An Empirical Approach to Fiscal Deficits and Inflation: Evidence from Turkey (*)

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ABSTRACT

The purpose of this paper is to examine the sustainability of fiscal deficits given the other macroeconomic targets such as inflation and output growth, and carry out an econometric analysis of the relationship between fiscal deficits and inflation in Turkey. Analysis of the relationship between fiscal deficit and inflation, and also the sustainability of fiscal deficits provide very valuable insights for sustainability of fiscal policies. In this study Anand & Wijnbergen (1989) model is used for sustainability analysis of fiscal deficits. The econometric relationship among fiscal deficits, inflation and monetary base, is tested by applying the co-integration analysis, exogeneity tests and Granger causality analysis. In a framework of the VAR systems, variance decomposition and impulse response functions are examined.

In the sustainability analysis, the required adjustment of the fiscal deficit is calculated for the year 2000 in which a comprehensive disinflation package is inactted. In this study different operational deficit measures are used as well as the different definitions of domestic debt stocks which cover the whole liabilities of public sector in Turkey, such as the quasi-fiscal activities of the three public banks. It is concluded that the required adjustments of fiscal deficit are effected by incomplete measurement of the fiscal deficits and different measures of debt stock.

The econometric analysis reveals that there is a long run relationship between fiscal deficit, inflation and monetary aggregate. Weak exogeneity test detects that inflation is an endogenous variable among the others. It is shown that the shock given to the fiscal deficits does not respond to inflation significantly in the short run. One reason may be that the inflation inertia is a very crucial factor for the inflationary process in the short term in Turkey. These results indicate that in order to obtain a permanent decrease in inflation permanent improvements in the fiscal deficits are essential.

1. An Overview of Fiscal Stance and Inflation for Turkey

Turkish economy has suffered from high and persistent inflation in a long period of time. The fundamental reason for inflation is seen as sustained fiscal deficits and their financing methods. In Turkey the general thought for the starting point of reducing inflation is a real decline in fiscal deficits. However primary budget balance of the public sector has been in surplus since 1994, except in 1999. The reason for not succeeding in reducing inflation is that disinflation can not be achieved only by fiscal retrenchment since inflationary expectations have a crucial role in reducing inflation. In addition there is a high increase in quasi-fiscal (QF) activities which are not covered in conventional budgetary process. An accurate and adequate measurement of fiscal deficits and debt are crucial to determine the required fiscal retrenchment.

In the first part of this study different measures of operational deficits are obtained according to various coverage of public sector deficits and the way in which public debt is consolidated. These measures are used in analysis of the sustainability of fiscal deficits within the framework of "Public Finance Approach to Inflation" developed by Wijnbergen (1989). These measures are developed in the study by Atiyas, Bal Gündüz, Emil, Erdem and Özgün (1999) which was presented on Conference on Issues Surrounding Disinflation in Turkey in October in 1998. The sustainability analysis for the years 1997-1999 are presented in detail in Atiyas et. al. (1999). In this study I update the analysis for year 1999 and analyze year 2000 in detail that will be the turning point for Turkish economy to stabilize sustained high inflation. Various operational deficits are measured with respect to different coverage of public sector especially quasi-fiscal activities of three major public banks are included conventional measure of public sector deficits.[1] These activities are not properly accounted in the public sector accounts. These measure are used in framework developed by Anand and Wijnbegen (1989; see also World Bank 1996 for

[1] Presume that the conventional PSBR captures adequately the QF activities of non-financial State Economic Enterprises (SEEs). This has not examined raw data on SEE performance to check the validity of this presumption.

a recent application) to determine the necessary aggregate adjustment in operational deficits consistent with target debt and inflation levels, under different assumptions about the paths of several other macroeconomic variables. In the second part of this study, the econometric relationship between fiscal deficits, inflation and monetary base is tested and co-integration analysis, exogeneity tests and Granger causality analysis are applied to these variables. In a framework of the VAR systems, variance decomposition and impulse response functions are also examined.

1.1 Adjustments on the PSBR

In the Turkish context, improving measures of fiscal stance requires both making several corrections to published PSBR data, and inclusion of activities not covered by conventional measures of PSBR. The first adjustment relates to privatization revenues. The conventional figures on PSBR treat privatization revenues as an above the line revenue item. These revenues are recorded as non-tax revenues in the consolidated budget and the accounts of the privatization administration. Deducting this item from revenues and treat it as a financing item instead. This adjustment is done only for 1996-1999, but this is not a serious omission since privatization revenues in earlier years were very small.

The second adjustment relates to interest income on deposits held by public entities. In the current accounting practice, this income is recorded under non-tax revenues. The adjustment I make subtracts this income from non-tax revenues and also deducts it from interest payments. This adjustment effectively increases primary deficits by an amount equal to interest income on deposits held by the public sector (to obtain "Primary Deficit with net interest payments") and decreases total interest payments on domestic debt by the same amount (to obtain "net total interest payments"). It leaves PSBR unchanged (Atiyas et. al. 1999). As shown in Table 1.2 below, this adjustment may increase primary deficits by close to 1 percent of GNP in

some years (in 1998 the primary surplus reduces from 2.54 to 1.38 percent of GNP and in 1999 the primary deficit increases from 0.56 to 1.41 percent of GNP).

The last adjustment has to do with interest payments on non-cash debt. The interest payments on these securities are often made through additional securities rather than through allocations from the budget. Therefore, under the current practice, these payments are treated as below the line, and are not recorded as interest payments in the conventional PSBR. The adjustment that interest payments are increased (and PSBR) by that amount. This adjustment is relevant since 1996. All of these three adjustments are shown in Table A.1.2. In the sections that follow, all measures of primary and operational deficits are derived from the adjusted PSBR figures.

1.2 Measurement of the Operational Deficit

The operational deficit measure which plays a central role in determining the current fiscal policy position and the estimation of required deficit reduction is conceptually a weighted measure of fiscal deficit putting zero weight on the inflation induced part of the interest payments. The rationale is that the effect of inflation on total interest payments can actually be perceived as part of the amortization of the debt, compensating the creditors for the erosion of their assets, and may well be interpreted as a below the line item. In that respect the conventional deficit measure will be overstating the deficit by this amount. Thereby it excludes part of the debt service compensating the debt holders for the inflationary erosion of their claims.

In the empirical part of the paper two different methods for calculating the operational deficit are implemented. The first method is based on the realisation of the interest payments: the inflationary erosion of the beginning of period domestic debt stock is deducted from the realised interest payments to end up with a measure of the real component of total interest payments. These real domestic interest payments and foreign interest payments are added to the primary balance to attain operational

deficit. Both OD calculations the foreign interest payments are taken as the realised figures and presume that the foreign inflation is negligible. For the remainder of the study this method will be referred as OD1. There are two major drawbacks in using this method of calculating the operational deficit. The first is general and the second is peculiar to the Turkish case. First, since most government securities carry zero coupons, the realisation of interest payments for the current year is very much dependent on the maturity structure of debt. A temporary shortening or lengthening of the maturity leads to a temporary worsening or improvement of the operational deficit even without a significant change in the underlying debt dynamics.

The second drawback specifically arising in Turkish context is related with the practice of issuing "non-cash bonds and bills". Non-cash bonds and bills are issued to retire the intra-governmental debt and therefore the Treasury does not obtain any cash receipts by issuing them. Due to this practice, the change in the total stocks of bonds and bills is not equal to the domestic financing of the deficit obtained by issuing bonds and bills. The problem is that the non-cash issues of government securities have historically carried less than the market interest rates, and their effective maturities have been longer than those of cash issues. As a result, interest payments from the consolidated budget are reduced compared what they would have been if these securities were to be offered to the market. However, this gain is illusory, since holders of non-cash securities, themselves public entities, incur losses. These losses are either real, as is the case if the holder of the security decides to sell it in the secondary market at a discount, or exist in the sense of opportunity cost if holders hold the securities till maturity. This loss should be reflected properly in the consolidated budget. In addition, note that real interest rates calculated for treasury auctions is a better estimate of the cost of borrowing that the government will face in the future than those calculated from realized payments, again because non-cash issues carry lower-than-market rates (Atiyas et. al. 1999). In recent years the share of "non-cash" issues of Treasury bills and bonds in total debt stock has been declining

mainly due to the rapid increase in cash issues. Securitized domestic debt figures as percentage of GNP are presented in Table 1.1.

Table 1.1: Securitized Domestic Debt Stock Figures (% of GNP)*

DEBT STOCK (% of GNP)	1991	1992	1993	1994	1995	1996	1997	1998
TOTAL	8.14	11.66	12.77	13.98	14.55	18.55	20.02	21.92
CASH	6.64	7.55	6.88	8.70	9.34	12.84	15.64	17.95
-INDEXED	2.24	0.92	0.31	1.14	0.96	2.12	4.39	5.41
NON-CASH	1.50	4.10	5.89	5.28	5.22	5.70	4.39	3.97
-INDEXED	0.33	1.38	1.74	1.17	0.89	2.10	1.73	1.60

(*) GNP is expressed in average prices.

The second method of calculating the operational deficit avoids most of the problems involved with the first one. Real interest payments under the second method is estimated as the product of the initial stock of debt and the ex-post real interest rate calculated from auction rates. Effectively, this assumes that all interest on debt existing as of t-1 is paid in period t. Operational deficits calculated in this manner will be referred to as OD2 (for detailed calculations of operational deficits, also see Atiyas et. al. 1999). Data for OD1 and OD2 are presented in Table 1.2 (see also Figure 3.2 in Annex 3).

Table 1.2: Conventional PSBR, primary deficit, primary deficit with net interest payments, OD1, OD2 (% of GNP), maturity of domestic cash borrowing (month)

	1991	1992	1993	1994	1995	1996	1997	1998	1999(**)
PSBR/GNP(*)	10.16	10.57	12.01	7.89	5.20	*10.17*	*9.04*	*10.93*	*14.98*
PD/GNP	4.58	4.88	4.10	-2.15	-3.39	-1.75	-0.65	-2.54	0.56
PD(net)/GNP	5.39	5.61	4.79	-1.18	-2.51	-1.07	0.42	-1.38	1.41
OD1/GNP	7.73	7.70	8.06	0.95	-0.92	4.64	2.44	3.51	7.41
OD2/GNP	7.30	7.35	7.19	2.62	0.31	2.43	2.94	2.84	6.74
MAT. BOR.	7.6	7.0	7.2	3.9	6.3	8.1	11.9	7.7	15.9

Note: A positive figure denotes a deficit and GNP is expressed in average prices.
(*) Between 1996 and 1999 the PSBR figures are adjusted for privatization revenues and interest payments on non-cash debt. All PD and OD calculations are based on adjusted PSBR.
(**) The figures, used in 1999, are very rough estimates.

The real interest rates paid on the domestic debt increases very significantly especially after 1993, which shows up as an increased positive gap

between OD2 and OD1 in most part of that period.[2] It can be also seen that difference between real auction rates and real time deposit rates for the years 1986-1999 in Figure 3.1 in Annex 3. Especially in mid- 90's gap between these rates was increased significantly. The table also shows how changes in maturity are reflected in the gap between OD1 and OD2. It can be seen, for example, that part of the apparent improvement in OD1 in 1995, relative to 1994, is attributable to the increase in average maturity from 3.9 to 6.3 months. The same situation can be seen in the year of 1997 and 1998. In 1998, shortening of maturity caused an increase in domestic interest payments, which is reflected in a worsening of OD1. By contrast, between 1997 and 1998 OD2 actually improves by decreasing from 2.9 to 2.8 percent of GNP. In 1999 both OD1 and OD2 deteriorate with respect to 1998. Although maturity of borrowing seems to be longer, new type of government securities is introduced in 1999. These papers have two to three years of maturity but they have a coupon payment at every three months. These coupon payments increased interest payments falling into 1999. The ratio of these papers to total stock is around 28% in October. As a consequence worsening of OD1 is more than OD2 in year 1999. Actually interest payments as a percentage of GNP increased from 10.6 to 11.9 between the years 1998 and 1999.

The public sector coverage of OD1 and OD2 is the same as that of the conventional PSBR and includes the central government, financial and non-financial state economic enterprises, local governments, revolving funds, social security institutions and extra-budgetary funds. The third measure extends coverage by incorporating a rough approximation of quasi-fiscal deficits. In this measure, called OD3, the fiscal balance is computed by adding, to the adjusted measure of PSBR, a major component of the quasi-fiscal deficits that accounts for the special duty losses of the major public banks. Public banks incur these duty losses mainly as a result of agricultural subsidies, and preferential credits they advance to specific classes of

[2] That is, the difference between interest rates on cash and non-cash issues increase.

borrowers. Moreover, these duty losses do not show up in the conventional measures of PSBR, even though the calculation of the conventional PSBR does take account of the profits and losses of state banks. The first time a duty loss occurs, it is recorded as a claim on the asset side of the state bank's balance sheet. Interest accruing on that stock is shown as interest income in the bank's profit and loss statement, even when no cash income is received from the Treasury (Atiyas et. al. 1999). The discrepancy may arise because state bank profit and loss statements are prepared on accrual basis whereas the PSBR is calculated on cash basis. The calculation of OD3 compensates for these discrepancies.

The detailed discussion on the treatment of the duty losses in the sustainability analysis is given in Annex 2. Due to the unavailability of data this third measure of operational deficit is only calculated for 1997, 1998 and 1999. Very briefly, the treatment of quasi-fiscal activities followed in the study assumes that they are transferred to the consolidated budget at the end of 1996 onwards for 1997 and the same assumption is also made at the end of 1997 and 1998 onwards for the following years. The public domestic debt stock is increased as well to incorporate the accumulated stock of duty losses (see below). OD3 turns out to be 4.30% of GNP, 5.20% of GNP and 10.74% of GNP in 1997, 1998 and 1999, respectively (Tables 1.3 and 1.4 below).

The fourth measure of operational deficits, OD4, is motivated by the idea of consolidating the debt stock of the public sector by removing intra-governmental debt. Though the size of the conventional PSBR is not affected by such a consolidation exercise, the operational deficit is, due to the interest income earned from the intra-governmental claims. The consolidation of the stock of domestic public debt is important to define the net debt relationship between the public and the private sector, which is actually the main determinant of the sustainability of deficits and clearly the interest rate that matters in these transactions are the market rate of interest. The important issue to be highlighted is that depending upon the derivation of

the net domestic debt stock, an adjustment to the total interest payments and primary deficit involved in the calculation of the operational deficit is required. For example, if the net domestic debt stock is obtained by subtracting the deposits from the debt stock conventionally defined, the primary deficit needs to be redefined to exclude the interest income from the deposits, and the interest payments have to be net of the interest income obtained from the deposits. For the consolidated debt stock taking account of the intra-governmental debt, both the primary deficit and interest payments need to be netted out, accounting for the interest income obtained for the corresponding claims for the asset owner party (as shown in Table A.1.5). The size of the overall PSBR is not affected by these adjustments (Atiyas et. al. 1999).

The consequences of including quasi-fiscal deficits, the stock of duty losses and debt consolidation on measures of primary and operational deficits and the net stock of public debt can be followed in Table 1.3 for the year 1998. Row 4 in the table shows that adding the stock of duty losses to the existing stock of net public debt increases the latter by 5.7% of GNP (end year prices), to 20.7. Consolidating intra-governmental debt reduces it to 11.6% of GNP (end year prices). The addition of quasi-fiscal activities to the budget turns the primary balance with net interest payments from a surplus of 1.38 percent of GNP into a deficit 0.24 percent of GNP. The netting out of intra-governmental interest payments and receipts ends up *decreasing* the primary surplus from 1.38 to 0.59 percent of GNP when one excludes the QF, and primary surplus turns to deficit from 0.24 to 1.03 percent of GNP when QF is included.

Table 1.3: Deficits and Domestic Debt for 1998

	OD1	**OD2**	**OD3**	**OD4**
PSBR (adjusted)/GNP	10.93	10.93	15.93	15.93
Primary Deficit (with net interest pay.)/GNP	-1.38	-1.38	-1.38*	-0.59*
Primary Deficit (with net interest pay., inc. QF)/GNP			0.24	1.03
Domestic Debt Stock/GNP (end-year prices)**	15.0	15.0	20.7	11.6
Operational Deficit/GNP	3.51	2.84	5.20	5.45

(*) The implied figures for OD3 and OD4 when QF is not included.
(**) GNP is expressed in end-of-year prices in domestic debt stock ratios, but in average prices otherwise.

The same operational deficits and domestic debt figures are also calculated for the year 1999 and shown in Table 1.4, however due to the unavailability of data, intra-governmental debt could not be consolidated and the fourth measure of operational deficit could not be calculated. In 1999 domestic debt of public sector increased by around 4.7 percent and reached out to 19.7% of GNP (end year prices). The stock of QF debt increased very rapidly in 1999 and reached 9.6% of GNP (end year prices). Adding this to the domestic debt stock, total public debt increases to 29.3% of GNP (end year prices). The primary balance, including QF, showed a deficit of around 3.9 percent of GNP. Thus, for 1999, the contribution of QF activities to the total public primary deficit was about 2.5 percent of GNP (inclusion of QF increases the deficit from 1.41 to 3.95 percent of GNP).

Table 1.4: Deficits and Domestic Debt for 1999

	OD1	**OD2**	**OD3**
PSBR (adjusted)/GNP	14.98	14.98	22.72
Primary Deficit (with net interest pay.)/GNP	1.41	1.41	1.41*
Primary Deficit (with net interest pay., inc. QF)/GNP			3.95
Domestic Debt Stock/GNP (end-year prices)**	19.7	19.7	29.3
Operational Deficit/GNP	7.41	6.74	10.74

Note: The figures, used in 1999, are very rough estimates.
(*) The implied figures for OD3 when QF is not included.
(**) GNP is expressed in end-of-year prices in domestic debt stock ratios, but in average prices otherwise.

Overall, we see that the difference between OD1 and OD2 is less than 1 percentage point of GNP in most years. Inclusion of QF has a larger impact: primary balances worsen by 1.0 percentage points in 1997 and 1.6 percentage points in1998 and 2.5 percentage points in 1999. OD increases by about 2-4 percentage points of GNP. The impact of QF on the stock of debt is also quite high, about 4-9 percentage points of GNP.

2. Methodology

The theoretical framework to analyse the consistency between the fiscal deficits and other macroeconomic targets is presented in Anand and Wijnbergen (1989) with a simple model. This framework has been widely used in empirical country analyses and constitutes the core of the methodology adopted in this paper. The consistency of fiscal deficit with the macroeconomic targets and the interactions between the fiscal deficits, output growth, rate of inflation and a range of main macroeconomic variables is sought for measuring the "financeable deficit". The financeable deficit as defined in World Bank (1996) is the deficit that does not require more financing than is compatible with "sustainable" external and internal borrowing, and existing targets for inflation and output growth. The Anand and Wijnbergen (1989) model is described briefly in section 2.1 section 2.2 presents the results for the money demand estimates used in the model.

2.1 The Model

The starting point in deriving the financeable deficit is the government budget identity given in equation (2.1),

$$D + iB + i^* B^* E = \dot{B} + \dot{B}^* E + \dot{DC}_g \qquad (2.1)$$

D	: Non-interest deficit
i	: Nominal domestic interest rate on domestic debt
i^*	: Nominal foreign interest rate on foreign debt
B	: Domestic debt
B^*	: Foreign debt
E	: Nominal exchange rate
DC_g	: The stock of Central Bank advances to the public sector.
"$\cdot$"	: Change in the value of the variable

Government budget identity simply states that the total deficit has to equal the sum of financing from all sources. The sources of financing are issuing interest-bearing internal and external debt, and using monetary sources of the Central Bank.

Taking into consideration the fact that Central Banks of most countries behave like a public sector entity, assuming foreign debt of the public sector, issuing

subsidized credits to preferential sectors, and the like, Central Bank profit and loss accounts should be included into the public sector account. In the paper presented by Anand and Wijnbergen (1989) a simple Central Bank account is taken into consideration:

Assets	Liabilities
DCg (Domestic credit to government)	NW (Net worth)
NFA*E (Net foreign assets)	Cu (Currency)
	RR (Commercial bank reserves)

Currency held by the public and required reserves of the commercial banks form base money definition from the liability side. Alternatively, net liabilities of the Central Bank to the private sector can also be stated as the base money as given in equation (2.2) and (2.3).

$$M = Cu + RR \tag{2.2}$$

$$M = DC_g + NFA^* E - NW \tag{2.3}$$

In the simple Central Bank account, profits are stated as interest earnings on foreign reserves and the counterpart of these profits is the increase in the Central Bank net worth, as stated below by equation (2.4),

$$i^* NFA^* E = \dot{NW} \tag{2.4}$$

In order to incorporate the Central Bank account into that of the public sector, the profit of the Central Bank should be subtracted from the deficit and the increase in net worth of the Central Bank should be subtracted from the increase in public sector liabilities. Therefore, consolidated account can be stated as in equation (2.5),

$$D + iB + i^*(B^* - NFA^*)E = \dot{B} + \dot{B}^* E + \dot{DC}_g - \dot{NW} \tag{2.5}$$

Two additional steps are required to render the accounting identity more useful. First, since the central bank and public sector accounts are consolidated, and

since the left hand side lists interest payments on net foreign debt of the public sector, it is useful to express the source of finance on the right hand side in terms of net foreign debt of the public sector as well. This is done by adding and subtracting the change in the net foreign assets of the central bank:

$$D + iB + i^*(B^* - NFA^*)E = \dot{B} + (\dot{B}^* - N\dot{F}A^*)E + \dot{DC}_g + N\dot{F}A^*E - \dot{NW} \qquad (2.6)$$

Second, the change in domestic credit to the government is a transaction between the two public entities and should be eliminated. This can be done by recognizing that the last three elements of equation (2.6) is equal to the change in monetary base:

$$D + iB + i^*(B^* - NFA^*)E = \dot{B} + (\dot{B}^* - N\dot{F}A^*)E + \dot{M} \qquad (2.7)$$

The budget deficit presented in equation (2.7) does not capture the public sector's claim on resources. The right hand side of the equation shows the total public sector liabilities in nominal terms. While measuring the real liabilities of the public sector to the private sector, domestic and foreign inflation components of the nominal interest payments should be excluded since these components are treated as capital account rather than current account. After subtracting the stated capital account from both sides of the equation, all variables are divided by the price level P and a new equation is obtained:

$$d + rb + r^*(b^* - nfa^*)e = \dot{b} + (\dot{b}^* - n\dot{f}a^*)e + \dot{M} / P \qquad (2.8)$$

Lower case variables denote the real variables, P and P* denote the domestic and foreign price level and r and e are calculated as follows,

$$1 + r = (1 + i) / (1 + \hat{P})$$

$$1 + r^* = (1 + i^*) / (1 + P^*)$$

$$e = EP^* / P$$

Here “hat” (^) denotes percentage change. Capital losses due to changes in real exchange rates, changes which are part of the cost of servicing foreign debt,

should also be included in the equation in order to show the real liability of public sector to the private sector. Capital loss due to foreign exchange rate changes is stated as:

$$\dot{\overbrace{(b^* - nfa^*)e}} = (\dot{b}^* - n\dot{f}a^*)e + \hat{e}(b^* - nfa^*)e$$

Substituting the above expression into equation (8) gives equation (9) given below,

$$d + rb + (r^* + \hat{e})(b^* - nfa^*)e = \dot{b} + \dot{\overbrace{[(b^* - nfa^*)e]}} + \dot{M}/P \qquad (2.9)$$

The last term of the right hand side of the equation is the increase in real money balances. The rise in real money balances shows the revenues of the government from the issuing of money as inflation tax and seigniorage. This can be shown as:

$$\dot{M}/P = \dot{m} + \hat{P}m$$

and substituting this into the equation (2.9),

$$d + rb + (r^* + \hat{e})(b^* - nfa^*)e = \dot{b} + \dot{\overbrace{[(b^* - nfa^*)e]}} + \dot{m} + \hat{P}m \qquad (2.10)$$

The deficit obtained above shows the fiscal deficit of the public sector in combination with the Central Bank profit and loss account, while excluding inflationary erosion of the public sector net debt from the private sector. Consequently, the formulation above establishes the equality between the real deficit (inclusive of central bank profit and loss account, and accounting for real components of interest payments) and changes in the real value of domestic and foreign debt plus revenue from the seigniorage and inflation tax.

Equation 2.10 is an accounting identity. Ex-ante it can be used to check the consistency of macroeconomic policy targets, given additional assumptions about the path of exogenous variables. In particular, it can be used to evaluate the needed adjustment in fiscal deficits (relative to a base year) consistent with inflation and debt targets. In that sense, the right hand side of the equation can be seen as an estimate of the financeable deficit, given debt and inflation, real exchange rate and GNP growth targets, which can be compared with the expression for actual deficit given on the left

hand side. When the two are not equal, policy targets are not consistent with realized deficits. The difference between the two provides an estimate of the required deficit reduction (RDR).

In order to carry out such an assessment, we will need to make some assumption as to the desirable level of the stock of public debt. We will simply assume that the ratio of the real stock of domestic debt to real output has to remain constant.[3] We also assume that the ratio of foreign debt to output remains constant as well (that is, real net foreign debt cannot grow faster than the ratio of output to the real exchange rate):[4]

$$\dot{b} = nb \text{ and } \dot{(b^* - nfa^*)e} = (n - \hat{e})(b^* - nfa^*)$$

$$\dot{b}/y = n\tilde{b} \text{ and } \dot{(b^* - nfa^*)e/y} = (n - \hat{e})\tilde{(b^* - nfa^*)}$$

~ indicate variables expressed as a percentage of GNP
n growth rate of real output, y. Using the equations above

$$\tilde{d} + r\tilde{b} + \tilde{r^*(b^* - nfa^*)e} = n\tilde{b} + (n - e)\tilde{(b^* - nfa^*)} + (\hat{P} + n)m \quad (2.11)$$

The equation above states that non interest deficit and real interest payments on domestic and foreign debt cannot exceed what can be financed through debt issue at the target debt-output ratios, and revenue from the steady-state seigniorage and inflation tax.

Note that for consistency and since demand for money itself is affected by changes in the inflation rate, demand for base money needs to be evaluated at the target inflation rate and prevailing interest rates. This requires an estimate of how money demand responds to changes in these variables. This is handled in the next sub-section.

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[3] Therefore I ignore the thorny issue of whether the current stock of debt is too high and unsustainable. It is often argued that even though the current stock of debt is not high relative to GNP, it is high relative to the size of the domestic financial system and therefore puts pressure on interest rates. The merits of this argument would depend critically on one's views about access to international capital flows.

[4] In further simulations I test how results change when the net foreign debt-GNP ratio is required to increase by two percentage points.

2.2 Money Demand Functions

Base money is determined by the demand functions for currency in circulation, demand deposit, time deposit and foreign currency deposit. In the estimations average quarterly data are used, starting from 1980-1 to 1998-1 except for foreign currency deposit equation which starts from 1986-1 to 1998-1. The functional forms used in the equations are based on the portfolio approach to the asset demands and similar to those used in World Bank Report (1996). The estimation results for the components of money demand functions are taken form Atiyas et. al (1999) and presented at Table 2.1, the implied long-run coefficients are given in Table 2.2.

Table 2.1: The Estimation of Base Money Demand

DEPENDENT VARIABLE	Const	ln(CPI/CPI(-1))	$\ln(1+i_{TD})$	$\ln(1+i_{FXD})$	Trend	Lagged Endogenous Variables
Ln(Cu/PY) R^2=.87 DW=1.83 1981.1-1998.1	-1.12 (-3.79)	-0.32 (-2.35)			-0.002 (-1.68)	0.62 (6.71)
Ln(DD/PY) R^2=.96 DW=1.70 1981.1-1998.1	-1.11 (-4.30)	-0.38 (-2.35)	-0.52 (-2.77)		-0.007 (-2.87)	0.47 (4.63)
Ln(TD/PY) R^2=.92 DW=1.53 1981.1-1998.1	-0.32 (-4.09)		0.104 (1.00)		-0.002 (-2.68)	0.847 (24.9)
Ln(FXD/PY) R^2=.96 DW=1.59 1986.2-1998.1	-1.09 (-3.28)			0.143 (2.46)	0.005 (2.524)	0.708 (8.40)

* The numbers in brackets are the t values of the regression.

Table 2.2: Implied Long Run Coefficients of the portfolio model

DEPENDENT VARIABLE	ln(CPI/CPI(-1))	$Ln(1+i_{TD})$	$ln(1+i_{FXD})$
ln(CU/PY)	-0.8571		
ln(DD/PY)	-0.7376	-1.003	
ln(TD/PY)		0.6875	
ln(FXD/PY)			0.4926

Cu : Currency in circulation
DD : Total demand deposits held in banks
TD : Total time deposits held in banks
FXD : Total foreign exchange deposits held in banks
CPI : Consumer price index
i_{TD} : Average weighted interest rates on time deposits
i_{FXD} : Average weighted interest rates on foreign exchange deposits, inclusive of nominal depreciation of the exchange rate.
PY : CPI index multiplied by annualized real GNP.

The estimation results show that the inflation elasticities of currency in circulation and demand deposits are very high. This implies that for an increase in the revenue from monetization in the form of inflation tax and seigniorage revenues, the government needs higher and higher inflation with more shock component in it.

3. Results

In this section the Anand and Wijnbergen model is used for calculating extent of fiscal adjustment that would be needed to implement a disinflation program. The various measures of operational deficits derived earlier to assess the extent to which estimates of required deficit reduction are sensitive to the specific approaches used in calculating operational deficits and public debt. In recent years quasi-fiscal activities of state banks increased very rapidly. Small part of these accounts financed by actions of the treasury. An exercise of the required deficit reduction should incorporate the QF accounts that is one of the fiscal adjustment component of a comprehensive stabilization program. In effect, including the QF accounts in the definition of public deficits and debt is tantamount to assuming first, that the Treasury compensates for the flow of duty loses fully within the year through budgetary

appropriations, and second, that it issues non-cash securities in exchange for the stock of accumulated duty losses.[5]

For 2000 basically scenarios are examined for each of the different measures of operational deficits and public sector debts introduced in section 1. The detailed accounts involved in the derivation of the debt stocks and the corresponding operational deficit figures are presented at Annex 1. In this framework is examined for the years of 1998 and 1999 and four different OD measures are used and various scenarios are made in our paper (see for details, Atiyas et. al. 1999). Due to unavailability of data sources OD4 can not be evaluated for the year 1999 and it is not used for the scenarios of year 2000. First three OD measures and domestic debt stocks (including quasi-fiscal activities) are used in five different scenarios for 2000. The first scenario is the base case in the sense that it takes 1999 as the point of departure and assumes that the real auction rate remains at their 1999 levels. The rate of growth of GNP in 1999 seems to remain negative but we presume the GNP growth, as zero assuming that there is no real change in domestic debt stock with respect to inflation. Target inflation for the first scenario and the other three scenarios (except the last one) is taken as 20% that is the target rate for 2000. Except the first scenario the growth rate of GNP is taken as a modest 4% for all scenarios. The third scenario analyses the required reduction in operational deficits when the real auction rate declines in 2000 about 10 percentage points with the inflation target of 20%. Difference between the third and the fourth scenario is that in the fourth scenario net foreign borrowing amounting to 2% of GNP is allowed in 2000. The fifth and the last scenario is the pessimistic scenario. The assumptions are no change in real interest rates, net foreign

[5] I also note that the fact that under the current regime the duty losses are financed by the state banks does not imply that they do not affect the financing of the deficit. To the contrary, financing of the deficit is affected through several channels. Duty losses create liquidity problems which state banks resolve either by increased recourse to the inter-bank market or by more aggressive behavior in the market for deposits. Both can be expected to affect the Treasury auction rates. In addition, the increased demand for liquidity may push the central bank to engage in open market operations, which affects the money supply.

debt increase of only 1% and 30% inflation target. The results are presented in Table 3.1.

Table 3.1: Alternative Scenarios for the Financable Deficits for 2000

			Key Assumptions			Operational Deficit		
			GNP Growth(%)	Real Dom. Int.(%)	Inflation	Actual	Financiable	RDR
A.		OD1 =7.41% & Dom.Debt/Y = 19.7%						
	A.1	Base Case	0.0	30.3	20	7.4	1.2	6.2
	A.2	20% Inf. Target	4.0	30.3	20	7.4	2.8	4.6
	A.3	20% Inf. Target & dec. in real int. rates	4.0	20.0	20	5.4	2.8	2.6
	A.4	A3 & 2% Net For. Debt Increase	4.0	20.0	20	5.5	4.9	0.6
	A.5	1% Net For. Debt Inc.& no change real int. rates	4.0	30.3	30	7.5	4.1	3.4
B.		OD2 = 6.74% & Dom.Debt/Y = 19.7%						
	B.1	Base Case	0.0	30.3	20	6.7	1.2	5.5
	B.2	20% Inf. Target	4.0	30.3	20	6.7	2.8	3.9
	B.3	20% Inf. Target & dec. in real int. rates	4.0	20.0	20	4.7	2.8	1.9
	B.4	B3 & 2% Net For. Debt Increase	4.0	20.0	20	4.8	4.9	-0.1
	B.5	1% Net For. Debt Inc.& no change real int. rates	4.0	30.3	30	6.8	4.1	2.7
C. (with QF Def.)		OD3 = 10.74% & Dom.Debt/Y = 29.3%						
	C.1	Base Case	0.0	30.3	20	10.7	1.2	9.5
	C.2	20% Inf. Target	4.0	30.3	20	10.7	3.2	7.5
	C.3	20% Inf. Target & dec. in real int. rates	4.0	20.0	20	7.7	3.2	4.5
	C.4	C3 & 2% Net For. Debt Increase	4.0	20.0	20	7.8	5.5	2.3
	C.5	1% Net For. Debt Inc.& no change real int. rates	4.0	30.3	30	10.8	4.5	6.3

A major issue to be highlighted by the results is that different measures of operational deficits suggest widely different recommendations regarding the size of the required fiscal adjustment. OD1 and net domestic debt are used in panel A. Under the assumption that no real growth in 2000, required deficit reduction (RDR) is around 6.2% of GNP to sustain target inflation. Increase in growth rate leads to increase in the financiable deficit and RDR falls to 4.6 percentage of GNP. Row A.3 suggests that in 2000 reaching a target of 20% inflation would have been possible with an operational deficit of 2.8 percent of GNP, which implied a reduction in 2.6 percentage points of GNP relative to its level in 1999 under the assumption that real interest rate decreases. In the fourth scenario there is a small amount of adjustment needed in the operational deficit to achieve the target rate of 20%. In the pessimistic scenario presented in row A.5, actual deficit would be 7.5 percent and 3.4% of GNP

reduction will be required. The scenarios for OD2 lead to similar results with that of OD1 since these two OD measures turn to be quite close in 1999 (panel B). Briefly scenario with OD2 also suggests a further retrenchment of fiscal policy for the base case. Referring to scenario B.4 with 4% rate of GNP growth, 20% real auction rate and 2 percentage point increase in the ratio of foreign debt to GNP, a target inflation rate of 20 percent can be achieved with no reduction for the operational deficit. The last scenario for OD2 suggests a retrenchment of 2.7% of GNP for operational deficit.

Panel C provides the results when QF activities are taken into account. Compared to panel A and B, the primary consequence of the inclusion of QF activities is the increase in the gap between financeable and actual deficits. Compared to an RDR of 1.9% of GNP in scenario B.3, scenario C.3 now suggests a RDR of 4.5 percent of GNP to attain an inflation target of 20 percent. In the scenario C.5 operational deficit increases 10.8% of GNP whereas financiable deficit is around 4.5% of GNP. The impact of the consolidation of intra-governmental debt is illustrated with similar scenario analysis for the year 1998 (see Atiyas et. al 1999).

Assuming an increase in net foreign debt of 2% points, interest payments on foreign debt amounts to 1.6% of GNP. Interest payment on domestic debt is about 7.4% of GNP. At a real interest rate of 20 percent in C.4 this amounts to a primary surplus of 3.5 percent of GNP in year 2000, implying 2.3% reduction in operational deficit. The same calculations are made for the pessimistic scenario, C.5, that presume only 1% of foreign debt increase and no change in real interest rates. Total interest payment increases and amounts to approximately 12.8% of GNP. In C.5, with a real interest rate of 30.3 percent, an OD3 of 4.5 percent of GNP translates into a primary surplus of 8.3 percent of GNP. Compared to its level in 1999, this amount to a further reduction in OD by 6.3 percentage points of GNP, respectively.

The first main point in all this is that policy recommendations regarding adjustment does indeed depend on how fiscal stance is measured. Second, the required deficit reduction is quite sensitive to the level of real interest rates that will prevail during the disinflation period. This suggests that debt management policies

will play a crucial role in the adjustment process, an issue that is not addressed in this paper. Comprehensiveness and transparency in public accounts are needed for the improvements in fiscal aggregates.

4. Econometric Relation Between Budget Deficit and Inflation

Inflation and deficit are always linked to each other. Especially monetary financing of deficits causes inflation. Even without monetization bond financing of the budget deficits may also be inflationary. Inflation can affect the budget revenues in both ways. The rise in inflation will increase revenues by seignorage and by rising in tax rates in the system. The seignorage revenue increases up to certain level of inflation, as higher inflation reduces tax revenue and through declines in seignorage revenue. Since higher inflation causes a flight from money (Fischer & Easterly, 1990). Inflation might cause budget deficits to rise due to increase in interest payments in the expenditure side and encourage tax evasion by means of delays in tax collections. There is two-way relationship between deficit and inflation so the net affect remains ambiguous in a short run. However in the long term sustained fiscal deficit which finance through borrowing might cause monetization of debt at the end and cause increase in inflation.

4.1 Methodology

It is difficult to explain relationship between deficits and inflation. As deficit can be inflationary and vice versa. It is too restricted to explain relationship among deficit, inflation and monetary base. In this paper vector autoregression system (VAR) is used. In the VAR systems every equation has the same right hand side variables, and those variables include lagged values of all of the endogenous variables. The aim of VAR analysis is to determine the interrelationships among the variables, not the parameter estimates.

In the VAR system, impulse response functions, variance decomposition, cointegration analysis, weak exogeneity test and Granger causality are used in order to test the relationship between variables. An impulse response function describes the

response of an endogenous variable to one of the innovations. Specifically, it traces the effect on current and future values of the endogenous variable of a one standard deviation shock to one of the innovations. The variance decomposition of the VAR gives information about the relative importance of the random innovations. Cointegration analysis is normal interpretation of long-run equilibrium relationship between variables. A group of non-stationary time series is cointegrated if there is a linear combination of them that is stationary. Namely the combination does not have a stochastic trend. Weak exogeneity test is used for testing which of the variable is endogenous in the cointegration analysis. A test of causality is whether the lags of one variable enter into the equation for another variable. Granger causality indicates the power of explanation of variable to each other in the system. In this study E-Views and Pc Fiml programs are used for the econometric analysis.

4.2 Data

Annual data for the period of 1950-1998 and quarterly data for the period of 1985:02-1998:04 are used in this paper. Annual data are consolidated budget deficit (percent of GNP, def), currency in circulation (percentage change, cur) and wholesale price index (percentage change, wpi). Quarterly variables are consolidated budget deficit (percent of GNP, def), central bank money (percentage change, cb) and wholesale price index (percentage change, wpi). The data in the VAR system are obtained from Undersecretariat of Treasury, Central Bank, State Institute of Statistics and Ministry of Finance.

It can be easily seen in the graphs of annual and quarterly data in Annex 3 that especially annual variables have a trend component. Thus quarterly data seems to be stable. A stationary time series tends to return its mean value and fluctuate around it within a more-or-less constant range. A non-stationary variable becomes stationary after it is differenced (generally first differencing is enough). Stationary of a variable depends on whether it has a unit root or not. For examining the unit root of variables Augmented-Dickey Fuller test is applied. The results show that annual data have a unit root whereas quarterly data have not. Annual data became stationary after first

differencing. Figures of level and first differencing of annual data are presented Figure 3.3 and Figure 3.4 respectively in Annex 3. Namely annual data is integrated order one. Unit root tests for quarterly data indicate that series are stationary without differencing (see also Figure 3.5 in Annex 3).

It is important to determine the appropriate lag length in VAR systems. If lag length is too small the model is misspecified, if it is too large, degrees of freedom are wasted. In this paper lag length determined based on Akaike Information Criterion (AIC) and Schwartz Bayesian Criteiron (SCB). Lag length for the annual data and for the quarterly system turn out to be 2 and 4 respectively. Vector Autoregression estimates for annual and quarterly data are shown in Annex 3 Table 3.1 and Table 3.2 respectively.

4.3 Empirical Findings

Cointegration technique is applied to annual data. Johansen Cointegration Test for VAR system is used to test the hypothesis that there is cointegrating vector versus the null hypothesis that there is no cointegrating vector. The cointegration test results are shown at the following Table 4.1. Null hypothesis is rejected with 95% confidence level. The hypothesis that there are two cointegrating vectors in the system versus the null hypothesis that there is one is rejected with 95% confidence level as well. Therefore in this VAR system there is a unique cointegrating vector.

Exogenous variables in this vector are examined with weak exogeneity test. Likelihood Ratio Test result showed that budget deficit and monetary aggregate are exogenous in the vector with χ^2=4.3934 (0.1112). Cointegration analysis and weak exogeneity test is concluded the long run equilibrium between variables as shown below.

wpi = 0.09def + 0.44cur

This cointegration vector displays a linear relationship between variables in the long-run equilibrium. Moreover one point increase in deficit over GNP and one

percentage point increase in currency in circulation will increase the long run inflation by 0.09 and 0.44 points respectively.

Table 4.1: Johansen Cointegration Test

Date: 02/18/99 Time: 16:09
Sample: 1950 1998
Included observations: 46
Test assumption: Linear deterministic trend in the data
Series: WPI DEF CUR
Lags interval: 1 to 2

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.386128	35.01011	29.68	35.65	None *
0.236674	12.56355	15.41	20.04	At most 1
0.003046	0.140350	3.76	6.65	At most 2

*(**) denotes rejection of the hypothesis at 5%(1%) significance level
L.R. test indicates 1 cointegrating equation(s) at 5% significance level

Unnormalized Cointegrating Coefficients:

WPI	DEF	CUR
-1.821389	0.172905	0.796374
-0.674961	-0.150045	2.087173
-0.040558	-0.162929	0.581779

Normalized Cointegrating Coefficients: 1 Cointegrating Equation(s)

WPI	DEF	CUR	C
1.000000	-0.094930	-0.437234	0.029407
	(0.02770)	(0.19176)	

Log likelihood -12.39715

Normalized Cointegrating Coefficients: 2 Cointegrating Equation(s)

WPI	DEF	CUR	C
1.000000	0.000000	-1.231745	0.116824
	(0.11435)		
0.000000	1.000000	-8.369428	0.920850
	(1.06289)		

Log likelihood -6.185555

If the variables in the system are integrated of order one and have cointegrating vector than there may be one-way or two-way Granger causality. In this

study Granger causality is tested for annual data and outcomes are displayed in Table 4.2. Granger causality test indicates that deficit over GNP effects inflation and vice versa at 5% significance level. Two-way Granger causality exists between inflation and deficit as expected. Inflation affects both expenditure and revenue side of the budget. It increases spending part of the budget by increase in interest payments. Inflation can reduce or move up public revenues. But net impact of inflation on public deficit is upward. Direction of inflation caused deficit is weaker hypothesis than deficit caused inflation and is rejected 1% significance level. Between monetary base and inflation unidirectional Granger causality is found. Monetary expansion causes inflation as expected. At this point Granger causality test results and weak exogeneity analysis outcomes are consistent with each other.

Table 4.2: Granger Causality Tests

Pairwise Granger Causality Tests Date: 02/19/99 Time: 11:24 Sample: 1950 1998 Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
DEF does not Granger Cause WPI	47	9.54558	0.00038
WPI does not Granger Cause DEF		4.32670	0.01956
CUR does not Granger Cause WPI	47	8.46704	0.00081
WPI does not Granger Cause CUR		1.05995	0.35556
CUR does not Granger Cause DEF	47	7.36737	0.00181
DEF does not Granger Cause CUR		1.96152	0.15332

In the VAR system for annual data dummy variable is used for the year of 1994 in order to eliminate effect of financial crises in 1994 (see Table3.1 in Annex 3). Variance decomposition functions (in Graph 3.6 in Annex 3) indicate that the forecast error variances of all variables for k step ahead are accounted for mostly by the variables themselves. In the impulse response function one standard deviation shock given to deficit over GNP and currency in circulation cause increase in inflation. In the Graph 3.7 in Annex 3 Impulse Response functions show that response of inflation

to monetary aggregate is stronger than to deficit. These results are also consistent with the long run equilibrium relationship among money, deficit and inflation.

In the quarterly system lag length is chosen as 4. Seasonal dummies D1, D2 and D3 are used in the VAR model. To remove the effect of financial crises in 1994 dummy variable, DUM9402, is used for the second quarter of 1994 (see Table 3.2 in Annex 3). Variance decomposition functions of quarterly variables indicate that the forecast error variances of all given values of k are accounted for mostly by the variables themselves in Graph 3.8 in Annex 3. In the impulse response function one standard deviation shock given to deficit over GNP and central bank money cause increase in inflation five periods ahead (see Graph 3.9 in Annex 3). A possible explanation for these results may be that in the short term expectations are more influential compared to the other factors. It is known that inflation inertia has a key role in the inflationary process in countries suffering from sustained high inflation. In annual data response of inflation to money is more than to deficit.

In this analysis both annual variables and quarterly variables indicate that budget deficit and inflation affect each other. Especially in the long run deficit, inflation and monetary aggregate have the same trend. In the long run the effects of monetary base on inflation is stronger than the effects of deficit. This may reason for financing methods of deficit more influential on inflationary process. Two-way Granger causality is detected between inflation and deficit. In addition unidirectional Granger causality is determined from monetary base to inflation. It is shown that one innovation shock given to deficit and monetary aggregate results in an increase in inflation. Moreover it is seen that relation between inflation and deficit weakens. Response of inflation to shocks given to deficit and money are not too strong and show up periods later. First reason of this situation is that, in the short run inflation inertia has central role in the inflationary expectations. Turkish economy has suffered from high and persistent inflation in a long period of time. During this time period inflation inertia has become one of the important point in the inflationary process. The second is, especially in the recent years public deficit and debt do not indicate a real

size of public sector. Especially consolidated budget deficit is not sufficient indicator to show whole public sector's liability. As a consequence credible macroeconomic policies and comprehensiveness in the public accounts are two major points for disinflation program.

5. Conclusion

In the first part of the study the major issue to be highlighted with an examination of the model results is that widely different policy recommendations can be made regarding the fiscal policy with different measures of the operational deficit. Required adjustments in operational deficit are changing among the different operational deficit measures for the scenario analysis for 2000. This leads to the fact that conventional measure of fiscal deficit and domestic debt are not sufficient indicators to measure the public sector's true fiscal stance. The accurate measurement of public sector's net requirements is important to design appropriate fiscal policies. The second important point is that change in real interest rates highly affects the amounts of adjustment in the operational deficits. This implies that debt management policies play a crucial role in the adjustment process. Especially the real interest rates depend on confidence and credibility of fiscal policies. Moreover real interest rates increase when domestic debt financing is heavily used. The model results point out that increase in net foreign financing of deficit decreases required operational deficit reduction in the model results.

A long run relationship between budget deficit, inflation and monetary aggregate is found in the econometric analysis of the series. In the light of weak exogeneity test, deficit and money are exogenous in the cointegration vector therefore both are influential factors in the inflationary process. Results of both cointegration analysis and impulse response functions in the VAR system indicate that the effect of budget deficit on inflationary process has weakened. Recently not only inflationary expectations plays important role on inflationary process in the short run but also public deficits do not indicate real size of the public sector in recent years. Permanent

reduction in inflation relies on credible macroeconomic policies, well understood by the public, which will break up the stickiness in inflationary expectations and comprehensiveness and transparency in public accounts.