Government Deficit and Inflation in India

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This study covering the period 1951-52 to 1999-2000 finds that government deficit has been an important cause for long-run inflationary trend in India. The estimates in the study, however, suggest that there is an optimal level of monetisation for a given level of government deficit and refutes the concern that monetisation of deficit is always inflationary. This is not to suggest in any way that there is more scope to finance government deficit through monetisation. With the increase in capital inflows on which there is a certain degree of lack of control and the consequent predominance of net foreign exchange assets in reserve money, there is a need for greater fiscal restraint as well as monetary-fiscal coordination.

Introduction

Traditionally, monetarists argue that inflation is always and everywhere a monetary phenomenon. Fischer and Easterly (1990) while accepting the monetarists' view, however, note that a rapid money growth without an underlying fiscal imbalance is unlikely, implying that rapid inflation is almost always a fiscal phenomenon. History has often witnessed cases of governments' resorting to seignorage at times of fiscal distress. In the case of fiscally dominant regimes, persistent deficits have led to money creation. The standard account of this fiscally dominant regime goes something along the following lines. The size of government budget is determined by the fiscal exigencies and the shortfall that cannot be financed from its normal revenue and borrowing in the budget is assigned to the monetary authority to be generated through money creation, which could lead to inflation.

The present study is set around the theme of fiscally dominant mechanism of inflation in India. An issue that arises is : for a given level of fiscal deficit what would be the appropriate level of monetisation? This issue lies at the heart of policy inconsistencies between monetary and fiscal authorities in ensuring price stability. Against this backdrop, the present study attempts to explore the long-run relationship between fiscal deficit and inflation in India during the period 1951-52 to 1999-2000, taking into account the external shocks provided by oil price. Oil price shock is treated as an exogenous factor influencing inflationary trend notwithstanding the fact that impact of crude oil price increase in India was mostly absorbed by the oil pool account, which is an extra budgetary item. Domestic oil price being largely administered and sticky, the increase in external oil price which otherwise cuts the profit margin of oil refineries is neutralised by subsidising from the oil pool account. Thus, the full impact of external oil price increase is not passed on to the domestic prices[1] .

In the next section, a brief review of the existing literature is undertaken, followed by a discussion on methodology and data source in Section II. This section is followed by an analysis of the estimated results in Section III and concluding remarks in Section IV.

Section I
An Overview of the Existing Literature

In the developed country context, fiscal policy is often thought to be unimportant for inflation determination as it is considered, at least on theoretical grounds, that the desire to obtain seignorage revenue plays no apparent role in the choice of monetary policy (Woodford, 2001). There are studies such as Lane (1995) and Click (1998), which do not consider fiscal balance to be a possible explanatory variable for inflation and seignorage. On the other hand, fiscal dominance is often a developing country phenomenon. Thus, fiscal-based theories of inflation are more common in the literature of developing countries; Aghevli and Khan (1978), Alesina and Drazen (1991), Cuikerman, Edwards, and Tabellini (1992) and Calvo and Vegh (1999), to mention a few.

The literature on inflation in the Indian context is also replete with fiscal based theories (see for examples Rangarajan and Arif (1990), Buiter and Patel (1992) and Rao (2000)). This does not come as a surprise since Indian economy is indeed characterised by high fiscal dominance. The authorities often resort to inflation tax or seignorage to finance government expenditure as described above though these are under certain limits in recent times. Until as recent as end-March 1997, it took the form of automatic creation of *ad hoc* treasury bills (though some limits were imposed since September 1994 which paved the way for abolishing the mechanism of *ad hoc* treasury bills from April 1997) whenever there was a shortfall in receipts to finance government expenditure. Thus, fiscal deficit has been understood as one of the crucial factors explaining the inflationary process in India.

Another theoretical strand for explaining inflation is the fiscal theory of inflation in which price level is determined by the government budget constraint:

$$\frac{\text{nominal debt}}{\text{price level}} = \text{present value of real surpluses}$$

In this theory, money and nominal debt are essentially valued as equity claims on government. Here, increase in price level need not work in the standard quantity-theoretic mechanism of fiscal deficit leading to increase in money supply and consequently price. The mechanism in this theory is essentially through the effects of fiscal deficit on private sector budget constraints and thus on aggregate demand and the price level. In equilibrium, however, fiscal disturbances affect the growth of money supply, but the causality is not from fiscal deficit to money supply and to price. Rather, it is from fiscal deficit raising the price level which in turn affects money supply as a result of the monetary authority's passive accommodation to meet higher money demand caused by higher price [on fiscal theory, see for example Cochrane (1998) and Woodford (2001)].

Sargent and Wallace (1981) by incorporating the role of expectations about future policy show that when a government is constrained to finance its deficit through inflation tax, any attempt to fight current inflation with tighter monetary policy works only temporarily. Eventually, it would lead to higher monetary expansion and inflation. This outcome, termed as unpleasant monetarist arithmetic (UMA), works out on the following lines. Given a budget constraint, reducing revenue from money creation currently means resorting to larger market borrowings, which at some point of time raises the real rate of interest above the real income growth, leading to unsustainable growth in debt to income ratio, threatening solvency in some cases. The solvency constraint eventually forces the government to resort to money financing at a much higher scale than what was required initially due to higher interest payments. They also show the plausibility of current tighter money policy leading to higher inflation not only in the future but also in the present. This would happen if the current rate of inflation depends on current and all anticipated future levels of money supply. Tight money now can then lead to anticipation for high rates of money creation in the future so that the current demand for money increases and raises the current inflation itself. The assumption crucial to the result of Sargent and Wallace's (SW) study is that the real interest rate on government debt is greater than the economy's growth rate. This condition has rarely been met in the Indian context, where interest rate on government borrowing was largely administered until the beginning of the 1990s. In the United States and Canada also, for most of the post-war period, the real interest rate has been below the growth rate. The recent literature, however, has shown that for the SW result to hold, it is not necessary that the real return on government debt exceeds the economy's growth rate. The proviso is that there exists a store of value with real return higher than the economy's growth rate (Bhattacharya and Haslag, 1999).

Further, there could be an optimal level of monetisation for a given level of fiscal deficit even though fiscal deficit inherently leads to higher inflation. Rao (2000) studying the Indian case suggests that theoretically for any given fiscal deficit, there exists an optimal level of monetisation at which both inflation and interest rate could be stabilised. Excessive monetisation could continue to increase inflation indefinitely, and insufficient monetisation leading to excessive market borrowing could also lead to high inflation-high interest equilibrium. Using the data over the period 1990-2000 to estimate the values of parameters derived in the model, and applying it to the 2000-01 budget, Rao (2000) concludes that actual level of monetisation is much lower than the estimated optimum of 40.0 percent of deficit[2].

Section II
Methodology and Data Source

Two measures of inflation are considered in the study *viz.,* wholesale price index (WPI), which is the most common and headline measure of inflation in the country and compiled on a weekly basis; and consumer price index for industrial workers (CPI), compiled on a monthly basis. Both the measures are important in India as they are adopted for different policy and practical purposes. WPI is much broader in coverage than CPI. The former is closer to the producer's price while the latter represents more of the retail prices. Exogenous shocks such as oil price hike to domestic price may have differential impact on the WPI and the CPI. If the full impact of such shock is not being passed on to the consumer, increase in wholesale price may be more than consumer price. Owing to such differences in the nature of inflation measures, both the measures of inflation have been considered for studying their relationships with government deficit.

The deficit considered is of the Central Government only though a broader public sector deficit concept might be more appropriate. The use of the latter concept of measure of deficit is constrained by the lack of time series data spanning from 1951-52 to 1999-2000, which is the period under consideration. Further, at least directly, seignorage capacity of the government is mostly confined to the Central Government.

Two alternative measures of scaling deficits are tried out. First is the conventional measure of fiscal deficit as a ratio to GDP. The second, and important to the analysis, is to scale the fiscal deficit with money. Defining a long-run relationship between fiscal deficit to money stock ratio and inflation has a theoretical foundation based on the shopping time dynamic model of Ljungqvist and Sargent (2000). Catao and Terrones (2001) extended this model to an open economy setting in which in steady state equilibrium, it postulates a linear function of inflation as follows[3] :

$$p = \beta \frac{FD}{M} \qquad (1)$$

where 'p' is inflation, 'FD' is fiscal deficit and 'M' is the stock of money and 'β' is a positive parameter. 'β' is postulated as a positive parameter implying that lower the stock of money for given level of fiscal deficit, the higher would be the long-run rate of inflation. The expansion in the monetary base, however, need not be necessarily due to monetised deficit. Conversely, a given level of monetised deficit need not lead to a corresponding expansion in base money and money stock, if base money increase is impounded through central bank policy measures such as raising of reserve requirements, which has been the Indian experience until recently[4] . In other words, there need not be one to one correspondence between monetised deficit and base money expansion. The proportion of seignorage revenue to finance deficit would, however, impact on the interest rate on government borrowing. In the Indian context, however, not much of a difference would have been made since there was captive borrowing under controlled interest rates regime until the beginning of the 1990s.

The right hand side (RHS) in (1) can be bifurcated into two components of fiscal and monetary variable by dividing both the numerator and denominator by gross domestic product (GDP) to obtain the following :

$$p = \beta \frac{FD}{GDP} * \frac{GDP}{M} \qquad (2)$$

The first term in RHS in (2) is the standard fiscal deficit to GDP ratio and the second term is the velocity of money. Thus, it becomes clear from this theory that a higher fiscal deficit to GDP ratio would lead to rise in inflation provided the velocity does not offsettingly decline. If it is, however, accompanied by a certain degree of money expansion or inflation tax base, inflation need not rise while a tighter monetary policy accompanying the rise in fiscal deficit to GDP ratio would lead to higher rate of inflation.

This theory postulating a positive coefficient of fiscal deficit to money ratio implies that given the level of fiscal deficit, monetary expansion even to the extent of financing the entire deficit through money creation would always lead to reduction in long-run inflation. This unbounded negative impact of money supply on inflation may appear to be counterintuitive, as one would expect the economy to degenerate into hyperinflation at some point. For economies with experience of very low budget deficit, it may be conceivable that financing the entire deficit through money creation is less non-inflationary in the long-run. But, this is less likely for economies with severe budget constraints. As Rao (2000) demonstrates, some optimal level of monetised deficit for such economies is also expected. Both lower and higher level of monetisation than this optimum level of monetised deficit could lead to more inflationary situation in the long-run. Hence, although the model we adopt hypothesises an unbounded negative relationship between inflation and money supply for given government deficit, we check for the possibility of a positive relationship when the relative degree of monetised deficit is high. This is done by identifying the time series on fiscal deficit to money stock ratio for instances with large decline. Decline in the ratio implies a relatively higher money stock for a given level of deficit or relatively higher money creation on account of deficit. The implication flowing from the model should lead to a decline in the long-run inflation for these instances. However, by creating a series through dummy, which is 1 for those years that show decline in the ratio by more than a randomly selected value and 0 otherwise, we check for statistically significant positive coefficient of the dummy. If such a statistically significant coefficient of the dummy exists, we infer that there exists a limit to the extent of monetised deficit, which when exceeded also leads to higher long-run inflation.

In the literature, primary deficit is also used as an alternative to gross fiscal deficit in order to remove the endogeneity bias resulting from reverse impact of inflation on nominal interest. When inflation has impact on nominal interest, the estimate of the relationship defined by (1) would be biased since it cannot capture the reverse relationship appropriately. This reverse effect in India, however, would not be very strong, except in the recent times, as interest rates were mostly administered.

For each of the two measures of inflation, two forms of specification are considered: a) rate of change in the index (p); and b) log (1+ p). The second specification enables addressing the nonlinearities problem in the fiscal deficit-inflation relationship. In the presence of non-linearity the response of inflation to deficit increases as inflation rises. This can be shown as follows:

In $(1+p) = \beta$ (GFD/GDP) which on taking derivative yields,
$\delta p/(1+p) = \beta\ \delta$(GFD/GDP)

or, $\delta p/\beta$ (GFD/GDP) = β (1+p) which shows that for a given estimate of β, the impact of a percentage change in fiscal deficit/ GDP ratio on inflation will be higher as p increases.

The notations are: FDM = gross fiscal deficit scaled to M_1; FDY = gross fiscal deficit to GDP ratio; CP = change in consumer price index; LCP = log (1+ CP); WP = change in wholesale price index; and LWP = log (1+ WP).

The following eight types of relationships are possible :

1. CP and FDM – between change in consumer price and gross fiscal deficit scaled by narrow money, M_1.
2. WP and FDM - between change in wholesale price and gross fiscal deficit scaled by narrow money, M_1.
3. CP and FDY - between change in consumer price and gross fiscal deficit to GDP ratio.
4. WP and FDY - between change in wholesale price and gross fiscal deficit to GDP ratio.
5. LCP and FDM – between change in consumer price in logarithm form and gross fiscal

deficit scaled by narrow money, M_1.

6. LWP and FDM - between change in wholesale price in logarithm form and gross fiscal deficit scaled by narrow money, M_1

7. LCP and FDY - between change in consumer price in logarithm form and gross fiscal deficit to GDP ratio.

8. LWP and FDY - between change in wholesale price in logarithm form and gross fiscal deficit to GDP ratio.

In the trivariate models, change in oil price is included in each of these relationships as an additional variable.

We adopt the autoregressive distributed lag (ARDL) approach advanced by Pesaran and Shin (1995, 1996) as the variables are integrated of different order. In this procedure, the dependent and the explanatory variables can enter the regression with different lags and need not be integrated of the same order. It involves two stages of estimation with the first investigating the existence of long-run relation and the second step estimating that long-run relation and its adjustment to equilibrium from the error correction model. The procedure may be explained as follows: Consider the following augmented ARDL structure where the dependent and the explanatory variables enter the regression with lags of order p and q, respectively.

$$Y_t = \alpha + \sum_{i=1}^{p} \beta_i \, Y_{t-1} + \sum_{i=0}^{q} \delta_i \, X_{t-i} \; + \; u_t \qquad (3)$$

where, Y_t is the explained variable at time t, α represents the fixed effects, and X_t is a (k´1) vector of explanatory variables including intercept, trend and dummies with fixed lags. Equation (3) can be re-parameterised and written in terms of linear combination of variables in level and first-differences:

$$\Delta Y_t = \alpha + \varphi \, Y_{t-1} + \varphi \, X_t + \sum_{i=1}^{p-1} \beta_{t*} o \, \Delta Y_{t-1} + \sum_{i=0}^{q-1} \delta_{*t} \, \Delta \, X_{t-1} + u_t \qquad (4)$$

where $\quad \phi = -(1 - \sum_{i=1}^{p} \beta_i), \quad \varphi = -\sum_{i=0}^{q} \delta_i, \quad \beta_i^* = -\sum_{m=i+1}^{p} \beta_m, \quad \delta_i^* = -\sum_{m=i+1}^{q} \delta_m$

with i=1, 2, ….,p-1

Grouping the variables in levels, equation (4) can be written as:

$$\Delta Y_t = \alpha + \phi \, [Y_{t-1} - \theta \; X_t] + \sum_{i=1}^{p-1} \beta_i^* \, \Delta Y_{t-1} + \sum_{i=0}^{q-1} \delta_i^* \, \Delta X_{t-1} + u_t \qquad (5)$$

where $\theta = -[\varphi/\phi]$ is a vector of the coefficients defining the long-run relationship between the variables involved and ϕ which is the coefficient of the error correction term $[Y_t-\theta X_t]$ is the speed of adjustment toward the long-run equilibrium.

The stability tests or tests for establishing the existence of long-run relationships between the variables are done by conducting F-test of adding one lag of the level variables to the ARDL equations of first differences *i.e.,* test the null :

$$H_0 : \phi = \varphi_1 = .. . = \varphi_k = 0 \text{ against } H_1 : \phi \neq \varphi_1 \neq .... \neq \varphi_k \neq 0$$

in (4) and k denotes the number of explanatory variables.

In other words, the coefficient of the lag of level variables must be jointly different from zero. If the null is rejected, there exists a long-run relationship among the variables with the explanatory variables as the long-run forcing variables for the explanation of the dependent variable. This procedure can be repeated for each of the variable as the dependent variable in order to determine whether long-run relationship exist in the reverse directions. If the null is rejected for one direction and not in the reverse direction, there is only one unique long-run relationship between the variables.

In the second stage, the optimum lag for each of the variable based on various model selection criterions, such as R-bar Square, Akaike Information Criterion (AIC), Schwarz Bayesian Criterion (SBC), and the Hann-Quinn Criterion is selected and the coefficient of the long-run relations and the error correction model (ECM) as represented by equation (5) is estimated.

The annual time series data covers the period 1951-52 to 1999-2000. Gross domestic product (GDP) at market prices is obtained from Economic Survey 2000-2001. Gross fiscal deficit data are obtained from Pattnaik *et al* (1999). Consumer price index for industrial workers (CPI-IW) is obtained from Chart Book on Financial and Economic Indicators and from the Handbook of Statistics on Indian Economy, Reserve Bank of India. Wholesale price index (WPI) has been culled out from Economic Survey and Handbook of Statistics on Indian Economy. Narrow money (M_1) is obtained from RBI sources. The change in crude oil prices in US dollar is obtained from International Financial Statistics, CD-ROM, July 2001.

Section III
Empirical Tests and Results

The stability tests for long-run relationship are conducted for all the eight formulations listed above using ARDL of order 3[4].

Table 1 : Stability Test for Bivariate Models

	Formulation	F-statistics	F-statistics
1.	CP and FDM	FDM←CP = 1.71	CP←FDM = 11.1*
2.	WP and FDM	FDM←WP = 1.42	WP←FDM = 10.5*
3.	CP and FDY	FDY←CP = 1.44	CP←FDY = 10.28*
4.	WP and FDY	FDY←WP = 1.50	WP←FDY = 9.42*

5.	LCP and FDM	FDM←LCP = 2.00	LCP←FDM = 7.54*
6.	LWP and FDM	FDM←LWP = 2.25	LWP←FDM = 11.2*
7.	LCP and FDY	FDY←LCP = 1.58	LCP←FDY = 7.03*
8.	LWP and FDY	FDY←LWP = 2.12	LWP←FDY = 10.1*

* denotes rejection of null at least at the 95% confidence level based on the critical value bounds computed by Pesaran *et al* (1996).

In Table 1, the arrow indicates the direction of causation. It can be seen that the F-statistics are significant in only one direction running from deficit to inflation in all the eight formulations. It may be interpreted that there exists a stable long-run relationship between inflation and deficit in India with the latter explaining the change in the former, and not *vice versa*.

The long-run coefficients and the associated ECMs were estimated for models with the highest R-bar square values[5]. It is seen from Table 2 that none of the long-run coefficients are significant. The ECM terms, however, are statistically significant and also have the correct signs. All the equations pass the diagnostic tests. The results presented in Table 1 and Table 2 may be interpreted as follows: A long-run equilibrium between deficits and inflation is indicated in all the specifications. The direction of influence flows from deficit to inflation and the speed of adjustment to their long-run equilibrium following deviation due to shock, which is measured by the coefficients of ECM terms range from 73 to 94 percent within a year. The estimated long-run coefficients, however, are not statistically significant. This may follow from omission of relevant variables.

Table 2 : Estimates of Long-Run Coefficients and ECM for Bivariate Models

Formulation	Long-Run Coefficient	ECM Coefficient and Diagnostic Test
1. CP and FDM	0.107 (1.26)	ECM = -0.93 (-5.52)*, R-bar ^{2}=0.41, F-stat = 11.38 DW = 2.05
2. WP and FDM	0.107 (1.02)	ECM = -0.73 (-5.12)*, R-bar ^{2}=0.36, F-stat = 14.0, DW = 1.79
3. CP and FDY	0.733 (1.24)	ECM = -0.92 (-5.57)*, R-bar ^{2}=0.42, F-stat = 12.0, DW = 2.05
4. WP and FDY	0.72 (1.00)	ECM = -0.74 (-5.35)*, R-bar ^{2}=0.38, F-stat = 15.0, DW = 1.80
5. LCP and FDM	0.109 (1.42)	ECM = -0.94 (-5.61)*, R-bar ^{2}=0.41, F-stat = 11.7, DW = 2.07
6. LWP and FDM	0.107 (1.11)	ECM = -0.74 (-5.13)*, R-bar ^{2}=0.36, F-stat = 14.0, DW = 1.79
7. LCP and FDY	0.75 (1.41)	ECM = -0.92 (-5.66)*, R-bar ^{2}=0.43, F-stat = 12.3, DW = 2.05
8. LWP and FDY	0.71 (1.19)	ECM = -0.74 (-5.25)*, R-bar ^{2}=0.38, F-stat = 15.1, DW = 1.80

Figures in the parentheses are the standard errors.
* denotes significance at least at 5% level.

Oil price in US dollar terms was, therefore, introduced as the third variable. The stability tests for the trivariate models are presented in Table 3. The F-statistics indicate only one long-run relationship in which inflation is explained by deficit and change in oil prices.

In these trivariate models, the positive coefficients of fiscal deficit on inflation are significant at least at the 10.0 percent level in all the formulations (Table 4). Oil price changes also has positive impact on all measures of inflation. All the equations pass the diagnostic tests and the estimates are far more precise than the corresponding bivariate models. The estimates show that exclusion of oil price change underestimates the impact of fiscal deficit on inflation. This probably indicates that increase in external oil price impacts domestic inflation partly through the fiscal deficit channel, despite the operation of oil pool account as an extra budgetary transaction. The speed of adjustments towards long-run equilibrium following deviations from disturbances are also estimated higher, and range from about 90 to 100 percent within a year. Only in formulation (1) is the coefficient of ECM term marginally more than one indicating a possible case of instability in the equilibrium or tendency to over correct a deviation within a year.

Table 3 : Stability Test for Trivariate Models

Formulation	F-statistics	F-statistics	F-statistics
1. CP and FDM, OP	FDM_CP, OP = 1.18	OP_FDM, CP = 2.90	CP_FDM, OP = 6.77*
2. WP and FDM, OP	FDM_WP, OP = 1.85	OP_FDM, WP =3.17	WP_FDM, OP = 6.15*
3. CP and FDY, OP	FDY_CP, OP = 0.97	OP_FDY, CP = 3.05	CP_FDY, OP = 6.16*
4. WP and FDY, OP	FDY_WP, OP = 1.80	OP_FDY, WP = 3.31	WP_FDY, OP = 5.36*
5. LCP and FDM, OP	FDM_LCP, OP = 1.45	OP_FDM, LCP = 3.54	LCP_FDM, OP = 7.61*
6. LWP and FDM, OP	FDM_LWP, OP = 1.95	OP_FDM, LWP = 3.33	LWP_FDM, OP = 6.57*
7. LCP and FDY, OP	FDY_LCP, OP = 1.06	OP_FDY, LCP = 3.78	LCP_FDY, OP = 6.91*
8. LWP and FDY, OP	FDY_LWP, OP = 1.89	OP_FDY, LWP = 3.50	LWP_FDY, OP = 5.71*

* denotes rejection of the null at least at 95% confidence level based on the critical value bounds computed by Pesaran *et al* (1996).

Although the econometric estimates need to be interpreted with great deal of caution, particularly in drawing policy implications, we nonetheless infer the following: fiscal deficits bear a strongly positive and statistically significant long-run relationship with inflation. The change in world oil prices also plays a crucial role in the long-run inflationary trend. The higher the rate of inflation, the greater is the inflationary impact of the deficit. Similarly, higher the rate of inflation the greater is the impact of oil price on inflation. In the estimated long-run relationships, the coefficients of fiscal deficit to GDP ratio is about 6.5 times the coefficients of fiscal deficit to money stock ratio. These results appear consistent given that velocity of money (GDP to money stock ratio) has hovered around 5.6 to 7.2 with median value of about 6.5. Higher the level of money stock for a given level of deficit, the lower is the level of inflation in the Indian context.

Table 4 : Estimates of Long-Run Coefficients and ECM for Trivariate Models

Formulation	Long-Run	ECM Coefficient and Dignostic Test

		Coefficient	
1.	CP and FDM, OP	FDM = 0.187 (2.56)* OP = 0.084 (3.07)*	ECM = -1.03 (-6.52)*, R-bar ^{2}=0.53, F-stat = 11.2, DW = 1.89
2.	WP and FDM, OP	FDM = 0.135 (1.76)** OP = 0.102 (3.15)*	ECM = -0.87 (-5.31)*, R-bar ^{2}=0.57, F-stat = 13.3, DW = 1.82
3.	CP and FDY, OP	FDY = 1.23 (2.38)* OP = 0.108 (3.75)*	ECM = -0.98 (-6.54)*, R-bar ^{2}=0.54, F-stat = 14.5, DW = 1.89
4.	WP and FDY, OP	FDY = 0.97 (1.80)** OP = 0.102 (3.15)*	ECM = -0.86 (-5.37)*, R-bar ^{2}=0.58, F-stat = 13.78, DW = 1.79
5.	LCP and FDM, OP	FDM = 0.169 (2.48)* OP = 0.072 (2.83)*	ECM = -1.00 (-6.44)*, R-bar ^{2}=0.52, F-stat = 13.3, DW = 1.92
6.	LWP and FDM, OP	FDM = 0.127 (1.80)** OP = 0.09 (3.14)*	ECM = -0.89 (-5.78)*, R-bar ^{2}=0.57, F-stat = 13.1, DW = 1.85
7.	LCP and FDY, OP	FDY = 1.19 (2.50)* OP = 0.073 (2.84)*	ECM = -0.99 (-6.55)*, R-bar ^{2}=0.54, F-stat = 14.2, DW = 1.90
8.	LWP and FDY, OP	FDY = 0.90 (1.83)** OP = 0.091 (3.13)*	ECM = -0.86 (-5.47)*, R-bar ^{2}=0.58, F-stat = 13.58, DW = 1.82

Figures in the parentheses are the standard errors.
*and ** denote significance at 5% and 10% levels, respectively.

The policy implications which seem to follow is that for a given level of deficit determined by fiscal exigencies, monetary expansion would keep inflation under check in the long-run. This implication, however, appears to be counterintuitive as some upper bound to the extent of monetary expansion is expected, beyond which inflation would increase in the long-run. Consequently, the time series on fiscal deficit to money stock ratio was investigated for instances that showed declines. During the reference period with 49 observations, the ratio declined in 21 instances with the rate of decline ranging from 0.14 percent to 16.2 percent. Of these declines, some random values were sequentially selected starting from the lowest and progressively moving upward. A dummy, equal to 1 for those years with declines in the ratio more than the randomly selected value, and 0 otherwise, was included in the estimates. Among the various randomly selected levels of decline in the ratio, for decline in the ratio by more than 8.0 percent (there were five such instances during the period under review) the coefficients of the dummies were found to be positive and statistically significant in all the relevant models. This indicates that when the degree of monetised deficit exceeds a critical level it has a positive long-run impact on inflation. The results are presented in Table 5.

Table 5 : Estimates of Long-Run Coefficients and ECM for Trivariate Models Including a Dummy for Decline in Fiscal Deficit Money Ratio by More Than 8.0 Percent

Formulation	Long-Run Coefficient	ECM Coefficient and Dignostic Test

1.CP and FDM, OP	FDM = 0.173 (2.57)* OP = 0.075 (2.89)* D = 0.046 (2.02)*	ECM = -1.06 (-6.75)*, R-bar ^{2}=0.54, F-statistics = 11.7, DW = 1.95
2.WP and FDM,OP	FDM = 0.130 (1.93)** OP = 0.089 (3.11)* D = 0.052 (2.27)*	ECM = -0.94 (-5.67)*, R-bar ^{2}=0.60, F-statistics = 11.97, DW = 1.85
3.LCP and FDM, OP	FDM = 0.167 (2.67)* OP = 0.065 (2.73)* D = 0.042 (2.00)**	ECM = -1.06 (-6.70)*, R-bar ^{2}=0.53, F-statistics = 11.3, DW = 1.97
4.LWP and FDM, OP	FDM = 0.122 (1.94)** OP = 0.08 (3.10)* D = 0.042 (1.96)**	ECM = -0.94 (-5.63)*, R-bar ^{2}=0.58, F-statistics = 11.49, DW = 1.86

Figures in the parentheses are the standard errors.
* and ** denote significance at 5% and 10% level, respectively.

In Table 5 there are only four equations since the estimates pertain to fiscal deficit to money stock ratio only. The coefficients of the dummies are significant at least at the 10.0 percent level. It may also be noted that there are some improvements in the fit of the equations as compared to the corresponding estimates in Table 4. The coefficients of the ECM term for consumer price measure of inflation are more than one, indicating instability. Thus, it appears that there is a limit to the extent of monetised deficit which when exceeded raises the long-run inflation instead of lowering it. The results vindicate Rao's demonstration that there is some optimal level of monetisation for a given level of fiscal deficit.

Section IV
Concluding Remarks

Fiscal deficit has been an important cause for the long-run inflationary trend in India. Fiscal consolidation, therefore, appears to be a key requirement for price stability in the long-run. The Fiscal Responsibility and Budget Management Bill (FRBM) would have the salutary effect of bringing down the level of inflation in the long-run. While this is so, our estimates refute the concern that monetisation of fiscal deficit is always inflationary. This is not to suggest in any way that there is a greater scope to finance government deficit through monetisation. The study also indicates that excessive monetisation of deficit also leads to higher inflation. Thus, there is an optimal level of monetisation for a given level of deficit, which is, however, not estimated in the present study. The study also shows that rise in oil prices adds to inflationary impact. The study vindicates the need for greater monetary-fiscal coordination. Especially in the 1990s, the composition of reserve money has changed with net foreign exchange assets forming a predominant proportion of reserve money. Given the benefits of the reserve accretion to the country, and a certain degree of lack of control over capital inflows, it is all the more compelling that there is greater fiscal restraint and in that a tighter leash on net central bank credit to the government.

Notes

1. The Administered Price Mechanism (APM) for petroleum and diesel and Oil Pool Account were abolished with effect from April 1, 2002.

2. The Report on Currency and Finance 2000-01 of the Reserve Bank of India estimates the optimal degree of monetisation of fiscal deficit to be in the range of 20-25 per cent.

3. For a detailed derivation of the model, see Catao and Terrones (2001).

4. However, raising of reserve requirements need not always lead to decline in the money multiplier and, *ceteris paribus,* a decrease in money stock. Under certain range of values for CRR and currency deposit ratio, an increase in the CRR may lead to an increase in the money multiplier and hence an increase in the money supply.

5. The current values of the explanatory variables are excluded in the test as it is not known *a priori* whether they are the long-run forcing variables or not. Once the existence of the long-run relationship is established by this test, they are included in the second stage estimating the long-run coefficients and the error correction model (Peseran and Peseran, 1997). ARDL of order 3 was uniformly chosen as the maximum lag as it gave the highest F-statistics and the co-efficients of higher lags of the variables were not statistically significant.

6. It may be noted that as against the stability test which had a uniform maximum order of lag 3, the order of lags for different variables in the error correction models are not the same. The appropriate lags for each of the variable are selected based on the highest R-bar square criterion from the maximum lag order of 3.

References

Aghevli, B. and Khan, M. (1978), "Government Deficits and the Inflationary Process in Developing Countries", *IMF Staff Papers*, September.

Alesina, Alberto and Drazen, Allan, (1991) "Why Are Stabilisations Delayed?", *American Economic Review*, Vol. 81, pp. 1170-1188.

Bhattacharya, J., and Haslag, J. (1999), "Monetary Policy Arithmetic: Some Recent Contributions", *Economic and Financial Review*, Federal Reserve Bank of Dallas, Third Quarter.

Buiter, W.J., and Patel, U. (1992), "Debt, Deficits and Inflation: An Application to the Public Finances of India", *Journal of Public Economics*, Vol. 47 (2), pp. 171-205.

Calvo, Guillermo and Vegh, Carlos, (1999), "Inflation Stabilisation and BOP Crisis in Developing Countries," In John Taylor and Michael Woodford, (Ed)., *Handbook of Macroeconomics*, Volume C, North Holland.

Catao, Luis and Terrones, Marco, (2001), "Fiscal Deficits and Inflation: A New Look at the Emerging Market Evidence", *IMF Working Paper, WP/01/74*, International Monetary Fund, May.

Click, Reid, (1998), "Seignorage in a Cross-Section of Countries," *Journal of Money, Credit and Banking* (30), pp. 154-163.

Cochrane H. John, (1998), "Long-term Debt and Optimal Policy in the Fiscal Theory of the Price Level," *National Bureau of Economic Research, Working Paper*, 6771.

Cuikerman, Alex, Edwards, Sebastian, and Tabellini, Guido, (1992), "Seignorage and Political Instability," *The American Economic Review*, Vol. 82, pp. 537-555.

Government of India, Economic Survey, 2000-01.

Government of India, "The Fiscal Responsibility and Budget Management Bill, 2000, New Delhi.

Fischer, S. and Easterly W., (1990) "The Economics of the Government Budget Constraint," *World Bank Research Observer,* 5.

International Monetary Fund, (2001) "International Finance Statistics", CD-ROM, July.

Ljungqvist, Lars and Sargent, Thomas, (2000), *Recursive Macroeconomic Theory*, Cambridge: The MIT Press.

Lane, Philip, (1995), "Inflation in Open Economies", *Journal of International Economics*, (42), pp. 327-347.

Pattnaik, R.K., Pillai, S.M., and Das, S. (1999), "Budget Deficit in India: A Primer on Measurement", *RBI Staff Studies*, Reserve Bank of India.

Pesaran, M.H. and Pesaran, B. (1997), "Working Microfit 4.0", Oxford University Press.

Pesaran, M.H. and Shin, Y. (1995), "An Autoregressive Distributed Lag Modeling Approach to Cointegration Analysis", *DAE Working Paper No. 9514*, Department of Applied Economics, University of Cambridge.

Pesaran, M.H. and Shin, Y. (1996), "Cointegration and Speed of Convergence to Equilibrium", *Journal of Econometrics*, 71, pp. 117-43.

Rangarajan, C. and Arif R.R. (1990), "Money, Output and Prices: A Macro-econometric Model", *Economic and Political Weekly*, April 21.

Rao, Manohar, M.J. (2000), "Fiscal Deficits, Interest Rates and Inflation : Assessment of Monetisation Strategy," *Economic and Political Weekly*, July 22, pp. 2637-2645.

Sargent, J. Thomas and Wallace, Neil (1981), "Some Unpleasant Monetarist Arithmetic", *Federal Reserve Bank of Minneapolis Quarterly Review*, Fall.

Reserve Bank of India, Handbook of Statistics on Indian Economy, 1999.

Woodford, Michael, (2001), "Fiscal Requirements for Price Stability", *National Bureau of Economic Research*, Working Paper, 8072.

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