

**IMPACT OF DOLLARIZATION ON EXCHANGE RATE:
THE TURKISH CASE BETWEEN 1990 AND 2004**

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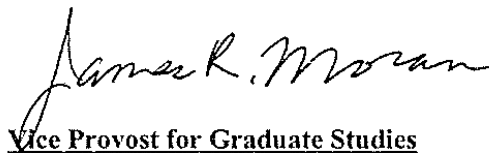
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CHAPTER 1

INTRODUCTION

Money is expected to have three main, classical roles or functions. These functions are being unit of account, means of payment and store of value. These roles of money are partially or completely related with the stability of the purchasing power of the money (inflation) used in the economy. In general, dollarization occurs because domestic currency does not fulfill the functions of money completely.

Dollarization has existed in many countries for years. Most of the literature is concerned with currency substitution, the use of foreign currency as a means of payment or unit of account, rather than asset substitution, the use of foreign currency instruments for investment purposes. Moreover, under strict rules for banking system for having foreign currency open positions, there is a strong relationship between asset substitution and liability dollarization, from asset substitution to liability dollarization. Since the reason behind asset and currency substitution is mainly inflation, controlling inflation will probably decrease dollarization. However, while substantial progress has been achieved during the last decade in controlling inflation throughout the world, dollarization remains a common feature of developing economies. Thus, not only inflation but also the foreign exchange rate regime may be important.

The aim of this paper is to model the empirical relationship between the foreign exchange rate and dollarization. Dollarization is expected to affect

the exchange rate since it reflects the demand for foreign currency. Consistent with the expectation, the estimation results show that a rise in dollarization causes depreciation of the domestic currency by increasing the demand for foreign currency and vice versa. Since dollarization makes conducting foreign exchange rate policy more complex by changing the demand for foreign currency, it should be reduced.

This study is organized as follows. Section 2 presents the concept of dollarization and theories of exchange rate. Section 3 presents financial reform, dollarization and some historical facts about Turkey. Section 4 presents the model, data and results of empirical study and finally section 5 presents conclusion.

I would like to note that although there are lots of studies about dollarization, in this study, I, especially, paid great attention to Yeyati's papers.

CHAPTER 2

DOLLARIZATION AND THEORIES OF EXCHANGE RATE

2.1 DOLLARIZATION

Dollarization can essentially be divided into two types: full dollarization and partial dollarization. Full dollarization occurs when a government adopts foreign currency as the predominant or exclusive legal tender. According to Yeyati and Sturzeneger (2003), full dollarization leads to the elimination of exchange rate risk, lower inflation, lower interest rate, the elimination of transaction costs, an increase in trade and thus a closer integration with global economies. On the contrary, countries which accept full dollarization quit their monetary independence. The largest independent country that currently has full dollarization is Panama.

Partial dollarization occurs when economic agents (including the government) hold a fraction of their portfolio (inclusive of money balances) in foreign currency assets and/or when the private and the public sector have assets or liabilities denominated in foreign currency. Unlike full dollarization, partial dollarization has no advantage except, according to Rennhack and Nozaki (2006), discouraging capital flight and encouraging residents to keep their savings in the domestic financial system.

Basically, partial dollarization can be divided into four categories: currency substitution, asset substitution, liability dollarization and financial dollarization.

According to Feige (2003), when firms and individuals voluntarily substitute foreign currency for domestic currency as a means of payment, it is called currency substitution. It is based on inflation differential that penalizes domestic currency holdings because of high inflation in domestic country. Guidotti and Rodriguez (1991) state that in case of currency substitution, it is the good money that drives out the bad money contrary to Gresham's Law.

Similarly, Yeyati and Sturzenegger (2003) regarded currency substitution as a function of expected returns of holding different currencies instead of the expected returns of interest bearing assets denominated in those currencies. If inflation can be controlled, so can currency substitution. According to this approach, the reason behind currency substitution is high and volatile inflation.

On the contrary, this presumption has been repeatedly at odds with the empirical evidence. Although stable inflation rates and macroeconomic environment have been achieved by the countries which have experienced high inflation such as Argentina, Bolivia and Peru, partial dollarization is still high. This is explained by dollarization hysteresis. Oomes (2003) defines dollarization hysteresis as the phenomenon that occurs when partial dollarization increases with exchange rate depreciation or inflation, but does not decrease with subsequent reductions in these variables. Similarly, for Honohan and Shi (2001), once depositors become used to holding foreign currency denominated deposits, they are slow to divest themselves of them even if the initial cause that triggered the holdings is reversed. This persistence

can be attributed to long lasting memories of past inflation that induce high inflation expectations even after years of price stability.

For Yeyati (2005), currency substitution stresses the negative connection between the demand for domestic currency (and its transactions motive) and the rate of inflation (or alternatively the memory of past inflation). Since a long period of high inflation and depreciation is needed to switch to stable foreign currency in an economy, similarly, a long period of low inflation and appreciation is needed to reverse the dollarization process.

Countries which have experienced bank failures like Turkey are likely to have currency substitution extensively. Because of lack of trust of economic agents' in the financial system, instead of depositing foreign currency in financial institutions, individuals and even firms tend to hold foreign currency under mattress or in their safe with gold either for store of value or for means of payment motives. Also, foreign currency is used as a unit of account in Turkey. Therefore, it is difficult to distinguish the motive behind holding foreign currency in the form of cash. Turkish experience indicates that it might be both since foreign currency shares the same role with gold. Still, economic agents in Turkey keep a fraction of their wealth in gold along with foreign currency.

For Feige (2003), when firms and individuals voluntarily choose to hold foreign rather than domestic denominated monetary assets as stores of value, it is called asset substitution. Not only expected real returns of interest bearing assets denominated in foreign currency but also expected nominal returns of holding foreign currency play important roles in determining asset

dollarization. When economic agents expect depreciation of the domestic currency, they tend to hold foreign currency or they increase their foreign cash holdings. Moreover, if the financial system allows holding foreign currency denominated assets, then they invest in them to take advantage of both expected depreciation of domestic currency and interest on foreign currency denominated assets. Although there are other alternatives, the most widely used foreign currency denominated asset is foreign currency deposits since it is so simple and easy for investors. Other alternatives are more complex than foreign currency deposits, since investors have to know some financial terminology like yield to maturity, compound interest etc.

When all the economic agents including the banking sector, treasury and firms have liabilities in foreign currency, this is called liability dollarization. When economic agents have liabilities in foreign currency and if they do not have foreign currency earnings, it is obvious that they are all exposed to foreign exchange risk or currency mismatch which increases the vulnerability of the country for exchange rate movements. As Eichengreen and Hausmann (1999) point out, virtually all non OECD countries can not borrow abroad in their own currency: part of a pervasive developing country problem of mismatched balanced sheets they call "original sin". Since most of the developing countries can only borrow in foreign currency from abroad instead of their domestic currencies, it causes a currency mismatch beginning with treasury because treasuries have permanent income stream in domestic currency in the form of taxes. Thus, a sharp depreciation of domestic currency

may result in a default of the country if the treasury is indebted heavily in foreign currency.

Financial dollarization refers to both asset substitution and liability dollarization. It is the situation where almost all the agents in an economy have both assets and liabilities on their balance sheets in foreign currency extensively.

According to Armas and Webb (2003), the first phase of partial dollarization is asset dollarization. As inflation increases and as it becomes unstable, partial dollarization takes the form of currency substitution. Economic agents tend to protect their purchasing power by converting domestic currency to foreign currency when inflation is both high and unpredictable.

Actually, partial dollarization implies either currency substitution or asset substitution or liability dollarization or financial dollarization or all of them at a time. Nearly all developing countries including Turkey suffer from partial dollarization which includes all forms of partial dollarization. For the rest of the study, when the word "dollarization" is referred, it should be understood as partial dollarization, which includes the four forms of it.

Under strict rules for the banking system for having foreign currency open positions, there is a strong relationship between asset substitution and liability dollarization. When banks accept foreign currency deposits or any form of foreign currency liability in their balance sheets, they have to create foreign currency assets. For banks, it is not only an enforcement of law but a way to hedge them against currency mismatch. Although from time to time, it

is more profitable to have foreign currency open positions, it is generally prohibited in developing countries because of its adverse effect on potential financial crises. Under these rules, banks will either lend in foreign currency or they can possess foreign currency denominated financial assets to cover their foreign exchange risk.

If economic agents who borrow from banks do not have a foreign currency income stream, then banks are exposed to foreign exchange risk. Banks' risks may look matched on their balance sheets because balance sheets do not give detailed information about each and every borrower. Banks should investigate their customers very carefully in order not to be exposed to foreign exchange risk. Table 1, 2 and 3 show the relationship among depositors, banks and firms. If economic agents can not pay their foreign currency debts due to devaluation, it is going to create a domino effect on the economy even if banks' balance sheets seem to be safe against foreign exchange movements. It is crucial that foreign currency debts should be borrowed by the ones who have foreign currency earnings. Generally, banks are reluctant to investigate if customers have foreign currency earnings or not even if they lend in foreign currency. Thus, when the banking supervision unit checks banks' balance sheets for currency mismatch, foreign exchange risk can be seen as matched. Moreover, it is difficult for banking supervision to investigate the details of every credit. At this point, the real sector's foreign currency open position is essential.

It can be argued that real sector agents that borrow in foreign currency can pay back their foreign currency loans if there is sufficient demand for the

goods they produce. However, a sharp depreciation of domestic currency is associated with a sharp contraction of aggregate demand. This means that a hypothetical firm that is indebted in foreign currency should both deal with the depreciation of domestic currency and falling demand. If the real sector can not fulfill its obligation to banks because of depreciation of the domestic currency, although banks' balance sheets seem to be hedged, it will hurt both the financial system and the real sector in the long run. It is because of this reason that monetary authorities are interested in real sector's foreign currency open positions and they warn them about risks related with currency mismatch on their balance sheets.

Consequently, inflation causes both currency substitution and asset dollarization where asset dollarization leads to liability dollarization and liability dollarization may cause currency mismatch or foreign exchange rate risk even if banks' balance sheets seem to be hedged against currency mismatch or foreign exchange risk under the assumption that the real sector is indebted heavily in foreign currency.

As explained above, there is a close relationship between asset substitution and liability dollarization and the causality is generally from asset dollarization to liability dollarization. Yeyati and Sturzeneger (2003) claim that countries which allow foreign currency deposits in their financial system will create dollarization. It is natural that foreign currency deposits will lead to foreign currency credits. Similarly, De Nicolo, Honohan and Izc (2003) find that a 10 percent increase in foreign currency deposits causes a 7.5 percent increase in foreign currency loans. The rest, 2.5 percent, are invested in

foreign currency denominated financial assets. When economic agents begin to hold assets in foreign currency, this causes the financial system to be dollarized by supporting foreign currency credits.

Since dollarization has various definitions, there are different ways of determining dollarization empirically in an economy. The ratio of the sum of bank deposits in foreign currency as a share of broad money; total external debt as a share of GNP; domestic government debt denominated in or linked to foreign currency as a share of total government debt; the ratio of the sum of the assets held by residents in foreign currency as a share of total assets held by residents; the ratio of foreign currency deposits to the sum of total deposits; and the ratio of the amount of foreign currency in circulation to the amount of domestic currency in circulation are the main indicators of dollarization in an economy.

However, collecting some of these data is either impossible or unreliable as in the case of the amount of foreign currency in circulation. For instance, for Calvo and Vegh (1992), there are usually no data available on foreign currency circulating in an economy and therefore the importance of currency substitution is basically unobservable. Thus, either the ratio of the sum of bank deposits in foreign currency as a share of broad money or the ratio of foreign currency deposits to the sum of total deposits is regarded as the indicator of dollarization for a country in economic literature. In this study, the ratio of foreign currency deposits to the sum of total deposits is used as a proxy for dollarization in Turkey.

On the other hand, although not very reliable, there are studies that try to estimate actual amount of foreign currency in a country. Oomes (2003) estimates actual foreign cash in circulation or currency substitution in Russia by using Currency and Monetary Instrument Reports collected by the U.S. Customs Service. By using the same technique, Fiege (2003) predicts actual foreign currency for transition countries.

If we look for the reasons of dollarization, it is obvious that the main driving force of this situation is the on going instability of the economy. Economic agents do not want to hold domestic currency if it does not fulfill three main roles (unit of account, means of exchange, store of value) of a stable currency. Dollarization is in large part a response to currency instability. According to Fiege (2003), dollarization is a rational response of economic agents due to a loss of confidence in domestic currency resulting from inflation, devaluation, currency confiscation and underground economic activities.

According to Ize and Yeyati (1998), dollarization is a function of the volatility of the real exchange rate and the volatility of inflation. Stable inflation and a fluctuating real exchange rate should be associated with low dollarization. Especially, the combination of inflation targeting (as long as it reduces inflation volatility) and a floating exchange rate regime (as long as it increases real exchange rate volatility) should encourage the use of domestic currency and discourage that of foreign currency. This approach is called the portfolio view since holding foreign currency is regarded as a way of diversifying the portfolios of economic agents. The portfolio view is based on

the relative risk of holding or investing in domestic currency and foreign currency. Domestic price inflation is a risk of holding domestic currency denominated assets or domestic currency itself. Exchange rate risk, which is the risk of appreciation or depreciation of domestic currency, is a risk of holding foreign currency denominated assets or foreign currency itself. Such a policy mixture increases the risk of keeping and/or investing in foreign currency and decreases the risk of keeping and/or investing in domestic currency and so helps to reduce dollarization in a country. Neumann and Von Hagen (2002) conclude that inflation targeting has proved to be an effective strategy against inflation in their paper that covers 9 countries between 1978 and 2001. They find that whenever inflation targeting is adapted, countries experience low inflation along with reduced volatility of inflation and interest rates.

To achieve the goal of low dollarization, the pass through effect which is mainly the effect of depreciation of domestic currency on inflation should be moderate. Similarly, Yeyati and Sturzeneger (2003) think that dollarized countries with an inflation target can not stand wide exchange rate fluctuations since it is going to harm their inflation target. In these economies where the pass through effect is high, depreciation of the domestic currency will quickly increase the inflation rate. If the pass through effect is high, the scope for increasing the volatility of the real exchange rate while preserving price stability will be limited.

A stabilization policy that reduces inflation volatility, through lower inflation, may fail to reverse dollarization if it is accompanied by a stable real

exchange rate (as may be the case, for example, of a crawling peg that implicitly targets the real exchange rate). So, dollarization can be reduced by increasing the flexibility of the exchange rate regime. This can be another explanation for dollarization hysteresis in developing countries since they generally conduct foreign currency based stabilization policies.

Economic agents tend to hold foreign currency when there is an implicit or explicit guarantee on foreign currency in the system. For instance, if a crawling peg exchange rate regime (explicit guarantee) is conducted by the central bank, it is likely that dollarization will increase, because the volatility of the exchange rate will decrease. By holding foreign currency denominated assets including cash, economic agents at least protect their portfolio from unexpected inflation and they will profit from any devaluation. According to Eichengreen and Hausmann (1999), pegged exchange rates create a moral hazard problem by implicitly guaranteeing the level of the exchange rate in the future for the ones who borrow in foreign currency. However, when there is no commitment by the central bank on the exchange rate, like in a floating exchange rate regime, dollarization is expected to lower gradually. Conducting such a flexible exchange rate regime allows both real and nominal exchange rate to oscillate, which causes either depreciation or appreciation of the domestic currency. In such a case, economic agents are exposed to exchange rate risk to which they have not been exposed before. Similarly, moral hazard can be regarded as another issue and can be an explanation for dollarization as well when borrowers in foreign currency tend to default in case of depreciation of the domestic currency. Broda and Yeyati (2003) claim that

equal deposit insurance requirements for all domestic and foreign currency exacerbates or increases dollarization by limiting the risk of lending for banks. Since the source of financial risk for banks is essentially foreign currency deposits, equal treatment to domestic and foreign currency deposits is not a consistent policy. Deposit insurance, by increasing the cost of foreign currency deposits relative to domestic currency, may help to reduce dollarization.

To change the portfolio choice of economic agents who get used to receiving high return in the long run on foreign currency either in the form of deposit or cash is difficult. It is a kind of historical addiction to foreign currency which takes time to heal for highly dollarized countries. In order to decrease dollarization, the risk of holding foreign currency should be increased by decreasing the commitment on exchange rates where the risk of holding or investing in domestic currency should be decreased by keeping low inflation levels. Only under these circumstances will economic agents comprehend that by holding foreign currency they take risk. They can make loss and there will be no bail out (implicit guarantee) in the system. Moreover, reliable and stable inflation will offer convincing and unbiased real interest rate for economic agents who will change their portfolio decisions in favor of domestic currency.

Rennhack and Nozaki (2006) find results in favor of the portfolio approach in their study of 62 countries. According to their paper, a 10 percent increase in portfolio variable, which rises as domestic inflation become more variable relative to the real exchange rate, causes a 6 percent increase in dollarization. They also find results that inflation increases dollarization.

For Domac (2002), the reasons behind dollarization are high and volatile rates of inflation, depreciating domestic currency, unsuccessful stabilization efforts and financial crises. According to an IMF Board Paper (2003), domestic borrowers and lenders prefer to denominate contracts in foreign currency when the latter is expected to provide a more stable (hence less risky) medium for intermediation. Especially with the deterioration of the store of value role of money because of high inflation, economic agents tend to hold foreign currency for saving motive.

According to Rennhack and Nozaki (2006), weak institutions undermine the credibility of economic policies and it is because of this reason that economic agents have the expectation that the government in a dollarized country will erode the value of financial assets by creating unexpected inflation. In addition to that, De la Torre and Scmulker (2004) state that weak institutions raise doubts about the enforceability of contracts. An independent central bank which focuses on inflation and takes any measure that is needed to achieve low levels of inflation will not surprise economic agents. In other words, it will allow less unexpected inflation compared with the situation where central bank is dominated by politicians. Therefore, an independent central bank concentrating on inflation may be helpful to lower dollarization.

Yeyati (2005) finds empirical evidence in favor of the portfolio view and the results are consistent with the view that poor institutional quality fosters dollarization. Similarly, Rennhack and Nozaki (2006) find results in favor of institutional quality decreasing dollarization in their paper which includes OECD countries as well. Indicators of quality of institutions have

been developed by the World Bank starting from 1996 including measures of political stability, government effectiveness, regulatory quality, rule of law and control of corruption, voice and accountability. They claim that significant gains in institutional quality are required to bolster confidence and discourage dollarization.

Since developed countries have institutional and political stability in almost every aspect and radical institutional changes are not common, dollarization is mainly the undeveloped countries' problem.

For Domac and Oskoev (2002), one of the reasons behind dollarization is undeveloped capital markets. When there are not enough financial instruments to protect wealth from inflation, dollarization rises.

Guidotti and Rodriguez (1991) think that it is financial liberalization, lifting of restrictions on financial activities that generate a process of dollarization even if the inflation is not high. Cetin (2004) concludes that the establishment of financial liberalization before reaching low levels of inflation supported high levels of dollarization in Turkey. It can be claimed that globalization with the help recent technological innovations increases the severity of dollarization in developing countries. Banning dollarization in the financial system may seem to be an option to get rid of dollarization, however, it has a potential danger of switching all these financial activities underground and causing shrinkage of financial sector.

Dollarization has some adverse effects on the economy by affecting money demand and inflation, financial crises, monetary policy, seignorage and economic growth.

The long run goal of monetary policy is to achieve price level stability. In order to achieve this purpose, the nominal money supply has to increase by as much as the growth in the demand for real money balances. If money demand is volatile and difficult to predict, then there will be divergence from price level stability.

A simple real money demand can be shown as follows:

$$\ln(M/P)_t = \beta_0 + \beta_1 \ln(y)_t - \beta_2 R_t \quad (1)$$

where β_0 , β_1 and β_2 are positive constants. As it is shown in equation (1), there is a positive relationship between real money demand (M/P) and real gross domestic product (y); however, the relationship between real money demand and the interest rate (R) is negative.

If there is dollarization in an economy and residents demand both domestic and foreign currencies, then the domestic demand for money may be destabilized. In this case, the real money demand function becomes:

$$\ln(M/P)_t = \beta_0 + \beta_1 \ln(y)_t - \beta_2 R_t - \beta_3 E_{t+1} \quad (2)$$

where β_0 , β_1 , β_2 and β_3 are positive constants. As it is shown in equation (2), there is a negative relationship between real money demand and expected rate of depreciation (E). If currency substitution exists, domestic money demand becomes more sensitive to both domestic and foreign influences. Therefore, money demand becomes more volatile with dollarization.

Oomes and Ohnsorge (2005) find that money demand in Russia is highly unstable because of dollarization dynamics. All measures of money demand that exclude foreign currency in circulation are strongly negatively dependent on the nominal depreciation of domestic currency, suggesting that

foreign currency is a substitute for domestic currency in Russia. Moreover, money demand is more stable when foreign cash holdings are taken into account. Inflation does not respond to a measure of excess money supply which does not include foreign cash holdings. However, the part of effective broad money supply, which includes foreign currency that exceeds money demand, accelerates inflation.

If we can conclude that the primary concern or objective for central banks is reaching and keeping price stability then it is clear that dollarization is a serious problem for the economy. A dollarized economy creates more inflation because the pass through effect from exchange rate to prices is high. Some of the prices in the economy (such as rents, sometimes salaries, some big transactions etc.) are directly determined by foreign currency. Besides, expectations of the economic agents are shaped by the level of foreign exchange rates. According to Honohan and Shi (2001), there is a strong positive correlation between the degree of dollarization and speed of pass through from exchange rates to consumer prices. An increase of 10 percent in dollarization increases estimated pass through by 6 percent. Dollarization has typically occurred in response to high inflation and a rapidly depreciating exchange rate. According to Yeyati (1998), dollarization, by reducing the costs of switching to the foreign currency to avoid the effects of inflation, may increase the volatility of money demand which undermines the conduct of monetary policy for central bank. Although this concern is mainly related with currency substitution, a similar argument can be made for asset dollarization as well. When the switch from domestic currency assets to foreign currency

assets is less costly, then the demand for domestic money will be more sensitive to a change in the exchange rate. Not surprisingly, Yeyati (1998) finds that dollarization is associated with greater sensitivity of inflation to changes in the monetary aggregate. Moreover, as dollarization increases, the elasticity of inflation with respect to changes in broad money rises significantly. However, the result does not imply that monetary policy is less effective under high dollarization because it probably is covering the inverse direction of causality from high and unstable inflation to dollarization or even it can be that an expansionary monetary policy can cause both high inflation and high dollarization, but it is obvious that dollarized economies display higher inflation rates on average independently of the path followed by monetary aggregates. Such a result indicates that countries which are highly dollarized are expected to have higher inflation rate more than the others, although they conduct similar monetary policies. Inflation is higher in dollarized economies, even after controlling for the rate of broad money growth. For Feige (2003), when dollarization is widespread, because of public's propensity to substitute foreign currency for domestic currency, it is difficult to control the money supply.

It is generally argued that highly dollarized economies are vulnerable to self fulfilling currency and therefore banking crises. If banks are allowed to hold open positions in foreign currency, a sudden devaluation can devastate banks' balance sheets because of liability and asset inconsistency or currency mismatch mentioned above. Even in a situation where there are certain prudential limits which banks can not exceed, foreign currency credits may

become unrecoverable and force banks into bankruptcy if foreign currency indebted firms' earnings are in domestic currency. Meanwhile, depositors are aware of these problems and if devaluation expectations increase, their incentive to withdraw their deposit will increase which in turn results in an increase in the demand for foreign currency, feeding back into devaluation expectations. An increase in dollarization either because of a rise in foreign currency deposits, asset dollarization, or because of a change in money demand, currency substitution, in favor of foreign currency can cause the depreciation of domestic currency.

There is a strong correlation between the level of dollarized balance sheets of the firms including banks and the devastation effect of financial crises because dollarization creates imbalances between assets and liabilities. De Nicolo, Honohan and Ize (2003) find that a dollarized banking sector is associated with higher insolvency risk and higher deposit volatility. For Mishkin (1996), unhedged foreign currency denominated liabilities are a major source of vulnerability for both firms and banks because large depreciations can lead to significant reductions in net worth. According to Calvo and Reinhart (2002), this process can lead to sharp contractions in output and is one of the reasons why many emerging countries exhibit a fear of floating of domestic currency. The first reason behind fear of floating in developing countries is that depreciation of the domestic currency is quickly transmitted into inflation. The second one is foreign currency denominated debts of households and firms in the economy or dollarization. As a consequence, governments in developing countries are afraid of depreciation

of the domestic currency or devaluation because it can trigger a financial turmoil and result in a general collapse.

Similarly, Rennhack and Nozaki (2006) state that banks in highly dollarized countries tend to lend in foreign currency to borrowers with little or no foreign currency earnings. This could weaken the balance sheets by creating a currency mismatch. Banks can suffer in case of a sharp depreciation which will increase the costs of servicing for borrowers without necessarily increasing their income. In such case, financial crises can deepen, as happened in Argentina in 2001 and in Uruguay in 2002.

Dollarization makes monetary policy more complex and less effective. Since the monetary authority can only dominate or control either to some extent the amount of domestic currency (monetary base) or the price of the domestic currency (short term interest rates) in a financially liberalized economy where capital is mobile, its power on foreign currency is limited by its international reserves. Dollarization makes money demand more volatile and so difficult to estimate for central banks. Domac and Oakoee (2002) claim that shocks to dollarization lead to a decline in the monetary base as the public switches from domestic to foreign money holdings.

For Yildirim (2003), when there is dollarization in any economy, monetary policy will be affected by foreign economic variables. Dollarization can lead to the loss of monetary independence and instabilities in domestic money demand. Under these conditions, domestic economy may no longer have monetary autonomy even under flexible exchange rates, since residents demand both domestic and foreign currencies. Thus, it is advised to give up

monetary autonomy and pursue a joint monetary policy targeting an area wide monetary aggregate such as in the European Union.

According to Batten and Hafer (1984), under the assumption of no currency substitution with flexible exchange rates, the monetary authority can increase the domestic money supply and allow domestic currency to depreciate. Therefore, at least theoretically, the monetary authority can conduct any domestic monetary policy it wishes as long as it permits the exchange rate to move. This system provides an environment in which monetary disturbances need not be transmitted from one economy to the other as long as the exchange rate moves up and down freely. However, under the assumption of currency substitution with flexible exchange rates, the monetary authority is not free to follow any monetary policy it desires even if it allows exchange rates to fluctuate freely. When the monetary authority increases domestic money supply, assuming that other countries keep their money supply constant, then economic agents will expect depreciation of the domestic currency. Since the central bank does not intervene, expected depreciation increases the opportunity cost of holding domestic currency relative to another country's currency. Consequently, residents of both countries will hold less currency of the country when depreciation is expected because of increasing money supply. Thus, a change in monetary policy of a country will affect domestic and foreign demand for money even if it is under flexible exchange rate. If a dollarized country does not consider the effect of money demand changes, it may lead to inappropriate policy actions.

Perhaps the best known theoretical result concerning the effects of dollarization is the loss of seigniorage, the profit of printing money, brought about by the lower demand for domestic currency at any given rate of inflation. A dollarized country loses seigniorage because economic agents hold a fraction of their assets in foreign currency. If there had been no dollarization, depending on the level of dollarization in the economy, seigniorage would have been higher since demand for domestic currency would have risen. According to Fiege (2003), dollarization causes a loss of seigniorage, thwarts the monetary authority from pursuing inflationary finance and inhibits its effectiveness in controlling exchange rates. For Oomes (2003), there are many costs associated with high dollarization including the loss of seigniorage revenue.

Although it is not generally mentioned in the economic literature, it is likely that dollarization causes lower growth in the long run. Since, high dollarization increases the devastating possibility of financial crises, it is expected that the higher the dollarization, the lower the growth rate. Moreover, it is possible that it increases the output volatility. According to Yeyati (2005), dollarized economies grow, on average, 1 percent less than non dollarized economies. Dollarization worsens the capacity of an economy to use the real exchange rate as a buffer against real shocks if pass through effect is high. If a change in nominal exchange rate leads to an equivalent change in inflation, these two effects cancel out each other leaving the real exchange rate constant since the real exchange rate is equal to the nominal exchange rate times the domestic price level over foreign price level. Due to dollarized economies'

sensitivity to currency fluctuations, capital flight and banking crises, they are more likely to exhibit greater cyclical volatility. The results indicate that dollarization has a negative impact on growth performance and output volatility. For a dollarized developing economy, the growth path is likely to be slower and more hectic than the rest.

According to an IMF Board Paper (2003a), with regard to the primary goal of monetary policy, the evidence shows that the average inflation rate is higher and more volatile in countries with a high degree of dollarization than in countries where the degree of dollarization is low or moderate, however the relationship between dollarization and growth is not as strong as it is in inflation case.

2.2 THEORIES OF EXCHANGE RATE

Since this study aims at finding the effects of dollarization on exchange rate, it is important to find out the potential determinants of exchange rate by going through theories of exchange rate.

2.2.1 PURCHASING POWER PARITY (PPP) THEORY

According to Gandolfo (2001), the oldest theory of exchange rate determination is the Purchasing Power Parity Theory (PPP). PPP is the theory that describes the relationship between prices and exchange rates. In its simplest and most strict form, known as absolute PPP, it can be written as $S = P/P^*$ where P and P^* denote domestic and foreign prices respectively and S is the exchange rate measured as the domestic currency price of one unit of the foreign currency. As a result of this equation when domestic prices rises

relative to foreign prices, the domestic currency will depreciate or S will rise and vice versa.

For Rosenberg (2003), absolute PPP is built on the notion of arbitrage across all tradable goods and services. This theory, the law of one price, generally does not hold, especially in the short term, because not all the goods are tradable internationally and the real exchange rate can vary if there are shifts in preferences for domestic or foreign goods. Moreover, trade barriers are an obstacle for PPP to hold. Hubbard (2005) states that if the inflation rate does not change, these factors can also explain shifts in the nominal exchange rate. There exists a huge volume of empirical work on whether or not PPP represents a valid tool for forecasting exchange rates. For Rosenberg (2003), the weight of evidence suggests that although there are often significant and persistent departures from PPP in both the short and medium term, exchange rates do exhibit a tendency toward their PPP values in the long run. This theory can be represented as follows:

$$s_t = \beta_0 + \beta_1 (p_t - p_t^*) \quad (3)$$

where β_0 and β_1 are positive constants.

In equation (3), which is a logarithmic function, s_t stands for exchange rate and p_t (p_t^*) represents the domestic (foreign) inflation rate. According to equation (3), the foreign exchange rate is a function of relative inflation rates between countries and differences in inflation rates will be reflected in foreign exchange rate as depreciation or appreciation.

2.2.2 VARIATIONS OF PPP THEORY

There are some theories that explain exchange rates by modifying PPP. One of them is the flow model of exchange rate which mainly says that exchange rate is determined by trade and capital flows as recorded on the balance of payments (BOP). According to Moosa (2000), in fact, this model views BOP and the foreign exchange market to be related to the extent that a balance of payments deficit is a reflection of excess demand for the foreign currency while a surplus reflects excess supply. Literally, there is no such thing as a deficit or a surplus of balance of payments, because balance of payments is always in balance. Therefore, we should look for a current account deficit or surplus. Changes in the capital account or reserves would outweigh the current account deficit or surplus. The exchange rate in this model is determined by supply and demand where supply and demand are affected by relative income levels, relative price levels and interest rate differential. This model can be shown as follows:

$$s_t = \beta_0(y_t - y_t^*) + \beta_1(p_t - p_t^*) - \beta_2(i_t - i_t^*) \quad (4)$$

where β_0 , β_1 and β_2 are all positive constants.

In equation (4), s_t stands for exchange rate, y_t (y_t^*) represents domestic (foreign) income, p_t (p_t^*) represents domestic (foreign) inflation rate and i_t (i_t^*) represents domestic (foreign) interest rate. According to equation (4), the foreign exchange rate is a function of relative gross domestic product, inflation and interest rate differentials between countries. These differences in gross domestic product, inflation and interest rates will be reflected in foreign

exchange rate in the form of depreciation or appreciation of the domestic currency.

The predictions of this model on income, inflation and interest rates are important. If domestic income (y_t) grows faster than foreign income (y_t^*), imports will grow faster than exports. The resulting deterioration in BOP will lead to domestic currency depreciation (higher s). In addition to that, if the domestic price level (p_t) rises faster than the foreign price level (p_t^*), domestic goods will be less attractive than foreign goods. Exports will decrease while imports will increase. The resulting deterioration in BOP will lead to domestic currency depreciation (higher s). On the other hand, if the interest differential rises, either because of a rise in domestic interest rate (i_t) or a fall in foreign interest rate (i_t^*), domestic financial assets become more attractive than foreign financial assets. According to Moosa (2000), the resulting capital inflows will result in an improvement in BOP and domestic currency appreciation (lower s). For Rosenberg (2003), the decline of the dollar in the late 1970s and the rise of the dollar in the first half of 1980s can be attributed to changes in U.S./German real long term yield spread.

The reason behind this situation is the assumption of validity of uncovered interest parity. Uncovered interest parity assumes that the higher the interest rate, the more overvalued a currency is. However, because of default risk in countries like Turkey, interest rates tend to move with the foreign exchange rate and it is because of this reason that short term interest rates might not be as powerful as it is assumed to control the value of domestic currency. As Blanchard (2004) argues, if the probability of default is high with

concerns about debt sustainability, then the uncovered interest parity condition may not work. Increases in interest rates may be regarded as an increase of country risk or risk premium and instead of causing appreciation, it may lead to depreciation of the domestic currency. Therefore, a rise (decline) in short term interest rates does not necessarily cause appreciation (depreciation) of the domestic currency. Increasing the short term interest rates by the central bank in order to appreciate the domestic currency in an environment where risk premium is rising can cause depreciation of the domestic currency instead of appreciation.

In addition to that, capital inflows or outflows, foreign direct investment and portfolio investment can affect exchange rate as well. According to Rosenberg (2003), a report recently published by the IMF tells that net equities flow under capital account and long term interest differential do matter for euro-dollar exchange rate. However, if current account deficit is financed by short term portfolio investment, it may be dangerous for developing countries. A relative increase of interest rates in favor of developed countries generally creates a safe haven for portfolio investment, and short term capital leaves these countries, leaving financial crises behind them.

Another modified model of PPP that explains the exchange rate is the monetary model, which is essentially an asset model. According to Moosa (2000), in essence, this model tells us that since the exchange rate is the price of one money in terms of another, it must be determined by the relative supplies and demands of the two monies. This theory assumes that PPP

(appendix 1) holds continuously which means it is valid in both the long and short term. By including interest rate in the model, it follows:

$$s_t = (m_t - m_t^*) - \beta_1(y_t - y_t^*) + \beta_2(i_t - i_t^*) \quad (5)$$

where β_1 and β_2 are positive constants and lower case letters denote the natural logarithms of the underlying variables except for interest rates.

The predictions of this model regarding money supply, income and interest rates are also important. If domestic money supply (m) rises relative to foreign money supply (m^*), it will lead to depreciation of the domestic currency (higher s), so there is a positive relationship between depreciation of the domestic currency and money supply. The higher the money supply, the higher the depreciation. The rationale behind this situation is probably inflation. Higher money supply will eventually result in high inflation. Under the validity of PPP, exchange rate will reflect the changes in inflation rates. In addition to that, if domestic income (y_t) grows faster than foreign income (y_t^*), it will lead to appreciation (lower s) of the domestic currency, so there is a negative relationship between depreciation of the domestic currency and domestic income. The higher the domestic growth, the higher the appreciation of the domestic currency is. When a country is in recession, its currency depreciates as a general rule because economic recession is regarded as a sign of economic weakness. In addition to that, increasing income will increase money demand that will lead to a fall in aggregate demand. Falling demand will decrease current account deficit and the result will be appreciation. This model implies that a rise in the domestic interest rate (i_t) relative to the foreign interest rate (i_t^*) causes depreciation (higher s) of the domestic currency, so

there is a positive relationship between depreciation of the domestic currency and interest rate. The higher the domestic interest rate, the higher the depreciation. The reason behind this situation is that: interest rate differential reflects expected inflation; therefore, a rise in interest rate differential is regarded as a rise of inflation expectations which eventually increases actual inflation.

It is obvious that the results of the flow model and monetary models of exchange rate are totally different. The predictions of the monetary model about the effect of income and interest rate are exactly the opposite to the predictions of the flow model. In flow model higher domestic growth and lower domestic interest rate are associated with depreciation whereas in monetary model higher growth and lower domestic interest rate are associated with appreciation of the domestic currency.

Another modification of PPP is the Hooper Morton model which argues that the most serious deficiency of the monetary model is that it overlooks the role of current account in the exchange rate determination process. Thus, the current account is introduced as a new explanatory variable. The cumulative current account, however, does not influence the exchange rate directly but only indirectly through its effect on exchange rate expectation. This implies that changes in the current account position give rise to changes in the market expectation of the long run real exchange rate, which in turn give rise to expected changes in the nominal exchange rate. If there is a rise in the cumulative current account surplus, an upward adjustment in the real (and hence in the nominal) value of the currency will be required. For

Rosenberg (2003), exchange rates typically do not adjust to equilibrate the current account balance in each and every period, however, if a country's current account deficit rises persistently over time, there is likely to come a point when it can no longer be financed.

Although not specifically mentioned by any theory above, according to Frankel and Rose (1996), foreign direct investment is a safe flow of capital compared to portfolio investments. Since it increases the supply of foreign currency in an economy, it leads to appreciation of the domestic currency. Unlike portfolio investment, foreign direct investment can not run away in the event of crises. Moreover, it can be regarded as a sign of trust in an economy.

2.3 THE RELATIONSHIP BETWEEN DOLLARIZATION AND EXCHANGE RATE

Almost all the dollarization literature emphasizes the relationship between dollarization and exchange rate. Generally, long term appreciation of domestic currency is advised as a dedollarization policy to erase the long lasting memory of past depreciations of domestic currency although it may lead serious macroeconomic problems. For instance, Guidotti and Rodriguez (1991) claim that if a long period of inflation and depreciation is needed to justify the switch to foreign currency, then, similarly, a long period of time of appreciation is needed to reverse the dollarization process. Thus, dollarization is regarded as a function of exchange rate. If domestic currency depreciates persistently, dollarization increases since economic agents will tend to increase their possession of foreign currency either in the form of foreign currency assets or cash. It is probably for this reason that Yeyati and

Sturzeneger (2003) state that policies that target a stable real exchange rate to protect competitiveness are not expected to decrease dollarization.

However, there is another face of the medal. Dollarization, itself, besides its other adverse effects, increases the demand for foreign currency and eventually causes depreciation of the domestic currency and vice versa. Therefore, it can be claimed that dollarization is both affected by and affecting the exchange rate. By changing the demand for foreign currency and leading to either appreciation or depreciation of the domestic currency, dollarization weakens the effectiveness of foreign exchange rate policy and causes macroeconomic problems. A persistent fall in dollarization may increase the appreciation of domestic currency which may harm exporters' competitiveness. For instance, dollarization has been decreasing in Turkey since 2001. By a gradual fall, it fell from 58 percent in 2001 to 36 percent in the third quarter of 2005. This situation, eventually, has increased the appreciation of domestic currency.

Ize and Yeyati (1998) indicate that in an economy with a floating exchange rate and highly dollarized financial sector, the high elasticity and instability of money demand should result in a high volatility of nominal exchange rate. For instance, by using an exponential generalized autoregressive conditional heteroscedasticity method, Akcay, Alper and Karasulu (1997) find that the higher the level of dollarization, the higher is the volatility of exchange rate in Turkey.

According to Moosa (2000), since currency substitution is the tendency of individuals and businesses to alter the composition of their money holdings

between domestic and foreign currencies, an important implication of currency substitution is that the more highly substitutable domestic currencies are the more volatile exchange rates may be in response to even small changes in the underlying economic fundamentals.

Banks' foreign currency open positions with a sudden devaluation can knock down the economy because banks would have difficulty in fulfilling their foreign currency liabilities and they would try to cover their exposure as quickly as possible in the foreign exchange market. In the end, it will either increase both the level and the volatility of foreign exchange rates or drain out the international reserves that central bank has. Apparently, dollarization increases the volatility of exchange rates. Therefore, dollarization increases the vulnerability of the domestic economy in case of a financial crises or currency attack. According to an IMF Board Paper (2003b), to buffer such crises, dollarized countries generally hold higher international reserves. Yeyati (2005) claims not only does the incidence of exchange rate changes in crises increase with dollarization, but also exchange rate shocks have a negative impact on financial stability only in the presence of dollarization.

CHAPTER 3

TURKISH EXPERIENCE WITH DOLLARIZATION AND EXCHANGE RATE REGIMES

Turkey had followed an import substitution policy and had controls on capital till 1980. This inward oriented economic policy led to balance of payment crises and severe economic breakdown at the end of 1970s. In 1980, after military takeover, Turkey started a stabilization and liberalization program. The rationale behind these changes was to form an export led growth model for Turkey instead of import substitution. Foreign currency controls were abolished and financial markets were deregulated. By these policies, inflation was brought down to 30 percent in 1982 from three digit levels in 1980 with relatively small sacrifice of GDP. Export led growth was supported by devaluations and tax rebates for exporters. Eventually, as can be seen from the graphs 1 and 2, between 1983 and 1987, GDP growth was over 6 percent and inflation was around 40 percent. These achievements in the economy were because of cutting real wages and reducing support to agriculture during the military regime between 1980 and 1983. However, as can be seen in graph 3, approaching elections in 1987 made the government loose its fiscal policy by increasing real wages of public workers and support for the agriculture.

The 1980s had been a period of financial liberalization and internationalization. The first step of financial liberalization was taken in 1984. According to this change, residents were free to hold foreign currency deposits in domestic banks and they were allowed to make foreign exchange

transactions. Moreover, with the second step in 1989, full convertibility of domestic currency was achieved. Accordingly, all the restrictions were abolished on domestic and international transactions for both residents and non residents. Akyuz and Boratav (2002) claim that the Turkish economy was exposed to international capital flows by these last amendments and the reason behind capital account liberalization was financing of public sector without creating crowding out. Similarly, for Selcuk and Ardic (2004), capital account liberalization in 1989 with high nominal interest rate and low depreciation of the domestic currency were used as a policy tool to attract foreign portfolio investment to Turkey which ultimately caused a capital inflow. Most Turkish banks borrowed in foreign currency and invested in domestic currency denominated assets to exploit low depreciation and high interest rates. However, by this policy they were exposed to foreign exchange rate risk. Lending to the Treasury was the most profitable activity for the banking system during this period which led to the crisis in 1994. The government announced some measures including massive devaluation and full insurance guarantee on deposits which later caused a moral hazard problem of the banking system. In addition to that, for Akyuz and Boratav (2002), during 1990s instability or volatility of inflation rate increased the risks of assets denominated in domestic currency which eventually increased the share of foreign currency deposits held by residents as a ratio of total bank deposits from 25 percent in 1990 to 43 percent in 1999.

Both Russian crises and a severe earthquake in 1999 in Turkey caused a fall in GDP by almost 6 percent. Eight insolvent banks were taken over by

the Saving Insurance Deposit Fund. Banks were not only dependent on high interest rates offered by treasury but also they carried large foreign currency open positions. By the end of 1999, the government announced a stabilization program which would be supported by the IMF financially. The goal of the program was to reduce inflation by keeping a foreign exchange rate basket, which was composed of the dollar and the euro, as an anchor to decrease inflation expectations. The target inflations for consumer price index (CPI) and wholesale price index (WPI) were 25 and 20 percent, respectively. The Central Bank of the Republic of Turkey (CBRT) announced the exchange rate basket path for 2000 with a depreciation of 20 percent consistent with the WPI target. A gradual shift toward a more flexible exchange rate regime would begin in July 2001 with a widening band around a central exchange rate.

The program was designed as a quasi currency board. There were certain limits for the CBRT to supply liquidity to the system. More technically, there was an upper limit on net domestic assets. Since the monetary base is the sum of net domestic and international assets, the only way of getting domestic currency was to exchange it for foreign currency on predetermined exchange rates and vice versa. Economic equilibrium was thought to be achieved by interest rates. If there were a demand for foreign currency, in case of a current account deficit, domestic currency supply would decrease and interest rates would rise. Since high interest rates would invite capital inflow, foreign currency would be sold to the CBRT in exchange for domestic currency and the domestic currency supply would increase causing

interest rates to fall. By this automatic mechanism, both external equilibrium would be restored and domestic demand would be restrained.

The IMF backed program was supported by tight fiscal policies to stabilize public debt with additional taxation, privatization and cuts in public spending. Moreover, strengthening the banking system and prudent agricultural policies were other requirements of the IMF. Although the exchange rate basket followed the predetermined path, inflation did not. The amount of the fall in inflation can be regarded as a success because the CPI was 60 percent in 1999. The CPI in 2000 was 39 percent which was 15 percent more than the target. The result was the appreciation of the domestic currency. Moreover, external factors worsened the situation. Since Turkish imports were mostly denominated in dollars and exports were mostly in euro, appreciation of dollar against euro exacerbated the current account deficit. In addition to that, oil prices began to rise. However, the main reason was internal. Appreciation of domestic currency increased total demand for imported goods which eventually put a burden on current account deficit. Moreover, interest rates dropped so quickly thanks to massive capital inflow. According to Akyuz and Boratav (2002), annualized rates on three month treasury bills averaged around 38 percent almost in the whole year 2000 compared to 100 percent in 1999. The CBRT was not supposed to sterilize the domestic currency liquidity since there was an automatic equilibrium. Excessive domestic currency liquidity increased the fall of interest rate which also increased aggregate demand. As a consequence, GDP increased 7 percent in 2000 with a current account deficit of 5 percent of GDP which was three times the target.

Meanwhile, foreign currency deposits share increased either because of a fall of interest in domestic currency denominated assets relatively or because of an expectation of devaluation with appreciation of the domestic currency.

These factors brought the collapse in February 2001 with the help of a political argument between prime minister and the president. The CBRT tried to defend the currency peg at the cost of losing 6 billion dollars in a day. Massive flight from domestic currency could not be stopped even if overnight rates exceeded 5000 percent. Consequently, the domestic currency was allowed to float against other currencies and lost about half of its value in a few days against the dollar.

Turkey had followed fixed or derivatives of fixed exchange rate regimes by trying not to allow the appreciation of the real exchange rate (graph 4) till 2001. To achieve this goal, generally, the domestic currency was devalued by the CBRT according to relative inflations in Turkey and abroad.

Since May 2001, new economic programs have been followed by the support of the IMF depending basically on a floating exchange rate regime, tight fiscal policy and primary surplus, privatization and rehabilitation of the banking system.

CHAPTER 4

4.1 EMPIRICAL EVIDENCE

According to Alan Greenspan, then the governor of the FED, "There may be more forecasting of exchange rates, with less success, than almost any other economic variable. Although measures such as real interest rate differentials, differential rates of productivity gains and chronic external deficits are often employed to explain exchange rate behavior, none has been found to be consistently useful in forecasting exchange rates even over substantial periods of one or two years. We at the Federal Reserve have spent an inordinate amount of time trying to find models which would successfully project exchange rates, not only ours but everyone else's. It is not the most profitable investment we have made in research time. Indeed, it is really remarkable how difficult to forecast."

Similarly, Rogoff and Meese (1981) claim that structural models which try to forecast exchange rates have explanatory power, but they predict badly because their explanatory variables are themselves difficult to predict, when the explanatory variables are endogenous, they will be correlated with the error term.

For Gujarati (2003), asset prices, such as stock prices or exchange rates follow a random walk; that is they are non stationary. If exchange rates follow a random walk process, then by definition they are non stationary. A stationary time series has a constant mean and variance. Exchange rates are non stationary under a floating exchange rate regime and under normal inflationary conditions.

According to Kennedy (2003), Box and Jenkins assume that the nature of economic time series data is such that any non stationarity can be removed by differencing. Empirical evidence shows that simple random walk, various univariate time series models and vector autoregression models (VAR) do not have sufficient forecasting power of exchange rates. However, for Moosa

(2000), although the exchange rate behaves like a random walk in the short run, its path is determined by economic fundamentals in the long run and it is possible to beat the random walk model for horizons longer than 12 months.

4.2 MODEL

A simultaneous equation model is used for empirical purpose. For Gujarati (2003), there are situations where there is a two way flow of influence among economic variables; that is, one economic variable affects another variable which is, in turn, affected by it. If the method of ordinary least squares (OLS) is used instead of simultaneous equations for these models, OLS estimators are not only biased but also inconsistent. It means that as the sample size increases indefinitely, the estimators do not converge to population values. Since equation (6) is over identified (appendix 2), two stage least square (2SLS) technique is used to estimate simultaneous system below.

$$FX_t = \beta_0 + \beta_1 DOLL_t + \beta_2 MS_t + \beta_3 GDP_t + \beta_4 I_t + \beta_5 FDI_t + \beta_6 CAD_t + u_{1t} \quad (6)$$

$$DOLL_t = \phi_0 + \phi_1 RISK_t + \phi_2 i_t + \phi_3 FX_t + \phi_4 DFX_t + u_{2t} \quad (7)$$

Where,

FX: represents the natural logarithm of foreign exchange rate which is domestic currency, Turkish Lira (TL), per USD

DOLL: represents dollarization (DOLL) which is foreign currency deposits over foreign currency deposits plus domestic currency demand deposits plus domestic currency time deposits

MS: represents the natural logarithm of reserve money differential between Turkey and USA

GDP: represents gross domestic product growth differential between Turkey and USA

I: represents money market interest rate and federal funds rate differential between Turkey and USA

FDI: represents yearly foreign direct investment in Turkey

CAD: represents yearly current account deficit in Turkey

RISK: represents standard deviation (risk) of inflation over standard deviation (risk) of real exchange rate

i: represents 3 month time deposit interest rate differential between domestic and foreign currency

DFX: represents interaction variable which is zero before the first quarter of 2001 and LN represents natural logarithm of the variable.

Basically, by considering PPP, monetary, flow and Hooper Morton models, these variables, above, are selected. However, the goal of this study is not to prove any of these theories about exchange rate determination.

According to the system of equations (6) and (7), dollarization is assumed to be a factor that affects the exchange rate along with money supply, GDP growth, interest rate differential, foreign direct investment and current account deficit, but at the same time, dollarization is affected by exchange rate because of obvious reasons discussed before.

4.3 VARIABLES AND DATA

The foreign exchange rate is affected by the tendency of holding foreign currency in the form of foreign currency deposit. Rising foreign currency deposits can be related to high demand for foreign currency. There is

supposed to be a positive relationship between dollarization and the foreign exchange rate. The higher the dollarization, the more the depreciation of the domestic currency.

Money supply differential is likely to affect foreign exchange rate, too. According to monetary model, a rise in the domestic money supply relative to the foreign money supply leads to a depreciation of the domestic currency.

The GDP growth differential is also important for the determination of the foreign exchange rate for both flow and monetary model. Although the expected sign of GDP is different in both of these models, it is likely that for a developing country, a high level of income increase will require high level of imported capital goods. Such a situation can make pressure on current the account deficit, depending on the level of exchange rate. Consequently, it is likely that the higher the GDP growth, the more the depreciation of domestic currency.

Interest rate differential may play a role in determining foreign exchange rate, although expected signs are different according to these two models. If a country has a relatively high interest rate, assuming other things being equal, domestic currency should be expected to appreciate since it is going to create an inflow of capital to the country. So, the higher the interest rate, the more the appreciation of the domestic currency. However, because of default risk of some developing countries, high interest rate can cause depreciation of the domestic currency. In addition to that, interest rate differential can be associated with expected inflation so that the higher

differential will reflect high inflation expectations which will eventually depreciate domestic currency.

The inflow of foreign direct investment to the country can cause appreciation of domestic currency, since it means the inflow of large quantities of foreign currency which can not leave the country in the short run. It is regarded as a secure way of financing current account deficit as opposed to portfolio capital, therefore, the higher the foreign direct investment, the more the appreciation of the domestic currency.

As the Hooper Morton model mentions, current account deficit may be another factor that is likely to affect foreign exchange rate. As the deficit rises, domestic currency is expected to depreciate.

The level of dollarization can be regarded as a function of relative returns on foreign and domestic currency, relative risk of inflation and real exchange rate and foreign exchange rate. Dollarization is expected to increase by high interest on foreign currency, high volatility in inflation, low volatility in real exchange rate with respect to the volatility of inflation and ongoing depreciation of domestic currency. An interaction variable, DFX, is included to reflect the policy change from fixed exchange rate regime to floating exchange rate regime in Turkey in 2001.

For this study, quarterly data (appendix 3) gathered from International Financial Statistics for the period between 1990 and 2004 are used.

4.4 RESULTS

Because of the possible simultaneity between dollarization and foreign exchange rate, the Hausman specification test (appendix 4) is run. Since there

might be a simultaneity problem according to this test and over identification, 2SLS technique can be used for estimation. There are three econometrical approaches that are followed in this study: first difference method with a constant, first difference method with no constant and level form equation by using cointegration.

Since all the variables except interest rate differential are non-stationary according to Dickey Fuller (ADF) tests, to make them stationary all the variables are differenced once. By taking the first differences, essentially, the behavior of variables around their (linear) trend values is studied and the equation below is derived:

$$\Delta FX_t = \beta_1 \Delta DOLLHAT_t + \beta_2 \Delta MS_t + \beta_3 \Delta GDP_t + \beta_4 \Delta I_t + \beta_5 \Delta FDI_t + \beta_6 \Delta CAD_t + \varepsilon_t \quad (8)$$

where Δ represents differenced form of the variables and ε represents $u_{1t} - u_{1t-1}$. After running 2SLS, we get the results in table 4 where the dependent variable is the differenced form of the exchange rate in equation (8) above.

According to Gujarati (2003), an intercept can be kept in the differenced form regression. In this case, intercept would represent the coefficient of the trend variable as it is shown below:

$$\Delta FX_t = \beta_0 + \beta_1 \Delta DOLLHAT_t + \beta_2 \Delta MS_t + \beta_3 \Delta GDP_t + \beta_4 \Delta I_t + \beta_5 \Delta FDI_t + \beta_6 \Delta CAD_t + \varepsilon_t \quad (9)$$

The only difference between equation (8) and equation (9) is that the constant is kept in equation (9). After running 2SLS, we get the results in table 5 where the dependent variable is the differenced form of the exchange rate in equation (9) above.

Instead of using differencing to get rid of non-stationarity, it can be preferred to work on a level form of the variables if the regression is

cointegrated. According to Kennedy (2003), differencing results in the loss of valuable information from economic theory concerning the long run equilibrium properties of the data. The regression of a non-stationary time series on another non-stationary time series may produce a spurious regression. However, if the variables are cointegrated, then traditional regression methodology (including t tests) may be applicable. According to Greene (1997), even if one or more of the variables are stationary or if they are integrated of order 0, I (0), there can be cointegration. Since all the variables except the interest differential are non-stationary according to DF tests, there can be a cointegrated regression as shown below:

$$FX_t = \beta_0 + \beta_1 DOLLHAT_t + \beta_2 MS_t + \beta_3 GDP_t + \beta_4 I_t + \beta_5 FDI_t + \beta_6 CAD_t + u_{1t} \quad (10)$$

Since all variables in the level form regression are individually integrated of order one except I, they are non-stationary and they have stochastic trends. However, a linear combination can be integrated of order zero, or stationary.

The Dickey Fuller Unit Root, Engle Granger and Cointegrating Regression Durbin Watson tests (appendix 5) indicate that cointegration for the level form regression is likely. Although the variables except I individually exhibit random walks, there seems to be a stable long run relationship among them which means they will not wander from each other. Thus, after running 2SLS for the equation (10) above, we get the results in table 6 where the dependent variable is the level form of the exchange rate.

The results of three regressions in tables 4, 5 and 6 show that GDP is not statistically significant.

Moreover, interest rate is statistically significant and there is a positive relationship between it and depreciation of the domestic currency.

Both the sign and significance level are satisfactory for the money supply differential.

Although the sign and significance level of FDI is satisfactory for the cointegrated regression in table 6, it is not statistically significant for the differenced form equations in tables 4 and 5.

The CAD is statistically significant and there is a positive relationship between the CAD and depreciation of the domestic currency.

Most importantly, both the sign and significance level are satisfactory for the dollarization variable in three of the regressions which show dollarization affects exchange rate. The result implies that a fall (rise) in dollarization leads to appreciation (depreciation) of domestic currency and vice versa.

CHAPTER 5

CONCLUSION

This thesis presents empirical evidences suggesting that nominal exchange rate is affected by dollarization, money supply, interest rate, foreign direct investment and current account deficit.

The first finding of this study is a fall in dollarization leads to appreciation of domestic currency by increasing the supply of foreign currency or vice versa. This situation, like in Turkey, may cause some adverse effects for the real sector if excess supply of foreign currency is not exterminated. There are basically two ways to sweep excess supply: intervention by the central bank or treasury borrowing in foreign currency. If the central bank makes buying interventions in the foreign exchange market, it will increase its international reserves at the expense of increasing money supply. If excess domestic currency liquidity is not sterilized, it may accelerate inflation in the long run. The Treasury should help the sterilization of excess liquidity by increasing its borrowing, since it can borrow for a longer time than the central bank can. If the treasury does not help central bank to dry out excess liquidity because of borrowing cost, depending on the amount, it may create more serious problems, since the central bank can only sterilize and roll over excess liquidity for short periods. The amount of excess liquidity that is sterilized for the short term may be dangerous and it may turn into foreign currency demand when uncertainty rises. Thus, it is essential to sterilize excess liquidity for longer periods of time. The Treasury may select to borrow in foreign currency

to decrease the supply of foreign currency. However, since the treasury has domestic currency income stream, it is going to create a currency mismatch and increase the vulnerability of the treasury to depreciation of the domestic currency. All in all, changes in dollarization make both foreign exchange rate policy and monetary policy more challenging.

The second finding of our model is that a persistent rise in money supply results in depreciation of the domestic currency in Turkey probably by creating more inflation. Therefore, if money supply is exogenous and controllable by the central bank, dominating the money supply may be an effective policy to stabilize the nominal exchange rate.

The third finding indicates that rising interest rates may not cause the appreciation of domestic currency. This result may be due to default risk or risk premium or country risk in Turkey. When the risk evaluation is low (high), it encourages capital inflow (outflow), lowers (increases) interest rates and causes appreciation (depreciation) of domestic currency.

The fourth finding of this study, although supported only by cointegrated regression, is increasing foreign direct investment (FDI) causes appreciation of domestic currency. Increasing FDI may create similar problems same as falling dollarization does on foreign exchange rate and monetary policy since FDI reflects foreign currency inflow to the country. Moreover, if FDI comes in to support exports, which is generally the case, then appreciation pressure on domestic currency will be much higher.

The fifth finding of our model is that a current account deficit (CAD) causes or increases depreciation of domestic currency.

In the future, this study can be elaborated by analyzing the determinants of dollarization empirically. By this way, not only the determinants of dollarization in Turkey can be understood in detail, but also it can help us to come up with the necessary measures to decrease dollarization.

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APPENDIX I

PPP THEORY

If PPP holds, then exchange rate is nothing but the ratio of inflation rates between countries and therefore:

$$S = P / P^* (1).$$

Moreover, the demand for money is a function of inflation rate and income. We can show it as follows:

$$M_d = kPY (2)$$

and by definition money supply is equal to money demand.

If we combine equations (1) and (2), we get:

$$S = M / kP^*Y (3).$$

This model tells us that exchange rate will rise or the domestic currency will depreciate when there is an increase in the money supply (M), a decrease in income (Y) and a decrease in the foreign price level (P^*). It also emphasizes that there is a proportional relationship between money supply and exchange rate. This prediction follows from a combination of the quantity theory of money and PPP. The quantity theory of money postulates that an increase in the money supply leads to a proportional increase in the price level ($MV = PT$). PPP then tells us that this rise in the price level leads to a proportional rise in the exchange rate ($S = P / P^*$).

APPENDIX 2

THE ORDER AND RANK CONDITIONS OF IDENTIFIABILITY

$$FX_t = \beta_0 + \beta_1 DOLL_t + \beta_2 MS_t + \beta_3 GDP_t + \beta_4 I_t + \beta_5 FDI_t + \beta_6 CAD_t + u_{1t} \quad (6)$$

$$DOLL_t = \phi_0 + \phi_1 RISK_t + \phi_2 i_t + \phi_3 FX_t + \phi_4 DFX_t + u_{2t} \quad (7)$$

If we define M, m, K and k as follow,

M = number of endogenous variables in the model

m = number of endogenous variables in the equation

K = number of predetermined variables in the model

k = number of predetermined variables in the equation

then, M = 2, m = 2, K = 8 and k = 5.

Since the order condition is $K - k \geq m - 1 \rightarrow 3 \geq 1$. Then, the order condition implies that equation (6) is over identified.

However, the order condition is a necessary but not a sufficient condition for identification. Rank condition, where rank is equal to M-1, should hold too. By using equations (6) and (7) and arranging for structural parameters, we get the following table:

N	1	FX	DOLL	MS	GDP	I	FDI	CAD	RISK	i	DFX
6	$-\beta_0$	1	$-\beta_1$	$-\beta_2$	$-\beta_3$	$-\beta_4$	$-\beta_5$	$-\beta_6$	0	0	0
7	$-\phi_0$	$-\phi_3$	1	0	0	0	0	0	$-\phi_1$	$-\phi_2$	$-\phi_4$

For equation (6) to be identified, there must at least be one none zero determinants from the coefficients of the variables excluded from equation (6) but included in equation (7). As a result, we get the following 1 x 3 matrix:

$$[-\phi_1 - \phi_2 - \phi_3]_{1 \times 3}$$

Since, rank $[-\phi_1 - \phi_2 - \phi_3]_{1 \times 3} = M - 1 = 1$, unless $\phi_1 = \phi_2 = \phi_3 = 0$, rank condition is met for equation (6) too.

APPENDIX 3

YEARS	FX	DOLL	NS	GDP	I	FDI	CAD	RISK	I	DFX
Q1 1990	-6.00	0.26	-9.54	0.08	30.75	663	938	0.00	39.87	0.00
Q2 1990	-5.93	0.25	-9.37	0.11	47.23	690	-369	0.00	39.89	0.00
Q3 1990	-5.90	0.25	-9.36	0.05	46.46	814	-892	0.00	40.08	0.00
Q4 1990	-5.83	0.26	-9.33	0.08	50.78	829	-1851	0.00	43.25	0.00
Q1 1991	-5.60	0.27	-9.29	0.01	71.98	684	-2625	0.00	51.71	0.00
Q2 1991	-5.44	0.29	-9.11	0.00	81.11	701	-1936	0.00	53.43	0.00
Q3 1991	-5.36	0.31	-9.02	0.04	58.82	578	-1137	0.00	60.96	0.00
Q4 1991	-5.28	0.33	-8.97	-0.02	56.31	686	-11	0.00	62.96	0.00
Q1 1992	-5.08	0.35	-8.80	0.06	58.37	810	250	0.00	63.27	0.00
Q2 1992	-4.98	0.38	-8.65	0.03	63.55	856	305	0.00	66.15	0.00
Q3 1992	-4.92	0.40	-8.52	0.02	61.72	929	-495	0.00	64.94	0.00
Q4 1992	-4.76	0.37	-8.47	0.01	63.69	925	-1147	0.00	66.25	0.00
Q1 1993	-4.66	0.37	-8.34	0.02	60.77	844	-974	0.00	60.90	0.00
Q2 1993	-4.52	0.38	-8.25	0.09	58.45	774	-1746	0.00	61.07	0.00
Q3 1993	-4.42	0.40	-8.13	0.05	55.27	767	-3498	0.00	61.06	0.00
Q4 1993	-4.24	0.42	-8.04	0.06	64.74	672	-5031	0.00	61.08	0.00
Q1 1994	-3.81	0.51	-7.85	0.02	208.25	636	-6433	0.00	83.45	0.00
Q2 1994	-3.47	0.45	-7.57	-0.15	187.79	593	-6634	0.00	117.04	0.00
Q3 1994	-3.38	0.48	-7.37	-0.12	62.17	510	-2882	0.01	63.36	0.00
Q4 1994	-3.25	0.50	-7.34	-0.10	70.86	498	712	0.01	74.28	0.00
Q1 1995	-3.17	0.49	-7.17	-0.05	67.65	608	2631	0.01	74.63	0.00
Q2 1995	-3.13	0.44	-7.00	0.11	61.70	683	-4192	0.01	69.13	0.00
Q3 1995	-3.02	0.44	-6.87	0.07	54.34	716	2341	0.01	63.58	0.00
Q4 1995	-2.82	0.50	-6.80	0.05	82.16	742	353	0.01	78.62	0.00
Q1 1996	-2.65	0.50	-6.64	0.06	84.11	885	-2338	0.01	77.41	0.00
Q2 1996	-2.51	0.48	-6.48	0.04	62.87	1018	-3195	0.01	73.61	0.00
Q3 1996	-2.39	0.48	-6.26	0.01	66.87	975	-4182	0.02	74.13	0.00
Q4 1996	-2.23	0.48	-6.19	0.03	69.91	955	-3738	0.02	73.69	0.00
Q1 1997	-2.06	0.48	-6.02	0.02	59.02	722	-2437	0.02	70.57	0.00
Q2 1997	-1.91	0.47	-5.85	0.04	62.93	579	-3256	0.02	71.05	0.00
Q3 1997	-1.75	0.48	-5.65	0.02	67.19	630	-2858	0.03	74.72	0.00
Q4 1997	-1.58	0.49	-5.58	0.03	70.32	668	-2380	0.03	75.03	0.00
Q1 1998	-1.42	0.50	-5.38	0.05	72.98	805	-2638	0.04	74.43	0.00
Q2 1998	-1.33	0.48	-5.25	-0.01	65.65	790	-2459	0.05	68.93	0.00
Q3 1998	-1.28	0.53	-5.12	-0.01	64.49	859	-1654	0.05	72.65	0.00
Q4 1998	-1.16	0.45	-5.04	-0.06	73.85	914	-1162	0.05	72.79	0.00
Q1 1999	-1.00	0.46	-4.80	-0.12	72.79	940	1984	0.05	70.76	0.00
Q2 1999	-0.87	0.46	-4.79	-0.07	72.20	1022	4329	0.06	74.77	0.00
Q3 1999	-0.78	0.44	-4.65	-0.11	64.78	1059	3192	0.07	63.34	0.00
Q4 1999	-0.61	0.47	-4.55	-0.07	64.46	909	1881	0.07	46.72	0.00
Q1 2000	-0.53	0.51	-4.35	0.02	36.34	783	-1344	0.08	29.42	0.00
Q2 2000	-0.48	0.52	-4.24	0.02	34.02	1087	-4889	0.10	30.61	0.00
Q3 2000	-0.40	0.52	-4.17	0.04	32.34	1136	-6789	0.09	39.78	0.00
Q4 2000	-0.40	0.47	-4.10	0.06	99.25	672	-8278	0.07	92.18	0.00
Q1 2001	0.02	0.49	-3.81	-0.03	169.13	982	-9819	0.08	105.64	0.00
Q2 2001	0.23	0.55	-3.70	-0.10	67.49	2349	-8023	0.10	54.87	0.23
Q3 2001	0.44	0.61	-3.55	-0.08	58.81	2169	-3504	0.19	58.63	0.44

Q4 2001	0.37	0.59	-3.60	-0.11	56.84	3006	-176	0.20	56.29	0.37
Q1 2002	0.29	0.52	-3.64	0.01	55.61	3266	3390	0.20	50.42	0.29
Q2 2002	0.45	0.55	-3.55	0.08	47.35	1485	3226	0.23	45.56	0.45
Q3 2002	0.50	0.56	-3.47	0.06	44.99	1683	1162	0.21	45.61	0.50
Q4 2002	0.50	0.55	-3.51	0.10	43.40	1470	224	0.13	41.09	0.50
Q1 2003	0.53	0.53	-3.41	0.06	42.75	1063	-1521	0.14	42.85	0.53
Q2 2003	0.34	0.49	-3.47	0.02	39.68	1254	-3898	0.17	34.67	0.34
Q3 2003	0.33	0.48	-3.43	0.02	32.19	1175	-5732	0.16	27.84	0.33
Q4 2003	0.33	0.46	-3.39	0.02	25.49	1484	-5683	0.12	24.20	0.33
Q1 2004	0.27	0.41	-3.34	0.07	21.99	1753	-8037	0.05	19.62	0.27
Q2 2004	0.40	0.43	-3.24	0.10	20.99	2165	-10400	0.05	20.71	0.40
Q3 2004	0.41	0.43	-3.14	0.01	19.90	2578	-12280	0.06	19.95	0.41
Q4 2004	0.29	0.42	-3.14	0.03	17.99	2792	-14009	0.04	18.81	0.29

Source: International Financial Statistics

APPENDIX 4

HAUSMAN SPECIFICATION TEST

Because of the possible simultaneity between dollarization and foreign exchange rate, the Hausman specification test is run to determine if there is a simultaneity or not in two equation system. For this purpose, dollarization is regressed on exogenous variables in the equations (6) and (7).

From this equation system, following reduced form equations (1) and (2) are obtained.

$$FX_t = \Pi_0 + \Pi_1 RISK_t + \Pi_2 i_t + \Pi_3 DFX_t + \Pi_4 MS_t + \Pi_5 GDP_t + \Pi_6 I_t + \Pi_7 FDI_t + \Pi_8 CAD_t \quad (1)$$

where,

$$\begin{aligned} \Pi_0 &= (\beta_0 + \beta_1 \vartheta_0) / (1 - \beta_1 \vartheta_3), \Pi_1 = (\beta_1 \vartheta_1) / (1 - \beta_1 \vartheta_3), \Pi_2 = (\beta_1 \vartheta_2) / (1 - \beta_1 \vartheta_3), \\ \Pi_3 &= (\beta_1 \vartheta_4) / (1 - \beta_1 \vartheta_3), \Pi_4 = (\beta_2) / (1 - \beta_1 \vartheta_3), \Pi_5 = (\beta_3) / (1 - \beta_1 \vartheta_3), \\ \Pi_6 &= (\beta_4) / (1 - \beta_1 \vartheta_3), \Pi_7 = (\beta_5) / (1 - \beta_1 \vartheta_3), \Pi_8 = (\beta_6) / (1 - \beta_1 \vartheta_3), \\ v_t &= (u_{1t} + \beta_1 u_{2t}) / (1 - \beta_1 \vartheta_3) \end{aligned}$$

and

$$DOLL_t = \Pi_9 + \Pi_{10} RISK_t + \Pi_{11} i_t + \Pi_{12} DFX_t + \Pi_{13} MS_t + \Pi_{14} GDP_t + \Pi_{15} I_t + \Pi_{16} FDI_t + \Pi_{17} CAD_t + w_t \quad (2)$$

where,

$$\begin{aligned} \Pi_9 &= (\vartheta_0 + \vartheta_3 \beta_0) / (1 - \vartheta_3 \beta_1), \Pi_{10} = (\vartheta_1) / (1 - \vartheta_3 \beta_1), \Pi_{11} = (\vartheta_2) / (1 - \vartheta_3 \beta_1), \\ \Pi_{12} &= (\vartheta_4) / (1 - \vartheta_3 \beta_1), \Pi_{13} = (\vartheta_3 \beta_2) / (1 - \vartheta_3 \beta_1), \Pi_{14} = (\vartheta_3 \beta_3) / (1 - \vartheta_3 \beta_1), \\ \Pi_{15} &= (\vartheta_3 \beta_4) / (1 - \vartheta_3 \beta_1), \Pi_{16} = (\vartheta_3 \beta_5) / (1 - \vartheta_3 \beta_1), \Pi_{17} = (\vartheta_3 \beta_6) / (1 - \vartheta_3 \beta_1), \\ w_t &= (\vartheta_3 u_{1t} + u_{2t}) / (1 - \vartheta_3 \beta_1). \end{aligned}$$

When equation (2) is estimated by OLS, the following is obtained:

$$DOLLHAT_t = \hat{\Pi}_9 + \hat{\Pi}_{10} RISK_t + \hat{\Pi}_{11} i_t + \hat{\Pi}_{12} DFX_t + \hat{\Pi}_{13} MS_t + \hat{\Pi}_{14} GDP_t + \hat{\Pi}_{15} I_t + \hat{\Pi}_{16} FDI_t + \hat{\Pi}_{17} CAD_t \quad (2)$$

Therefore,

$$DOLL_t = DOLLHAT_t + \hat{w}_t \quad (3)$$

where DOLLHAT_t are estimated DOLL_t and \hat{w}_t are the estimated residuals.

Substituting (3) into (6), we get:

$$FX_t = \beta_0 + \beta_1 DOLLHAT_t + \beta_2 MS_t + \beta_3 GDP_t + \beta_4 I_t + \beta_5 FDI_t + \beta_6 CAD_t + \beta_7 \hat{w}_t + u_{1t} \quad (4)$$

Then the hypothesis is:

H_0 = There is simultaneity between dollarization and exchange rate

H_1 = There is no simultaneity between dollarization and exchange rate.

Since t statistic for \hat{w}_t is 8.48, \hat{w}_t is statistically significant at almost 100 % confidence level. Since H_0 can not be rejected, there might be simultaneity problem between dollarization and exchange rate.

APPENDIX 5

DICKEY FULLER (DF) UNIT ROOT TEST

If the error terms are stationary (or in other words if they are integrated of order zero), then the level form regression may be cointegrated.

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t \quad (1)$$

We have to test if δ is statistically different than zero or not. If it is zero, it is concluded that Y_t is non stationary. The DF test for the residuals gives a p-value of zero. Thus, we can reject a unit root in the error structure with almost 100 % confidence. This means that the model is likely to be cointegrated, in that while the variables may be non stationary in similar ways such that they cancel each other out.

ENGLE GRANGER TEST

We can test the residuals for stationarity by using the unit root test by the equation below:

$$Y_t = \rho Y_{t-1} + u_t \quad (1)$$

where u_t is a white noise error term.

If $\rho = 1$, in the case of a unit root, equation (1) becomes a random walk model without a drift which is a non-stationary stochastic process. It is obvious that in this case Y_t is non stationary.

When we perform a unit root test on the residuals obtained from the regression (10), the following result is obtained:

$$\Delta \bar{u}_t = -0.69 u_{t-1} \quad (2)$$

Since the t value of u_{t-1} is -5.5 and it is bigger than the critical value in absolute terms, the residuals from the regression (10) are integrated of order

zero, $I(0)$ or they are stationary. The model might be cointegrated with almost 99 % confidence.

COINTEGRATING REGRESSION DURBIN WATSON TEST

Durbin Watson d statistic which is defined as

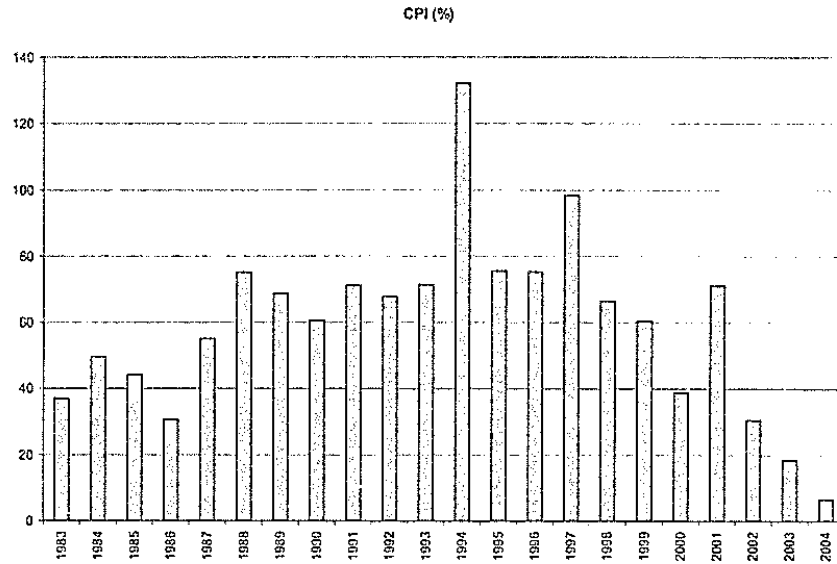
$$d = \frac{\sum_{t=2}^{t=n} (\hat{u}_t - \hat{u}_{t-1})^2}{\sum_{t=1}^{t=n} \hat{u}_t^2} \quad (1)$$

where d is the ratio of the sum of squared differences in successive residuals to the residual sum of squares.

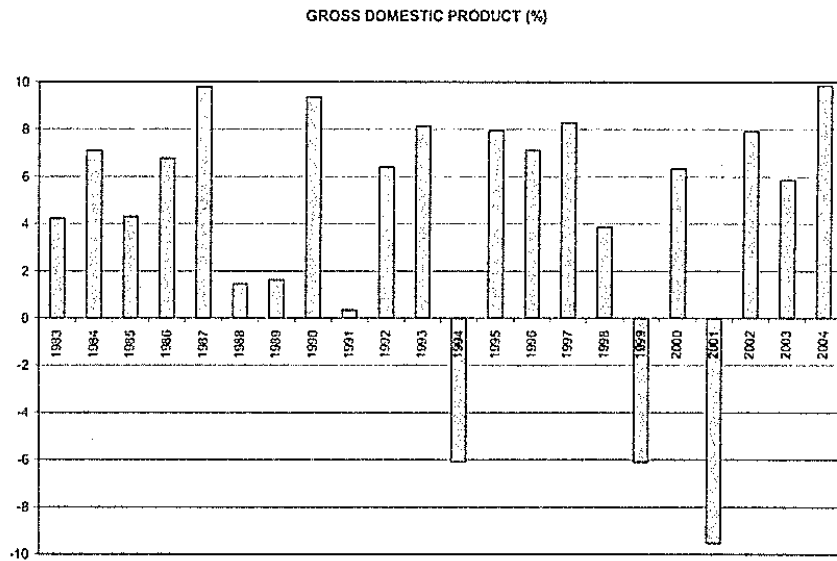
If we run a Durbin Watson d test obtained from cointegrating regression, it can be used to determine cointegration. For CRDW, null hypothesis is $d = 0$ because $d \cong 2(1 - \hat{\rho})$.

If there is to be a unit root estimated $\hat{\rho}$ will be about 1 so that d will be 0. Therefore, if computed d value is above the critical value, then the model will be cointegrated. Since our computed d value is 1.44 which is bigger than the approximate critical value of 1.28, the model is likely to be cointegrated with 95 % confidence.

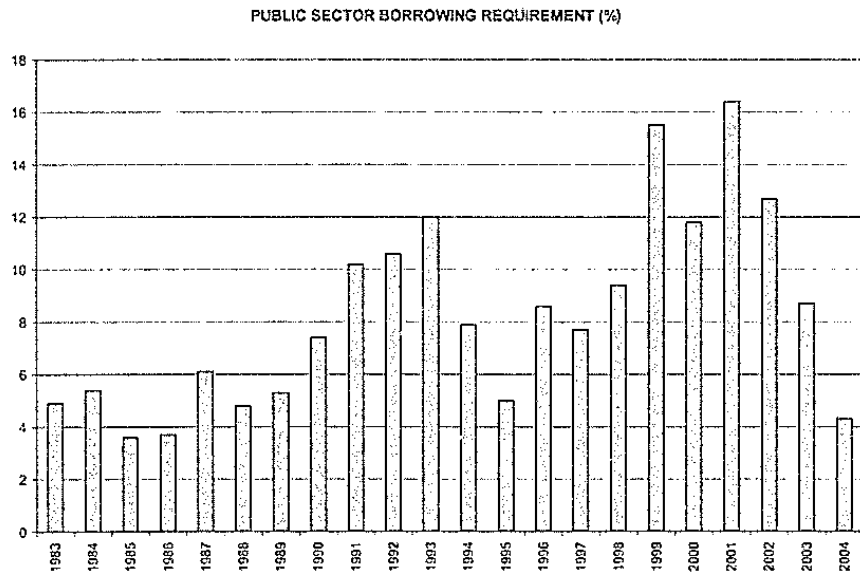
GRAPH 1



GRAPH 2



GRAPH 3



GRAPH 4

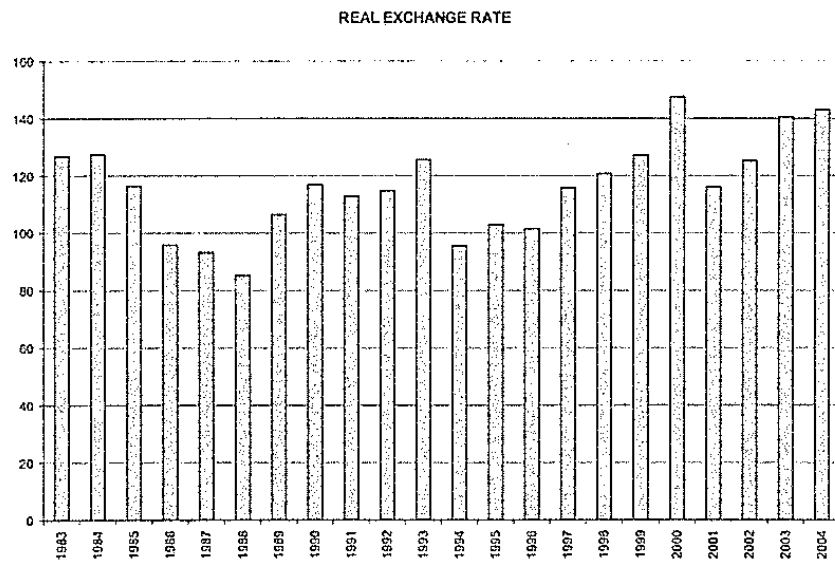


Table 1: A simple balance sheet of a depositor

Assets	Liabilities
Foreign Currency Deposit	

Table 2: A simple balance sheet of a bank

Assets	Liabilities
Foreign Currency Credits	Foreign Currency Deposits
Foreign Currency Financial Assets	Foreign Currency Loans

Table 3: A simple balance sheet of a firm

Assets	Liabilities
Domestic Currency Assets	Foreign Currency Loans

TABLE 4	dDOLLHAT _t	dMS _t	dGDP _t	dI _t	dFDI _t	dCAD _t
Coefficients	1.69	.86	-.28	.0009304	-.000011	8.45e-06
Robust Standard Errors	.59	.87	.22	.0002116	.0000227	4.72e-0.6
Z values	2.86	9.86	-1.26	4.4	-.48	1.79
Significance Level	**	***		***		*

Centered $R^2 = 0.5708$, Uncentered $R^2 = 0.7848$, Observation Number = 59 and *, **, *** represent 10 %, 5 % and 1 % significance levels, respectively.

TABLE 5	Cons	dDOLLHAT _t	dMS _t	dGDP _t	dI _t	dFDI _t	dCAD _t
Coefficients	.037	1.90	.62	-.38	.0009	-.0000227	9.66e-06
Robust Standard Errors	.019	.73	.18	.25	.0002	.0000195	5.00e-06
T values	1.89	2.58	3.40	-1.48	4.09	-1.17	1.93
Significance Level	*	***	***		***		**

$R^2 = 0.5795$, Observation Number = 59 and *, **, *** represent 10 %, 5 % and 1 % significance levels, respectively.

TABLE 6	CONS	DOLLHAT _t	MS _t	GDP _t	I _t	FDI _t	CAD _t
Coefficients	2.73	2.09	.97	-.17	.0009379	-.0000353	9.31e-06
Robust Standard Errors	.31	.47	.018	.13	.0004337	.0000182	2.95e-06
T values	8.90	4.49	54.06	-1.29	2.16	-1.94	3.15
Significance Level	***	***	***		**	**	***

Centered $R^2 = 0.9991$, Observation Number = 60 and *, **, *** represent 10 %, 5 % and 1 % significance levels, respectively.

**IMPACT OF DOLLARIZATION ON EXCHANGE RATE:
THE TURKISH CASE BETWEEN 1990 AND 2004**

An Abstract of a Thesis

Presented to

The Faculty of Social Sciences

University of Denver

In Partial Fulfillment

Of the Requirements for the Degree

Master of Arts

by

Ilker Sari

August 2006

Advisor: Prof. Tracy Mott

ABSTRACT

This thesis explains the relationship between dollarization and nominal foreign exchange rate in Turkey by using two stage least squares technique. The empirical results provide evidence that dollarization along with money supply, gross domestic growth, interest rates, foreign direct investment and current account deficit affect nominal exchange rate in Turkey. It concludes that a change in dollarization may cause some adverse effects on foreign exchange rate regime and monetary policy.