhart (2002). … International reserves could play a role in this coordination game, since, as pointed out above, they could help to cushion destructive financial spillovers of Sudden Stop. But, of course, for that to be the case, (a) the stock of reserves has to be large enough,…

In that regard, international reserves level *(RES)* is specified as a function of the degree of financial dollarization. D stands for dummy variable for the different levels of financial dollarization in the inflation targeting countries.

$$RES_{it} = a + bD_{it} + e_{it} \qquad\qquad (2)$$

By formulating this model, the work would provide evidence empirically to support or disprove the claim in Calvo (2006) that in the presence of liability dollarization, it would become more attractive to switch from inflation targeting regime to pegging the exchange rate by foreign exchange intervention.

In the second equation the coefficient of the dummy variable needs to be emphasizing. In order to support the claim, the coefficient is expected to be significantly positive. If it turns out to be significantly positive, the conclusion would be that dollarized economies tend to hold greater international reserves. On the other hand, if the coefficient turns out to be insignificantly positive, the conclusion would be that there is no significant difference between the dollarized and nondollarized countries in their behavior of holding international reserves. In addition, if the coefficient of the dummy variable is found to be significantly negative, it would turn out to be an unexpected result, which is not compatible with the economic intuition.

Furthermore, the thesis also aims to investigate the relationship between the inflation targeting performance and financial dollarization. In order to explain the issue, the work formulates the linear simple regression model as follows:

$$(\Pi_{it} - \Pi_{it}^{t}) = \gamma_0 + \gamma D_{it} + w_{it} \qquad\qquad (3)$$

The deviation of the current inflation rate from the targeted inflation rate stands for the inflation targeting performance. Dollarization dummy (D) is used again to capture the effects of the different degree of financial dollarization in the inflation targeting adopting countries. If the coefficient of dummy variable is significant, we will conclude that there is a relation between dollarization and inflation targeting performance. If the coefficient of dummy variable turns out to be significantly positive, the result would be that financial dollarization could affect inflation targeting performance in an adverse manner. On the other hand, if it turns out to be significantly negative, the result would be that financial dollarization could have affirmative effect on inflation targeting performance.

Furthermore, more several interesting results would emerge. Firstly, if the coefficient of dummy variable in the third equation turns out to be insignificant but the coefficients of dummy variables in the first equation are significant, the result would be that financial dollarization does not affect inflation targeting performance and policy makers could exhibit the same performance by taking the exchange rate fluctuations and external shocks into consideration. Hence, policy makers would reach the same result by different means.

Secondly, if the coefficient of the dummy variable in the third equation is significantly positive and the coefficient of dummy variables in the first equation turn out to be significant; the result could be interpreted in the way that financial dollarization affects inflation targeting performance in an adverse manner. This would be the case because it would be likely for policy makers and monetary authorities not to focus on inflation targeting by paying attention also to other variables, resulting in a shift away from the primary focus, the inflation target. On the other hand, if all the coefficients of dummy variables in both the first and the third regressions turn out to be insignificant, the conclusion would be that

financial dollarization would not have any implications for inflation targeting framework.

Finally, if the coefficient of dummy variable in the third regression turns out to be significant but the coefficients of dummy variables in the first equation are insignificant, the result would be that dollarization would have an adverse impact on the inflation targeting performance, however the relation between the variables in the first model would be incapable of explaining the situation.

IV.2. Empirical Results

This section provides the econometric framework discussed in the previous section and the empirical results of the econometric analysis are presented below[6].

Table 2: Specification of Dummy Variables

Dummy Variable	Specification of Dummy Variable	Degree of Financial Dollarization
ldol	= 1 if dollarization level < 0.1 = 0 otherwise	No or Low Dollarization
mdol	= 1 if $0.1 \leq$ dollarization level < 0.25 = 0 otherwise	Moderate Dollarization
hdol	= 1 if $0.25 \leq$ dollarization level < 0.40 = 0 otherwise	High Dollarization
sdol	= 1 if $0.40 \leq$ dollarization level = 0 otherwise	Severe Dollarization
hsdol	= 1 if $0.25 \leq$ dollarization level = 0 otherwise	High and Severe Dollarization

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[6] All the regressions in this study are estimated using Stata 9 program.

In order to investigate the implications of different degree of financial dollarization, dummy variable is specified as in the Table 2.

We first estimate the monetary policy rule in the inflation targeting framework in order to investigate whether monetary policy rule in inflation targeting countries exhibits a different behavior depending on the level of financial dollarization. We consider the following generic equation:

$$i_{it} = a + bi_{it-1} + \alpha \Pi^g_{it} + \beta y^g_{it} + \phi \Delta reer_{it} + \delta FF_t + cVIX_t + u_{it} \qquad (1)$$

The estimated equation is defined as (1a):

$$lrt_{it} = \alpha_1 + \alpha_2 Lrt_{t-1} + \alpha_3 infgap_{it} + \alpha_4 outputgapsa_{it} + \alpha_5 lreer_{it} + \alpha_6 lvix_{it} + \beta_4 lff_{it} + \varepsilon$$

where, lrt = ln (1+ i/100), Lrt_{t-1} = lagged (lrt), lvix = ln (VIX), lreer = ln (reer), lff = ln (1+FF/100) and outputgapsa is specified as seasonally adjusted output gap.

Table 3 reports the results of the cross-section fixed effects estimation of equation (1a) for our unbalanced panel data of twenty four countries with differing degrees of dollarization. The results from the table suggest that the monetary policy instrument responds to inflation gap in all countries as it is expected. The inflation rate gap is statistically significant in explaining the behavior of the short term nominal interest rate. As the current inflation rate exceeds the inflation rate at the full employment level, interest rate increases so as to depress the aggregate demand. These results are consistent with the conventional inflation targeting wisdom.

On the other hand, the coefficients associated with the seasonally adjusted output gap are solely significant in the highly and severely dollarized countries.

However, it is not wrongly signed in moderately dollarized and no/low dollarized countries.

Table 3: Monetary Policy Rule in Inflation Targeting Regime

Variable	No or Low Dollarized Countries	Moderately Dollarized Countries	Highly and Severely Dollarized Countries
Dependent Variable	lrt	lrt	lrt
Constant	0.0591057** (0.69)	0.057464** (1.08)	0.0880677** (2.79)
Lr_{t-1}	0.6045539** (11.67)	0.7856765** (21.68)	0.8543671** (54.41)
infgap	0.7063999** (2.97)	0.6483066** (4.64)	0.4044803** (5.72)
outputgapsa	0.0364449** (0.44)	0.0885547** (1.33)	0.0783961** (5.38)
lreer	-0.0069475** (-0.42)	-0.0097554** (-0.86)	-0.020007** (-3.20)
lvix	-0.0033393** (-0.50)	-0.0017286** (-0.47)	0.003909** (2.16)
lff	0.2081435** (2.62)	0.1939044** (2.61)	0.0850947** (2.78)
N	135	142	370
R-squared	0.6821	0.9196	0.9229

Notes: t-ratios in parentheses. (**) denotes significance at 5 % level. N is the number of observations.

Additionally, several interesting results also emerge. The coefficients associated with the changes in the real effective exchange rate are only statistically significant for highly and severely financially dollarized economies. The findings for the real effective exchange rate provide evidence that monetary authorities in highly dollarized countries have taken financial dollarization into account for controlling the financial dollarization risks owing to fear of floating while they are conducting the inflation targeting regime. On the other hand, the

real effective exchange rate turns out to be insignificant in the countries without dollarization and the countries with low or moderate dollarization.

Moreover, the findings of equation (1a) support that monetary policy is affected by the global liquidity conditions on the grounds that the coefficients associated with the Federal Fund Rate turn out to be significant in all country groups. Besides, Table 3 reports that the volatility index VIX is statistically significant in the highly and severely dollarized countries.

To investigate the relationship between the behavior of holding international reserves and financial dollarization we consider the following generic equation, which was already discussed in the earlier sections of the study.

$$RES_{it} = a + bD_{it} + e_{it} \qquad\qquad (2)$$

The estimated equation is defined as follows:

$$ltres_{it} = \gamma_1 + \gamma_1 mdol_{it} + \gamma_2 hdol_{it} + \gamma_3 sdol_{it} + \upsilon_{it} \qquad\qquad (2a)$$

where, ltres = ln(RES) and, mdol, hdol and sdol are specified as in the Table 2.

Table 4 reports the empirical findings of equation (2a). The control group is chosen as no/low dollarized countries. The significant coefficients of the dollarization dummies for the moderate and, highly and severely dollarized countries indicate that the behavior of holding international reserves in these countries is different from the no/low dollarized countries. Moreover, the behavior of accumulating international reserves in moderately dollarized and highly dollarized countries is much more similar. Besides, the findings provide evidence that severely dollarized countries are found to be statistically significant in accumulating more international reserves than any other country

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group. Hence, the empirical results supports that building up total reserves is affected by the level of financial dollarization.

Table 4: Accumulation of Reserves

Variable	All Countries
Dependent Variable	ltres
Constant	9.2534** (334.20)
mdol	0.2276911** (4.86)
hdol	0.2340918** (1.94)
sdol	0.526667** (16.13)
N	883
R-Squared	0.2682

Notes: t-ratios in parentheses. ** denotes significance 5 % level. N is the number of observations.

Furthermore, this study formulates the generic equation (3) below in order to analyze the relationship between the inflation targeting performance and financial dollarization.

$$(\Pi_{it} - \Pi_{it}^{t}) = \gamma_0 + \gamma D_{it} + w_{it} \qquad\qquad (3)$$

As explained in the previous section, $(\Pi_{it} - \Pi_{it}^{t})$, which is the deviation of the current inflation rate from the targeted inflation rate, stands for the inflation

targeting performance. Besides, D denotes dollarization dummy to capture the effects of the different degree of financial dollarization.

The estimated equation is defined as follows:

$$infgap_{it} = \delta_1 + \delta_2 mdol_{it} + \delta_3 hdol_{it} + \delta_3 sdol_{it} + \kappa_{it} \qquad (3a)$$

The empirical results presented in the Table 5 suggest that level of financial dollarization does not seem to affect the inflation targeting performance. The coefficients of mdol, hdol and sdol turn out to be insignificant, indicating that there is no statistically significant difference from the inflation targeting performance of no/low dollarized countries.

Table 5: Inflation Targeting Performance

Variable	All Countries
Dependent Variable	infgap
Constant	0.0000721** (0.13)
mdol	-0.0003071** (-0.33)
hdol	-0.0026641** (-1.10)
sdol	0.0002179** (0.33)
N	883
R-Squared	0.0025

Notes: t-ratios in parentheses. ** denotes significance 5 % level. N is the number of observations.

All in all, the empirical evidence therefore supports that the inflation targeting performance is not affected by the different levels of financial dollarization. On the other hand, by interpreting all the findings presented in the Table 3, and Table 5 we could assert that although the inflation targeting performance is not affected by the degree of financial dollarization, monetary policy rule and thus the variables to be taken into account in the decision making of the implementation of the policy are affected by the level of financial dollarization.

CHAPTER V

CONCLUSION

Financial dollarization has recently become a topic of interest to many inflation targeting countries around the world yet it possesses many noteworthy economic implications for the conduct of monetary policy, monetary and financial stability and overall economic performance (Balino *et al.*, 1999; Fischer, 2006 and Levy-Yeyati, 2006). In fact, financial dollarization has been stated as a potential serious limitation to the performance of inflation targeting because it makes the design and implementation of the inflation targeting framework more complicated and less effective (Reinhart *et al.*, 2003 and Armas and Grippa, 2005). In that regard, it is argued that the challenge might emerge when the conventional transmission mechanism is invalidated by financial dollarization. Basically, the economic implications of financial dollarization for inflation targeting regime have been generally grounded on exchange rate movements, the incidence of balance sheet effects and thus fear of floating.

In general, an economy with a high level of financial dollarization is regarded more vulnerable to currency imbalances through balance sheet effects. The deterioration of the balance sheets of the economic agents in the aftermath of a sharp depreciation of the domestic currency creates financial fragility for the economy (Levy-Yeyati, 2006). Facing with the risk of a financial crisis, monetary authorities, therefore, take financial dollarization into consideration in the implementation of the regime (Armas and Grippa, 2005 and Chang, 2007). In this framework, they might have a special focus on foreign exchange intervention and international reserves accumulation, which is not a usual prescription under conventional inflation targeting wisdom (Chang, 2007).

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Accordingly, it is not a futile attempt to investigate the departures of the implementation of the regime in financially dollarized economies from that of nondollarized economies.

The purpose of this study is to analyze empirically the implications of financial dollarization on the working and performance of inflation targeting framework in twenty four countries (Australia, Brazil, Canada, Chile, Colombia, Czech Republic, Hungary, Iceland, Indonesia, Israel, Korea, Mexico, New Zealand, Norway, Peru, Philippines, Poland, Romania, South Africa, Sweden, Switzerland, Thailand, Turkey, and United Kingdom). In order to investigate the links between financial dollarization and inflation targeting regime, these countries are grouped under different levels of financial dollarization and panel data techniques are employed.

In the empirical analysis, we basically centered on three aspects of the implications of financial dollarization on the regime. All three aspects, in fact, are grounded on the basic argument that monetary authorities might consider financial dollarization when implementing the regime because of its devastating effects on the economy. Therefore, in line with this argument, the first aspect stems from the question whether the monetary policy rule is affected by financial dollarization. In order to find out an answer to the question, the empirical analysis investigates the monetary policy rule in inflation targeting countries with different levels of financial dollarization. Additionally, the empirical investigation includes several other variables (Δreer, FF and VIX), which can be thought as helpful in explaining the behavior of interest rate. The findings of this empirical analysis support the conventional view that the monetary policy rule is affected by the inflation rate gap regardless of the degree of financial dollarization. However, output gap is found to be a significant determinant of the behavior of monetary policy rule only in highly and severely dollarized economies. Another result deserves to be emphasizing is that while the coefficients associated with the real effective exchange rate are found to be

statistically significant in the highly and severely financially dollarized economies, they are found to be insignificant in moderately and no/low dollarized economies. Moreover, Federal Fund Rate, a proxy for the foreign interest rates, is found to be statistically significant in all countries. Besides, VIX is found to be significant only in the highly and severely dollarized countries, indicating that monetary policy is affected by global liquidity conditions. Consequently, the empirical findings provide an evidence to support the view that monetary authorities have taken financial dollarization into consideration when implementing the regime.

The second aspect is originated by the claim argued by Calvo (2006) that accumulating international reserves is a convenient way to reduce the vulnerabilities of financial dollarization. Therefore, the study has also attempted to explain the behavior of accumulating international reserves through the level of financial dollarization. The empirical findings reveal that the behavior of holding reserves is significantly different in moderately dollarized, highly dollarized and severely dollarized countries than that of no/low dollarized countries. Thus, the results lend a strong support to the argument that level of financial dollarization has an implication for accumulation of international reserves.

Last but not least, the study investigated the inflation targeting performance according to different levels of financial dollarization. Interestingly, it is found out that the degree of financial dollarization does not seem to affect the inflation targeting performance.

To conclude, the empirical results have addressed the implications of financial dollarization for the inflation targeting regime. The main finding of the paper is that monetary authorities take financial dollarization into account when they implement the regime. In that regard, monetary policy rule as well as behavior of accumulating international reserves are affected by the degree of financial

dollarization. The vital point deserving attention is that inflation targeting performance is not affected by the level of financial dollarization. Consequently, the empirical results of this analysis suggest that even if different levels of financial dollarization do not affect the inflation targeting performance, it does affect the monetary policy rule and the variables to be taken into account to reach the target.

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