

# MONETARY POLICY REACTION FUNCTION IN TURKEY

(Comments are Welcome)

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**Abstract:** *Determining the offset and sterilization coefficients of the central bank could be useful in terms of measuring of the scope and the stance of the monetary policy. The purpose of this paper is to measure the sterilization and offset coefficient and degree of the relation between the Central Bank's reactions and the macroeconomic variables. Additionally, neutralization coefficient was calculated. Estimations were done on a monthly basis and in two different sub-periods, from 1990 to 1993 and 1995 to 1999. The results showed that in the first period which is the pre-crisis period (1990-1993), low degree of sterilization, offset and neutralization coefficients, which suggest that the CBRT implemented a relatively accommodative policy to fiscal policy by expanding domestic credits to finance budget deficit. In contrast, in the second period which is the post-crisis period (1995-1999), the CBRT implemented more active policy by sterilizing most of the foreign assets increase and neutralizing the government credits by reducing the banking sector credits which was reflected in the high level of sterilization, offset and neutralization coefficient. In addition, in the second period, the CBRT gave importance to the stability of the markets more evidently by injecting the required liquidity. Finally, the link between high sterilisation and low inflation accepted generally as a rule in the literature were not observed in Turkey since the pricing behaviour changed especially after the 1994 crisis.*

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## I-Introduction

The purpose of this paper is to estimate the sterilisation and offset coefficient and degree of the relation between the Central Bank's reactions and the macroeconomic variables by estimating the monetary policy reaction function on a monthly basis. The offset and sterilisation coefficients, together with monetary policy reaction to inflation itself, measure the extent to which monetary policy is accommodating or used systematically for monetary control. This paper applies previously developed methodologies<sup>1</sup> to study monetary policy in Turkey for the period of 1990-1999 in which Turkey decided to liberalise its capital account completely in 1989. This period also includes 1994 financial crisis, which hit the economy seriously during that time.

Altinkemer (1997) estimates the domestic credit reaction function of CBRT by dividing the estimation period into two sub-periods, February 1990-October 1993 and April 1994-June 1997. She concludes that, during the pre-financial crisis period, it seems that the CBRT was reacting to changes in net foreign assets (NFA), real exchange rate and not to interest differential. While in the post financial crisis period, it seems that the CBRT reacted more to NFA changes compared to the pre-crisis period and also interest rate differentials gained importance in the monetary policy framework. The sterilization coefficients have been found as 0.82 and 0.91 for the first and second periods respectively by using OLS. However, Kouri and Porter (1974) and Obstfeld (1982) point out in the case of sterilization, the offset coefficient is subject to a possible sterilization bias. The source of the bias is the possible endogeneity of NFA. If capital inflow is systematically sterilized, the change in NFA will be correlated with the disturbance term in the NFA equation (or capital-flow equation), therefore OLS estimates will be inconsistent. To remedy this problem, Argy and Kouri (1974) and Obstfeld suggest that the offset and sterilization equations be estimated by two-stage least squares using instrumental variables.

Celasun and Denizer (1999) also examines sterilization of capital flows as part of a study mainly focused on the determinants of capital flows, their impact on the real sectors of the Turkish economy, macroeconomic management issues that relate to capital flows together with the banking intermediation of capital flows and issues surrounding the process. In (Celasun, Denizer), Central Bank sterilization reaction function, with consideration of the endogeneity problem, was estimated based on the methodology of Cumby and Obstfeld (1983). Net domestic assets<sup>2</sup> (NDA) item is

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<sup>1</sup> Altinkemer, M. (1997), Celasun O, C. Denizer, and D. Ke (1999)

<sup>2</sup> Including revaluation account and adjusted for reserve requirements

estimated by using two-stage least squares, for the period February 1990 to June 1996. The reaction function allows net domestic assets to respond to other variables, such as, net foreign assets of the Central Bank of Turkey (CBRT), real exchange rate, real GDP and consolidated government deficit<sup>3</sup>. For the whole period, the sterilization coefficient was found as 0.37, which indicated that 37 percent of reserve flows were sterilized within a month (given that lags of NFA proved insignificant). Unlike our results, they concluded that the Central Bank engaged in relatively more active sterilization and pursued a tighter stance in the pre-1993 period. However, NDA reaction function of the CBRT has been estimated through whole period, during which NDA exhibits different characteristics.

The main motivation of this study is to determine the monetary policy reaction function of CBRT. Contribution of this study are twofold. First, some macroeconomic variables as exogenous other than the main financial variables are included. Second, we have sub-divided NDA into two components, which are net credits to private sector and public sector. Then, we estimated "net credits to private sector" instead of total NDA by putting net credits to the government sector as the explanatory variable besides other exogenous variables. In that equation, the coefficient of net credits to government sector measures the "neutralization" coefficient that is expected to lie between zero and minus one. While monetary control dictates complete neutralisation of increased government borrowing from the system, the factors influencing the government's credit requirements may well affect the banking sector's credit demands in a similar way. A passive or accommodating monetary policy would then sanction increases in banking sector domestic credit along with increased government borrowing. In this case, the estimated neutralisation coefficient would be positive.

An organization of the paper as follows: In section II, the monetary policy implementation in Turkey in a historical perspective together with instruments of monetary management under the constraints of fiscal dominance and sustainability of current account balances was given. Section III presents the literature survey and section IV goes into the estimation results. The last section concludes.

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<sup>3</sup> Including instrumental variables; constant, monthly dummies, three lags of the dependent and conditioning variables, 6 lags of net foreign assets, uncovered interest parity and three lags of it.

## **II- Conduct of Monetary Policy in Turkey with the Historical Background**

### ***1991-1993: Pre-crisis Period***

The Turkish economy entered into a new stage of development that envisaged an outward oriented economy based on free market forces with the January 24<sup>th</sup> measures in 1980. Starting from this date, financial liberalisation process was realised gradually through some new regulations such as determining the exchange rates by the Central Bank, setting interest rates free, permitting to residents to hold foreign exchange deposits freely, establishing the interbank money market and Istanbul Stock Exchange and starting to use indirect monetary policy instruments in policy implementation. Finally, in 1989, the capital account was fully liberalised.

Initial effect of capital account liberalisation was rapid capital inflow to the Turkish economy through both borrowing from international markets by the banking sector and increasing portfolio investments to the Istanbul Stock Exchange. As a result, the sum of the current and capital accounts was in surplus during the period except for 1991 when uncertainties surrounding the Gulf War led to a substantial capital outflow. The modest expansion in 1989 was followed by an aggregate demand-led boom in 1990 and a sharp contraction in 1991, the latter reflecting uncertainties surrounding the Gulf crisis.

As to monetary policy, on the other hand, for the first time the CBRT announced a monetary program in a medium term horizon in 1990<sup>4</sup>. With the monetary program the CBRT tried to control the credits extended to the public sector, thus the domestic assets and increase the share of Turkish lira liabilities in the balance sheet. As a result, the balance sheet targets of the first monetary program were realised in some sense. The net foreign liability of the CBRT declined but was still negative. The cash credits to public sector declined in nominal terms but the credits to banking sector increased in real terms, in sum the cash credits to public sector and banking sector did not change in nominal terms in 1990 but declined in real terms. Although the revaluation account had not change as proposed, the control on the CBRT credits enabled to stay in the total domestic assets target interval. The share of the "central bank money" increased but it was not remarkable since CBRT financed its assets partly by creating foreign liabilities.

Because of the uncertainties created by the Gulf crises, CBRT did not announce a monetary program in 1991 and pursued a policy, which would bring the instability in

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<sup>4</sup> Monetary programs in 1990-1999 period were summarized in Table 1 at the end of this section.

the exchange rates to the minimum levels, without incurring large losses in the foreign reserves. As a result of the huge increase in the cash credits to the public sector, domestic assets could not be controlled. But the movements of the central bank money were in the desired direction and its growth rate was higher than that of the total domestic liabilities. Although there was contraction in the economy, inflation accelerated, due to rapidly rising public sector borrowing requirement (PSBR) and its increased monetary financing through CBRT credits.

In the 1992-1993 period, the economy rebounded strongly. This was associated with strong import growth, large increase in public and private sector real wages, and further deterioration in fiscal balances resulting in increased recourse to central bank financing (Agener, Mc Dermott and Üger (1997)). Indeed, there was a lack of fiscal discipline in 1992 and 1993. In 1992, a monetary program was designed under several assumptions related to inflation, the consolidated budget deficit, and the public sector's borrowing from the CBRT. However, the rapid expansion of the credits extended to the public sector made it impossible for the CBRT to comply with the monetary program targets, and instead it strove to eliminate excessive fluctuations in the exchange rates. The exchange rate policy quite different in 1992 compared with the period 1989-1990, and CBRT did not allow the exchange rates to appreciate and the exchange rate basket depreciated by 2 percentage points in 1992. The deterioration in fiscal accounts should be the main driving force for CBRT to not letting exchange rates to appreciate during the period 1991-1993.

In 1993, CBRT did not announce a monetary program because of the difficulty in controlling its balance sheet items due to the inability in controlling the financing needs of the public sector, trying to prevent the pressures of the increasing liquidity on the foreign exchange rate without reserve losses. Monetary developments in 1993 once again dominated by the deficit of the consolidated budget deficit. The main policy objective was maintaining the stability in the money and foreign exchange market. The CBRT's credits to agricultural sector grew by 96,6 percent in 1993. The contribution of net domestic assets (NDA) to reserve money growth was 95 percent. The CBRT did not sterilise the capital inflows and created the money by domestic credit expansion. Thus, the CBRT foreign exchange reserves did not increase and kept its previous year level. The real effective exchange rate was almost constant compared with the previous year but there was still 10 percent appreciation at the end of 1993, which was the residual of the 1989-1990 monetary program.

In 1993, public sector borrowing requirement continued to rise and reached 12 percent of GNP that was highest ever recorded. Primary deficit of the consolidated budget continued in 1993, as was the case in 1991 and 1992. Non-interest expenditures jumped due to the "other transfers" item of the budget and interest payments exhibited the most dynamic expansion and reached a record level with 5,3 percent of GNP due to lagged effects of Gulf War and 1992 parliamentary elections. Another factor, which boosted interest payments in 1993, was the shortening of the maturity of the debt stock. The increase in credits, public sector expenditures and real wages boosted the economy and economy grew by 8.1 percent, which was the highest economic growth rate after 1990. Strong consumption and private investment led to rapid deterioration in current account and current account deficit reached 3,5 percent of GNP at the end of 1993.

In the last months of 1993, government tried to decrease the cost of domestic borrowing. For this purpose, in some of the auctions, the government either did not borrow or borrowed small amounts, despite the increasing fiscal deficit. Furthermore, the Treasury relied heavily on CBRT resources and created excess liquidity in the market, which put pressure on foreign exchange rates so that the margin between market and official exchange rate started to widen in the last quarter of 1993. The rating agencies downgraded the Turkish economy during that time. These developments triggered the financial crisis, which stemmed not only from worsening macroeconomic fundamentals but also debt mismanagement as well. At that time one of main disadvantages of the CBRT was that the level of foreign exchange reserves of the Bank was low compared to the level of Banks' open foreign exchange (FX) positions (almost 75 percent of reserves). The government devaluated the currency and took some measures on the 5<sup>th</sup> of April including tight monetary and fiscal policy and structural reforms. The results of the crisis were destructive. The economy contracted by 6.1 percent. Nominal interest rate of government securities reached 100 percent. The maturity of the debt stock shortened to 4 months. Despite some success in fiscal adjustment, the PSBR increased again after 1995 raising inflationary expectations.

#### *1995-1999: Post-crisis Period*

The 1994 financial crisis heavily influenced the monetary policy of the CBRT. The balance sheet of the Bank took a new form. Typical IMF conditionality in the context of ceiling on "net domestic assets" and floor on "net international reserves" together with an unannounced predetermined exchange rate path were the main

"performance criteria" of the monetary authority as part of the Stand-by agreement. However, after the financial crisis the maturity of the debt stock was shortened and the destructive results of the crisis was heavily seen on the fiscal balances of the Turkish economy in 1995. As a result of less recourse to foreign borrowing, the Treasury heavily resorted to domestic borrowing in financing the increased budget deficit that exerted heavy pressure on the financial system. On the other hand, the real depreciation of the TL in 1994 again led to increase in exports and current account deficit decreased to 1,4 percent of the GNP. Again capital inflows accelerated in 1995 and the economic growth was above its potential again and reached 8,1 percent. The source of the growth was not only domestic consumption but private investment as well.

The Stand-by arrangement came to end at September 1995 since the election atmosphere forced CBRT to a more supportive monetary policy. On the inflation front 1995 was a partially successful year, inflation declined to 65,6 percent that was 149,6 percent in 1994. However lack of fiscal discipline together with unresolved structural imbalances including rehabilitation of banking system dominated the Turkish economy after that time. Between years 1989-1995, which was pre-crisis period, average inflation rate was around 60s. After the crisis, inflation rate moved to an upper plateau of 80s until 1998.

During 1996-1997, the CBRT centred its monetary policy implementation on achieving stability in financial markets rather than decreasing the inflation rate. The fiscal dominated environment together with a permanent crisis memory and the failure of weak coalition governments to deal with structural problems resulted in the economy operating under a cloud of vulnerability, particularly in terms of worsening debt dynamics together with increase in country's risk premium. Under these conditions, the CBRT implemented its monetary and exchange rate policy without announcing any operating targets. However the monitored balance sheet structure was almost same with the previous two years. Since the short term advances to Treasury were limited by the Law and credits were not extended to the other public sector institutions, the CBRT managed to control the growth of the domestic assets and increased the domestic liabilities in return for increase in foreign assets. Exchange rate policy was conducted in line with the forecasted inflation rates. This policy ensured not only real effective exchange rate stability but competitiveness in the export sector and a sustainable current account deficit as well. Besides this, unlike 1989-93 period, Central Bank official reserves reached to 21 billion US dollar as of October 1997 compared to the level of 6 billion US dollar at the end of 1993

which enhanced the CBRT's resistance to speculative attacks experienced both in Asian crisis in the second half of 1997 and Russian crisis in August 1998. Wholesale price inflation which decreased to 65 percent by the end of 1995 following the financial crisis, returned to an increasing trend in 1996 and this trend continued in 1997 reaching to 84 percent.

CBRT again announced its monetary program in 1998. For the first and second quarter of the year, "reserve money" target bands were announced together with the expected inflation rates. Besides this, Treasury also announced quarterly budget "primary surplus" targets. However, the overall program was not comprehensive i.e. lack of structural reform agenda. The only positive step was that the "tax reform" which was launched on July 1998. During that time, the bands were determined through money demand projections by considering the expected income and inflation figures for the first half of the year. The targeted levels were designed according to a modest remonetization rate in the economy on one side and thought as a buffer for any external shock together with including seasonal factors on currency developments on the other side. The reserve money targets were realized below the projected lower band.

As to inflation, decreasing trend in interest rates with heavy short-term capital flows together with a decline in inflationary expectations on one side and the realised favourable figures both on the budget and monetary side on the other side contributed to decrease in inflation rates in the first half of the year.

In June, Turkey signed a "Staff Monitoring Program" (SMP) with the Fund. In that context, the CBRT announced a six-month monetary program. According to this program, a new definition of "net domestic assets" item was defined and targeted. In line with the consultations done with the I/MF Staff, the target for the "reserve money" was not announced to the public. Given a "net foreign assets" and "reserve money (X)" projections, the target for "net domestic assets" was determined. The main reasons behind this new monetary policy framework were as follows:

*In many developing countries, the Central Bank's control over its balance sheet tends to be incomplete. Changes in net foreign assets which is a reflection of the balance of payments outcome, cannot generally be considered to be a fully policy-controlled variable. Although the Central Bank could, to some extent, counteract exogenous shocks to the reserves and/or resist the monetization of the fiscal deficit, in practice the most controllable factor compared to others remains claims on commercial banks. Another important issue (with respect to reserve money) is that during disinflation, estimating the rate of re-monetization of an economy following a period of high inflation is very difficult. Policy simulations with regard to money demand applications implicitly assumes that de-monetization and re-monetization are symmetric processes. However in practice these elasticities are generally not same. (Ergel, 1998)*



As can be followed from the Graph 1 in Appendix A<sup>5</sup>, during the first half of the year (especially March-June period), due to rapid short-term capital inflows, the share of changes in "net foreign assets" in the initial stock of reserve money is positive. Thus, this was the period, where the secondary market interest rates were stayed between the CBRT's official interest rate corridor (Interbank money market). However, starting from the middle of July; uncertainty created by the controversies over civil servant's salary rises, early election and withholding tax debates and thus increases in inflationary expectations and the Russian crises in August reversed the trend of interest rates. This was the period during which the source of the growth of reserve money was the increase in net domestic assets. Moreover, the Russian crisis observed during that time, limited the chance of the Treasury to find loans in international markets. This development increased the dependence of Treasury to domestic borrowing which exerted upward pressure on domestic interest rates. The observed foreign capital outflow in last months of the year triggered the interest rate hikes. Therefore, in October, the end-of-year target of the "net domestic assets" was revised towards an upper level, which indicates a more loose monetary policy. Besides the all efforts of the Central Bank, the year ended with high real interest rates which increased the burden of future domestic interest payments on the budget that lead to worsening domestic debt dynamics in 1999 and the economy entered into a recession. But year-end inflation stayed around 50's as targeted (Erçel 1998).

The policy implementation under SMP agreement continued in 1999. NDA targets were determined loosely under the assumption of neutral NFA position. However, capital inflows were again more than expected which led to CBRT to carry out the NDA targets despite the election environment in the first half of the year and the earthquake in the second half. The real burden of the Russian crises was observed in that year. The economy contracted by 3 percent in line with contraction in both domestic and external demand. Although the "primary balance" targets were hold during the year, overall public sector deficit deterioration and rapid increase in interest payments prevented to keep the public sector price inflation under control. Since SMP was seen as a bridge for a future comprehensive disinflation program, the Central Bank expressed its views with regard to inflation target by choosing a rate of crawl it deems acceptable allows for no doubts about the sustainability of the chosen exchange regime especially under constraints of both current account and

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<sup>5</sup> CBRT balance sheet and fx reserve developments were stated in Appendix A.

fiscal sustainability and rapid changes of directions and volume of short-term capital flows (and thus the level of foreign exchange reserves).

The CBRT moved to an exchange rate policy based on forward-looking inflation targets as part of a disinflation programme backed by the Fund on the 1<sup>st</sup> of January 2000. The announcement of the program with its pre-determined daily exchange rate path on a sliding 12-month horizon was done on the 9<sup>th</sup> of December 1999. Thus, a new monetary policy framework has been introduced (Erçel 1999).

Thus, in the context of the above historical background, it is possible to examine the 1989-1999 period in two sub-periods as pre-1994 and after 1994.

During 1989-1993 period, the CBRT mostly did not sterilise the capital inflows, heavily extend direct cash credits to Treasury and did not tighten enough the credits extended to banking sector. With non-sterilised intervention policy, the CBRT did not accumulate the necessary foreign exchange reserves to defend the domestic currency in case of speculative attacks. In the second period, which was between 1995-1999, the Bank chose the sterilised intervention policy. The result was sound current account balances, strong FX reserves, coping with external shocks without incurring heavy losses but increased burden of interest payments on the budget and thus unsustainable domestic debt dynamics.

The distinction between these two periods was that the monetary policy was re-shaped in line of the argument, which the 1994 currency crises showed that non-sterilised intervention should not be a policy option in case of unsustainable fiscal stance.

**Table 7  
MONETARY PROGRAMS**

YEAR	PROGRAM	FAVORABLE	PAVING	TOTAL BARRER	FINAL BARRER	CONCLUSION
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		...	...	...	...	
1991	...	...	...	...	...	...
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1992	...	...	...	...	...	...
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1998	...	...	...	...	...	...
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		...	...	...	...	
1999	...	...	...	...	...	...
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1. The data in this table are based on the data in the ...  
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### III-Theoretical Framework

In theory, the main goal of the monetary policy for most central banks is to maintain the internal and external value of the domestic currency. The ultimate objective of most of the central banks is to keep inflation low and steady. Thus, most central banks attempt to control it indirectly through affecting interest rates or the quantity of monetary aggregates. In addition, in the open economy, the central bank cannot implement both an independent domestic monetary policy – whether on interest rates or the money supply- and the exchange rate policy. If it has independent target for interest rates, for example, it will have to accept the market-determined exchange rate. If, on the other hand, it targets the exchange rate it will have to accept the interest rates (and the quantity of domestic money) necessary to keep the exchange rate stable (Gray and Hoggart; 1996). On the other hand the central bank can temporarily set both domestic monetary policy and exchange rate. This could be achieved through sterilised intervention in which central bank offsets the monetary impact of its foreign exchange operations. In this point, as parallel to the aim of this study, the issue of different types of exchange rate systems should be analysed separately.

When the exchange rate is fixed, to maintain the official parity, the central bank must intervene in the foreign exchange market by buying high-powered money with foreign reserves. In this manner, attempts to alter the domestic source component of the monetary base are impeded, even in the short run, by offsetting movements in its foreign source component. If the offset to domestic credit expansion is complete, the monetary base is determined independently of the central bank's policies by the saving and portfolio decisions of the public. The central bank can affect the monetary base only when domestic and foreign assets are imperfect substitutes. If there is perfect substitutability, the capital account offset to domestic credit measures is immediate and complete, provided there are no lags in portfolio adjustments (Obstfeld 1982). When the exchange rate is flexible, the level of exchange rate is determined by the supply and demand of currency. In this system, the nominal money supply becomes a policy determined variable and as in the fixed exchange rate, the central bank can attain independent monetary management only if there is imperfect substitutability between domestic and foreign assets.

In this point, two concepts emerge: Offset coefficient and sterilisation coefficient. Offset coefficient indicates the fraction of any domestic credit expansion reversed by central bank foreign reserve losses in the same period while sterilisation coefficient

indicates that the degree of sterilisation which is offset in the inflows so as to leave the overall money supply unaffected through open market operations or some other monetary regulations like reserve requirements.

Under those mentioned above, determining the offset and sterilisation coefficients of the central bank could be useful in terms of measuring of the scope and the stance of the monetary policy. indeed, this issue has discussed in the literature by several authors. They all estimated a reaction function for monetary policy and assessed the sterilisation and offset coefficient. in Kamas (1986) for Mexico and Venezuela, in Renhack and Mondino (1988) for Colombia, in Fry, Lilien and Wadhwa (1991) and Fry(1996) for Pacific Basin Countries, Savvides (1998) for West and Central African Countries, the offset and the sterilisation coefficients were estimated to measure the degree of monetary independence or performance of monetary policy. On the other hand, in Siklos (1996) and Arvai (1997) for Hungary, Altinkemer (1997) for Turkey and in Celasun-Denizer (1999) for Turkey, sterilisation policy was examined.

In those studies, monetary policy reaction functions were estimated where the reduced form equations were not derived from a general macroeconomic model. Whereas in Kamas (1986), a reduced form equation was derived from a general macroeconomic model. On the other hand, there are some issues related to these two approaches. Obstfeld (1982) indicates that the structural approach suffers from several disadvantages relative to the reduced-form approach. For example, it may be less robust with respect to certain specification errors in structural equations. Also, unlike the reduced form approach, it cannot be implemented when there is unlimited substitutability between domestic and foreign assets. However, the structural approach avoids an important econometric problem that may bias reduced-form estimates.

As to methodology, various estimation techniques were used: Ordinary least square , two stage least squares, iterative three stage least squares, vector autoregression models etc. Among these, since the application of OLS method to an equation belonging to a system of simultaneous equations yields biased and inconsistent estimates, the obvious solution is to apply other methods of estimation.

Some results of these studies were summarised in the following table:

**Table 2**  
Sterilization and Offset Coefficients in Developing Countries

Source	Country	Period	Exchange Rate System	OFFSET COEFFICIENT	STERILIZATION COEFFICIENT	Methodology
Kamas (1988)	Mexico	1971.3-1981.4	Fixed Exchange Rate	0.04 to 0.09 <sup>(1)</sup>	1.55	OLS and TSLS
	Venezuela	1970.4-1982.4		-0.85 to -0.82 <sup>(1)</sup>	-1.04	Equations derived from a macro-model
Kamas (1985)	Colombia	1970.3-1980.4	Crawling peg	-0.43	-0.92	5 equation model using TSLS
Renhack-Mondino (1988)		1975.2-1984.2		-0.39 to -0.72 <sup>(2)</sup>	-1.24	Small structural model of financial markets using 2SLS
Siklos (1996)	Hungary	1991.1-1994.12	Crawling peg	NA	-0.69	2SLS (with error-correction terms)
Fry (1996)	Pacific Basin Countries <sup>(3)</sup>	1960-1988	Pegged exchange rate	-0.32	-0.62	Iterative three-stage least squares (3SLS) <sup>(4)</sup>
Savvides (1998)	Cameroon, Cote d'Ivoire, Gabon, Ghana and Nigeria	1966-1991	Fixed Exchange Rate	-0.41	-0.12	Iterative three-stage least squares
Altinkemer (1997)	Turkey	1990:2-1993:10 and 1994:4-1997:6	Managed Floating	NA	-0.82 and -0.91 respectively	OLS
Calasun (1999)	Turkey	1990.2-1996.6	Managed floating	NA	-0.37	Instrumental estimation (with error-correction terms)

(1) Kamas made estimations in the context of three different specifications: the monetarist, the portfolio balance, and Keynesian.

(2) Two types of domestic credit policies were defined. First is the helicopter drop and second is the open market operation.

(3) Indonesia, Hong Kong, Korea, Malaysia, the Philippines, Singapore, Taiwan, Thailand

(4) The 27 individual country equations for capital flow ratios are estimated as a system of equations with cross-equation restrictions on all coefficients except the intercept.

Actually it could not be said for most of these studies to reach a firm conclusion concerning the offset and sterilisation coefficients which change according to choosing, definition, and calculation of the variables like in Kamas(1985), Kamas (1986), Siklos(1996), Renhack, Mondino (1988). In Roubini (1988), on the other hand, it is emphasized that there is no unique offset and sterilisation coefficient; that is, these coefficients are changing according to the different disturbances hitting the economy and the preferences of the monetary authorities. However, it may be useful to estimate offset and sterilisation coefficients for policy analysis.

Generally in these studies, small offset coefficient and high sterilisation are evaluated as the indicator of independent and effective monetary policy leading to low level of inflation and moderate and sustainable macroeconomic balances whatever the exchange rate system is. These coefficients together with the neutralisation coefficient<sup>6</sup> also help to determine the relationship between monetary and fiscal policy. As a matter of fact that in Fry (1995) this issue was examined with the sample of 70 developing countries and found that larger deficits and greater reliance by governments on the inflation tax and financial repression are associated both with less sterilisation of increased net foreign assets and with less neutralisation of increased government borrowing requirements. In this point, another inference concerning Mexico worths to mention. As seen from the Table 2, offset coefficient is very small while sterilisation is not found. During the period of estimation, the Mexican government played a large role in the economy by utilising the foreign borrowing extensively to finance current account and budget deficit. Venezuela, in contrast, represent the case of a smaller role for the government, and estimated coefficients are in accordance with the predictions of theory. In addition, the small offset coefficient can indicate limited capital movements or exchange rate policy coordinated with monetary policy as suggested by Fry(1996) for the Pacific Basin Countries. Indeed, this issue was confirmed by Moreno(1996) for Korea that had more restrictive capital controls in the 1981-1994 period and found that it may be more insulated from foreign asset shocks<sup>7</sup>.

#### **IV- Methodology and Estimates of the Offset and Sterilisation Coefficient for Turkey**

When a central bank follows a sterilisation policy, domestic credits will be an endogenous variable, since, domestic credits are varied in response to the change in foreign assets. Also "foreign assets" is an endogenous variable since domestic credit expansion is offset by a fall in foreign exchange reserves. As a result, domestic credit will be correlated with the error term in the foreign assets equation while the foreign assets will be correlated with the error term in the domestic credit equation. The following behavioural simultaneous equation system was created.

$$\Delta NDA_t = a_1 \Delta NFA_t + a_2 X_{1t} + u_{1t}$$

$$\Delta NFA_t = b_1 \Delta NDA_t + b_2 X_{2t} + u_{2t}$$

<sup>6</sup> Neutralization indicates the decrease in the amount of private sector credits when the government credits expand.

$\Delta NDA^8$  and  $\Delta NFA$  are the change in the domestic assets and the foreign assets in the balance sheet of the central bank, respectively.  $X_{it}$  is a vector of other explanatory variables postulated to affect the changes in domestic and foreign assets.

In equation (1), the parameter  $a_1$  is an indicator of the degree of sterilisation of net foreign assets.  $a_1$  measures how much of a change in net foreign assets deriving from interventions in the exchange rate market is sterilised by the monetary authorities. The coefficient ranges from zero to minus one. If  $a_1 = -1$ , the sterilisation is complete while  $a_1 > -1$ , the degree of sterilisation is less than full. In equation (2), the parameter  $b_1$  is the offset coefficient. Offset coefficient gives the amount of capital outflow per domestic currency of expansion of domestic credit.  $b_1$  is close to  $-1$  if domestic and foreign assets are close substitutes, indicating a high degree of capital mobility and a low degree of control over the money stock. If the  $b_1$  close to 0, a high degree of monetary control and a low degree of capital mobility are available.

In this framework, we estimated the following equation system:

$$\Delta NDA_t = a_0 + a_1 \Delta NFA_{t-1} + a_{21} \Delta BUDGET_{t-1} + a_{22} INF_{t-1} + a_{23} VINT_{t-1} + a_{24} G_{t-1} + u_{1t} \quad (1')$$

$$\Delta NFA_t = b_0 + b_1 \Delta NDA_{t-1} + b_{21} \Delta NDA_{t-1} + b_{22} CAP_{t-1} + b_{23} CUR_{t-1} + b_{24} PRIM_{t-1} + u_{2t} \quad (2')$$

Equation (1') is the monetary policy reaction function of the CBRT. All the nominal variables used in terms of US dollar.  $\Delta NDA$  is the change in net domestic assets of the CBRT excluding revaluation account.  $\Delta NFA$  is the change in net foreign assets of CBRT and its coefficient indicates sterilisation degree. The variables out of  $\Delta NFA$  are postulated to affect monetary policy. In other words, these variables were put into equation to capture the respond of CBRT to changes in these variables.  $\Delta BUDGET$  is the change in primary budget deficit,  $INF$  is the monthly WPI inflation, and  $G$  is the annual real output growth rate. Industrial production is used as a proxy for output since monthly GDP series is not available.  $VINT$  is the volatility of short-term interest rates (weighted average of overnight interest rates in the interbank money market and the Istanbul Stock Exchange (ISE) Repo-Reverse Repo Market) measured by the moving standard deviation method with the order of six<sup>9</sup>. We used this variable to

<sup>7</sup> In Moreno(1996) a VAR model for Korea and Taiwan was estimated using monthly data to analyse the monetary implications of intervention and sterilization policies.

<sup>8</sup> " $\Delta$ " denotes a change in the variable

<sup>9</sup> The formula is  $\sigma_{t+m} = \left[ (1/m) \sum_{i=1}^m (X_{t+i-1} - \bar{X}_{t+i-2})^2 \right]^{1/2}$  where  $X$  is the variable used for

measuring volatility and  $m$  is the order of the moving average.



see whether the CBRT implemented a monetary policy observing financial stability as stated in the previous section and how it did.

In equation (2'), the coefficient of  $\Delta NDA$ ,  $b_1$ , indicate the offset coefficient. The other explanatory variables show the possible source of foreign assets changes. CAP is the capital account, CUR is the current account, and PRIM indicates the spread between devaluation rate adjusted by the cost of foreign exchange and weighted average of overnight interest rates in the interbank money market and the ISE Repo-Reverse Repo Market. PRIM can be thought as the indicator of demand factor which generally proxied by the output in other studies. increase in PRIM means that the cost of funding via selling foreign exchange to CBRT is lower for the banks, i.e. net foreign assets increases, that is, the expected sign of coefficients of PRIM is positive like CAP and CUR.

We estimated the system with two-stage least square (2SLS) method with the monthly data for 1990-1999 period.

We employed augmented Dickey-Fuller Test to check for unit roots and found that all variables used are stationary. The instruments are all the predetermined variables, constant, and seasonal dummies<sup>10</sup>. We implement the experiments in the two sub-periods excluding the year 1994 in which financial crisis occurred. We carried out Chow test to test the presence of a structural break statistically and rejected the null hypothesis of no structural change. The estimation results are presented in Table 3.

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<sup>10</sup> We estimate the system with the longer lag instruments but the results did not change. The results were not reported to save the space.

**Table 3**  
**Estimation Results<sup>(1)</sup>**

Dependent Variable	$\Delta$ NDA		$\Delta$ NFA	
	1990-93	1995-99	1990-93	1995-99
C	-183,062 (-1,036)	251,315 (1,080)	48,270 (1,044)	54,645 (0,515)
$\Delta$ NFA <sub>t</sub>	-0,544 (-2,612)	-0,884 (-10,526)		
$\Delta$ NDA <sub>t</sub>			-0,293 (-3,380)	-0,779 (-8,302)
$\Delta$ NDA <sub>t-1</sub>			-0,120 (-1,981)	-0,088 (-1,252)
$\Delta$ BUDGET <sub>t-2</sub>	0,206 (2,184)	-0,068 (-1,003)		
INF <sub>t-1</sub>	33,550 (0,921)	-36423 (-0,769)		
VINT <sub>t</sub>	0,924 (0,223)	2,027 (1,797)		
G <sub>t-1</sub>	27,921 (2,019)	-4,820 (-0,582)		
CAP <sub>t</sub>			0,369 (5,592)	0,131 (1,851)
CUR <sub>t</sub>			0,570 (5,042)	0,376 (2,714)
PRIM <sub>t</sub>			2,800 (1,857)	2,995 (1,510)

(1) The equations are estimated using two-stage least squares method. The instruments used are all the predetermined variables and seasonal dummies. (\*) indicates statistical significance at the 1 percent level, (\*\*) indicates statistical significance at the 5 percent level, and the three stars (\*\*\*) indicate significance at the 10 percent level. Figures in parentheses are t-statistics.

The most striking result is the difference of the sterilization and offset coefficients in each period. In the second period, which is post-crisis, absolute values of both coefficients are considerably high compared to the first period.

The estimate of the offset coefficient is -0,29 in the first period. For every one unit of an expansion of net domestic assets, -0,29 unit of net foreign assets flow out. After the crisis, this offset coefficient is -0,78. This means that, in the second period, capital mobility increased and the CBRT cannot affect the money supply by controlling or influencing domestic credit in the short run. However this also was a reflection of Treasury's net repayer position in terms of foreign debt. In other words, the Treasury paid part of its foreign debt through CBRT FX reserves in return for TL that was an influential factor on this high level of offset coefficient in the second period. The estimated sterilisation coefficient is -0,88 in the second period while -0,54 in the first period indicating partial sterilization although higher than our expectation. This suggests that the CBRT has been able to insulate the economy from the monetary effects of reserve flows.

In NDA equation, the estimated coefficient for the second lag of primary budget deficit is significantly positive in the pre-crisis period. In the first period, CBRT

increased the net domestic assets when output growth increase which could be evaluated as accommodation at least part of additional domestic demand stemmed from increase in government expenditures through an expansion of domestic credit. In the second period, we couldn't observe any relationship among net domestic assets and budget deficits and output. There is no significant relationship between net domestic assets and inflation in all periods. These results consistently suggest that the CBRT implemented a monetary policy accommodating to fiscal deficit and domestic demand until 1994. Since "short-term advances to Treasury" were heavily curtailed in the second period, we may not observe any relation between deficit and NDA in the second period. The estimated coefficient of VINT is positive significantly in the second period. This result is consistent with the CBRT's policy goal of stability in both TL and foreign exchange markets by the help of exchange rate policy, liquidity management techniques and the interest rate policy, which are consistent with the conducted fiscal policy.

In the NFA equation, the estimated coefficient of the capital account and current account are positive significantly in all periods as expected. The estimated coefficient of PRIM marginally significant in the second period while considerably significant in the first period. This is not surprising when considered the fact that the level of open FX positions of the banking system increased dramatically compared to the level of CBRT FX reserves and reached to 75 percent of official FX reserves at the end of 1993 as seen from Graph 1 in Appendix A.

### ***Second Trial***

We also estimated the equations by using "net credits to private sector" (CRDPRIV) instead of total net domestic assets. We obtained net credits to private sector (sum of "open market operation (OMO) stock", "credits to banking sector" and "other items") by excluding the net credits to government sector from the total net domestic assets. In the second step, we used the net credits to government sector (CRDGOV) as explanatory variable in the reaction function to measure the *neutralization* coefficient. The estimated coefficient for this variable is expected to lie between zero and minus 1. A coefficient of -1 would imply that the central bank neutralizes completely the public sector's credit requirements by cutting back credit to the private sector. Partial neutralization, on the other hand, produces a coefficient less than zero but greater than -1, and no neutralization entails a coefficient of zero. An accommodating monetary policy would increase in private sector domestic credit along with increased

government borrowing from central bank. In this case, the estimated neutralization coefficient would be positive. The estimation results are as follows:

Table 4  
Estimation Results

Dependent Variables	$\Delta$ CRDPRIV		$\Delta$ NFA	
	1990-93	1995-99	1990-93	1995-99
C	-54,807 (-0,538)	244,298 (1,000)	11,076 (0,192)	166,891 (1,082)
$\Delta$ NFA <sub>t</sub>	-0,038 (-0,234)	-0,882* (-9,008)		
$\Delta$ CRDPRIV <sub>t</sub>			0,419*** (1,769)	-0,442* (-3,428)
$\Delta$ CRDGOVt	-0,285* (-3,325)	-0,820* (-8,090)		
INF <sub>t-1</sub>		-82,743 (-0,726)		
VINT <sub>t</sub>	-1,535 (-0,828)	1,822*** (1,881)		
G <sub>t-1</sub>	15,451* (2,776)	-3,056 (-0,887)		
CAP <sub>t</sub>			0,345* (3,304)	0,414* (5,082)
CUR <sub>t</sub>			0,639* (4,358)	0,647* (3,400)
PRIM <sub>t</sub>			4,775* (2,612)	-0,851 (-0,305)

(\*)The equations are estimated using two-stage least squares method. The instruments used are all the predetermined variables and seasonal dummies. One star (\*) indicates statistical significance at the 1 percent level, two stars (\*\*) indicate statistical significance at the 5 percent level, and the three stars (\*\*\*) indicate significance at the 10 percent level. Figures in parentheses are t-statistics.

In this situation, sterilization and offset coefficients changed considerably, indicating no sterilization and offset in the first period. Also in Fry (1998) this phenomenon was detected for Turkey in 1980's. Fry consider this the evidence of financing of investment and growth by expanding domestic credit. On the other hand, in our sample period, when considered together with the low neutralisation coefficient, one can see that the CBRT implemented a relatively accommodative policy to fiscal policy by expanding domestic credits to finance budget deficit. In contrast, in the second period, the CBRT implemented more active policy by sterilising most of the foreign assets increase and neutralising the government credits by reducing the banking sector credits. Finally, although the offset coefficient in the second period seems to counteract monetary autonomy, it supports the findings of effective monetary policy when evaluated together with the high sterilisation and neutralisation. When considered that period including Asian and Russian crisis, it may reflect how the economic agents become more vulnerable after the domestic and external crisis. On the other hand, other relationships showed the same pattern as in the first trial with marginal differences (Table 4).

## CONCLUSION

In this paper we have estimated the CBRT's monetary policy reaction function with the structural equation system to measure the performance of monetary policy and evaluate the relationship between monetary policy and macroeconomic variables together with the sterilisation, offset and neutralisation coefficient.

According to the results of the estimations, the way CBRT implemented its policy indicated different characteristics in 1990-1993 and 1995-1999 periods. In the first period, low degree of sterilisation, offset and neutralisation coefficients suggest that the CBRT implemented a relatively accommodative policy to fiscal policy by expanding domestic credits to finance budget deficit. In contrast, in the second period, the CBRT implemented more active policy by sterilizing most of the foreign assets increase and neutralizing the expansion of government credits by reducing the banking sector credits which was reflected in the high level of sterilisation, offset and neutralisation coefficients. In addition, in the second period, the CBRT gave priority to the stability of the financial markets more evidently by injecting Turkish Lira and/or foreign exchange when needed.

However, especially in the last two years, the banking sector was in a net debtor position to CBRT. During that time the CBRT supplied just the required daily need of the market at higher costs, which facilitated the Treasury's domestic borrowing strategy. In order to prevent sharp portfolio switch of market participants from domestic currency to foreign exchange, the CBRT did not let short-term market interest rates to fall to levels which was not consistent with its nominal devaluation rate of the exchange rate basket (plus the cost of holding FX for banks and risk premium compatible with the conditions of that time). Although the link between high sterilisation and low inflation accepted generally as a rule in the literature, we did not observe this situation in Turkish case since sterilisation policies may easily end up with high real interest rates in the economy. Normally in low inflation countries high real interest rates can dampen domestic demand, which alleviates inflationary pressures. However especially after 1994 crisis, together with the inflationary expectations, the risk premium of the country rose which caused the real interest rates reach to unsustainable levels, which halted the negative relationship between excess demand and inflation.

The inflation process is driven in part by the pricing behaviour of economic agents in the goods and factor markets. The shorter adjustment intervals, which is a consequence of change in the pricing behaviour of the producers and is independent

from aggregate demand, becomes a crucial factor behind the inflationary dynamics. Throughout this information process, inflation dynamics shift from demand-pull inflation to an inflationary process where the cost effects are dominant. Taking into account that Turkey is a net importer of the most of the intermediate goods, a possible surge in the international price level of these goods will result in the worsening of the terms of trade and the prices of imported goods again will be pushed up which directly increases cost of production. Another important impact of this process is that in such an environment, producers expect a permanent depreciation of TL without knowing anything about the magnitude of the depreciation, which brings an important uncertainty on the replacement cost of the products they produce, and they increase the prices of their products to cover the risk of replacement cost. As a result, the relationship between demand and prices disappears and becomes indeterminate. In other words, in the price determination of the private firms replacement cost and mark-up pricing behaviour gains importance. The process further feeds the cost-push inflation.

The estimation results suggest that "sterilisation coefficient" was significantly higher after the 1994 currency crisis that was the period a disciplined discretionary monetary policy was implemented under the constraints of worsening fiscal balances. Similarly, the "offset coefficient" in the second period (between 1995-99) was found significantly higher than the first period (between 1990-93). This indicates that after the crisis monetary autonomy in Turkey was lost together with faster capital movements and increasing burden of domestic borrowing on financial markets. On the other hand, CBRT had pursued a strong sterilisation policy in the second period. This was consistent with the monetary policy implemented after the 1994 crisis, which aimed particularly at stabilising the financial markets. In implementing its monetary policy, the CBRT tried to prevent fluctuations in both the Turkish lira and foreign exchange markets by focusing on the consistency among Central Bank balance sheet items and macro balances of the economy, mainly real exchange rates, interest rates and the current account.

As a result, the policy strategy in the second period was not the best but a better strategy and a more sound monetary policy under the constraints of increasing crises memory of the economic agents, sustaining current account soundness, worsening domestic debt dynamics, and increasing probability of contagion effects of external shocks with high capital mobility.

## REFERENCES

- AGENOR, P.R., McDERNOTT, C.J., E.M. UÇER, 1997, "Fiscal Imbalances, Capital Inflow, and Real Exchange Rate: The Case of Turkey", *IMF Working Paper*
- ALTINKEMER, M., 1997, "Capital Flows and Effects on Monetary Policy", CBRT Research Department, unpublished manuscript.
- Annual Reports of the Central Bank of Turkey, Various Issues
- ARVAI, Z., 1997, "An Econometric Analyses of Capital Inflows and Sterilization Policy: The Hungarian Case", *NBH Working Paper*
- CELASUN, O., DENİZER, C., and D. HE, 1999, "Capital Flows, Macroeconomic Management, and the Financial System: The Turkish case, 1989-97", *World Bank Working Paper*
- ÇULHA, A., EMİR, O., Y., KARASOY, A., KUNTER, K., 1999, "Monetary Policy Issues and Experiences", *unpublished manuscript*
- ERÇEL, G., 1998, "1998 Yılı Para Politikası Uygulaması: Basın Toplantısı", Türkiye Cumhuriyet Merkez Bankası
- ERÇEL, G., 1998, "Results of the Monetary Program of Central Bank of Turkey for the First Half of 1998 and Plans to Implement the Monetary Program for the Second Half", Central Bank of Turkey
- ERÇEL, G., 1998, "Results of the Monetary Program of Central Bank of Turkey for the First Quarter of 1998 and Plans to Implement the Monetary Program for the Second Quarter", Central Bank of Turkey
- ERÇEL, G., 1999, "Disinflation Program for the Year 2000: Implementation of Exchange Rate and Monetary Policy", Monetary Program Announcement of the Central Bank of the Republic of Turkey.
- FRY, M., J., 1996, "Inflation and Monetary Policy in Pacific Basin Developing Economies",
- FRY, M., J., 1998, "Assessing Central Bank Independence in Developing Countries: Do Actions Speak Louder Than Words?", *Oxford Economic Papers*, 50 512-529
- FRY, M., LILLEN, D., M., WADHWA. 1991, "Economic Success in Pacific Asia: Behavior or Policy?", *CCBS Bank of England*, Seminar in 9-20 February 1998

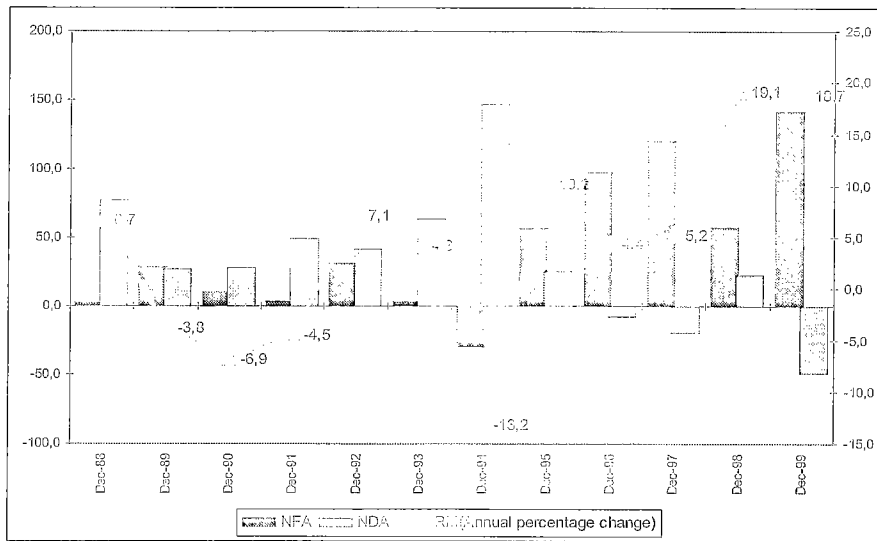
- GRAY, S., HOGGART, M., 1996, "Introduction to Monetary Operations", *Handbooks in Central Banking*, No.10, CCBS Bank of England
- Inflation Report, May 2000, Central Bank of Turkey
- KAMAS, L., 1986, "The Balance of Payments Offset to Monetary Policy: Monetarist, Portfolio Balance, and Keynesian Estimates for Mexico and Venezuela" *Journal of Money, Credit and Banking*, Vol. 18, No: 4, pp. 467-481
- KAMAS, L., 1985, " External Disturbances and the Independence of Monetary Policy Under the Crawling Peg in Colombia", *Journal of International Economics* 19, 313-327
- KOURI, P., and PORTER, M., 1974, "International Capital Flows and Portfolio Equilibrium", *Journal of Political Economy*, pp. 443-468
- MORENO, R., 1996, "Intervention, Sterilization, and Monetary Control in Korea and Taiwan", *FRBSF Economic Review*, No.3, pp.23-33
- OBSTFELD, M., 1982, " Can We Sterilize? Theory and Evidence", *AEA Papers and Proceedings*, Vol.72, No.2, pp.45-50
- RENHACK, R., MONDINO, G., 1988, "Capital Mobility and Monetary Policy in Colombia", *IMF Working Paper*, WP/88/77
- ROUBINI, N., 1988, " Offset and Sterilization Under Fixed Exchange Rates With an Optimizing Central Bank", *NBER Working Paper Series*, No. 2777
- SARACOĞLU, R., (1990), "The Briefing Given by Dr. Rüşdü Saracoğlu on the Central Bank's Monetary Program"
- SARACOĞLU, R., (1992), "The Briefing Given by Dr. Rüşdü Saracoğlu on the Central Bank's Monetary Program"
- SAVVIDES, A., 1998, "Inflation and Monetary Policy in Selected West and Central African Countries", *World Development*, Vol. 26, No. 5, pp.809-827
- SIKLOS, P., L., 1996, "Capital Flows in Transitional Economy and the Sterilization Dilemma: The Hungarian Case", *IMF Working Paper*, WP/96/86



APPENDIX: A

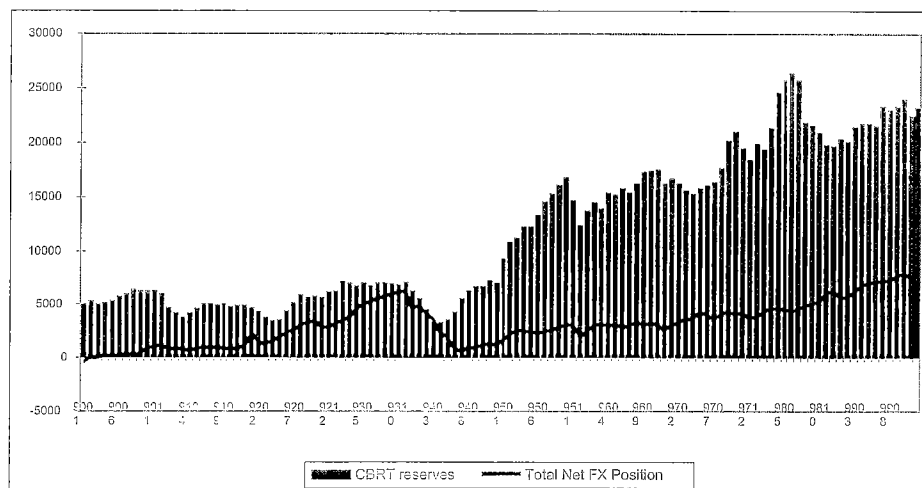
Graph 1

ANNUAL CHANGE OF NDA AND NFA AS PERCENT TO THE YEAR END RESERVE MONEY

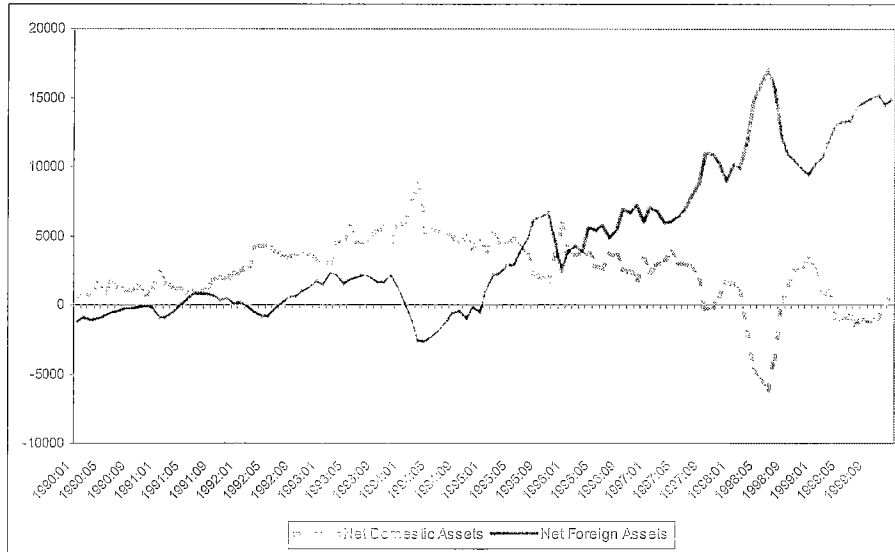


Graph 2

CBRT Reserves and Foreign Exchange Position (Million \$)



**Graph 3**  
**Net Foreign Assets and Net Domestic Assets**  
 (Million US Dollar)



**Graph 4**  
**Net Foreign Assets and Domestic Credits**  
 (Million US Dollar)

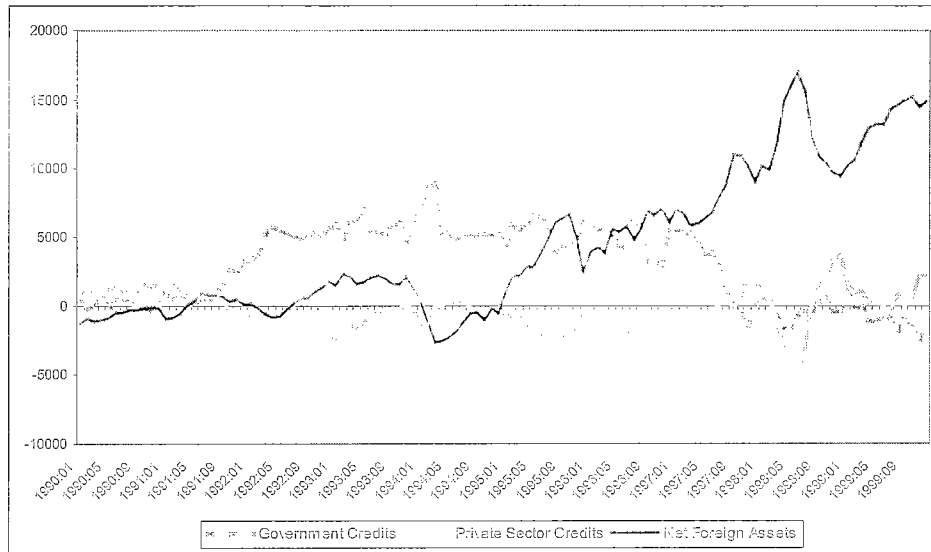


TABLE 1: MAIN MACROECONOMIC INDICATORS

	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
Real Increase in M1 (2)	5.2	0.1	-12.9	0.0	-3.7	-20.7	-4.5	28.5	-11.4	-4.5	-1.2	11.6	
Real Increase in M2 (2)	5.5	-5.3	-4.4	-1.9	-13.5	-1.0	13.3	29.5	-2.3	19.0	14.1	-6.3	
Real Increase in M2Y (2)	1.9	-5.0	5.2	5.4	-5.9	12.1	14.8	23.8	-0.3	11.7	17.7	2.4	
CPI (1)	64.3	60.4	71.1	66.0	66.0	125.5	76.0	79.8	99.1	69.7	66.6	43.8	
WPI (1)	62.5	40.6	59.2	61.4	60.3	149.6	65.6	84.9	91.0	54.3	62.9	39.1	
Noninflation Depreciation of TL vis-a-vis US dollar (1)	78.0	27.5	26.6	73.4	68.6	165.7	58.9	76.1	90.5	52.7	72.7	33.2	
US dollar (buying rate) (4)	1,813.0	2,311.4	2,927.1	5,074.8	8,555.9	14,458.0	38,418.0	61,054.0	107,505.0	204,750.0	312,720.0	540,098.0	692,883.0
Nominal Depreciation of TL vis-a-vis German mark (1)	60.2	33.4	42.7	71.5	58.8	57.4	195.7	72.6	62.1	65.4	64.0	47.9	14.1
German Mark (buying rate) (4)	1,022.9	1,384.5	1,947.5	3,339.8	5,302.7	8,347.6	24,653.0	42,600.0	69,073.0	114,240.0	187,340.0	277,169.0	302,296.0
Nominal Increase in Exchange Rate Basket (1)	69.4	30.2	34.2	72.4	63.7	65.4	179.6	65.6	69.0	78.2	57.9	61.0	18.9
Exchange Rate Basket (1.5 DM+ 1 US \$) (4)	3,658.7	4,359.0	5,948.4	10,084.5	16,509.3	26,979.4	75,442.5	124,954.0	211,114.5	376,110.0	593,730.0	955,851.5	1,136,327.0
Real Effective Exchange Rate with WPI (1.5 DM +1 US \$) 1987=100 (5)	105.6	66.0	30.4	86.9	89.4	90.9	103.1	100.9	99.8	93.6	95.3	95.1	36.1
Real GNP (Billion TL) (2)	76,108.0	77,347.0	84,592.0	84,887.0	90,323.0	97,647.0	91,733.0	99,028.0	106,080.0	114,874.3	119,303.1	112,043.8	89,296.6
GNP growth rate(2)	1.5	1.6	9.4	0.3	6.4	8.1	-6.1	8.0	7.1	8.3	3.8	-6.1	5.4
Current Account Balance (Million US dollar) (3)	1,596.0	961.0	-2,625.0	250.0	-974.0	-6,433.0	2,631.0	-2,339.0	-2,437.0	-2,638.0	1,984.0	1,364.0	-6,771.0
Current Account Balance / GNP (3)	1.8	0.9	-1.7	0.2	-0.6	-3.5	2.0	-1.4	-1.3	-1.4	0.9	0.7	-3.4
Central Bank Reserves (Million US dollar) (3)	2,307.0	4,831.0	5,972.0	4,910.0	6,116.0	6,216.0	7,112.0	12,391.0	16,273.0	18,419.0	19,721.0	23,177.0	24,222.0
Central Bank Reserves / GNP (3)	2.5	4.4	3.9	3.2	3.0	3.4	5.4	7.2	8.3	9.5	9.7	12.1	12.0
Real Ex-ante Interest Rate On Government Papers (period average) (6)	-7.8	-2.7	-4.7	7.8	9.1	12.9	25.1	18.6	28.6	10.1	16.5	24.2	-19.4
Real Ex-post Interest Rate On Government Papers (period average) (6)	1.0	-3.0	14.2	9.1	10.3	16.3	16.7	13.2	17.3	7.6	15.7	35.2	na
Average Maturity of Government Papers (Months) (6)	0.6	14.3	19.2	7.7	7.1	7.2	3.7	6.6	12.3	12.0	7.8	15.8	15.2
3 months compound-d average interest rates (2)	0.0	67.0	56.6	79.2	68.6	82.0	124.6	100.7	106.7	106.5	107.6	120.0	42.2
3 months time deposits: ex-ante real interest rate (2)	0.0	2.3	-2.3	8.0	10.9	9.6	3.9	6.2	15.7	11.2	12.4	33.5	-11.2
Overnight Rates (4)	83.3	51.0	68.6	109.6	92.2	87.6	591.7	103.2	115.1	102.1	111.2	126.7	54.7
Revenues (end of period) / in GNP (6)	13.6	13.6	14.24	15.62	16.14	17.6	19.2	17.7	16.0	19.6	21.8	23.9	28.0
Expenditures other than the Int. Pay. / GNP (6)	12.7	13.3	13.69	17.08	16.77	16.5	15.4	14.4	16.3	19.4	17.2	21.3	21.0
Total Expenditures / Nominal GNP (6)	16.6	16.9	17.21	20.87	20.42	24.3	23.1	21.8	26.3	27.2	28.8	35.5	37.3
Interest Payments / Nominal GNP (6)	3.9	3.6	3.52	3.79	3.65	5.6	7.7	7.3	10.0	7.7	11.7	13.7	16.3
Domestic Interest Payments / Nominal GNP (6)	2.4	2.2	2.4	2.7	2.8	4.6	6.0	6.1	8.9	6.7	10.7	12.6	15.0
Primary Surplus - Deficit / Nominal GNP (%) (6)	0.0	0.3	0.55	-1.46	-0.64	-0.9	3.8	3.3	1.7	0.1	4.6	2.1	7.0
Budget Balance / Nominal GNP (6)	-3.0	-3.3	-3.3	-5.25	-4.29	-6.7	-3.9	-4.0	-8.3	-7.6	-7.0	-11.6	-9.3
Central Bank Reserves / Imports(fob) (3)	2.0	3.6	3.2	2.6	3.2	2.5	3.6	4.2	4.5	4.6	5.2	7.0	5.6
PSBR/GNP (6)			7.4	10.2	10.6	12.0	7.9	5.0	8.7	7.7	9.0	15.3	10.9
Foreign Debt Stock/GNP (6)			32.2	33.2	34.6	37.2	50.3	42.7	43.3	43.9	47.3	54.3	54.0
Domestic Debt Stock / GNP (6)	7.4	8.1	14.4	15.4	17.6	17.9	20.6	17.3	21.0	21.1	21.3	23.3	26.0
Domestic Debt Stock (billion \$) (3)	5.2	6.1	8.3	8.5	15.0	17.6	14.1	18.7	25.0	29.0	37.1	42.4	48.7

Source: GRT, SIS, Treasury, SPO

1 to 5 belongs year 2000.

(1) November-november

(2) January-september

(3) September

(4) End of november

(5) October

(6) 2000 projection