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A Monetary Disequilibrium Model for Turkey: Investigation of a Disinflationary Fiscal Rule and its Implications on Monetary Policy

K. Azim Özdemir
Paul Turner

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K. Azim Özdemir*

And

Paul Turner

The Central Bank of the Republic of Turkey
Research Department

And

The University of Sheffield
Economics Department

ABSTRACT : In this paper we present a monetary disequilibrium model based on Khan and Knight's framework, estimate it for the Turkish economy and run several simulation experiments. The simulation results show the importance of fiscal discipline to achieve the objectives such as to sustain the disinflation process and to reduce the high budget deficit in Turkey. In the long term perspective, however, we conclude that tight fiscal policies should be mixed with either monetary or debt management policy to avoid the excessive monetary contraction as the real demand for broad money increases with the disinflation process.

* The corresponding author: e-mail: azim.ozdemir@tcmb.gov.tr Tel: +90 312 3103646/2656. Address: The Central Bank of the Republic of Turkey, Research Department, İstiklal Cad. No:10/15,06100-Ulus, Ankara-TURKEY. The views presented are those of the authors and do not necessarily reflect the Central Bank of the Republic of Turkey (CBRT).

1-Introduction

Disequilibrium in the money market, as the difference between money supply and money demand, provides the focus of the monetary block of many econometric models that assign a role to the quantity of money in explaining the interrelationships in an economy.[1] The policy importance of such a monetary disequilibrium, as proposed by the quantity theory of money, comes from the relation between money supply and nominal income and the ability of the monetary authority to control the money supply under the assumption of a fairly stable demand for money behavior (Friedman, 1968, 1970). However, the quantity of money will not be a desirable policy variable for the monetary authority if the institutional characteristics of the financial system, such as banks' reserve ratio, the behavior of the public's cash holding etc. do not provide a stable environment for the Central Bank to control the money supply. Moreover, this control over money supply becomes a wider policy issue, which involves both monetary and fiscal authorities if the counterparts of money supply such as budget deficits or the change in the composition of the outstanding government securities are the dominant sources of monetary expansion in a country. On the other hand the quantity of money loses its usefulness for policy makers if the demand for money absorbs any change in money supply which may arise from the existence of absolute liquidity preference (Keynes (1936)) and if it is not predictable by a small set of variables (Judd and Scadding (1982)).

It is also known that the relation between the quantity of money and the nominal income is not the only alternative for the policy makers to control nominal income or its components, inflation and real output. As stated by Modigliani and Papademos (1990), if there exist any other relations between nominal income and some other variables that the authorities can manipulate, nominal income can be controlled without assigning any important role to the money supply. In practice the most frequently used tools for this purpose are to peg interest rates or exchange rates. For example, in developing countries Central Banks attempt to control high inflation rates by introducing exchange rate controls to anchor the price level. However, the success of this kind of program also relies on the credibility of the pegging policy that money market will be in equilibrium at the pegged rate. Any loss of confidence will result in the collapse of the policy.

On the other hand, the quantity of money remains an important variable on its own for the stabilization programs in high inflation countries. The reason is that monetary expansion caused by either financing high budget deficits or the excessive credit expansion by the banking system is the source of high aggregate demand and the resulted balance of payments deficits that any stabilization programs needs to address. As observed in the past stabilization programs in Turkey, the most important reason for the failure of the programs was the lack of confidence in controlling the monetary expansion

[1] Modigliani and Papademos (1990) present a collection of this kind of models. Those models range from quantity-theoretic formulations to the Keynesian aggregate demand models.

as budget deficits and the credit expansion continued to grow even after the announcement of the stabilization programs.

Monetary disequilibrium models are useful to explain interactions in these economies where the major source of disturbances is the disequilibrium in the money market. With these models it is possible to track the effects of the monetary expansion on the economy. The earliest version of this kind of models can be traced to Blejer (1977) and to Blejer and Leiderman (1981). However Blejer and Leiderman's model was basically the short run analysis of the implications of the monetary approach to the balance of payments with only two adjustment channels, price and balance of payments adjustment, to restore equilibrium in the money market at the end of each period. Fiscal policy, which can be an important source of monetary expansion, had only an implicit role and they ignore the potential effect of monetary disequilibrium on real income. The version developed by Khan and Knight (1981) gives an explicit role to the link between fiscal policy and money supply and recognizes the output effect of monetary disequilibrium. Therefore it draws a more complete picture of the interaction in an economy than the models introduced by Blejer and Leiderman. They also estimate the model with a pooled times series of twenty nine developing countries and perform several simulation experiments to analyze the alternative stabilization programs. The studies following Khan and Knight extend the pegged exchange rate assumption and the specification of the behavioural equations of the model. For example in Lipschitz (1984) the equations for the balance of payments adjustment are extended by an explicit exports and imports functions and the resulted model is applied to the Korean economy. Sundararajan (1986) and Millack (2004) also estimate a similar model for the Indian economy which take into account the endogenous determinants of the balance of payments equation by incorporating import and export functions into the model. However, the set up of their models does not include any output adjustment equation to monetary disequilibrium as in Blejer and Leiderman. On the other hand the main difference between Sundararajan and Millack is in the specification of price formation. While Sundararajan specifies a price adjustment equation by inverting the money demand function, Millack drives the price adjustment equation from a weighted average of the prices of traded and nontraded goods. Agenor (1990) and Ozatay (2000) extend the monetary disequilibrium model by recognizing the currency substitution effect on real money demand. Agenor estimates the model for a pooled time series of nine countries and Ozatay estimates the model for Turkey to analyze the credibility issues of alternative stabilization programs. However, Ozatay also does not include the output effect of the monetary disequilibrium to the model. Finally monetary disequilibrium models are applied to the developed economies by Sassanpour and Sheen (1984). The most important contribution of this study is that it specifies a version of the augmented Phillips equation to capture the price adjustment in which the monetary disequilibrium is related to expected inflation. They also elaborate monetary policy by specifying a reaction function of the Central Banks for setting the nominal interest rate. Following the development of the model they estimate it for France and Germany. Their results show the important role played by the external sector in removing any disequilibrium in the money market. Therefore they interpret their findings as consistent with the predictions of the monetary approach to the balance of payments.

In the following sections we will present a monetary disequilibrium model for Turkey based on Khan and Knight's framework. After developing the model we estimate it for the Turkish economy to explain the interaction between main economic variables and to run several simulation experiments. The special focus of the simulations is on the fiscal side of the economy. The reason is that tight fiscal discipline, together with an independent Central Bank and restructuring the banking sector, are one of the most important ingredients of the current stabilization program, which was introduced in 2001. Although the implementation of the program has been satisfactory so far, the high domestic debt stock, the prospect of the continuation of high budget deficits in the near future and the structural problems in the banking sector are still considered to be the main risks facing the economy. Therefore we believe that it will be interesting to examine alternative fiscal discipline rules by analyzing and comparing the consequences on the main economic variables such as inflation, the GDP growth, the broad money growth and the deficit/GDP ratio. The next section shows the link between budget deficits and the money supply process by introducing an alternative approach to the money multiplier analysis. After defining money supply we will discuss the behavioural equations of the model in the second part of this section. In section (3) the model is estimated for Turkey by using annual observations covering the period 1968-2002. Section (4) presents several simulation exercises under alternative fiscal discipline rules. The final section gives the conclusions of the study.

2- The Model

We will introduce a monetary disequilibrium model in two parts in order to emphasize the sources of disequilibrium in Turkey. For this purpose the first section discusses the potential links between money supply and other sectors of the economy and introduce a formal analysis by using the flow of funds identities. After this introduction the second section provides a discussion on the behavioural equations of the model.

2.1- Money Supply Identities

If the money market is continuously in equilibrium, then there is no rationale for the disequilibrium to play a role in the interaction of the economy. Therefore, exogenous money supply or the delayed endogenous response of money supply to disequilibrium in the money market, which can explain the persistence of disequilibrium, are the important assumptions of monetary disequilibrium models. The most obvious reason to consider money supply to be exogenous for an economy is the exercised controls by the authorities in order to reach their monetary targets. The same can be also argued if the monetary authority is influenced by the outside factors such as by the government fiscal policy, the debt management policy or the conduct of credit rationing in determining the rate of monetary expansion. On the other hand the delayed response of money supply can arise from institutional factors such as a less developed financial system or the imperfect substitutability between financial assets. Moreover, if the country implements a fixed exchange rate regime, the delayed endogenous response can be observed as a result of

capital controls, the imperfect substitutability between domestic and foreign assets and the degree of the openness of the country to foreign trade.

The literature that analyzes the sources of money supply in Turkey has exclusively concentrated on budget deficits as the main source of monetary expansion. For example Koru and Ozmen (2003), Ozmen (1998), Metin (1998), Ozatay (1997) and Akcay et al. (1996) provide evidence for the existence of a long run relationship between budget deficit, money growth and inflation in Turkey. However, this literature also recognizes the definition of money and the sample period of the analysis as significant factors in their conclusions. For example, the long run relationship between narrow money and budget deficits is only supported before 1990 (see Metin and Akcay et al.). After this year this relationship appears to be valid only for broad money while the link between narrow money and budget deficits has been weakened (see Koru and Ozmen). Nonetheless there is now consensus in Turkish economic circles that macroeconomic stability and monetary control can be only achieved if governments can successfully control budget deficits and the resulting monetary expansion.

The shift in the relationship between budget deficits and money supply from narrow definitions to broad definitions and the instability of the money multiplier after the 1990s can be considered as an indication that the conventional analysis of the money supply through the money multiplier is no longer a useful tool for policy makers in Turkey. An alternative method of analysis, which is included in some text books (see Lewis and Mizen (2000)) and based on accounting identities, is more useful for countries where budget deficits and the credit expansion are considered to be the main sources of monetary expansion. One advantage of this analysis is that the money multiplier does not have any explicit role in the determination of money supply. Therefore it avoids the problems, which may arise from the instability in the money multiplier. Another advantage is that this approach stresses the sources of the monetary expansion by decomposing money supply into its components. Since these components, as shown below, are related to the decision-making processes of government, the monetary authority and the banking sector, it can provide a better framework for the policy coordination to control monetary expansion.

We begin the formal derivation of the broad money supply as proposed by this alternative approach with a well known open economy version of the saving investment identity from national income accounting;

$$S - I = (X - Z) + (G - T) \tag{1}$$

where S is private savings, I is private investment, X and Z are exports and imports respectively, G is government expenditures including transfer payments and T is government revenues. This basic identity shows the financing requirement among the government sector, the foreign sector and the private sector. The total financial deficits of two of these sectors must be matched by the surplus of other sector. In market economies the problem of financing the deficit of one sector by the surpluses of other sectors is solved by the involvement of financial intermediaries. However, the inclusion of

financial intermediaries as a fourth sector into this framework creates financial assets, such as bank deposits which are the main components of the broad money supply in modern economies. As a result there emerges a link between deficits and surpluses of these sectors and the creation of money in market economies.

To show this link we can start by identifying the homogenous groups, which include the similar financial transactions of the private sector. As stated by Lewis and Mizen (2000) there are five alternative investment opportunities for the private sector to dispense the net financial surpluses that may arise from the net private savings, which is the left hand side of equation (1), and the borrowing from the banking sector (ΔA). Those opportunities that are available for the private sector are currency, bank deposits, non-deposits liabilities of banks, government securities and foreign assets as expressed in the equation below,

$$S - I + \Delta A = \Delta D + \Delta NDL + \Delta GS_p + \Delta C - K_p \qquad (2)$$

$(S - I) + \Delta A$ shows the total financial surpluses of the private sector. With these surpluses they can acquire bank deposits (ΔD), non-deposits assets from the banking sector (ΔNDL), government securities (GS_p), foreign assets in the form of private capital outflow ($-K_p$), or they can simply increases their currency holding (ΔC).

If we substitute equation (2) for ($S - I$) in equation (1) and solve for the sum of the change in deposits of the banking sector (ΔD) and the change in the currency in circulation (ΔC), we can write the following identity for the broad money supply,

$$\Delta D + \Delta C = \Delta M_s = (G - T) - \Delta GS_p + (X - Z + K_p) + \Delta A - \Delta NDL \qquad (3)$$

The right hand side variables show the possible sources of the change in broad money. We can simplify this relationship with the following definitions,

$$X - Z = -K_p + \Delta NFA \qquad (4)$$

$$\Delta DC = (G - T) + \Delta A \qquad (5)$$

$$\Delta BAL = \Delta NDL + \Delta GS_p \qquad (6)$$

Equation (4) is a definition for net exports, which defines the current account balance. It equals to the sum of the private sector's net capital outflow and the increase in the international reserves of the country. If we assume that the international reserves (R) of the country is only held by the Central Bank, then it is also possible to replace ΔR with the change in the Central Bank's net foreign asset, ΔNFA, as in equation (4). Equation (5) expresses the change in the domestic credits (ΔDC) as the sum of budget deficits and

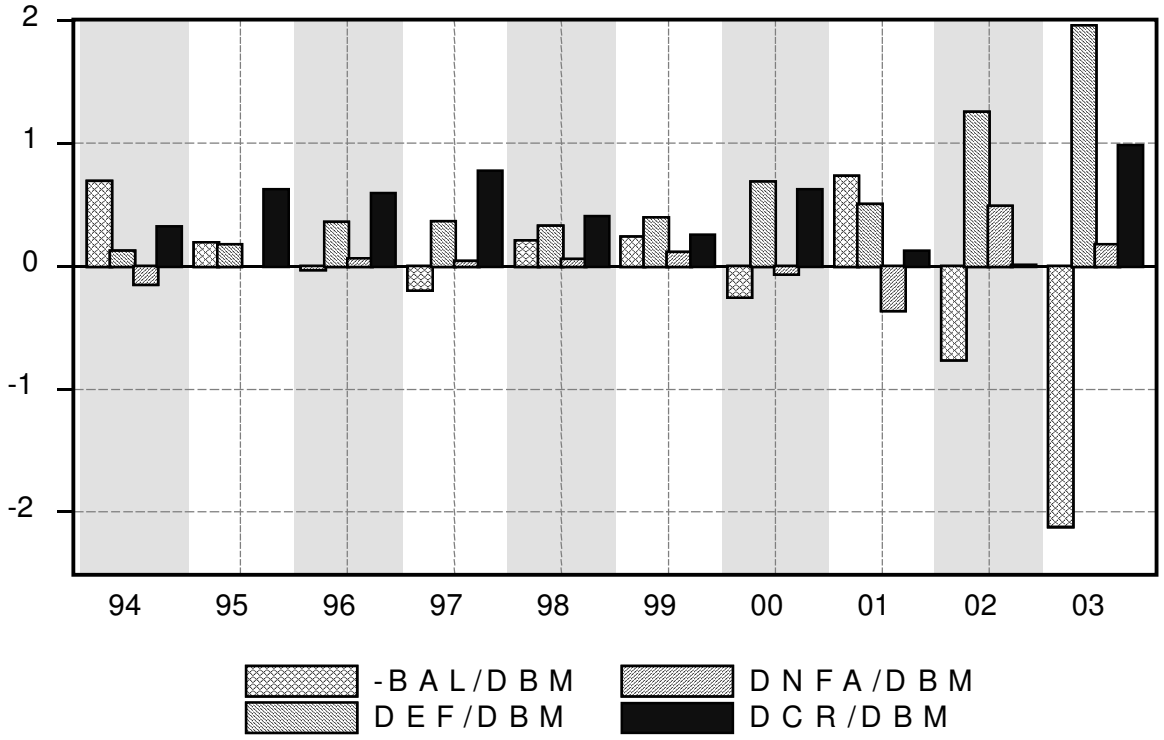
the change in credits to the private sector. In equation (6) we collect the change in the non-deposit liabilities of the banking sector and the change in the holding of government securities by the private sector under the ΔBAL term. If we substitute (4), (5) and (6) into (3), the final version of the money supply equation of the model can be obtained as follows,

$$\Delta M_s = (G - T) + \Delta A + \Delta NFA - \Delta BAL \qquad (7)$$

This final equation is important in emphasizing the financing requirement of high budget deficits, especially for a developing economy where banks are the major holders of the domestic debt stock. For example, if there is a high enough projection of budget deficits over a period of years, the government sector will need sustained borrowing from either the private sector or the foreign sector. Since it is difficult for a developing economy to rely continuously on foreign financing in the long term perspective, the private sector will be a very important source of borrowing for the government. Any pessimism about private savings, which can be reflected in the private credit expansion, may eventually feed the monetary expansion.

Graph-1 shows the share of each component of equation (7) in the change of broad money supply in Turkey. This graph is useful to see main trends in the composition of the money supply, which can reveal the sources of high rates of monetary expansion approaching 60 percent per annum on average over the period 1994-2003. One of the striking features of the graph is that the share of budget deficits (DEF/DBM) has been steadily increasing since 1994. As a result of this trend, budget deficits even exceeded the change in the broad money supply in 2002 and 2003. The second striking feature, which can also explain the relatively higher budget deficit compared to the change in money supply in recent years, is the jump in the share of the non-deposit liabilities of the banking sector (BAL/DBM) which is a part of (BAL) as defined in (6). In the aftermath of the banking crisis in 2001, the government issued long term securities, which accounted for more than 50 percent of the domestic debt stock at the end of 2001, in order to strengthen the balance sheets of the public banks and some failed private banks. As a result of this operation the banking sector accumulated non-deposit liabilities against the Treasury, which are not reflected in the change in the broad money supply, but which is responsible for the jump in the non-deposit liabilities of the banking sector.

Graph-1 Decomposition of the Change in Broad Money into its Counterparts



These two features, a high budget deficit and the jump in the non deposit liabilities, also indicate the potential importance of the budget deficit and the composition of the debt stock in the determination of money supply in coming years. Any sudden switch in the non-deposit liabilities of the banking sector to deposit associated with the continuation of the current high budget deficits may create undesired monetary expansion in the Turkish economy. If we look at other components of equation (7), government securities held by the private sector, which is also included in the (*BAL*) term, is not more than 5 percent of the domestic debt stock in Turkey. On the other hands banks are the main source of finance for the Turkish firms and households for their financial needs arising from their investment and consumption activities. However, graph-1 shows that the share of credit to the private sector (DCR/DBM) collapsed in 2001 and 2002 as a result of the recession and the banking crisis in those years. Finally, it is difficult to observe any trend in the contribution of the change in the net foreign assets of the central bank to the change in money supply (DNFA/DBM) over the period 1994-2003.

2.2- Behavioural Equations

The previous section analyzed the link between the financial activity of the different sectors of an economy and money supply. One of the conclusion from this analysis is that if there are high budget deficits, it can be considered as the source monetary expansion and the resulted disequilibrium prevailing at the money market. The importance of this conclusion is that it provides the rationale for the systematic persistence of monetary disequilibrium, which can trigger adjustment forces in the rest of the economy to restore equilibrium in the money market.

Economic theory predicts three adjustment channels to restore long run equilibrium in the money market. The first channel is the price adjustment channel. Since a change in the price level also changes the real money stock in the economy, the excess money supply in the market can be removed by the opposite movement in the price level. The second channel is the output adjustment channel. As monetary disequilibrium affects the real economy through some monetary transmission channels, the resulting change in the real income can also remove monetary disequilibrium in the money market by its impact on the demand for real money balances. In addition to these channels there may be some endogenous response of the money supply if there are interest rate or exchange rate controls. However, this endogenous response of money supply can be delayed due to reasons mentioned in the previous sections even if the pegging policy for interest rate or exchange rate is successfully implemented in the long run.

Table 1- Definitions of the Model Variables

Variable	Definition
m_d	Log of broad money demand (M_d) (nominal)
m_s	Log of broad money supply (M_s) (nominal)
p	Log of domestic average consumer price index, base year: 1995:100,
pf	Log of foreign average consumer price index, base year 1995:100 (US)
π	Domestic inflation rate
π_f	Foreign inflation rate (US)
π^e	Expected inflation rate in the domestic country
y	Log of Real Gross Domestic Product, base year: 1995
y^*	Log of Capacity Output, trend component of HP filter from (y) series
ε	Monetary disequilibrium
nfa	Net Foreign Assets of the Central Bank
e	Log of exchange rate, TL per US dollar
g	Log of Total Government Expenditures (G)
tx	Log of Total Government Revenues (T)
A	Claims on Private Sector (CR)
NDL	Non Deposit Liabilities of the Deposit Banking Sector
GS_p	Government Securities held by Public

To take into account these features of the economy, we discuss the behavioural equations of a monetary disequilibrium model below. The approach adopted here for building this disequilibrium model can be traced to the model developed by Khan and Knight (1981). Their model is suitable for our purpose, as it links money supply to budget deficit and incorporates the adjustment channels mentioned in the previous paragraph. The definitions of variables that enter into this model are given in table-1. The complete model is also presented in table-2. The model starts with a standard long run real money demand function as shown by the second equation of the table. After defining monetary disequilibrium as the difference between real money supply and real money demand, we specify inflation in the fourth equation which capture the price adjustment channel. The inflation equation is an inverted short run money demand function in which monetary disequilibrium is represented by an error correction term. For the output adjustment, which is represented by the real output in the fifth equation, the supply behavior is assumed to be given for the economy, which is a fixed rate at the capacity growth. However, we assumed that monetary disequilibrium, the real exchange rate and private credits can affect the capacity utilization around this given capacity growth rate in the short run. On the other hand to capture the likely endogenous response of money supply to monetary disequilibrium we included a balance of payments equation into the model as described by the sixth equation of the table below. It is also assumed that the purchasing power parity condition is a good description of the exchange rate movements. In the Turkish case this assumption is supported by the exchange rate movements in our sample period, 1968-2002. Large departures only occur in the crises years, which could be associated with the collapse of the exchange rate rule that was used as a nominal anchor for the price setting.

Table-2 Identities and Functional Relationships of the Model

1.	**Money Supply**
	$\Delta M_s = (G - T) + \Delta A + \Delta NFA - \Delta BAL$
	$\Delta BAL = \Delta NDL + \Delta GS_p$
2.	**Money Demand**
	$m_d - p = \alpha_{10} + \alpha_{11} y + \alpha_{12} \pi^e$
3.	**Monetary Disequilibrium**
	$\varepsilon = \log(M_s / p) - \log(M_d / p)$
4.	**Inflation**
	$\pi = \Delta m_s + \alpha_{20} + \alpha_{21} \varepsilon_{-1}$
5.	**Real Output**
	$y - y^* = \alpha_{30} + \alpha_{31} \varepsilon_{-1} + \alpha_{32} \Delta \log(a) + \alpha_{33} (y_{-1} - y^*_{-1}) + \alpha_{34} (\Delta e + \pi_f - \pi)$
6.	**Balance of Payment Adjustment**
	$\Delta nfa = \alpha_{40} + \alpha_{41} \varepsilon_{-1} + \alpha_{42} \Delta e$
7.	**Government Spending**
	$g = \alpha_{50} + \alpha_{51} (y + p) + \alpha_{52} g_{-1} + \alpha_{53} g_{-2}$
8.	**Tax Receipts**
	$tx = \alpha_{60} + \alpha_{61} (y + p) + \alpha_{62} tx_{-1} + \alpha_{63} tx_{-2}$

1. *Money Demand:* The demand for real money (m_d) is in standard form. It depends on real income (y) and a measure of the opportunity cost of holding money. For the opportunity cost measure we preferred expected inflation (π^e), which is suggested for developing countries where the availability of financial assets other than money is limited for the public (see Khan and Knight (1981) and Agenor and Montiel (1999)). This argument can be supported for Turkey since public's holding of financial assets other than banks' deposits constitute only a small fraction of their financial wealth. For example government securities held by the public, which is normally the most important alternative to the bank deposit, is not more than five percent of domestic debt stock in Turkey until 2001. Therefore the general form of the demand for real money function can be written as follows:

$$m_d = m(\overset{+}{y}, \overset{-}{\pi^e}) \tag{8}$$

The expected signs of the partial derivatives with respect to each variable are shown above each variable. The demand for real money in this function is the demand for the sum of base money and deposits in both Turkish lira and foreign currencies at the deposit-banking sector, which is known as M2Y in Turkey. Following this specification of the demand for money, we can define disequilibrium in the money market as the difference between the real money supply and the demand for real money balances,

$$\varepsilon = \log(M_s / P) - \log(M_d / P) \tag{9}$$

where M_s is for the nominal money supply, M_d is for the demand for nominal money balances, P is the price level and ε is the disequilibrium term.

2. *Inflation:* The inflation equation of the model is the short run inverse money demand function taking the above real money demand function as the long run equilibrium relationship. A price adjustment equation of this type can be found in the buffer stock literature of the money market in which the price level is the endogenous variable of the money demand function while money supply is regarded as exogenous (see Laidler (1982), Coats(1982), Gordon (1984)). As a result of this specification it is the price level that react to any monetary disequilibrium in the money market to restore the equilibrium. On the other hand Barro (1978) presents a similar price adjustment mechanism in the context of the 'anticipated money' literature. In his specification inflation responds with a unit elasticity to the contemporaneous growth rate of money supply, which is the anticipated part of the disequilibrium in the market while it gradually adjust to the unanticipated part of the money growth which has a similar interpretation to the disequilibrium term defined by equation (9). Following this literature we can write the short run price adjustment equation in general form as follows:

$$\pi = \Delta m_s + p(\overset{+}{\varepsilon_{-1}}) \tag{10}$$

In this function π is inflation and Δm_s is the growth rate of the nominal money stock.

3. *Real Output:* Monetary disequilibrium may also have an effect on the economy through a transmission mechanism. The output adjustment equation presented below captures this effect. However, in this equation the capacity growth of the economy is assumed to be given. The variables that determine the deviation of output from this given growth path in the short run are the monetary disequilibrium of the previous period, the growth rate of the real private credit and the real exchange rate which is a measure for the relative prices in home and abroad. The output adjustment equation is therefore:

$$y - y^* = y(\overset{+}{\varepsilon_{-1}}, \overset{+}{\Delta\log(a)}, \Delta e + \overset{\mp}{\pi_f} - \pi, \overset{+}{y_{-1} - y^*_{-1}}) \tag{11}$$

where y is real output. y^* is capacity output. $\Delta\log(a)$ is the growth rate in the real private credit. Δe is the depreciation of the exchange rate and π_f is foreign inflation. This equation is similar to the one presented by Khan and Knight. The excess money supply has an expansionary effect on the capacity utilization as captured by the lagged monetary disequilibrium term. However, this effect will be restricted to the short run. In addition to the monetary disequilibrium we also include the growth rate of the real private credit. The expected sign of this variable is also positive. High growth rates in the private credit have expansionary effects on the economy. In the long run there will be an adjustment toward the capacity growth rate, which is ensured by the lagged term of the deviation of output from the capacity growth. On the other hand the coefficient of the real exchange rate can be ambiguous for a country where the authorities implement some exchange rate controls. Economic theory predicts that this coefficient should have a positive effect on the capacity utilization. However, as reported by Khan and Knight it has the opposite sign for the developing countries. The reason for these conflicting empirical results might be related to the exchange rate regime in the country. Most of the developing countries, as in Turkey, incorporated some exchange rate rules to anchor the price level. Therefore the accumulated departures between domestic and foreign prices and the concerns about the credibility of the exchange rate rule in the face of growing monetary expansion could eventually result in the collapse of the exchange rate policies of these countries, which generally occurs in a sudden and excessive fashion. Moreover such a collapse can disturb the orderly flow of goods and services in the country. Therefore the negative sign of this coefficient can be interpreted as capturing the negative effect of the currency crises on the economy.

4. *Balance of Payments:* While it is difficult to argue that the nominal money supply in Turkey was endogenously determined by the demand conditions that exist in the money market in the long run, there could still be some influences of demand side factors on the determination of money supply in the short run. As it is argued by the monetary approach to the balance of payments (Blejer and Leiderman(1981)), if a country implements exchange rate controls, which can be incorporated either in a fixed or crawling peg exchange rate regime, the monetary authority loses control over money supply. Therefore the excess money supply in the money market is removed by buying and selling foreign assets which restore the equilibrium by equating the nominal money supply to the demand for nominal money balances.

   However, the exchange rate controls in Turkey were not perfect after the liberalization of the economy in 1980 and there were some speculative fluctuations both in exchange rate and international reserves held by the Central Bank. The fluctuations in both exchange rates and the international reserves of the Central Bank can be considered as an indication that the endogenous response of money supply could be only partial in this period. To capture this likely partial endogenous response we also included a balance of payments adjustment channel into the model. The specification of this equation is similar with the one proposed by Blejer and Leiderman. In this equation the change in the net foreign assets of the central bank is mainly determined by two variables. The first variable is the exchange rate depreciation (Δe), which is expected to have positive effect on the net foreign assets of the central bank. The second variable is the monetary disequilibrium defined by equation (9). Since the excess money supply may cause an opposite change in the net foreign assets of the central bank, the sign of this variable is expected to be negative. The general form of the equation can be written as follows:

$$nfa = f(\overset{-}{\varepsilon_{-1}}, \overset{+}{\Delta e}) \qquad (12)$$

   where nfa is for the net foreign assets of the central bank.

5. *Government Sector :* The specification of the government sector is taken from Aghevli and Khan (1978) and Khan and Knight (1981). The main feature of this specification is that it takes into account the feedback from inflation to money supply through budget deficits. The reason for this feedback is that government spending and tax revenues are related to the nominal income either through a constant elasticity or simply through a constant proportion coefficients. Therefore a change in the nominal income also means a proportional change in budget deficits, which must be reflected in money supply. The relation between tax receipts and nominal incomes in constant elasticity form can be expressed as follows:

$$T = (Py)^{\beta} \qquad (13)$$

In addition to the previous definitions of the variables, (β) is the elasticity of tax revenues with respect to nominal income. A similar function can be also written for government expenditures,

$$G = (Py)^{\gamma} \tag{14}$$

where (γ) is the elasticity of government expenditures with respect to nominal income. However, Aghevli and Khan consider these relationships as long run desired relationships which are targeted by the government's fiscal policy. Therefore they also incorporate an adjustment process in which the actual government spending and tax revenues respond proportionally to the difference between the targeted relationship and the realization of government spending and revenues in the previous period. As it can be seen in table-2, we also included two lags of each of the independent variables in order to capture the adjustment processes. In the simulation section, the policy analyses are based on the alternative values for the elasticity coefficients and the lag structures of these equations, which are assumed to be the choice variables for fiscal policy.

3- Estimation

The model described in the previous section consists of six behavioural relationships and two identities that define the broad money supply. The behavioural relationships of the model were estimated using OLS with Turkish data. The frequency of the observations is annual and they cover the period 1968-2002. These choices can be justified since it is more appropriate to use a long time span to allow the structural interaction in the economy. The estimation results are reported in table-3.

The crucial equation of the model is the demand for money function, which is the first equation of table-3. This equation describes the long run relationship between the real demand for broad money, expected inflation and real income. The expected inflation rate is the long run average of the actual inflation rates. For this purpose, the Hodrick-Prescott (HP) filters was used with a smoothing coefficient value of 100. The estimation results show that there exists a satisfactory long run relationship for the demand for real broad money in Turkey. The coefficients are all significant and they have their expected signs. Moreover, the sizes of the coefficients are in agreement with those reported for the developing countries by the previously mentioned literature. The residuals from this equation are stationary and there is no indication of autocorrelation as indicated by the DW and LM_1 statistics. Additional diagnostic checks also show no further misspecification problems. Following these results, the stability of the relationship was also tested by using the Chow breakpoint test for three important events in the estimation period. Those events are the liberalization of the economy in 1980, the transition to the full convertibility in 1989 and the currency crisis in 1994. The test results support the null hypothesis that the demand for money relationships remained stable even after those events.

Table-3 also presents three adjustment equations, which act to restore the equilibrium in the money market. The first adjustment equation is the inflation equation. This equation is the short run inverted money demand equation obtained by using the money demand function, shown by the first equation of the table, as the long run equilibrium relationship. In this equation monetary disequilibrium is represented by the error correction term. This specification postulates that inflation responds to the contemporaneous money growth with a unit elasticity while the response of inflation to the deviations caused by the fluctuations in the real money demand exhibits a lagged pattern. The Wald test for the unit elasticity restriction gives the F value of 1.1253, which supports the restriction. On the other hand the error correction term, which represents the monetary disequilibrium in the money market, has a positive and significant effect on the inflation rate as expected. The reported diagnostic test statistics also show no specification problems for the inflation equation.

Table-3 Estimation Results of the Model Equations - *Page(1) of Table-3*

1. Money Demand

$m_d - p$	=	α_{10}	+	$\alpha_{11} y$	+	$\alpha_{12}\pi^e$	
Coefficients		-15.8762		1.9702		-1.1369	
t-values		(-8.7253)		(15.7510)		(-3.4827)	
Diagnostics		R^2=0.9751		DW =1.92		LM_1=0.002 [0.96]	JB=0.04 [0.98]
		$ARCH_1$=0.27[0.60]		WH =0.53[0.71]		PP=-5.639 [0.00]	
		Chw_{1980}=0.86[0.47]		Chw_{1989}=0.88[0.46]		Chw_{1994}=1.84[0.16]	

2.Inflation

$\pi - \Delta m_s$	=	α_{20}	+	$\alpha_{21}\varepsilon_{-1}$	+	$\alpha_{22} d80$	
Coefficients		-0.0661		0.3783		0.2313	
t-values		(-4.9737)		(2.8335)		(4.2387)	
Diagnostics		R^2=0.8379		DW =1.76		LM_1=0.675 [0.42]	JB=0.39 [0.82]
		$ARCH_1$=0.56[0.46]		WH =0.36[0.93]		PP=-4.807 [0.00]	
		Chw_{1980}=0.70[0.51]		Chw_{1989}=0.69[0.51]		Chw_{1994}=1.29[0.29]	

3. Real Output

$y - y^*$	=	α_{30}	+	$\alpha_{31}\varepsilon_{-1}$	+	$\alpha_{32}\Delta\log(a)$	+	$\alpha_{33}(y_{-1} - y^*_{-1})$	+	$\alpha_{34}(\Delta e + \pi_f - \pi)$
Coefficients		-0,0029		0.1369		0,0948		0.3137		-0.0689
t-values		(-0,6719)		(2,4829)		(3,1395)		(5,4524)		(-2.2839)
Diagnostics		R^2=0.6188				DW =2,03		LM_1=0.29 [0.59]		JB=0.20 [0.90]
		$ARCH_1$=1.27[0.27]				WH =0.40[0.96]		PP=-6,96 [0.00]		
		Chw_{1980}=0,76[0.58]				Chw_{1989}=0.91[0.49]		Chw_{1994}=1,23[0.32]		

4. BoP. Adjustment

Δnfa	=	α_{40}	+	$\alpha_{41}\Delta e$	+	$\alpha_{42}\varepsilon_{-1}$	+	$d89$ +	$d01$
Coefficients		-0.3500		2.7513		-4.3215		-6.3315	-3.4626
t-values		(-0.6846)		(2.6128)		(-2.0894))		(-6.4307)	(-4.605)
Diagnostics		R^2=0.7898		DW =1.99		LM_1=0.000 [0.99]		JB=0.56 [0.76]	
		$ARCH_1$=0.02[0.89]		WH =0.60[0.78]		PP=-4.769 [0.00]			
		Chw_{1980}=0.06[0.98]		Chw_{1989}=0.29[0.83]		Chw_{1994}=0.27[0.84]			

Table-3 Estimation Results of the Model Equations - *Page(2) of Table-3*

5. Government Spending

g	= α_{50}	+ $\alpha_{51}(y+p)$	+ $\alpha_{52}g_{-1}$	+ $\alpha_{53}g_{-2}$
Coefficients	-0.7554	0.4214	0.8253	-0.2168
t-values	(-3.2454))	(3.8959)	(4.0224)	(-1.4033)
Diagnostics	R^2=0.9995	DW =1.78	LM_1=1.136 [0.30]	JB=1.91 [0.38]
	$ARCH_1$=0.03[0.85]	WH =0.18[0.99]	PP=-4.972 [0.00]	
	Chw_{1980}=4.29[0.01]	Chw_{1989}=0.74[0.57]	Chw_{1994}=0.24[0.91]	

6. Tax Receipts

tx	= α_{60}	+ $\alpha_{61}(y+p)$	+ $\alpha_{62}tx_{-1}$	+ $\alpha_{63}tx_{-2}$
Coefficients	-0.8723	0.4627	0.9106	-0.3579
t-values	(-4.2752)	(5.0783)	(5.3205)	(-2.5957)
Diagnostics	R^2=0.9996	DW =1.68	LM_1=2.53 [0.12]	JB=0.87 [0.65]
	$ARCH_1$=0.62[0.44]	WH =0.96[0.49]	PP=-4.665 [0.00]	
	Chw_{1980}=3.01[0.04]	Chw_{1989}=1.46[0.25]	Chw_{1994}=1.11[0.37]	

The equations are estimated by OLS. The estimation periods are 1968-2002 for the money demand equation, 1970-2002 for the inflation and real output equations, 1977-2002 for the Balance of Payments adjustment equation and 1970-2001 for the equations for government spending and tax revenues, The frequency of observations is annual and the definitions of the variables is given in Table 2. The dummy variable in the money demand equation is for the liberalization in 1980. The dummy variables in BoP. Equation are for the convertibility in 1989 and the banking crisis in 2001. Δ_i is the difference operator (=1- L^i). The values in the square parenthesis are for the probabilities of the statistic. R^2 is for the coefficient of Determination. DW is the Durbin-Watson statistic. LM_1 is the F-statistics for the Breusch_Godfrey Serial Correlation LM test. JB is the Jarque-Bera test for the normality of residuals. $ARCH_1$ is the F-statistics for the ARCH effect. WH is the F- statistics for the White Heteroskedasticty test with no cross terms. PP is the Phillips – Perron test statistic for the unit root. Chw_{1980} is the Chow structural break point test for the liberalization of the Turkish economy in 1980 . Chw_{1989} is the Chow structural break point test for the transition to the full convertibility in 1989. Chw_{1994} is the Chow structural break point test for the currency crisis in 1994.

The second equation of the adjustment channels is for the real output, which is explained by the deviation of the actual output from the capacity output. Capacity output is estimated by using the HP filter. As expected the coefficient of the disequilibrium term is positive and significantly different from zero at 10 percent confidence level. Moreover the coefficient of the private credit is also positive and significant. These findings can be interpreted as an indication for a transmission mechanism in which the quantity of money plays a role in the fluctuations of the output in Turkey. On the other hand the coefficient of the real exchange rate depreciation is negative and significant. This result contradicts the economic theory that postulates a positive coefficient for this variable. In the Turkish case, however, this variable could capture the collapse of the Turkish lira in the crisis years. Therefore it acts as a dummy variable for these years, which were also associated with the contraction of the economy that may explain the negative sign. Finally, the diagnostic checks indicate no specification problems for the output adjustment equation.

The final adjustment channel of the model is the adjustment through the balance of payments. This adjustment channel is one of the implications of the monetary approach to the balance of payments, which predicts some endogenous response of money supply to monetary disequilibrium. As expected the coefficient of the monetary disequilibrium and the depreciation rate have significant effects on the net foreign asset of the central bank with the right signs. However, the explanatory power of the equation is very sensitive to two dummy variables for the convertibility and the banking crisis in 2001 and to the alternative sample periods. Without those dummy variables the depreciation of the exchange rate and the disequilibrium in the money market have little explanatory power which may diminish the usefulness of the equation in predicting movements in the net foreign assets. However, the reported fourth equation in table-3 has satisfactory diagnostics statistics which are all in acceptable regions.

In addition to these adjustment processes we also estimated two equations for the government sector to describe the average fiscal rule in the pre 2001 period. These are equations for government expenditure and tax revenues. The significant and positive coefficients for the nominal income suggest that there was some feedback from the nominal income to money supply through the budget deficit in the estimation period. Moreover, the coefficients for the lagged independent variables indicate some adjustment process. The coefficients of the first lags of the dependent variables have significant positive effects while the second lag of the dependent variables have a significant negative effect in the equation for tax revenues and an insignificant negative effect in the equation for government spending. It is difficult to find a clear theoretical basis for the inclusion of the second lags of the dependent variables into those equations. However, the inclusion of the second lags removes the remaining autocorrelation in the equations. Other diagnostic test results also indicate no major problems for these equations.

4- Simulation Results

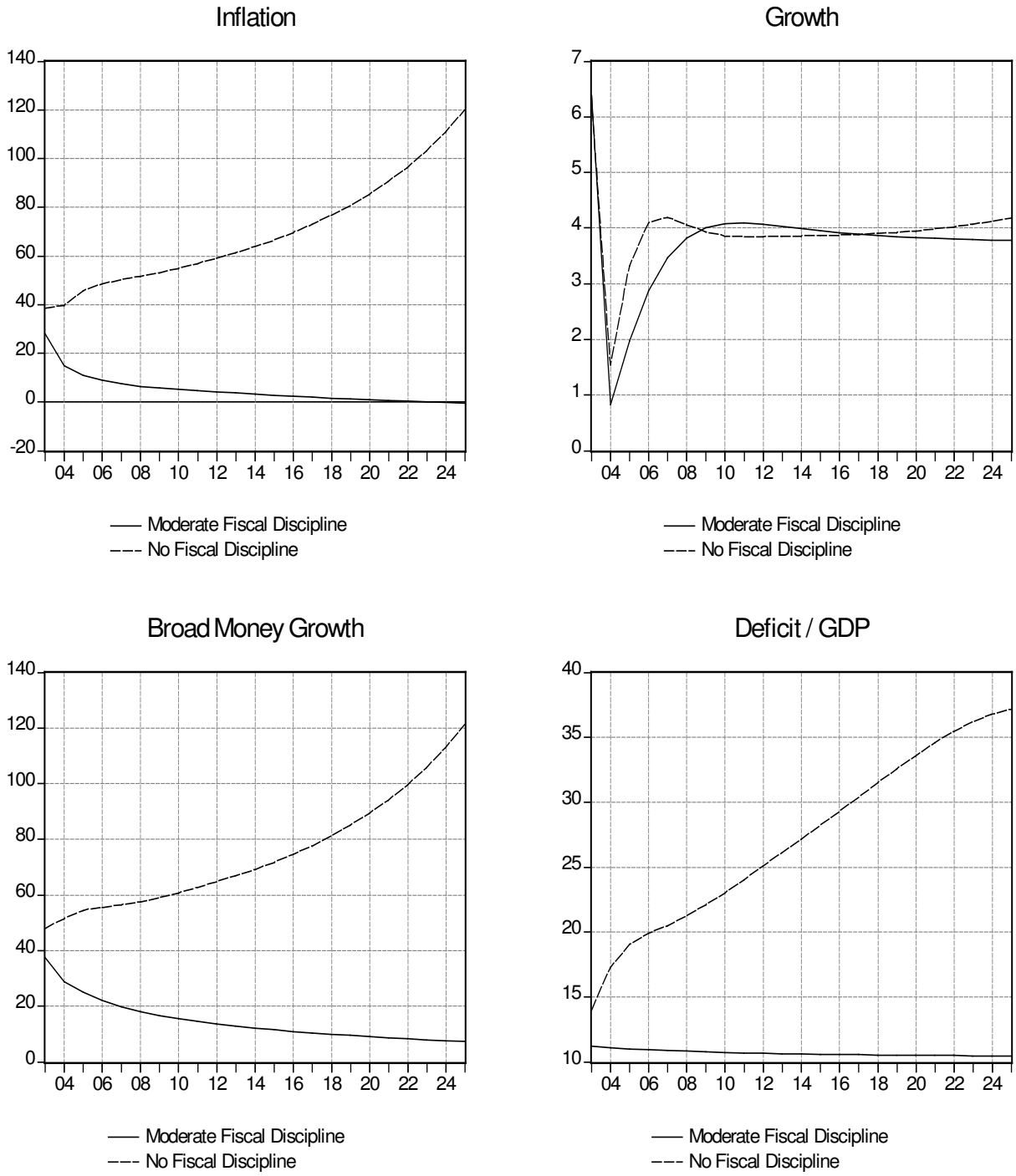
The purpose of this section is to simulate time paths for the endogenous variables of the model under alternative fiscal policy rules. The simulation period is 2003-2025, which might be a useful perspective in analyzing the convergence of some of those variables to the target values set by the European Union. The variables that are considered to be important for the analysis are the time path for inflation, the growth path for GDP, the growth path for the broad money supply and the ratio of the budget deficit to GDP. There are five simulation assumptions regarding to the exogenous variables of the model. The first assumption is that the credit to the private sector increases by 6 percent of the nominal GDP in each year. This growth rate is the historical mean between 1968-2002 for this variable. The second assumption is related to the net foreign assets of the Central Bank. It is assumed that there is no change in the Central Bank's net foreign assets in the simulation period. This assumption is consistent with the Central Bank policy that there will be no systematic exchange market intervention in the future. The third assumption concerns supply side behavior. The growth rate for capacity output is taken as 3.9 percent, which is the average growth between 1968-2002. The fourth assumption is that the exchange rate movement is determined by relative purchasing power parity. However, there was a big appreciation of the Turkish Lira against the US dollar in 2003. This appreciation is also taken into account in the simulation. Finally, we assume that US inflation is fixed at an annual rate of 2.5 percent.

The model is simulated under four scenarios, which differ from each other with respect to the incorporated fiscal rule and the composition of the domestic debt stock. The composition of the debt stocks is assumed to be a part of the debt management policy taken by the Treasury. In the first scenario the fiscal rule was defined by the parameters of the estimated relationships for the government expenditures and the tax revenues of the previous section. These parameters were considered to be appropriate for describing no fiscal discipline, since the domestic debt stock had increased from 5 percent in the 1980s to more than 60 percent in 2001 and the budget deficits reached a record level of 15 percent of GDP in 2001. Therefore this scenario is called 'no fiscal discipline'. In the second scenario, we imposed some degree of fiscal discipline on the model. This is achieved by defining a rule for the increases of government expenditures and tax revenues. With this rule it is assumed that the growth rates for total government expenditures and total government revenues are equal to the growth rate of the nominal GDP. Since expenditures and revenues grow at the same rate this scenario is assumed to be suitable for describing 'moderate fiscal discipline'. The third scenario assumes an even tighter short run fiscal policy. With 'tight fiscal discipline' the growth rate of tax revenues exceeds the growth rate of government expenditures 10 percent in 2003 and 5 percent in 2004. After 2004, however, it is assumed that government follows the moderate fiscal discipline described in the previous scenario. However, debt management policy, as in the previous scenarios, remains unchanged in the simulation period. With unchanged debt management policy we assume a government policy to keep the share of government securities held by the banking sector in the total debt stock constant. In other words there is no change in the ratio of government securities held by State Deposit Insurance Funds (SIDF), the Central Bank, households and the bonds held by the public

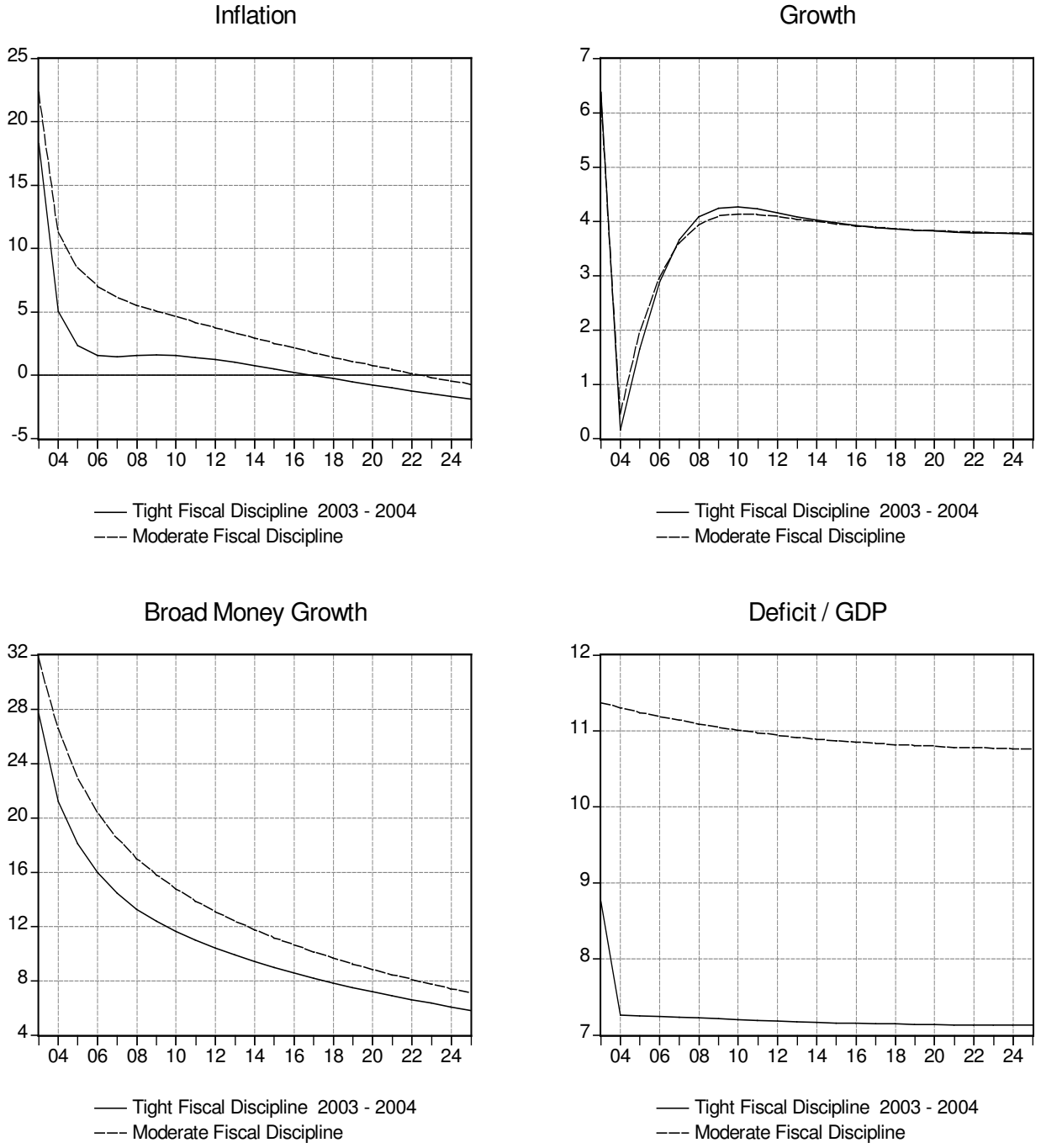
banks in their capital account. This assumption becomes important after the banking crisis in 2001 which forced the government to issue long term securities to strengthen the capital structure of the banking sector and to compensate the losses of the failed banks. These four groups have held more than 50 percent of the debt stock after the banking crisis in 2001. In the fourth scenario, therefore, we concentrated on the debt management policy both under moderate fiscal discipline and tight fiscal discipline. In this final scenario we allowed the ratio of the government securities held by those four groups to change. Therefore it is assumed that the share of the private banks in the domestic debt stock steadily increases to 74 percent of the domestic debt stock in 2015 and 94 percent in 2025.

Graph-2 shows the simulation of the endogenous variables under the first scenario, which represents no fiscal discipline. For comparison the simulation results obtained under the second scenario are also included. The first point to note from this scenario, 'no fiscal discipline', is that inflation increases to 120 percent in 2015 as the monetary expansion continues in the simulation period. In contrast the second scenario, the moderate fiscal discipline, produces a deceleration in inflation rates and it implies a better control over the money supply in Turkey. These results indicate the importance of fiscal discipline for the continuation of the disinflation process in Turkey. A return to the fiscal policies implemented before 2001 means a return to the high and chronic inflation rates. Such temptation may exist for the government as it may create some output gain by switching to expansionary fiscal policy. However, as it can be seen from the comparison of GDP growth obtained under these two scenarios in graph-2, this output gain is limited to the short run.

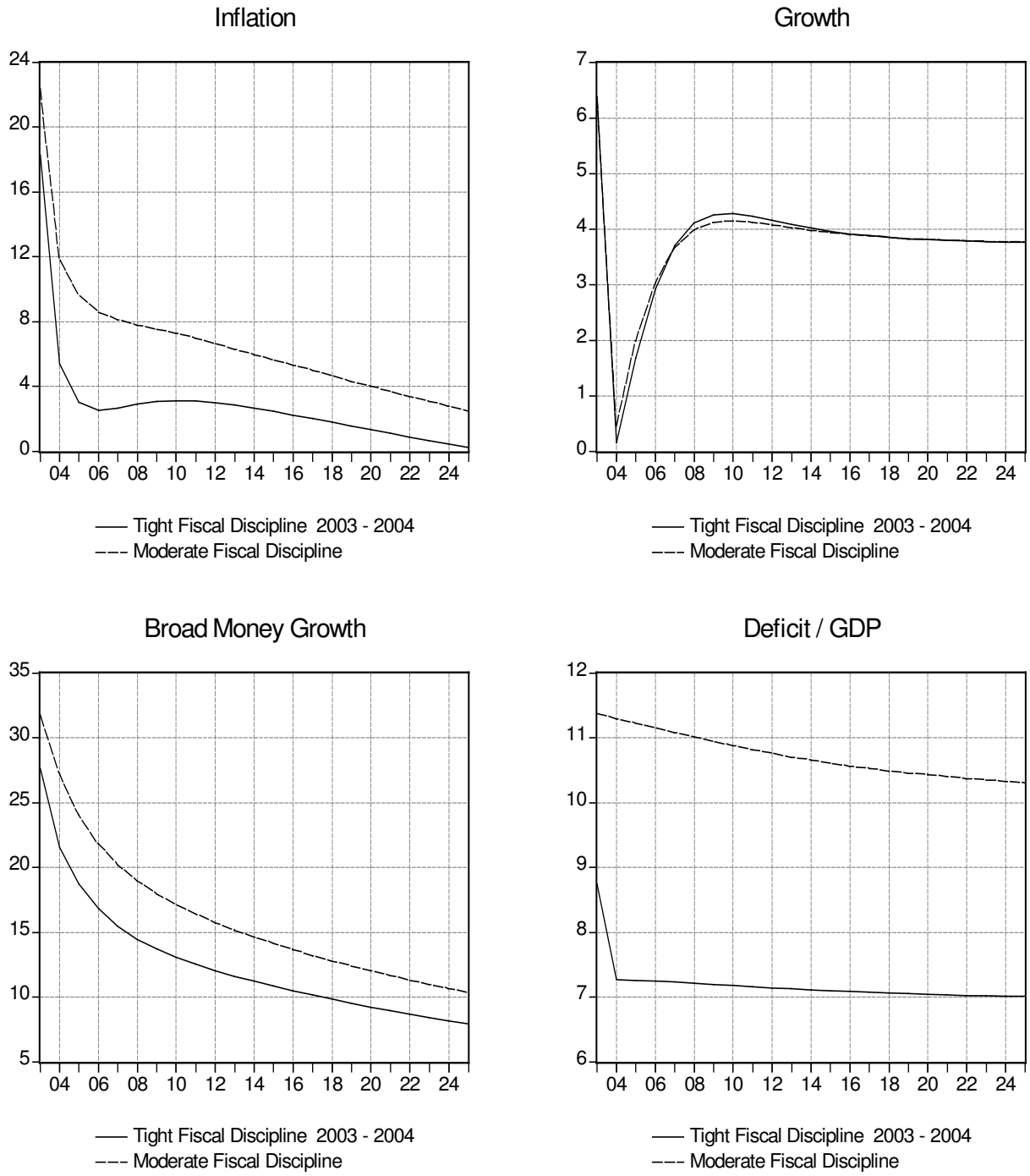
Graph-2 No Fiscal Discipline - Moderate Fiscal Discipline



Graph-3 Moderate Fiscal Discipline - Tight Fiscal Discipline



Graph-4 Moderate Fiscal Discipline - Tight Fiscal Discipline: Following a Steady Change in the Debt Management Policy



Graph-3 shows moderate and tight fiscal discipline, which are the second and the third scenarios of the simulation experiments. One of the important results is that both types of fiscal discipline produce negative inflation rates in the long run. This result indicates that, if there is no shift in the money demand relationship and the other components of the money supply follow their historical trends, the disinflation process may create excessive monetary contraction as a result of the increase in the real demand for broad money. From the comparison of these scenarios it can be also argued that tight fiscal discipline is more successful in reducing inflation to the low single digit numbers in the short run than the moderate fiscal discipline. Moreover, the disinflation process is also associated with a deceleration in the growth rate of broad money. However, the growth rates for broad money remain higher than inflation rates in the long run. If we look at the growth performance from these two scenarios, it can be seen that both type of fiscal discipline predict GDP growth, which is under the capacity growth rate between 2004-2006. The comparison of the growth performance shows that tight fiscal discipline is only slightly worse than the moderate fiscal discipline. Therefore, there is no significant reason to prefer one of them on this criterion. However, one result that makes a significant difference between these two scenarios is the simulated time path for the deficit/GDP ratio. Moderate fiscal discipline is not enough to reduce this ratio below 10 percent level in the simulation period. On the other hand tight fiscal discipline is more successful in reducing the deficit/GDP ratio in the short run. This scenario implies that 5 percent higher growth rate of total tax revenues over total government expenditures reduces the deficit/GDP ratio about 1 percent each year. To reach a balanced budget in Turkey, therefore, the government should extend the tight fiscal policy rule of 5 percent higher growth rate of tax revenues over government expenditures, from 2004 to 2010.

Finally, we analyze a steady change in the composition of the domestic debt stock, which became an important issue in the debt management policy of the Treasury after the banking crises in 2001. Graph-4 shows the simulation results from both moderate and tight fiscal disciplines under this environment. The most important conclusion from this scenario is that a steady change in the composition of the domestic debt stock either through redemption or resale of the bonds held by SIDF, the non marketed bonds held by public banks or by the Central Bank can compensate the monetary contraction caused by the fiscal disciplines in the long run. In this scenario the inflation rate remains between 8 and 0 percent in the long run. Moreover, the growth rate of broad money is relatively higher than for the previous scenarios. However, this scenario also reveals the sensitivity of inflation rates and monetary expansion to a change in the composition of the domestic debt stock. A sudden change of this composition is a potential risk, which can create inflationary pressures in the economy. The remaining variables, GDP growth and the deficit/GDP ratio, behave in a similar fashion as in the second and the third scenario.

5- Conclusions

This paper seeks to explain the interaction in the Turkish economy by using a monetary disequilibrium model. The estimated model is also analyzed by running several simulation experiments. The focus of these simulations was the link between fiscal policy and money supply. This link is important in the model, because it could be one of the sources of monetary disturbances. It is arguably also the reason for persistent monetary disequilibrium in the Turkish economy. After defining the monetary disequilibrium, the model assumes that there will be three adjustment channels to restore equilibrium in the money market. The first and second channels can be related to the quantity theory of money. If we assume there are a stable money demand relationship and no absolute liquidity preference, then equilibrium in the money market will be restored through a change in output and price level. On the other hand the third channel is related to the monetary approach to the balance of payments under the pegged exchange rate regime, which predicts an endogenous response of money supply through the balance of payments. However, this response can be delayed due to reasons such as the imperfect substitution between domestic assets and foreign assets, obstacles to capital mobility and the degree of openness of the economy.

The estimation results of the behavioural equations show that there is a satisfactory long run demand for real broad money relationship for Turkey in the sample period. The parameters of this money demand relationship have their expected signs and their magnitudes are similar to those reported in the previous literature. Moreover, this relationship remains stable after three important events in the estimation period. Those events are the liberalization of the Turkish economy in 1980, the convertibility of the Turkish Lira in 1989 and the currency crisis in 1994. Using this relationship, we define monetary disequilibrium as the difference between real money supply and the demand for real money. The estimation results of the adjustment equations show that monetary disequilibrium has a significant role in the interaction of the economic system in Turkey. Furthermore, we also estimate two policy equations, government spending and tax revenues, in order to describe the fiscal rule between 1970 and 2001. Most of this period can be characterized as one of no serious fiscal discipline since the domestic debt stock and budget deficits increased to a level which became one of the underlying sources of the economic problems in Turkey.

After estimating the model, we run several simulation experiments by formulating four scenarios for the stance of fiscal and the debt management policy. The simulation results obtained from the first scenario, which is used to describe no fiscal discipline, indicate that high budget deficits still remain a risk in front of the economy even after the tight fiscal policies of the last two years, 2001 and 2002. A return to the fiscal policies implemented before 2001 results in excessive monetary expansion, which creates acceleration in inflation rates in the simulation period. On the other hand if we assume there is no shift in the money demand relationship, the current fiscal policy, which can be approximated by the third scenario, 'tight fiscal discipline', becomes too tight in the long run, producing negative inflation rates. This conclusion is also true for the second scenario, which we characterize as moderate fiscal discipline. Our calculation shows that

five percent higher growth rate of total tax revenues over government expenditures reduces the deficit/GDP ratio about one percent in each year. Therefore the balanced budget can be only achieved in 2010 if the government follows this five percent rule after 2004.

The dilemma for the authorities is that while the tight fiscal discipline creates excessive monetary contraction producing negative inflation rates in the medium term, it is essential for reducing the deficit/GDP ratio. The fourth scenario provides a solution to this dilemma. A steady change in the debt management policy by allowing private banks to hold a higher share in the domestic debt stock is able to reduce the monetary contraction caused by the tight fiscal policies as the real demand for broad money increases with the disinflation process. However, it also signals a risk in that if there is a sudden change in the composition of the debt stock it may create inflationary pressure. Of course, a steady change in the debt management policy is not the only alternative to avoid excessive monetary contraction. The desired equilibrium in the money market can be also achieved by mixing tight fiscal policies with an expansionary monetary policy by allowing a steady increase in credit to the private sector by the deposit banks.

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