Debt-deficit dynamics in India and macroeconomic effects: A structural approach

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Debt-Deficit Dynamics in India and Macroeconomic Effects: A Structural Approach

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Abstract

The structural approach adopted in this paper aims to trace out the evolution of public debt and deficits over a medium term horizon and its dynamic interaction with other key macroeconomic variables such as interest rate, inflation, trade gap and output. The policy simulations for India reveal that persistence of high level of fiscal deficits and debt may have adverse impact on interest rate, output, inflation and trade balance in the medium to long run. The passive evolution of fiscal deficits leads to an unstable regime over the medium to long term as debt-GDP ratio rises asymptotically. The findings of the paper imply that fiscal adjustment with compositional shifts in expenditure to achieve convergence not only leads to acceleration in the investment rate in the economy, it also facilitates monetary management by moderating inflation expectations and contributing to stable interest rate regime. The adjusted converging debt path is consistent with the higher growth trajectory. Such corrections also do not pose the challenge of growth inflation trade-off.

Key words: Public debt; Fiscal deficit; Prices; Interest rates.

JEL Classification: H6; E31; E43

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I. Introduction

Persistently high deficits and public debt have generated considerable debate in the literature on the sustainability of public debt and their spillovers to other macroeconomic variables. The roots of high fiscal deficits can be traced equally to the automatic fiscal policy response to unanticipated economic shocks as well as the discretionary actions in the form of deliberate demand management. However, in most countries, the growing public debt is recognized to emanate mainly from structural factors such as high income elasticity of demand for public goods and downward rigidity in public spending. The causes of large structural fiscal deficits are also rooted in the fact that public spending has inherent tendency to adjust more quickly to inflation than to tax revenues[1]. The high debt-GDP ratio in many developing countries has led to monetary expansion and inflationary spiral, typically a symptom of Sargent-Wallace unpleasant monetarist arithmetic.

It is axiomatic under the national accounting identity that if the private sector is in balance, the government deficit will be fully reflected in the current account deficit. A contrarian view in the face of this orthodoxy takes the form of the new classical resurgence of the Ricardian equivalence hypothesis. Movements in the fiscal deficit lead to offsetting changes in households' saving behaviour. Future taxes to cover present-day fiscal deficits are fully anticipated through an equivalent increase in private saving and, therefore, there is no spillover of fiscal deficit to current account deficits. Empirical evidence in support of the Ricardian equivalence is weak and in the real world, therefore, the fiscal roots of the current account are widely recognised. Relatively stronger links between the current account and the fiscal balance are observed in underdeveloped financial systems where liquidity constraints are likely to be more binding (Milesi-Ferretti and Razin, 1996), and where macroeconomic policies rely predominantly on fiscal deficits for the acceleration of capital accumulation and growth. Despite the schools of thoughts on implications of budget deficit, there is a growing consensus that containing deficit and debt would remove one of the important structural constraints on growth path of the economy over a medium-term horizon. In the above backdrop, the paper first seeks to assess the policy conduct and stability of public debt in India. Second, it builds up a framework to capture dynamic interaction of deficits and debt with other macroeconomic, both financial and real variables. The key objective of this paper is to examine the pass-through of deficits and debt to interest rates, prices, trade balance and output growth.

II. Fiscal Deficits and Debt Stability

The starting point to analyze debt dynamics is the dynamic budget constraint, explained with the help of a simple budget identity:

$$g_t + i*d_{t-1} = x_t + b_t \qquad (1)$$

Where g is government's non-interest expenditure, *i* is nominal interest rate, d is stock of debt, *x* is current revenue receipts, and *b* is the net borrowing. A broad measure of government borrowing from all sources is expressed by *b* and the stock of debt at the end of period t is given by: $d_t = d_{t-1} + b_t$. Here, b_t can be further decomposed into: primary deficit (b_{prt}) and interest payments ($r*d_{t-1}$). Primary deficit is:

$$b_{prt} = g_t - x_t \qquad (2)$$

Since $y_t = y_{t-1} + (1+q+p)$, where *q* is the real GDP growth and *p* is the inflation rate. The debt-GDP ratio can be expressed as:

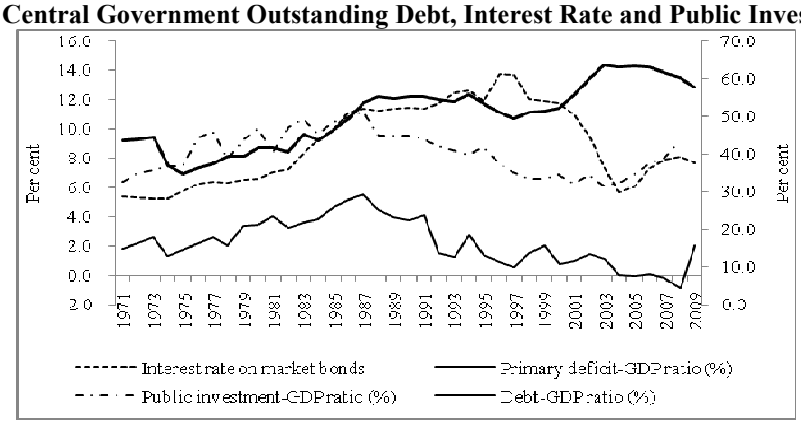
$$d'_t = [d'_{t-1} * (1+r+p)]/[y_{t-1} * (1+q+p)] + [g'_t - x'_t] \qquad (3)$$

Assuming the primary deficit is zero [*i.e.,* $g'_t - x'_t = 0$], the real debt (*i.e*., debt-GDP ratio) would rise if $r>q$ and decline with $r<q$. Given *r* and *q*, primary deficit would rise when $g_t > x_t$ and decline in the opposite case. The behaviour of real debt in other cases would depend on the relative values of the above parameters. Theoretical notion of fiscal stability is that if government expenditure exceeds tax revenue and real interest rate exceeds real output growth of the economy, the debt-output ratio would inexorably grow [2]. Even if the output growth exceeds the interest rate, persistent primary account deficits may result in a steady growth in debt-output ratio towards a limit where investors may be unwilling to hold. Further, when the real interest rate exceeds real growth rate, even with a zero primary deficit, the interest burden on existing debt would be translated into secular growth in debt-GDP ratio. In the short-run, however, more serious concerns of rising stock of public debt emanate from a sharp growth in interest burden and the 'crowding out' of essential public services, absorption private savings by the government, and rising pressure on interest rates. Large magnitude of borrowing also puts pressure on the absorptive capacity of market, particularly when the commercial banks are holding excess government securities; therefore, additional subscription of government paper by them is guided by their portfolio choice based on risk-return considerations. As the long-term yields turn downward rigid, bonds are placed at the shorter end of the market with the underlying objective of minimising funding cost to government.

In India, expansionary fiscal policy led to steady accumulation of the central government debt-GDP ratio, particularly in the 1980s and the 1990s, with associated pressure on interest rate on government bonds (*r*), except for some moderation in the recent years - more an outcome of excess liquidity (Figure 1). Consequent to the policy move to minimise the borrowing cost for the government, the share of short-term maturity bonds (i.e. <5 years) in total outstanding dated securities witnessed a sharp increase from 9 per cent to 41 per cent between 1991 and 1997, before moderating to 24 per cent in 2004 due to active debt management. With the pressure of market borrowings, the maturity structure has tilted again towards the short end with its share rising to 30 per cent by

2008. Prevalence of such unbalanced maturity structure translated into sharp bunching of redemption of securities and leads to frequent rollover in the market [3]. Concomitantly, growing interest burden was accommodated by cutting back capital spending, reflected in steady decline in capital expenditure 1980-81 and 2005-06, before recording some improvement, with attendant risk to output growth given the complementarity between government and private investment. In fact, it is empirically proved that during the process of fiscal consolidation, governments find it easier to go for 'Type 2' adjustments that rely primarily on tax cuts and reduction in capital expenditure (Alesina and Perotti, 1997).

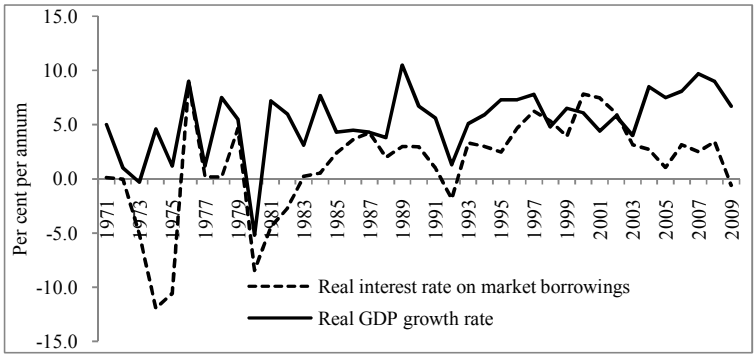
Figure 1: Central Government Outstanding Debt, Interest Rate and Public Investment



The Domar condition on debt stability states that the debt ratio is stable provided the output growth exceeds the interest rates in the economy and *vice- versa*. An important empirical consideration in applying the stability condition requires using suitable measures of output growth and the interest rate. A distinction is sometimes made between strong and weak condition of sustainability; the strong condition corresponds to stationarity of the debt process while weak condition requires that the growth rate of debt to be lower than the growth rate of the economy (Quintos, 1995). In applying the stability condition in the Indian context, Moorthy, Singh and Dhal (2000) argue that the choice of interest rate for the Domar condition is not straightforward for India. Although they find no evidence of a systematic shift to an unsustainable debt regime during 1990s, the component of debt that displays potential instability is that of small savings because of administered rates. Rajaraman and Mukhopadhyay (2000), also point to the 'crossover' of interest rates above growth rate in 1990s. We attempt evaluating the Domar stability condition by comparing the real growth rate and real interest rate. The interest rate used here is the weighted average interest rate on government bonds, which is the market determined interest rate and reflects agents' response to the fiscal policy. Domar condition in the Indian case remained satisfied during 1980s and the major part of 1990s, although during the latter half of 1990s there was crossover of real interest rate over the real output growth on two occasions (Figure 2). Additionally, if the effective interest rate on small savings and provident funds, taking into account the tax

concessions, is used for the analysis, the stability condition may be violated on account of this component of debt.

Figure 2: The Domar Debt Stability Condition for the Central Government

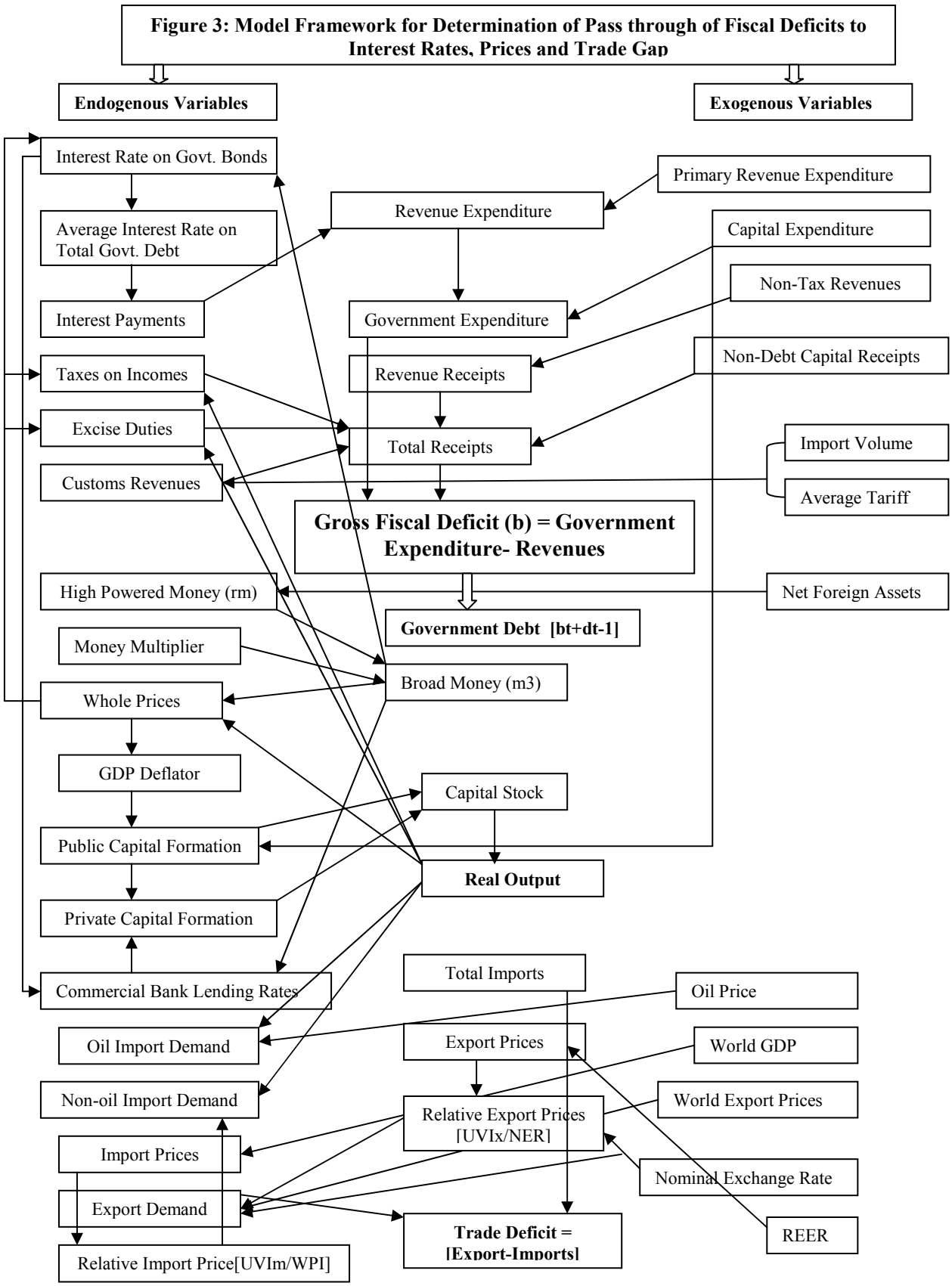


III. Analytical Framework for Debt-Deficits and Macroeconomic Interlinkages

The emergence of the structuralist models in India in the 1980s set the tone for analysing the passthrough of public debt and deficits to other macroeconomic variables. Notable among these with emphasis on fiscal accounts included Krishnamurthy (1984) Pandit (1984), Pani (1984) etc. These and later models had peripheral focus on fiscal sector mainly used to highlight the fiscal-monetary nexus. A relatively elaborate attempt was made by Rangarajan, Basu and Jadhav (1989) to assess the impact of money financed deficit on inflation. Rangarajan and Mohanty (1997) assessed the relationship between fiscal deficit, external balance and monetary growth. Rao (2000) also assessed the fiscal impact on interest rate and inflation, limited to formalising the links between budget deficits, money creation and debt financing. On assessment of sustainability of public debt in India, Parker and Kastner (1993), Cashin, Olekalns and Sahay (1998), Olekalns and Cashin (2000), Callen (2001), Reynold (2001), Lahiri and Kannan (2002), Rangarajan and Srivastava (2003), Ram Mohan, Dholakia and Karan (2005), Buiter and Patel (2006) analyze fiscal sustainability and majority indicate unstable future path of debt-GDP ratio. Goyal, Khundrapakam and Ray (2004) conclude that the fiscal stance of the Central and the State Governments when examined individually is unsustainable. Jha and Sharma (2001), however, found that the public debt situation in India was sustainable in the 1990s. Notwithstanding the efforts at modeling fiscal deficit and debt within macroeconomic models, the assessment of their pass through to financial markets and real variables needs further research in a more open economy framework with integrated financial markets. The model developed here to trace out the path of deficits and other intertwined macro variables is unique in two ways. First, the model systematically links the pressure of government borrowings on bond interest rates, which is important benchmark for the financial assets. Secondly, it clearly brings out spillover of the bond interest rates on lending rates and crowding out through financial prices. Complete model

structure is presented figure 3 below. In modeling debt-deficits and their interaction with the key macroeconomic variables, we follow a structural approach, which provides comprehensive inter-sectoral interlinkages.

Figure 3: Model Framework for Determination of Pass through of Fiscal Deficits to Interest Rates, Prices and Trade Gap



(i) Modelling Deficits and Debt

The starting point to illustrate the implications of Government debt is the inter-temporal budget constraint. The growth of debt-GDP ratio equals primary deficit-GDP ratio plus the real interest rate net of GDP growth multiplied by the initial period debt ratio less the revenue from seigniorage. In the model formulated to assess the impacts of deficits, government spending is taken in the form of identities, as they are policy driven. The components of public expenditure analysed in the model include consumption spending, interest payments, transfer payments and capital expenditure. While the transfer payments *viz*., pensions, subsidies *etc*. are guided by certain social and distributional objectives, capital expenditure in a developing economy subsumes several developmental objectives. The aggregate expenditure (g) identity in the model is:

$$g = g_{rev} + g_{cap} \quad (4)$$

where g_{rev} = government's current spending, *cexp* = government capital expenditure

Current expenditure of government (g_{rev}) is determined in the form of an identity including interest payments on debt (*ip*) and the primary consumption expenditure (g_{prev}), which reflects the discretionary fiscal policy stance.

$$g_{rev} = ip + g_{prev} \quad (5)$$

Interest payment on debt (*ip*), in turn, is determined by interaction between interest rate on debt (r_d) and stock of debt (*dt*).

$$ip = r_{dt} * d_{t-1} \quad (6)$$

Revenue from taxes includes taxes on incomes (t_{dir}), domestic trade taxes (t_{exc}) and custom/import duties (t_{cus}). The government also realizes revenues other than tax revenues (*ntr*) from sources such as interest receipts on lending to state governments, public enterprises *etc*., dividends and profits accruing to government on account of its pre-dominant holding of equity of departmental and non-departmental enterprises. Revenues from taxes on income/profits are specified as function of real income (*lny*) and domestic price level (*lnwpi*). The estimation period used in the model refers to the annual data for the period 1971 to 2006. Three dummies D81 (1981), *D94* (1994) and *D02* (2002) have been used to capture adverse shocks to taxes. The figures in brackets are t-statistics. Taxes on income are highly elastic to real output (income elasticity 1.79), implying that such taxes would be highly procyclical.

$$\ln t_{dir} = \underset{(-5.550)}{-18.887} + \underset{(5.287)}{1.791}\ \ln y + \underset{(2.824)}{0.775}\ \ln wpi - \underset{(-2.619)}{0.198}\ D81 - \underset{(-2.00)}{0.150}\ D94 - \underset{(-1.696)}{0.128}\ D02 \quad (7)$$

$\bar{R}^2 = 0.986$ DW = 1.896 Mean = 8.885 SEE = 0.09 $\rho = 0.839(6.940)$

Commodity taxes (*tdcom*) are divided into domestic commodity taxes and trade taxes. Domestic commodity taxes (*ltexc*) are determined by level of real economic activity (*lny*) and the price level (*lnwpi*). Estimated price elasticity implies that the pass through of

inflation to excise revenues is not complete, possibly due to adjustment of price rise by the manufacturers in their margins and (or) lower inflation for intermediates and raw material. Dummies D84 and D01 are used to control break in the series in 1984 and 2001.

$$\ln t_{exc} = -11.488 + 1.324\ \ln y(t-1) + 0.641\ \ln wpi(t-1) + 0.149\ D84 + 0.148\ D01 \qquad (8)$$
(-4.004) (4.667) (2.887) (2.444) (2.407)

$\bar{R}^2 = 0.985$ DW = 1.610 Mean = 9.357 SEE = 0.08 ρ = 0.831(6.861)

International trade taxes (lnt_{cus}) are determined by the volume of imports (*lnmqi*), effective tariffs (cduty) and the lagged value of custom revenues to represent speed of adjustment. Long run elasticity of custom revenue with respect to volume of imports (1.63) implies a highly volume elastic duty structure. While dummy for 1996 (D96) spurt in custom revenues in mid 1990s, a negative coefficient for D01 (dummy for 2001) captures the impact of progressive reduction in peak tariff rates and to some extent the slowdown in imports.

$$\ln t_{cus} = 0.324 + 0.226\ \ln mqi + 0.141\ cduty + 0.861\ \ln t_{cus}(t-1) + 0.137 D96 - 0.325\ D01 \qquad (9)$$
(3.653) (3.200) (3.101) (24.023) (6.349) (-6.071)

$\bar{R}^2 = 0.987$ Mean = 9.187 SEE = 0.07 h = -0.503

Aggregate government revenue (*rev*) is specified in the form of an identity.

$$rev = t_{dir} + t_{exc} + t_{cus} + t_{oind} + ntr \qquad (10)$$

Thus, government fiscal deficit (*b*) and debt (*dt*) can be posited as,

$$b_t = g_t - rev_t - ndcr_t \qquad (11)$$

$$dt_t = b_t + dt_{t-1} \qquad (12)$$

where, *ndcr* is the non-debt creating capital receipts *i.e.,* revenues from disinvestments of public enterprises and recovery of loans.

(ii) Modelling Money and Prices

The central issue with regard to relation between government deficits and monetary policy is as to how the government finances its deficits and to what extent it relies on seigniorage, which affects monetary stability. In the Indian context, the nexus between fiscal and monetary policy has been explicated in terms of the impact of fiscal operations of the government on the base money through the route of direct borrowings from the central bank. Indirect impact on base money is through feedback from foreign assets of the central bank and the changes in the balance of payments situation. Growth in central bank credit to government leads to expansion of reserve money and thus, the expansion of primary liquidity in the system. In the present analysis the supply of broad money (*m3*)

is determined in terms of an identity consisting of money multiplier (*mm*) and reserve money (*rm*). Reserve money is endogenously determined in the model by the size of government borrowings (*lb*) with underlying notion that excess borrowings are accommodated by the central bank to avoid adverse impact on the market liquidity, and net foreign currency assets (*lnfa*), which represent capital inflows being sterilized [4]. Dummies, D76, D90, D97 and D03, are used to capture unanticipated shocks in the reserve money growth in 1976, 1990, 1997 and 2003.

lnrm = 0.480 +0.096 lnb +0.030 lnfa +0.855 lnrm(t-1) -0.112 D76 +0.078 D90 -0.084 D97 -0.065D03 (13)
(3.181) (2.709) (1.785) (16.021) (-6.739) (4.403) (-6.446) (-4.428)
$\bar{R}^2$ = 0.988 Mean =10.987 SEE = 0.05 h = 0.145

Demand for real money balances is influenced by level of real output (y) and the cost of holding money balances (opportunity cost), interest rate (i) and inflation expectations (Π^e):

$m3/p = f(y, i, \Pi^e)$ (14)

Inverting the money demand function yields the following price function (*p*):

$p = f(y, i, \Pi^e, m3)$ (15)

In the estimated price equation (*lnwpi*), short run elasticity of prices with respect to output (*lny*) is estimated at -0.30 and the long run elasticity is high at -1.37. Long run elasticity with respect to money supply (*m3*) works out at 0.91. The lagged price variable captures the lagged effect of output and money on the current year's price level. The dummies, D74, D79 and D80, capture impact of oil price shocks in 1974, 1979 and 1980.

lnwpi = 2.731 +0.201 lnm3 -0.302 lny + 0.779 lnwpi(t-1) +0.146 D74 -0.069 D79 +0.070 D80 (18)
(3.703) (3.673) (-3.695) (10.645) (5.258) (-9.130) (6.147)
$\bar{R}^2$ = 0.988 Mean = 5.058 SEE = 0.03 h = 0.526

In order to establish the transmission channel between wholesale prices and nominal output, the GDP deflator (lny_{def}) is postulated as a function of log of wholesale prices. The impact of oil price shock on deflator for 1974 is captured by dummy D74.

lny_{def} = -0.368 +0.526 lnwpi +0.041 D74 (19)
(-0.455) (7.523) (2.853)
$\bar{R}^2$ = 0.989 Mean = -0.486 SEE = 0.018 ρ = 0.988(132.350)

(iii) Interest Rates

High public debt cause increases in interest rate, which in turn affects real output. The lines of criticism against the orthodox conclusion stated above are two. First, there is the assumption of spontaneous compensating behaviour on the part of the private sector.

Second, there is an assumption that the elasticity of the supply of funds schedule for the sale of government bonds is high or even infinite. However, in real world, if the government increases its demand for funds by selling bonds, this additional demand would put pressure on interest rates unless there is some countervailing effect elsewhere or unless the rest of the world can accommodate that demand. Alternatively, it could be associated with a decline in private investment not caused by the increase in interest rate. However, in the former case, excessive dependence on external sources could prove a source of instability in the external account. The latter would result in a decline in private sector investment. Even if government fully offsets the decline in private investment by channelising the borrowed funds for investment purposes, the fact remains that private investment has an edge over public investment in terms of productivity, particularly in a developing economy. In India, the interest rate on government bond (*r*)[5] is significantly influenced by the size of borrowings (*lnb*) as well as the overall liquidity (*lnm3*). Inflation expectations also play an important role in determining nominal interest rates. The lagged value of interest rate reveals the rigidity regarding interest rates expectations on long maturity bonds. Liquidity induced downward movement in interest rates in the recent period is captured with a dummy variable (*D0306*). The dummies, D86 and D96 are used to capture the impact of liquidity crunch impact on interest rates in the mid 1980s and mid 1990s.

r = 0.006 +0.016 lnb +0.019 lnwpi -0.019 lnm3 +0.617 r(t-1) +0.003 D86 +0.020 D96 -0.020 D0306 (20)
(0.319) (2.683) (2.095) (-2.376) (5.462) (1.836) (7.919) (-2.858)

$\bar{R}^2$ = 0.950 Mean = 0.092 SEE = 0.03 h = 2.038

In order to capture the dynamics of interest burden, the average interest rate on total debt (r_{dt}) is taken as a function of bond interest rates (*r*) as presently market bonds finance about 70 per cent of the fiscal deficit. Dummies for 1977 (*D77*), 1984 (*D84*), 1987 (*D87*) capture volatility in the series.

r_{dt} = 0.001 +0.104 r +0.865 r_{dt}(t-1) -0.002 D77 -0.005 D84 -0.003 D87 (21)
(1.220) (3.016) (19.250) (-3.977) (-10.074) (-4.621)

$\bar{R}^2$ = 0.982 Mean = 0.07 SEE = 0.002 h = -0.799

Lending rate of commercial banks (r_l) provides an important link to assess the impact of fiscal policy on private investment. The rigidity in nominal interest rate is also captured in the form of lagged variable. It is evident that the government bond rates (opportunity cost variable) put upward pressure on lending rates of commercial banks. The dummy, D92, indicate shift towards deregulation of interest rates and D98 and D0104 capture the liquidity induced moderation in interest rate in recent period.

$$rl = 0.041 + 0.35\ r - 0.002\ lnm3(t-1) + 0.607\ r_l(t-1) + 0.042\ D92 - 0.024\ D98 - 0.010\ D0104 \quad (22)$$
(3.136) (2.338) (-1.851) (5.057) (16.144) (-9.121) (-2.471)

$\bar{R}^2 = 0.907$ Mean = 0.129 SEE = 0.009 h = 0.490

Real interest rates are an important transmission link between the financial sector and the real sector. Real interest rates are derived on the basis of the standard Fisher hypothesis for determination of nominal interest rates ($r = rr + \Pi^e$). Real interest rate can be derived as $rr = r - \Pi^e$. The difficulty in such formulations, however, lies in the measurement of Π^e. Since there are no universally acceptable methods for estimating expected inflation, the first period lag of the inflation variable is used assuming an adaptive expectations framework.

(iv) Capital Accumulation

Fiscal sector produces a feedback into the real sector in the form of growth stimulus. Capital spending of government (lng_{capr}) augments real public capital formation (lnK_{pub}), which, in turn, fosters investment activity in the private sector. The real public capital formation (lnk_{pub}) is specified as a function of government expenditure (lng_{capr}). Dummies are used to capture negative shocks to public investment due to the oil shock second (D78), cutback in government expenditure in the early 1990s (D90) and the recent cutbacks (D03).

$$lnk_{pub} = -1.234 + 0.270\ lng_{capr} + 0.861\ lnk_{pub}(t-1) - 0.184\ D78 - 0.169\ D90 - 0.105\ D03 \quad (23)$$
(-1.852) (3.53) (18.971) (-10.624) (-13.033) (-5.779)

$\bar{R}^2 = 0.963$ Mean = 11.018 SEE = 0.07 h = -0.272

There has been considerable debate at the theoretical plane as well as in the empirical literature on the private sector response to fiscal policy [6]. Notwithstanding, government consumption may have direct impact on private consumption behaviour (Easterly and Schmidt-Hebbel, 1993) and public investment, particularly in basic infrastructure, may enhance marginal productivity of private investment in a developing economy (Aschauer, 1989). In India, investment behaviour has been notably investigated in Sundararajan and Thakur (1980), Blejer and Khan (1984), Krishnamurthy (1984), Pradhan, *et al*. (1990), Bardhan (1994) and others. However, no clear consensus emerges out of these findings. In the present fiscal model, private investment behaviour (K_{pvt}) is postulated as a function of real interest rate (r_l) and real public investment (K_{pub}). Complementarity between public and private investment is brought forth by high long run elasticity (2.18) of private investment with respect to public investment. Long term interest elasticity of private investment reveals that investment activities are significantly sensitive to borrowing cost of the corporate sector. The dummies, D96 and D98, capture the upward blip in private

investment in mid 1990s and D02 reflects the impact of global slowdown on investment activity.

$$lnk_{pvt} = -2.004 + 0.388\ lnk_{pub} - 1.416\ r_l + 0.822\ lnk_{pvt}(t-1) + 0.314\ D96 + 0.106\ D98 - 0.062\ D02 \quad (24)$$
$$(-2.979)\ (2.794)\quad (-1.975)\ (10.540)\quad (7.349)\quad (4.655)\quad (-2.880)$$
$$\bar{R}^2 = 0.979 \quad \text{Mean} = 11.496 \quad \text{SEE} = 0.103 \quad h = -2.278$$

Real Capital Stock (*lnkst*) is specified as a function of public and private investment. Dummy, D95, captures the break in series in mid 1990s.

$$lnkst = 4.928 + 0.413\ lnk_{pub} + 0.420\ lnk_{pvt} - 0.031 D95 \quad (25)$$
$$(24.410)\ (11.530)\quad (16.609)\quad (-2.684)$$
$$\bar{R}^2 = 0.979 \quad DW = 1.426 \quad \text{Mean} = 14.281 \quad \text{SEE} = 0.048$$

(v) Output

To evaluate the impact of deficits on output through interest rate and capital accumulation process, a variant of Cobb-Douglas production function is formalised with single factor of production, *i.e.,* capital. The measurement issues relating to information on labour in India compel to exclude the labour variable. Non-linear production function ($Y = Ak^{\theta}$) can yield a linear function for estimation ($y = c + \theta\ k$) through log transformation, where output (y) depends upon real capital stock (k). Output is assumed supply constrained rather than demand constrained. Real output is significantly influenced by real capital stock (*lnkst*) as the (long run) elasticity is estimated at 1.30. Significant lagged value of output denotes capacity constraints in the economy. D76, D80 and D92 capture the positive output shocks in 1976, negative impact of oil shock in 1980 and 1992.

$$lny = -0.771 + 0.203\ lnkst + 0.844\ lny(t-1) + 0.046 D76 - 0.089\ D80 - 0.037\ D92 \quad (26)$$
$$(-2.607)\ (1.975)\quad (9.430)\quad (7.876)\quad (-13.672)\quad (-8.401)$$
$$\bar{R}^2 = 0.988 \quad \text{Mean} = 13.339 \quad \text{SEE} = 0.02 \quad h = 0.344$$

(vi) External Trade Linkages

The integration of trade block in the model enables us to capture pass-through of fiscal deficits to external sector. The building blocks of foreign trade are export and import demand and relative price equations. The conduit of fiscal deficit affecting trade balance is captured through fiscal deficit affecting the domestic liquidity, prices and output, thus leading to changes in relative prices, competitiveness and external demand. The direct linkage is through deficits induced money supply and inflation causing relative price shifts and making imports cheaper and exports less competitive in the world market. In India, empirical work analyzing the external linkages of deficits and debt is scant

(Mohanty and Joshi; 1992 and Rangarajan and Mohanty; 1997) basically following Cambridge Economic Policy Group (1976). In the estimated model, real demand for exports (*lnxr*) *i.e.,* nominal exports deflated by the export prices, is posited to be directly related to world demand (lny_w) and inversely to world export prices ($lnuvi_{wx}$) with underlying argument that an increase in world export prices would lead to a shift in demand in favour of India. Conversely, the prices of Indian exports facing the foreign buyer (lnp_x, *i.e.,* unit value index of exports deflated by the nominal exchange rate) are inversely related to the export demand as a rise in India's export prices lead to switching of demand in favour of India's export competitors. Exchange rate pass through on exports is embedded in the variable on export prices facing the foreign buyer. The elasticity of India's export is highly sensitive to world income, which denotes the lager degree of integration to the global economy. This also implies that the trade cycles would exert a significant impact on the Indian exports. The price elasticity is found to be relatively moderate.

$$\text{Lnxr} = -8.859 + 2.842\ \text{lny}_w + 0.497\ \text{lnuvi}_{wx} - 0.533\ \text{lnp}_x \qquad (27)$$
$$(-4.175)\quad (7.651)\quad (2.658)\quad (-2.926)$$
$$\bar{R}^2 = 0.983 \quad \text{DW} = 1.789 \quad \text{Mean} = 4.740 \quad \text{SEE} = 0.07 \quad \rho = 0.919(16.932)$$

Export prices ($lnuvi_x$) are specified as inverted export supply function. Export supply is determined by the real activity in the domestic economy and the relative level of export prices *vis-à-vis* the domestic prices (Patra and Pattanaik, 1994; Rangarajan and Mohanty, 1997; Ranjan and Nachane, 2002). While the domestic supply conditions would positively impact on exports, relative export prices would determine the profitability of exports and hence decisions to export. The elasticity of exports to REER (-0.46) in the export price equation implies that overvalued real exchange rate are to be accommodated through reduction in export prices in order to remain competitive in the world market. Dummy variable (D92) captures the break in the series.

$$\text{lnuvi}_x = -2.133 + 0.525\ \text{lny} + 0.561\ \text{lnwpi} - 0.457\ \text{lnreer(t-1)} + 0.083\ \text{D92} \qquad (28)$$
$$(-1.006)\quad (2.770)\quad (3.483)\quad (-2.641)\quad (1.876)$$
$$\bar{R}^2 = 0.986 \quad \text{DW} = 1.555 \quad \text{Mean} = 5.505 \quad \text{SEE} = 0.054 \quad \rho = 0.780(7.004)$$

There are two distinct components of imports – crude oil and non-oil imports. Crude oil imports (lnm_{oil}) in the model are posited to be determined by the crude oil prices on the one hand and the pace of domestic economic activity on the other as the energy demand rises with pick up in domestic activity. The elasticity of demand for oil imports (1.47) implies that rising production levels would lead to higher fuel demand. On the other hand, oil demand is nearly price inelastic. Dummy variables, D81 and D87, capture sudden price led spurt and dip in oil demand in 1981 and 1987.

lnm_{oil} = -9.256 +0.812 lny(t-1) +0.193 lnp_{oil}+0.449 lnm_{oil} (t-1) +0.313 D81 -0.473 D87 (29)
(-4.340) (4.537) (2.079) (3.675) (5.156) (-12.657)
$\bar{R}^2$ = 0.969 Mean =3.704 SEE = 0.17 h= 2.483

Nonoil import demand (*lnm*$_{noil}$), signifying mainly the imports of bulk consumption and capital and intermediate goods, depend on the real activity and the relative import prices *i.e.*, prices of imported goods relative to domestic prices adjusted for exchange rate (*rp*$_m$). Here again, the exchange rate pass through to import demand is embedded in relative import price variable in the equation. Exchange rate changes can affect the relative import prices, which in turn, may cause a change in import demand. While D75, D92 capture impact of compression in domestic demand in 1975 and 1992, D95 represents upward shift in demand during the economic expansion in the mid-1990s. The volume of import appears to respond strongly to domestic economic activity (1.74).

lnm_{noil}= -11.648 +1.130 lny(t-1) -0.545 rp_m +0.352 lnm_{noil}(t-1) -0.158 D75 -0.262 D92+0.208 D95 (30)
(-4.991) (5.107) (-4.190) (2.877) (-4.476) (-13.683) (7.648)
$\bar{R}^2$ = 0.977 Mean =4.972 SEE = 0.10 h= 1.432

Import prices for an economy whose share in world trade is relatively small, are assumed to be endogenously determined as they exert little influence on international prices, thus, are mainly price takers. Keeping the theoretical postulate in view, Indian import prices (*lnuvi*$_m$) are posited top be determined by world export prices (*lnuvi*$_{wx}$) and global output (*lny*$_w$). Growth in world GDP is found to have a significant impact on Indian import prices with long run elasticity at 1.65. Spikes in import prices in 1974 and 1987 are captured in dummies D74 and D87.

$lnuvi_m$= -1.787 +0.515 lny_w+0.276 $lnuvi_{wx}$+0.689 $lnuvi_m$(t-1) +0.357 D74 -0.229 D87 (31)
(-2.993) (2.616) (3.946) (6.983) (4.654) (-15.417)
$\bar{R}^2$ = 0.981 Mean =5.302 SEE = 0.08 h = -0.107

IV. Empirical Assessment of Fiscal Deficits and its Pass through to Interest Rates, Prices, Trade Balance and Output

The complete model, as specified above, is estimated with the help of 18 bahavioural equations and 26 identities. The model consists of 16 exogenous and 14 lagged endogenous variables, covering a sample period of 1971 to 2006, and integrates deficits and debt to other major macroeconomic financial and real variables. The model is estimated by using two stage least square (2SLS) simulation technique following Gauss-Siedel algorithm and tested for convergence. Simulation error statistics of key endogenous variables in the model are reported to assess the stability of the model (Table 1). Out of sample forecasts are done

based on the standard Box-Jenkins approach.

Table 1: Simulation Error Statistics for Key Endogenous Variables

Variables	Mean Error	Mean Abs Error	RMS Error	Theil U
lnt_{dir}	0.1094	0.1094	0.1123	0.0219
lnt_{exc}	0.0277	0.0328	0.0429	0.0109
lnt_{cus}	0.0563	0.0563	0.0599	0.0149
Lnrm	0.0206	0.0243	0.0319	0.0070
Lnwpi	0.0018	0.0018	0.0024	0.0010
R	0.0074	0.0074	0.0085	0.5442
r_{dt}	-0.0008	0.0013	0.0015	0.0446
r_{l}	-0.0016	0.0016	0.0023	0.8332
lnk_{pub}	0.0812	0.0812	0.0812	0.0599
lnk_{pvt}	0.0230	0.0230	0.0265	0.0120
Lnkst	-0.0431	0.0431	0.0501	0.0357
Lny	0.0078	0.0078	0.0078	0.0046
lny_{def}	-0.0168	0.0168	0.0171	0.0069
$lnuvi_{x}$	0.0302	0.0305	0.0429	0.0154
Lnxr	-0.0085	0.0118	0.0127	0.0049
$lnuvi_{m}$	-0.0152	0.0152	0.0152	0.0057
lnm_{oil}	0.0305	0.0305	0.0383	0.0106
lnm_{noil}	-0.0164	0.0164	0.0193	0.0082

The underlying objective of the simulation exercise carried out in this section is to provide alternative path of deficit deficits and debt and their pass through to other aggregates. The instruments used in the exercise are the discretionary components of fiscal policy. In the absence of adjustment process, a baseline scenario is formulated to assess the passive evolution of debt-GDP ratio, and pass through to interest rates, inflation, output and trade balance in a medium-term framework (i.e., 2006-07 to 2011-12). We also explore the combinations of fiscal corrections to achieve convergence in fiscal deficits and debt and examine pass through to other variables.

(a) Baseline Scenario: Passive Evolution of Deficits and Debt

Under the baseline scenario, as key fiscal variables are assumed to grow at the average rate of the base year, fiscal deficit and debt ratio grows passively over time (Table 2). Under the baseline scenario, primary revenue expenditure growth (13 per cent) much exceeds the revenue growth (11 per cent). As a result, there is continuous deterioration over medium term. Revenue deficit (rd), gross fiscal deficit (b) and outstanding debt (dt) all rise asymptotically and bring distinct rigidity to medium to long-term interest rates. As interest rates persistently cross over the real output growth rate, the Domar stability condition is violated over the medium-term, thus, leading to an unstable debt regime over the medium horizon. The expansionary policies are also reflected in the trade gap consistently rising over

the medium-term. Pressure of government borrowings is transmitted to commercial bank lending rates, which in turn crowd out private investment.

Table 2: Evolution of Debt and Other Macroeconomic Variables Under the Baseline

Year	r	rl	rr	g_{prev} (growth)	g_{cap} (growth)	g_{rev}/y	g_{cap}/y	rev growth	rd/y	b/y	dt/y	yg	π	td/y	rm (growth)	m3 (growth)
2006-07	0.086	0.097	0.038	0.128	0.134	0.125	0.020	0.115	0.027	0.043	0.638	0.081	0.048	-0.070	0.134	0.127
2007-08	0.095	0.106	0.057	0.128	0.013	0.127	0.018	0.113	0.031	0.045	0.630	0.077	0.039	-0.077	0.135	0.127
2008-09	0.102	0.114	0.068	0.128	0.055	0.129	0.017	0.108	0.034	0.048	0.660	0.071	0.034	-0.086	0.136	0.133
2009-10	0.107	0.120	0.075	0.128	0.038	0.135	0.015	0.103	0.040	0.053	0.667	0.065	0.033	-0.094	0.137	0.138
2010-11	0.111	0.125	0.076	0.128	0.043	0.139	0.015	0.099	0.044	0.057	0.716	0.059	0.035	-0.101	0.139	0.147
2011-12	0.116	0.129	0.075	0.128	0.040	0.147	0.014	0.097	0.053	0.065	0.738	0.053	0.040	-0.106	0.140	0.151
Average	0.103	0.115	0.065	0.128	0.054	0.134	0.016	0.106	0.038	0.052	0.675	0.068	0.038	-0.089	0.137	0.137

Note: r = interest rate on government bonds, rl = commercial bank lending rates, rr = real interest rate, gprev = primary revenue expenditure, gcap = capital expenditure, g = total expenditure, rev = revenue receipts, rd/Y = revenue deficit-GDP ratio, b/Y = fiscal deficit-GDP ratio, dt/Y = debt-GDP ratio, yg = real GDP growth, л = inflation rate, td/y = trade deficit-GDP ratio, rm= reserve money, m3= broad money

In the backdrop of a baseline scenario, the process of adjustment outlined below aims at attaining the targets of zero revenue deficit and fiscal deficit-GDP ratio of 0.03 by the terminal year of the adjustment process. Thus, the remainder of this section summarises the results of a number of exercises in which time path of one instrument (policy) variables is modified while maintaining the remaining variables at the benchmark level. Policy instruments with the fiscal authorities in the model are primary revenue expenditure (g_{prev}), capital expenditure (g_{cap}) and non-tax revenues (ntr) and innovations in the tax administration.

(b) Shock to Primary Revenue Expenditure

If the convergence is to be achieved solely through expenditure reducing policies, a cutback in primary revenue expenditure (g_{prev}) i.e., wages, salaries and other non-developmental expenditure, the average growth of g_{prev} has to sharply moderate by about 40 per cent from the baseline level (a deceleration from 13 to 8 per cent) (Table 3). Sharp expenditure correction would lead to a situation where average growth of primary revenue expenditure (8 per cent) exceeds the revenue growth (10 per cent) for the simulation period. This helps achieve convergence in both revenue deficit and fiscal deficit, however, convergence in revenue deficit is much slow. Debt-GDP ratio grows at a gradual rate and stabilizes at 0.65 by 2011-12. While the nominal interest rate shows significant moderation, real interest rates slightly edge up due to shaper moderation in inflationary expectations. Inflationary expectations are contained due to sharp deceleration in growth of money supply (11 per cent from 16 per cent) as deficits are contained. Under this scenario, although the deficits converge, the Domar debt stability condition does not hold well over longer term. Policy adjustments bring marginal moderation in the pace of trade deficit over the medium horizon as aggregate absorption of government slows down.

Table 3: Impact of Shock to Primary Revenue Expenditure

Year	r	rl	rr	g_{prev} (growth)	g_{rev}/y	g_{cap}/y	rd/y	b/y	dt/y	yg	π	td/y	rm (growth)	m3 (growth)
2005-06	0.076	0.088	0.032	0.205	0.126	0.020	0.026	0.041	0.622	0.084	0.044	-0.065	0.172	0.204
2006-07	0.081	0.096	0.033	-0.011	0.098	0.019	0.016	0.032	0.627	0.081	0.048	-0.070	0.109	0.127
2007-08	0.086	0.102	0.054	0.092	0.097	0.018	0.016	0.031	0.606	0.077	0.033	-0.077	0.083	0.098
2008-09	0.089	0.107	0.064	0.092	0.096	0.017	0.015	0.030	0.623	0.073	0.025	-0.085	0.085	0.100
2009-10	0.092	0.110	0.068	0.092	0.095	0.016	0.018	0.031	0.616	0.067	0.024	-0.093	0.085	0.100
2010-11	0.093	0.113	0.068	0.092	0.095	0.015	0.018	0.031	0.650	0.062	0.025	-0.099	0.094	0.108
2011-12	0.095	0.115	0.070	0.092	0.094	0.014	0.022	0.035	0.654	0.056	0.025	-0.104	0.097	0.111
Average	0.089	0.107	0.060	0.075	0.096	0.016	0.018	0.032	0.630	0.069	0.030	-0.088	0.092	0.107

(c) Shift in the Composition of Primary Expenditure

In order to delineate the growth enhancing impact of public capital expenditure, government capital spending is enhanced at a sustained rate of 15 per cent over a medium-term (5 per cent in the baseline). This is achieved mainly by shifting the composition of expenditure (Table 4). As primary revenue expenditure growth (8 per cent) turns much lower than the revenue growth (15 per cent), revenue and fiscal deficits show sharp convergence in the debt-deficit indicators. Although convergence is attained, achieving revenue deficit target takes longer. Positive shock to capital expenditure result in capital spending to GDP ratio rising to 2.6 per cent (1.6 per cent in baseline), in turn, domestic investment rate improves by about 7 percentage points of GDP over the baseline. Trade gap widens in response to expansionary demand effect of government capital spending. However, output effect of higher capital spending is so strong that Domar stability condition is satisfied over the medium-term horizon and debt-output ratio shows near stability. As the primary liquidity growth moderates to 10 per cent (14 per cent in baseline) due to non-inflationary nature of the government spending, inflationary expectations get significantly subdued.

Table 4: Impact of Reallocation between Primary Revenue Expenditure and Capital Expenditure

Year	r	rl	rr	g_{prev}/y	g_{cap}/y	rev (growth)	rd/y	b/y	dt/y	yg	π	td/y	rm (growth)	m3 (growth)	I/y
2005-06	0.076	0.088	0.032	0.089	0.020	0.139	0.026	0.041	0.622	0.084	0.044	-0.065	0.172	0.204	0.265
2006-07	0.084	0.097	0.036	0.076	0.027	0.123	0.015	0.039	0.628	0.091	0.048	-0.069	0.109	0.127	0.279
2007-08	0.092	0.105	0.058	0.073	0.027	0.135	0.014	0.038	0.602	0.100	0.034	-0.076	0.101	0.116	0.296
2008-09	0.095	0.111	0.066	0.069	0.027	0.145	0.010	0.034	0.603	0.110	0.029	-0.086	0.104	0.119	0.319
2009-10	0.096	0.114	0.069	0.065	0.026	0.156	0.007	0.032	0.572	0.121	0.028	-0.098	0.100	0.115	0.349
2010-11	0.094	0.115	0.064	0.061	0.026	0.169	0.001	0.026	0.568	0.132	0.030	-0.112	0.099	0.113	0.388
2011-12	0.088	0.114	0.053	0.058	0.026	0.182	-0.004	0.020	0.528	0.144	0.035	-0.129	0.086	0.100	0.316
Average	0.092	0.109	0.058	0.067	0.026	0.152	0.007	0.031	0.583	0.116	0.034	-0.095	0.100	0.115	0.324

(d) Simultaneous Corrections in Primary Revenue and Capital Spending and Revenues

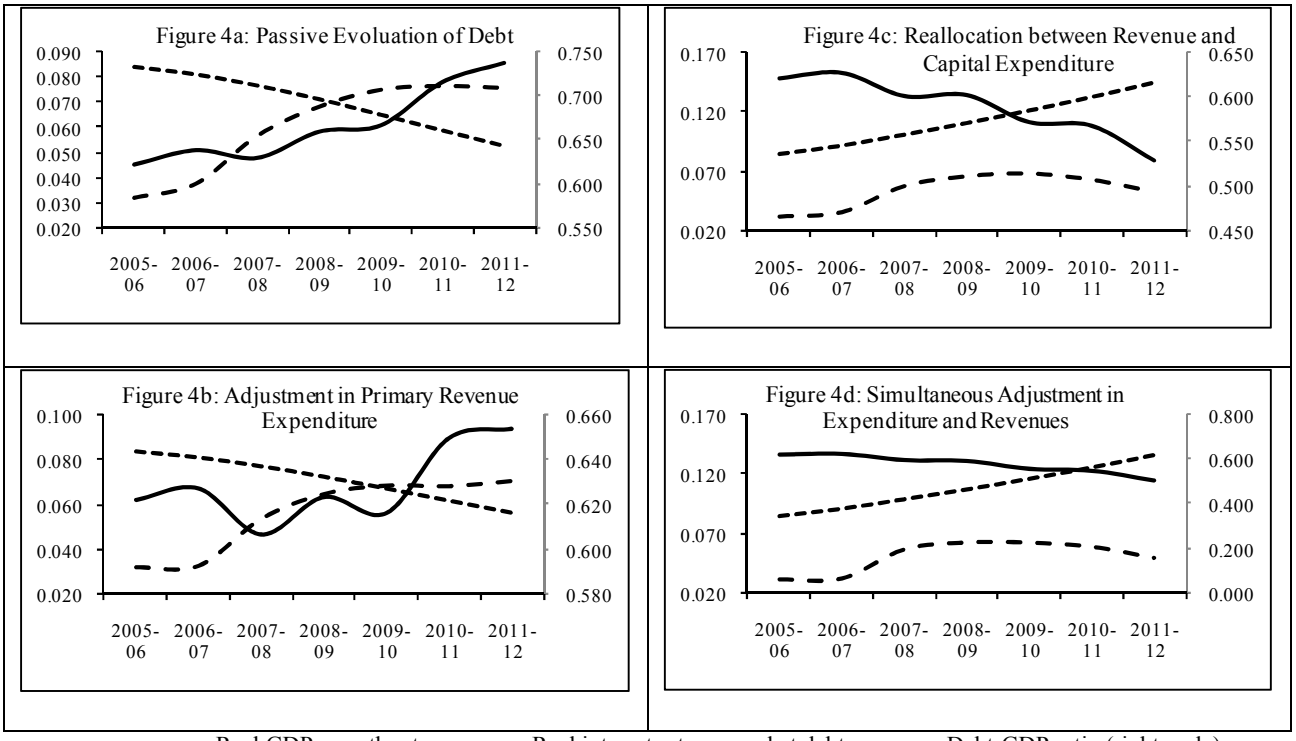
The required rate of adjustment either solely through expenditure containment or revenue augmentation is bound to be of large magnitude to meet the convergence and, therefore, would be difficult to achieve. Keeping this in view, an alternative scenario with corrections both on revenues and expenditures is worked out. On the expenditure front, besides attaining moderation in the level of expenditure, the attempt is to bring significant change in the composition in favour of capital expenditure. To achieve the convergence under this scenario, growth in primary revenue expenditure would be moderated by one-fourth, while growth in capital spending would be almost doubled. How the additional growth in capital spending would be financed so that simultaneous convergence in debt ratio is achieved? In order to satisfy this condition, on the revenue front, the non-tax revenue is assumed to grow by 16 per cent (Table 5). Despite augmenting capital expenditure, a moderation in primary revenue expenditure growth and buoyancy in non-tax revenues leads to revenue growth (17 per cent) comfortably exceeding the expenditure growth (12 per cent), broadly indicating fiscal stability. These corrections have strong growth spillovers. Debt stability condition is satisfied over the entire simulation horizon with debt-GDP ratio converging to 0.50 by 2011-12. Policy induced capital spending yields a rise in rate of public investment by about 1.3 percentage point of GDP over the baseline. Strong complementary effect is reflected in private investment rising by 5 percentage points of GDP. The cumulative effect is the high growth trajectory of above 10 per cent (below 7 per cent in the baseline). The substitution effect of public expenditure, from revenue to capital, is reflected in lower interest rate regime and lower inflationary expectations. Thus, fiscal policy facilitates a lower inflationary regime as money supply growth moderates to 9.5 per cent from 16 per cent in the baseline scenario. Lower inflationary expectations along with waning pressure on government borrowing result in a low and stable interest rate regime. The expansionary phase of course leads to higher domestic absorption, which, in turn causes larger import demand for capital investment, leading to expansion in trade deficit.

Table 5: Cumulative Impact of Change in Composition of Primary Revenue and Capital Expenditure and Acceleration in Revenue Growth

Year	r	rl	rr	g_{prev} (growth)	g_{cap} (growth)	rev (growth)	g/y	rev/y	rd/y	b/y	dt/y	g	π	td/y	rm (growth)	M3 (growth)	I/y
2005-06	0.076	0.088	0.032	0.205	-0.152	0.139	0.108	0.100	0.026	0.041	0.622	0.084	0.044	-0.065	0.172	0.204	0.264
2006-07	0.081	0.096	0.033	0.022	0.479	0.209	0.141	0.105	0.013	0.035	0.625	0.090	0.048	-0.069	0.109	0.127	0.276
2007-08	0.086	0.102	0.058	0.110	0.120	0.151	0.138	0.106	0.011	0.034	0.597	0.099	0.029	-0.076	0.084	0.099	0.289
2008-09	0.087	0.106	0.063	0.110	0.120	0.155	0.134	0.107	0.007	0.030	0.593	0.107	0.024	-0.085	0.084	0.099	0.308
2009-10	0.086	0.108	0.063	0.110	0.120	0.159	0.132	0.108	0.003	0.026	0.557	0.116	0.023	-0.096	0.075	0.090	0.332
2010-11	0.080	0.107	0.060	0.110	0.120	0.163	0.127	0.109	-0.003	0.019	0.547	0.126	0.020	-0.108	0.071	0.085	0.364
2011-12	0.071	0.103	0.051	0.110	0.120	0.167	0.124	0.111	-0.010	0.013	0.503	0.136	0.020	-0.123	0.049	0.064	0.305
Average	0.082	0.104	0.055	0.095	0.180	0.167	0.133	0.108	0.004	0.026	0.570	0.112	0.027	-0.093	0.079	0.094	0.312

To sum up, continuance of the present fiscal policy stance could lead to crossover of real interest rate over the growth rate of output and the gap tends to widen over the medium term horizon (Figure 4a-4d). Consequently, the debt-output path diverges over time and may assume explosive proportion over the long horizon. The fiscal adjustment carried out as combination of revenue augmenting measures as well as appropriate expenditure adjustment help to achieve the Domar stability condition. With the strengthening of the debt stability over time, the debt-output ratio rapidly converges.

Figure 4a-d: Dynamic Domar Debt Stability under various Convergence Assumptions



----- Real GDP growth rate _ _ _ Real interest rate on market debt ____ Debt-GDP ratio (right scale)

V. Conclusion

The analytical framework developed in this paper provides important insight of how the size of deficits and debt assume an important role in evolution of interest rates inflationary pressures in the economy. Debt and deficit linkages of interest rates are clearly brought out by significant elasticity of bond interest rates to fiscal deficit. Higher debt levels also put upward pressure on lending rates of the commercial banks through the conduit of government bond interest rates, which may be more pronounced as the degree of financial market integration rises over time. High level of debt builds in rigidity in the medium to long term interest rates and thus, poses a binding constraint on output growth. Thus, Domar stability condition does not hold over the medium-term, leading to unstable debt regime

over the longer horizon.

Convergence in fiscal deficit and debt over the medium run, therefore, requires simultaneous corrections on both revenue and expenditure fronts with growth conducive compositional shifts. A combination of cutbacks on primary revenue expenditure, augmented capital expenditure and improved revenues, lead to smooth convergence of deficits over the medium-term. A strong pass-through of such fiscal adjustments is clearly reflected in a regime of softer nominal interest rates and stable inflationary expectations. Adjustment by shifting the existing composition of expenditure in favour of capital investment has strong complementary effect on private investment. While the trade gap widens in response to expansionary demand effect of government capital spending, the output effect of higher capital spending is so strong that the Domar stability condition is satisfied over the medium-term horizon and debt-output ratio shows near stability. The above findings imply that fiscal adjustments with compositional shifts in expenditure not only lead to acceleration in the investment rate in the economy, these also contribute to monetary management by moderating inflationary expectations and facilitating stable interest rate regime. Such corrections thus do not pose growth inflation trade-off.

Endnotes

[1] Price elasticity of nominal expenditures is greater than that of nominal receipts due to nominal rigidities in tax rates and collections - called Keynes-Olivera-Tanzi effect.

[2] Bispham (1987), Blanchard (1990), Hamilton and Flavin (1986), Mason (*1985), Spaventa (1987) and others are the protagonists of the view that any primary deficit will lead eventually to an explosive rise in debt-output ratio provided that the real interest rate is higher than the real growth rate of output.*

[3] Missale et al. (1997) argues that frequent roll over of short term debt obligations makes fiscal position vulnerable to interest rate volatility and the gains of shortening maturity accrued during the initial period are replaced by higher rollover risk.

[4] Significant changes have occurred with respect of deficit financing as a source of high-powered money. Reserve money growth is now also attributed to voluntary holding of government securities by the central bank for open market operations. Besides, the rising component of the net foreign assets has emerged as an important source of reserve money growth necessitating holding of government securities for sterilization operations.

[5] Interest rate considered here is the primary market yield on government bonds. There are two reasons for considering the primary yields. One, primary market yield represents the true cost of debt servicing, which is being used in the present model. Two, prior to mid 1990s, secondary market in government securities was virtually non-existent.

[6] In the conventional Keynesian paradigm, rise in government deficit, either through the tax cuts or increase in spending causes a rise in disposable income and thus, boosts private spending. The finite horizon models, however, bring forth the argument that the rise in budget deficit effected by permanent tax cuts is more effective in influencing consumer spending. The Ricardian equivalence, assumes that budget deficits do not matter as a result of compensatory behaviour of private agents.

References

Alesina, A. and Perotti, R. (1997) 'Fiscal Adjustments in OECD Countries: Composition and Macroeconomic Effects', *IMF Staff Papers* 44(2): 210-48.

Aschauer, D. A. (1989) 'Does Public Capital Crowd Out Private Capital?', *Journal of Monetary Economics* 24: 171-88.

Bardhan, P. (1984) *The Political Economy of Development in India*, New Delhi: Oxford University Press.

Barro, R. J. (1974) 'Are Government Bonds Net Wealth?' *Journal of Political Economy* 82(6): 1095-117.

Bispham, J.A. (1987) 'Rising Public Sector Indebtedness: Some more unpleasant Arithmetic' in M.J. Boskin, J.S. Flemming and S. Gorini (eds.) *Private Savings and Public Debt*, Oxford: Basil Blackwell, pp. 40-71.

Blanchard, O., Chouraqui, J-C., Hagemann, R. and Sartor, N. (1990) *The Sustainability of Fiscal Policy: New answers to an old question*, OECD Economic Studies No. 15, OECD.

Buiter, W. H. and Patel, U. R. (2006) *India's Public Finances: Excessive Budget Deficits, A government-Abused Financial System and Fiscal Rules*, Centre for Economic Policy Research Discussion Paper Series No. 5502 (February).

Callen, T. and Cashin, P. (2001) 'Assessing India's Position'. in Callen, T., Reynolds, P. Towe C. (eds.) *India at the Crossroads: Sustaining Growth and Reducing Poverty*, Washington: International Monetary Fund.

Cambridge Economic Policy Group (1976) *Economic Policy Review No. 2*, Cambridge: Department of Applied Economics.

Cashin, P., Olekalns, N. and Sahay, R. (1998) *'Tax Smoothing in a Financially Repressed Economy: Evidence from India'*, IMF Working Paper 98 (122), International Monetary Fund.

Domar, E. (1944) 'The Burden of the Debt and the National Income' *American Economic Review* 34 (4): 798-827.

Easterly, W. and Schmidt-Hebbel, K. (1993) 'Fiscal Deficits and Macroeconomic Performance in Developing Countries', *The World Bank Research Observer* 8(2): 211-37.

Goyal, R., Khundrakpam, J.K. and P. Ray (2004) 'Is India's public finance unsustainable? Or, are the claims exaggerated?', *Journal of Policy Modeling*, 26 (3): 401–420.

Hamilton, J.D. and Flavin, M.A. (1986) 'On the Limitations of government Borrowing: A Framework for Empirical Testing', *American Economic Review* 76(4): 808-819.

Jha, R. and Sharma, A. (2001) 'Structural Breaks and Unit Roots: A Further Test of the Sustainability of the Indian Fiscal Deficit', *ASARC Working Paper*, September.

Krishnamurthy, K. (1984) 'Inflation and Growth: A Model for India', *Indian Economic Review* 19(1): 16-111.

Lahiri, A. and Kannan, R. (2001) 'India's Fiscal Deficit and Their Sustainability in Perspective', World Bank NIPFP Seminar of Fiscal Policies for Growth: New Delhi.

Mason, P.R. (1985) 'The Sustainability of Fiscal Deficits', *IMF Staff Papers* 32(4).

Milesi-Ferrett , G. M. and Razin, A. (1996) Sustainability of Persistent Current Account Deficits, *NBER Working Papers* No. 5467, National Bureau of Economic Research.

Missale, A. (1997) 'Managing Public Debt: The Optimal Taxation Approach', *Journal of Economic Surveys* Vol. 11(3): 235-265.

Mohanty, M.S and Joshi, H. (1992) 'The Dynamic Interrelationship Between Fiscal and Trade Deficits in India: 1970-71 to 1990-91', *Reserve Bank of India Occasional Papers* 15(4).

Moorthy, V., Singh, B. and Dhal, S.C. (2000) *Bond Financing and Dent Stability: Theoretical Issues and Empirical Analysis for India*, Development Research Group Study 19, Reserve Bank of India.

Olekalns, N. and Cashin, P. (2000) 'An Examination of the Sustainability of Indian FiscalPolicy', University of Melbourne, Department of Economics, Working PaperNo.748, May.

Ranjan, R. and Nachane, D. M. and (2002) *An Econometric Model of the Capital Account of India's Balance of Payments*, Indian Economic Association Trust for Research and Development: New Delhi.

Pandit, V. (1984) 'Macroeconomic Adjustments in a Developing Economy: A Medium Term Model of Outputs and Prices in India', *Indian Economic Review* 19(1).

Pani, P.K. (1984) 'A macro model for the Indian economy with specific reference to output, demand and prices', 1969-70 to 1981-82', *RBI Occasional Papers,* 5(2): 1-154.

Parker, K. and Kastner, S. (1993) *A Framework for Assessing Fiscal Sustainability and External Viability, with an Application to India,* IMF Working Paper 93(78).

Patra, M. D. and Pattnaik, S. K. (1994) 'Exchange Rate Passthrough and Trade Balance: The Indian Experience', *RBI Occasional Papers,* 15(4): 281-314.

Pradhan, B.K., Rath, D.K. and Sharma, A. (1990) 'Complementarily between Public and Private Investment in India', *Journal of Development Economics* 33(1): 101-116.

Quintos, C. (1995) 'Sustainability of the Deficit Process with Structural Shifts', *Journal of Business & Economic Statistics,* 13: 409–417.

Rajaraman, I. and Mukhopadhyay, A. (2000) 'Sustainability of Public Domestic Debt in India' in D.K. Srivastava (ed.) *Fiscal Federalism in India- Contemporary Challenges,* National Institute of Public Finance & Policy, New Delhi.

Ram Mohan, TT, Dholakia, R.H. and Karan, N. (2005) 'Is India's Central Debt Sustainable? Revisiting an Old Debate', *Economic and Political Weekly* 40(10): 951-59.

Rangarajan, C., Basu, A. and Jadhav, N. (1989) 'Dynamics of Interaction Between Government Deficit and Domestic Debt in India' *RBI Occasional Papers* 10(3).

Rangarajan, C. and Mohanty, M. (1997) 'Fiscal Deficit, External Balance and Monetary Growth: Evidence on the Indian Economy', *RBI Occasional Papers* 18(9): 583-653.

Rangarajan, C. and Srivastava, D.K. (2003) 'Dynamics of Debt Accumulation in India: Impact of Primary Deficit, Growth and Interest Rate', *Economic and Political Weekly* 38(46): 4851-58.

Rao, M.J.M. (2000) 'Fiscal deficits, Interest rates and Inflation', *Economic and Political Weekly* 35(23).

Rath, N. (1989) 'Agricultural Growth and Investment in India', *Journal of Indian School of Political Economy* 1(1).

Reynolds, P (2001) 'Fiscal Adjustments and growth Prospects in India', in Tim Callen et al., *India at the CrossRoads: Sustaining Growth and Reducing Poverty,* International Monetary Fund.

Spaventa, L. (1987) *The Growth of Public Debt: Sustainability, Fiscal Rules, and Monetary Rules*, IMF Working Paper No. 86(8).

Sundararajan, V. and S.Thakur (1980) 'Public Investment Crowding out and Growth: A Dynamic Model Applied to India and Korea', *IMF Staff Papers,* 27: 814-55.