Chapter 5

An Assessment of Sustainability of the Central Government

Domestic Debt in India

In recent years, no issue in public finance has drawn as much attention among the policy makers as the sustainability of fiscal policy. This has become a major subject of intense debate and discussion relating to the economic policy of most of the indebted economies. The government of a country finances its deficits through various ways. Considering the fact that there is a limit to taxation, external sources of financing the deficits, and monetization of public debt\(^4\), when a government runs budget deficits beyond these three ways of financing, ultimately resorts to other domestic sources of borrowings. There are three other principal domestic sources of government borrowing in India. They are: (a) public/households, (b) commercial banks and other financial institutions and (c) governmental institutions other than the RBI.\(^5\)

As noted in the preceding Chapter 3, with a continuous and phenomenal increase in fiscal deficit, there is a corresponding build up of domestic debt of the central government in India. A continuous rise in government debt not only has implications towards the financial position of the central government, but also towards the growth and stability of the economy. In this context, the issue of sustainability of public debt assumes critical importance in a country like India chronically dependent on domestic debt as an instrument of financing its growing revenue deficit (out of total fiscal deficit).

An unsustainable fiscal policy may lead to a recessionary situation which can result in deep-rooted macro economic evils such as unemployment and low growth

\(^4\)Monetisation of debt refers to the process through which an increase in government debt results in an increase in money stock. This is done through borrowing from the central bank of a country. The limit for monetization of public debt can be defined as the level of monetization which gives rise to maximum seignorage revenue within a certain tolerable inflation capacity of the economy.

\(^5\)The government borrowing from governmental institutions or departments is known as intra-governmental borrowings.
rate; further it erodes the potential taxable capacity of the economy forcing the government to persistently rely on further borrowings for bridging its resource gap. Chronic accumulation of debt leads to insolvency affecting adversely the confidence and credibility of the government. As a result, it becomes very difficult for the government to discharge its responsibilities in terms of allocating financial resources for developmental and welfare enhancing activities. Government faces difficulties in investing resources on yield enhancing long-term and short-term capital investment projects and servicing the accumulated debt arrears. Rapid accumulation of government debt puts pressure on monetary policy resulting in macroeconomic distortions (deadweight losses) and ultimately, can lead to unsustainability of public debt and the economy itself. In view of a sustained relative increase in domestic debt, this chapter attempts to evaluate sustainability of domestic debt of the central government in India. This is examined by looking into broadly defined components of domestic debt as well as the aggregate domestic debt of the central government over the last four decades. A period of four decades is considered to be long enough to judge the long term perspective of fiscal policy in the economy.

In order to empirically examine the issue in the Indian context, the study, at first, brings out in nutshell the conceptual and analytical framework underlying the issue of sustainability as discussed in the literature and then generalize in the Indian context with a view to empirically ascertain whether the current pattern of government domestic debt is sustainable or not and derive implications for the future fiscal policy of the country.51

5.1 Concept and Measurement of Sustainability of Domestic Public Debt
A sustainable situation is generally referred to as a continuation of an action (the action refers to the act of borrowing by the government) without any breakdown. This can indirectly be interpreted as an action consistent with other economic targets. When it is inconsistent with other economic targets, the action raises the question of its own continuation. On the contrary, an unsustainable situation is defined as one under which, circumstances economic variables cannot continue

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51Sustainability may relate to prospective/future fiscal policy or past fiscal policy. Since future is uncertain and prediction against future on the basis of present is also uncertain; the study tries to evaluate sustainability of past fiscal policy in order to analyse that if the given fiscal policy continued into the future what would be its
indefinitely on their historical path as implied by the current policies and private sector behaviour. This means for future policy to be sustainable, the current policy is required to be on the sustainable line or the overall fiscal policy is required to be intertemporally consistent with desired fiscal targets and other economic parameters.

Quite contrary to the classical line of thinking, which argues that debt should not be incurred in normal situations by a government as it is perceived to be wasteful and burdensome on the future generations, Keynes maintains that debt incurrence would not pose any problem as long as it is within a threshold limit. The threshold limit would be breached when debt liability is in excessive proportion of aggregate national income. Under such circumstances borrowings would be undesirable, as it presages dangerous macro-economic consequences, such as crowding out effect, lower economic growth (Afonso, 2000). Thus, the level of public debt should always be seen in relative terms as a proportion of GDP of an economy (since the tax base of an economy principally depends upon the GDP; and with a higher level of GDP, the capacity of a government to impose taxes becomes higher and therefore its ability to service the past debt becomes much certain and easier).

On the Keynesian line of thinking, it is argued that public borrowing is usually not harmful for an economy where the resources are lying idle/underutilised. Rather it improves the economic position by utilising the untapped resources of the economy. Moreover, Unsustainability of public debt does not arise as long as an increase in public debt is accompanied by an increase in growth rate and expansion of the economy.

Following Keynes's contention on sustainability, Domar (1944) treats the problem of public debt as one of an expanding national income i.e. how national income rises in relation to the level of public debt. According to him, government debt creation would be unsustainable if the after-tax real interest rate on
government bonds exceeds the real growth rate of the economy. Given the level of primary deficit, if the rate of interest is above the growth rate of the economy, it leads to a steady rise in the debt level which is known in the literature as the violation of Domar's debt stability condition. The government debt to be sustainable, Domar's debt stability condition has to be fulfilled (Report on Currency and Finance, RBI, 2002). The stability condition would get fulfilled when the growth rate of income exceeds the rates of interest on government debt, and if there exists any primary deficit in the government budget the fulfillment of this condition would help in improving the fiscal situation at least by keeping the primary deficit-to-GDP ratio at a constant level. Moreover, it can be generalized that the growth of public debt to be sustainable, fiscal policy should not compromise on the growth rate of the economy as well as expenditure and revenue generation capacity of the government in the future.

In the recent period, economists began to opine that the feasible fiscal policies must be considered in a framework in which government is subject to an intertemporal budget constraint (Buiter, 1983; subsequently presented in the analytical framework). The level of government debt is sustainable if it does not violate the intertemporal budget constraint (Wilcox, 1989). It should be intertemporally consistent with future fiscal policy. If it violates the budget constraint over the long-run, then an expansionary fiscal policy at present must involve either contractionary fiscal policy at some point in the future or an increase in the seignorage revenue from money creation. Otherwise, debt eventually becomes excessively large relative to other macroeconomic indicators. It is implausible to gauge under such circumstance whether investors would be willing to continue acquiring government bonds indefinitely without there being a conceivable way out for the government to meet its debt service payments without further borrowing (Masson, 1935). Unsustainability becomes a more and more pronounced

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52Since the interest receipt is also subject to taxation, the taxable income of a country depends on both GDP and interest receipts of private individuals on the holdings of public debt (Domar, 1944).

53In contrast to Keynesian viewpoint, the rational expectationist, Barro (1974) viewed public debt from the perspective of Ricardo's debt neutrality theorem. Barro contended that under the assumption of rational behaviour of the individuals a tax-cut bond-financed public expenditure in the current period would result in an equivalent increase in the present value of future taxes in the latter period, leaving other parameters of the economy unaltered. Hence, on account of this conception, the increase in debt-financed public expenditure does not entail the public debt becoming unsustainable. The issue has not been intensely discussed by the new classicals.
problem as time goes on along with the rise in debt as it leads to an increase in interest payments. In a similar vein as Domar did, other economists began to point out that if the government is running a primary deficit, and at the same time, real rate of interest exceeds the economy’s real growth rate, the tax rate increase is necessary to offset the increase in deficit and to stabilize the government debt. If tax revenue cannot grow as to offset the the growth of deficit or there cannot be cut in revenue expenditure, then the debt would explode and a situation may arise where government, in order to meet interest payments on its past debt, has to resort to further borrowing - a situation in the literature popularly reckoned as 'debt trap', which indicates debt unsustainability or fiscal policy unsustainability.

Moreover, higher the outstanding stock of government debt, the greater would be the need for fiscal retrenchment or monetisation. Higher monetisation would result in inflationary expectations and this in turn, may lead to an increase in nominal interest rate on bonds as a compensation against inflation. As a result of these rippling effects, it may have deleterious impact on the economic growth by weakening and destabilising the economic fundamentals. On the other hand, given the increasing tendency of deficit, if there is no fiscal retrenchment and increase in the monetised deficit, it implies higher debt level. Higher debt inducing the rate of interest to a higher level would result in lowering the level of steady-state consumption and capital stock (Spaventa, 1987).

The experience of economies around the world reveals that there is a changing perception about the stance of fiscal policy. The shift towards fiscal restraint has begun in the early 1980s in several Organisation for Economic Cooperation and Development (OECD) countries. In the United States, for instance, the Balanced Budget Act of 1997, forbids congress authorising any expenditure that exceeds government revenue. The Maastrict treaty fiscal convergence protocol sets the benchmark limit for gross value of debt and deficits not to exceed 60 per cent and 3 per cent of GDP respectively. This is declared to be the required norm for the European countries to join the European Monetary Union (EMU) (Buiter and Patel, 1997). The countries that have already attained this threshold limit are considered fiscally unsustainable and are debarred from joining the union, as their entry into...
the union is perceived to have destabilising impact on fiscal and monetary policy of the member countries. In Canada, even though there is no constitutional framework preventing the fiscal authorities in running deficits, balanced budget and achieving surpluses are now a firm commitment not only of the federal government but also the provincial governments (Bougrine, 2002). Since economic development differs across countries, it is not justifiable and feasible to apply the same benchmark limit for all the developing countries. The implementation of these fiscal convergence criteria for assessing sustainability depends on the extent of economic development of the countries concerned. Further, measuring economic development and fixing sustainable limits on the fiscal indicators for the economies is also not an easy task. However, following these norms, some countries have arbitrarily gone in for fixing the fiscal limits. In India, the fiscal responsibility and budget management bill (FRBMB) is being currently enforced.

Another popular approach to evaluate sustainability of public debt is to look at the behaviour of different indicators of sustainability - known as indicator approach. This approach evaluates debt sustainability in terms of capacity of a country to raise debt and discharging the debt obligation. It employs a number of proximate measures of real life debt service problems (Hjertholm, 2003). One can also compare the total costs (liabilities) associated with government borrowings with total assets of the government.\(^{54}\) This is called net worth approach to assessing sustainability. If the cost borne on borrowings exceeds, over time, the present discounted value of returns on the utilisation of borrowed funds, it is an indication of debt unsustainability (Buiter, 2001). But this method of measuring debt sustainability has got limitations. Evaluating fiscal sustainability through this approach has been ruled out due to the practical problems involved in getting the data especially on the future returns associated with a particular level of government borrowing incurred at a particular point of time. If the borrowings made in a year are invested in the same year, may not generate immediate returns but may give rise to returns over a period of time. Under such circumstance, it is difficult to distinguish returns associated with different levels of borrowings at different points of time. If the government uses the borrowed funds for investment

\(^{54}\)There are practical difficulties in valuing the total assets of the government.
in areas such as infrastructure, education, health care etc., the sustainable level of debt not only depends on the relationship between the marginal social returns on the investments and marginal cost of borrowings, but also on government's ability to appropriate domestic resources (through tax revenues) for debt services. That apart, the public sector debt service ratio, public debt-to-GDP ratio, interest payment-to-GDP ratio, debt-to-tax revenue ratio and the interest payment-to-tax revenue ratio are considered as fundamental indicators of debt sustainability under the indicator approach.

**Domestic Debt Sustainability in India: Indicator Approach**

Following the above conceptual analysis, before outlining an analytical framework for examining sustainability, a look at the popular fundamental indicators of debt sustainability in the context of India, would enable us to get a preliminary idea about the present stance of fiscal policy in the country. In this context, a look at the sustainability indicators reveals that the fiscal position of the central government presents a worrisome picture. Table 5.1 provides a comparative picture of the level of aggregate domestic debt of the central government in relation to the level of GDP of the economy on a five yearly average basis. As we have seen from the earlier analysis in Chapter 3 that in contrast to the increase in nominal growth rate of domestic liabilities, the nominal growth rate of external debt of the central government drastically declined in the 1990s. The decline in external debt was observed to be dramatic especially after the macroeconomic crisis of 1990s. Contrary to the growth rate of external public debt, the growth rate of domestic public debt had been increasing over the years and even in many years outstripped the growth rate of GDP raising the fear of unsustainability of fiscal policy. Further, a component-wise analysis of domestic debt shown in Table 5.1 indicates that all the components of domestic debt such as market debt and other liabilities taken as percentage of GDP registered a phenomenal increase during 1980s and early 1990s over their previous levels. In the later part of 1990s on account of some degree of fiscal restraint exercise and good performance of the economy, the overall domestic debt-to-GDP ratio had been kept under control and in fact it marginally declined to 47.50 per cent. The decline was observed to be more from RBI's ways and means advances\(^5\) and from small savings. The drastic decline in small savings component

\(^5\)Ways and means advances consist of advances of RBI through floating loans (issue of special securities) and loans against the issue of treasury bills, which are short-term in nature.
of centre's liability got obscured in Table 5.1 due to the combination of small savings and provident funds. The reason for the decline in ways and means advances was due to the limit put on the automatic monetization of government debt. The monetisation component does not pose a threat of unsustainability as it is abolished and rate of interest charged on these loans is very marginal. Rather, it serves as a source of revenue for the government and its withdrawal poses a threat for other forms of debt. The decline in small savings in 1990s was due to changes in the institutional and fiscal policies. In the preceding years, the central government had taken the major responsibility of mobilizing resources for the states and union territories. From the year 1999-00 (with recommendation of Gupta committee in 1998), the central government does not need to mobilize resources through the channel of small savings for the state and union territory governments. As a result, this would reduce the large scale borrowing requirements and deficits of the central government in the long-run if not in the short-run. In the short-run, the reduction of debt and deficit may not be possible in a significant way because of large committed expenditure along with interest payments on outstanding liabilities which is a major concern of the central government at least for next few years.

The abolition of automatic monetization along with prevention of resource absorption through net small savings resulted in increase in centre's market debt. The market debt continued to increase attaining the highest limit of 24 per cent of GDP towards the end of 1990s. As a consequence, interest payment on domestic debt also increased over the years as can be seen from net domestic interest payment (defined as the total domestic interest payment of the centre minus repayment of interest liabilities by the states and union territories to the centre) as a percentage of tax revenue and also as a percentage of GDP. This raised the fear that India was not far off from the debt trap. Had there been adequate GDP growth (more than what was realized), adequate generation of tax revenues would have brought down the level of public debt. The fact that the growth rate of the economy was not coping up well with the growth rate of domestic debt and other developments in fiscal policy, implied a lower taxable capacity of the economy and hence government's absorption of resources through increased borrowings. Given the growth rate and structural features of the economy (where the contribution of service and agricultural sectors to total tax revenue is minimal, although their
contribution towards the GDP growth being significant), it is difficult on the part of the government to impose taxes beyond a certain limit. If the government exceeds in its taxing capacity beyond a certain tolerable limit, it would discourage the workers' interest to work as well as affect the willingness and the capacity of the investors to invest their resources (Wheeler, 2004). The latter consequence follows due to the adverse impact of higher taxes on profit margin of investors. Further, higher the tax rates, more would be the tax evasion. Higher tax rates following higher growth of public debt would adversely affect the economic growth. Sometimes it is argued that even in periods of good performance of the economy as reflected in the increase in growth rate of GDP, the government has not been able to mobilize tax revenues, because of other dimensions to the issue of low tax revenue accrual to the government. This is beyond the analysis of the present study as it deviates from our main discussion, but generally it is believed that tax revenue base depends upon the GDP of a country. Recently, policy makers have envisaged bringing more number of services under the tax net. Nothing can be concluded from these indicators unless the issue is dealt with at length and with more vigour. On the one hand, there is an increase in the share of market debt, and on the other hand, there is a decrease in certain components of domestic debt. Given the present stance, it becomes difficult to decide as to what would be the future stance of fiscal policy in the economy. Considering the above conceptual and theoretical analysis, the study moves further to bring out an analytical framework for assessing sustainability of domestic debt of the central government in India.

Table 5.1: Indicators of Domestic Debt Sustainability of the Central Government in India (5 yearly annual averages)

<table>
<thead>
<tr>
<th>Years</th>
<th>Market Borrowings and Bonds /GDP</th>
<th>Outstanding Treasury Bills &amp; Special Floating Loans/GDP</th>
<th>SS &amp; PF /GDP</th>
<th>Other Liabilities exclusive of SS &amp; PF/GDP</th>
<th>Market Borrowings and Bonds plus Aggregate Other Liabilities /GDP</th>
<th>Net Domestic Interest Payment /GDP</th>
<th>Net Domestic Interest Payment /Tax Revenue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-65</td>
<td>14.08</td>
<td>6.29</td>
<td>10.58</td>
<td>0.00</td>
<td>24.66</td>
<td>0.26</td>
<td>4.25</td>
</tr>
<tr>
<td>1965-70</td>
<td>10.84</td>
<td>7.52</td>
<td>7.28</td>
<td>1.97</td>
<td>20.09</td>
<td>0.39</td>
<td>6.85</td>
</tr>
<tr>
<td>1970-75</td>
<td>9.37</td>
<td>7.58</td>
<td>6.90</td>
<td>3.70</td>
<td>19.97</td>
<td>0.43</td>
<td>7.15</td>
</tr>
<tr>
<td>1975-80</td>
<td>9.50</td>
<td>8.43</td>
<td>6.98</td>
<td>3.80</td>
<td>20.29</td>
<td>0.96</td>
<td>13.24</td>
</tr>
<tr>
<td>1980-85</td>
<td>13.98</td>
<td>8.86</td>
<td>7.77</td>
<td>5.48</td>
<td>27.23</td>
<td>0.96</td>
<td>13.87</td>
</tr>
<tr>
<td>1985-90</td>
<td>20.46</td>
<td>6.72</td>
<td>9.16</td>
<td>10.85</td>
<td>40.48</td>
<td>1.56</td>
<td>19.85</td>
</tr>
<tr>
<td>1990-95</td>
<td>22.04</td>
<td>4.97</td>
<td>10.51</td>
<td>11.44</td>
<td>43.98</td>
<td>2.68</td>
<td>38.18</td>
</tr>
<tr>
<td>1995-00</td>
<td>24.22</td>
<td>3.95</td>
<td>9.29</td>
<td>10.14</td>
<td>43.65</td>
<td>2.94</td>
<td>45.39</td>
</tr>
</tbody>
</table>

5.2 Sustainability of Domestic Public Debt: Analytical Framework

There are two approaches to analyse sustainability of government debt: (i) the accounting approach and (ii) the present value borrowing constraint (PVBC) approach / intertemporal budget constariant (IBC) approach (Hamiton and Flavin, 1986; Cuddington, 1996; Gupta, 1992; Buiter et al., 1992, Auerbach and Kotlikoff, 1998). The straightforward method for analysing sustainability of public debt under both the approaches is to start with the budget constraint of the government.

i) Accounting Approach to the Government Budget Constraint

In the absence of external loan-financing and money-financing the deficit (inflationary financing), let the government’s budget constraint be expressed in real terms as:

\[ B_t = (G_t - T_t) + (1 + r_{t-1}) B_{t-1} \]  
\[ B_t - B_{t-1} = -S_t + r_{t-1} B_{t-1} \]

where \( B_t - B_{t-1} \) is the real amount of net interest-bearing government debt held by the private sector and other financial institutions in the economy at the time period \( t \), or it is the change in the stock of government debt between two time points; \( r \) is the \textit{ex post} real interest rate on government loans; \( G \) and \( T \) are real government expenditures net of interest payments and real tax revenues respectively. \( S \) denotes the non-interest real surplus (-\( S \) denotes real primary deficit, that is, the difference between real government expenditures and real revenue receipts exclusive of interest payments on government debt). The real government deficit can be defined as the change in the real value of government debt over time. The government budget constraint is adjusted for inflation so that changes in its components do not reflect the price variation. Based on the preceding conceptual framework, expressing the budget constraint (2) as a proportion of real national income\(^{56}\), it would yield the following equation as in (3)\(^{57}\).

\[ \frac{B_t}{Y_t} = (1 + r_{t-1}) \frac{B_{t-1}}{Y_{t-1}} \frac{Y_{t-1}}{Y_t} + \left( \frac{G_t - T_t}{Y_t} \right) \]  

\(^{56}\)In a growing economy, public debt should be seen in relative terms as a proportion of GDP of the economy (Afonso, 2000).

\(^{57}\)Income is divided throughout the budget constraint in order to account for the effect of growth on borrowing capacity of the government.
The small case letters in (4) represent the real value of corresponding variables as a ratio to real national income. Using the approximation \((1+r)/(1+\eta) \approx (1+r-\eta)\), where \(r\) and \(\eta\) are very small fractional values, we will get the following as represented in (5).

\[ b_t = (g_t - t_t) + (1 + r_{t-1} - \eta_{t-1}) b_{t-1} \]  

(5)

Where \(b\) represents the real value of the stock of domestic debt of the central government. The small case letters \(g\) and \(t\) are real government expenditures (exclusive of interest payments on government debt) and real tax revenue, each as a proportion to real national income, respectively. The \(r\) is the \textit{ex post} after-tax real rate of interest and \(\eta\) is the rate of real income growth. According to the above budget constraint, the evolution of the domestic debt-to-income ratio depends on two factors: (a) primary deficit-to-income ratio \((g_t - t_t)\), and (b) the product of the accumulated debt-to-income ratio \(b_{t-1}\) times the difference between real rate of interest and real income growth rate \((r - \eta)\). If the difference between \(r\) and \(\eta\) is positive, primary surplus is needed to maintain a constant debt-to-income ratio. If the difference is negative, it is possible to run a certain level of primary deficit and maintain a constant debt-to-income ratio. In other words, when the after-tax real rate of interest is greater than the economy’s growth rate, a positive primary deficit will induce a growing stock of government debt and therefore, growing interest payments have to be met by an ever increasing tax rate or by reducing government expenditure.

Moreover, the budget constraint reveals that given the level of primary deficit to income ratio (in the context of comparing the real rate of interest with the real growth rate of income), debt level would be considered sustainable if the real
income growth rate exceeds the real rate of interest and makes the debt-to-income ratio decline or at least bounded one. Putting alternatively, a level of government debt would be sustainable if debt-to-income ratio decreases or at least remains constant over time. According to budget constraint expressed in (5), the debt-to-income ratio would remain constant when \( b_i = b_{i-1} \), which implies that \[-(g_i - t_i) = (r_{i-1} - \eta_{i-1})b_{i-1}.\] Clearly, when the real rate of interest exceeds the growth rate of the economy, the government would have to run a primary surplus in order to maintain a constant debt-to-income ratio over time. In steady state, with constant primary deficit-to-GDP ratio i.e. \( \text{pdef} = g - t \), the equation (6) would hold.

\[ b^* = \frac{\text{pdef}}{(\eta_{t-1} - r_{t-1})} \] (6)

The above equation (6) tells that \( b^* \) (the steady state value of debt/GDP) would be stable if \( \eta > r \) and unstable if \( r > \eta \). In the event of a given amount of primary deficit-to-GDP, ratio if \( r \) exceeds \( \eta \), it would lead to an increase in debt-to-GDP ratio and would make the debt level unbounded, an indication of instability of fiscal policy. Let’s examine the PVBC approach to sustainability which is believed to be a stronger condition for debt sustainability.

ii) Present Value Borrowing Constraint (PVBC) Approach

The PVBC approach reveals that the willingness of the lenders to hold government bonds operates as a binding constraint for the government to raise funds for financing its deficits. On the other hand, if willingness of the borrowers does not operate as a constraint, and government keeps on borrowing, this would necessitate more interest payments in the future. The required level of government borrowing eventually would exceed the real wealth of the economy. The bottom line for the government to borrow would be till the government eventually pays off the bill. The government’s budget is balanced in expected present-value terms, when current value of debt is equal to the sum of expected present value of future primary surpluses. The fulfillment of this condition, in the literature, is called the solvency condition.\(^5^8\) This condition requires the government to collect, over time,

\(^5^8\)A government is solvent if and only if it is able to generate in the future a stream of primary surpluses that are sufficient to repay (in present value terms) the stock of outstanding debt that it has inherited from its predecessors. Such a condition will hold if and only the present discounted value of debt converges itself toward
net taxes that are large enough, in terms of present value, to cover the present value of its expenditure and the initial debt. In other words, this implies that if the government purchases more now without raising net tax payments, it must either reduce its future purchases or alternatively increase future net taxes by an amount that has an equal present value. As long as government makes this compensating change, its intertemporal budget would remain balanced.

Considering the equation (4) as derived from the budget constraint equation (2), and for the sake of simplicity, assuming for the moment that the real rate of interest on government securities (r) and the rate of income growth (η) are constant, the government budget constraint can be expressed in the following form (7).

\[ b_t = -s_t + \left( \frac{1 + r}{1 + \eta} \right) b_{t-1} \]  
\[ b_{t-1} = \left( \frac{1 + \eta}{1 + r} \right) s_t + \left( \frac{1 + \eta}{1 + r} \right) b_t \]

where \( r = i - \pi \) stands for the real rate of interest i.e. nominal rate of interest net of inflation rate. If the equation (7) is iterated once, it will take the form of the following equation (8).

\[ b_t = \left( \frac{1 + \eta}{1 + r} \right) s_{t+1} + \left( \frac{1 + \eta}{1 + r} \right) b_{t+1} \]  
\[ b_{t+1} = \left( \frac{1 + \eta}{1 + r} \right) s_{t+2} + \left( \frac{1 + \eta}{1 + r} \right) b_{t+2} \]

If the equation (7) is iterated twice, it would take the form of equation (9).

\[ = \left( \frac{1 + \eta}{1 + r} \right) s_{t+1} + \left( \frac{1 + \eta}{1 + r} \right) \left( \left( \frac{1 + \eta}{1 + r} \right) b_{t+2} + \left( \frac{1 + \eta}{1 + r} \right) s_{t+2} \right) \]

\[ = \left( \frac{1 + \eta}{1 + r} \right) s_{t+1} + \left( \frac{1 + \eta}{1 + r} \right)^2 s_{t+2} + \left( \frac{1 + \eta}{1 + r} \right)^2 b_{t+2} \]  

\[ \frac{\partial b_t}{\partial s_t} = 1 - \left( \frac{1 + \eta}{1 + r} \right) \]

zero in the long-run. If this is the case then this condition implies that the debt is “repaid” asymptotically and that there would always be a chain of investors willing to refinance the government (so long as they are certain that the government will continue to implement the set of primary surpluses that generate such an outcome) (D. Cohen, 2002).
With the above equation (8) recursively forwarded for N period \((N \geq 1)\), the present value borrowing constraint can be expressed in the following equation form as in (10).

\[
b_t = b_{t+N} \left(\frac{1 + \eta}{1 + r}\right)^N + \sum_{j=1}^{N} S_{t+j} \left(\frac{1 + \eta}{1 + r}\right)^j
\]

(10)

Letting \(B_{t+N} \equiv b_{t+N} \left(\frac{1 + r}{1 + \eta}\right)^{-(t+N)}\) and \(S_{t+j} \equiv S_{t+j} \left(\frac{1 + r}{1 + \eta}\right)^{-(t+j)}\) it would yield the following intertemporal budget constraint (11).

\[
B_t = B_{t+N} + \sum_{j=1}^{N} S_{t+j}
\]

(11)

The relevant question that arises is what creditors expect to happen to \(B_{t+N}\) as \(N\) gets larger. Taking expectations as of time \(t\) of equation (11) and applying the limit as \(N\) goes to infinite yields, then the equation will be as in (12).

\[
B_t = \lim_{N \to \infty} E_t B_{t+N} + E_t \sum_{j=1}^{N} S_{t+j}
\]

(12)

The equation (12) implies that debt is sustainable if the transversality (no-ponzi game) condition i.e. \(\lim_{N \to \infty} E_t B_{t+N} = 0\) is satisfied. The condition can be restated as debt to be sustainable requires the government’s budget balanced in expected present-value sense\(^59\), where the current value of outstanding debt gets offset by the sum of expected discounted future primary surpluses. The version of equation (12) forms the basis for applying the empirical test which is presented in a later section.

Alternatively, according to equation (12), government’s budget is balanced in expected present-value terms, when current value of stock of debt is equal to the sum of expected discounted future primary surpluses. This is the case when

\(^{59}\)The discount factor is used to convert future expenditures and net tax receipts into their present values. The present value borrowing constraint approach does not require the government ever fully pay off the total debt. One way to satisfy the constraint is to make zero purchases/expenditures through time and simply collect taxes each period to cover interest payments on the debt. The policy leaves the stock of debt unchanged through time, but it satisfies the present value borrowing constraint, since in present value, paying interest forever is equivalent to paying off the debt immediately (Auerbach 1998).
This is the familiar 'no ponzi finance' terminal boundary condition constraining the growth of public debt in the long-run. It states that, in the long-run, the growth rate of debt-to-GDP ratio must be less than the excess of domestic real interest rate over the long-run growth rate of real GDP. If \( \lim_{N \to \infty} B_{t+1} < 0 \), it implies that the expected discounted future primary surpluses exceed the current value of stock of government debt by a certain amount, implying debt sustainability. The situation indicates that the government accumulates enough revenues to clear off its deficit in the future.

In the opposite case, \( \lim_{N \to \infty} B_{t+1} > 0 \), the current value of the government’s stock of debt exceeds expected discounted primary surpluses. This implies that the government is borrowing on a continuous basis in order to meet interest payments on its debt, which will grow, *ceteris paribus*, at the rate of interest. Such a Ponzi scheme would violate the optimality condition of debt. But, when \( \lim_{N \to \infty} B_{t+1} = 0 \), the government is asymptotically using the resources allowed by its budget constraint, no more and no less. It means the current face value of debt is no greater than the present discounted value of all future augmented primary surpluses.

### 5.3 Methodology Applied in the Literature for Assessing Sustainability

As noticed earlier, broadly there are two major approaches in the literature to ascertain fiscal sustainability, namely, (a) Accounting approach and (b) Intertemporal Budget Constraint (IBC) or Present Value Budget Constraint (PVBC)/Present Value Borrowing Constraint (PVBC) approach. Besides these two approaches, there are also various indicators to ascertain sustainability of fiscal policy for a country. Hamilton and Flavin (1986) pioneered the IBC approach to evaluate fiscal policy sustainability. Under this approach, they carried out Dickey-Fuller’s unit root test on the undiscounted value of public debt and deficit series under the assumption of a constant real rate of interest. Finding both the series stationary, the study concluded that fiscal policy was sustainable for the U.S.

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60Ponzi financing scheme means where government continually borrows just for repayment of its past loans. Ponzi finance is ruled out if the present discounted terminal value of the public debt tilts to zero, that is, if the long-run growth rate of the public debt is less than the long-run interest rate (Wilcox, 1989; Buiter, 2001).
economy. Subsequently, this prompted a series of sustainability tests, particularly for the U.S. economy. Kremers (1989) examined the mean zero stationarity of discounted public debt series for the U.S. economy during the period 1920-1985. Finding that the data followed a stationarity process until 1981, but there after is a non-stationarity process, concluded that intertemporal budget balance did hold until 1981, but there after it didn't, implying unsustainability of debt for the later period. Besides applying unit root test under the IBC approach, other studies applied test of co-integration in order to find out co-integrating relationship between public expenditure and revenue receipts, and between primary surpluses and stock of public debt for assessing sustainability. Trehan and Walsh (1991), in their study, pointed out that if primary surplus and the debt series were co-integrated, then the intertemporal budget constraint would be satisfied and this would ensure fiscal policy sustainability or public debt sustainability. Testing this proposition in U.S. context for the period 1960-84, they found that the behaviour of data ensured sustainability of fiscal policy after taking first difference of both the series. Considering the same period for U.S economy, Wilcox (1989), extended the work of Hamilton and Flavin by allowing for a stochastic interest rate and found that discounted public debt didn't follow a mean zero stationarity process. Therefore the study concluded that debt was not sustainable for the economy. The difference between both the results could be due to the differences in their methodology adopted. Bohn (1991), for examining the sustainability of public debt tested the stationarity property of debt series to see whether the series followed a mean reverting process or not.

Greiner et. al. (1999) investigated the time series property of debt series for Germany for the period 1955-1994 through the Dickey-Fuller and Flood-Garber unit root test and found that the series did not converge to its mean value. From this, their study concluded that given the present trend in the fiscal variables, the sustainability of fiscal policy for the Germany economy was not possible. Luporini (1999) analyzed the sustainability of the federal government debt in Brazil during 1966-96. Applying the standard unit root test on debt series after subtracting its mean value, he observed mixed evidence. However, dividing the original data into two sub-samples for the period 1966-80 and 1981-1996, he found that the
government fiscal policy was sustainable prior to 1980, but assumed an unsustainable path after 1980.

In another study, Uctum and Wickens (2000), examined the sustainability of fiscal policies for the E.U. countries along with the U.S. economy by applying the unit root test on the fiscal variables for the period 1965-1994. The result indicated that with an infinite horizon, there was some evidence that fiscal stance in Denmark, the Netherlands and Ireland was sustainable, while the fiscal policy in Spain, Italy, Belgium, Portugal and United States was not.

In the context of India, although there are studies which have attempted to assess sustainability of fiscal policy, very few studies have comprehensively looked at the aspect of sustainability of domestic public debt, on the basis of a component-wise analysis, as defined in the data section. The component-wise assessment of sustainability would indicate whether it is market debt or other liabilities, the continuation of which poses a threat to the sustainability and stability of fiscal policy. Gupta (1992) assessed sustainability for nine Asian countries including India, examining under the present value borrowing constraint approach/intertemporal budget constraint approach for the period 1974-84. Under the present value budget constraint approach, he employed Dickey-Fuller's unit root test to the undiscounted value of debt and deficit series (due to lack of data on the discounted values) on the hypotheses that if both the series were stationary, then it would satisfy the present value borrowing constraint, and the public debt would be sustainable, otherwise it would not be sustainable. Finding the null of non-stationarity not rejected for most of the countries, the study concluded that debt and deficits were unsustainable for most of the countries including India.

Buiter and Patel (1997) analysed debt solvency through an accounting framework. Applying the unit root test to the discounted public debt and the deficit series, they found that solvency couldn't be assured in India. But the limitation of the study is that they considered a short series for the application of unit root test of time series analysis. In fact, they had applied ADF test, the results of which cannot be much relied upon since the series consisted of less number of annual observations. But, there are also studies which have examined debt sustainability by
considering the total amount of government debt without looking into its composition.

In another study, Rajaraman and Mukhopadhaya (2000) assessed the sustainability of public debt by adopting a structural time series model (STSM). The model predicted that debt-to-GDP series in India did not follow a sustainable path. The limitation of the study lies in considering an undiscounted debt series. By taking the undiscounted debt series, they didn’t evaluate sustainability from an intertemporal budget constraint framework. Besides, applying the STSM model on the projected undiscounted debt, they could not conclude anything about the current stance of fiscal policy. Moorthy et. al. (2000), by employing Domar’s stability condition, found that market public debt was stable in India at the prevailing levels of primary deficit and monetised deficit during the period 1970-1998. The study pointed out that the potential for debt instability had arisen due to high-administered rates on non-market borrowings such as small savings and provident funds. Despite the short-run debt instability, bond-financing of deficit, i.e. the switchover to market borrowing had not led to debt trap situation. Rangarajan et. al. (2003) applying the same method found that during 2000-2003 an excess of interest rate over growth rate led to a rise in debt-to-GDP in India. However, the limitation of their study lies in the stability test, which cannot guarantee sustainability of debt. For example, at a primary deficit of 5 percentage of gdp, the debt may be stable or constant but that particular level of deficit may not ensure sustainability of public debt. Further, the period over which it is constant has to be taken into account. And mere comparison of rate of interest rate with growth rate does not ensure sustainability of public debt, rather it will be sensible to compare the growth rate of debt with the growth rate of the economy. It is the level of debt which matters more than the rate of interest in the economy.

The debt sustainability is analysed under both the approaches. The solvency condition under the PVBC approach is stronger than the stability condition under the accounting approach. The solvency condition points out that debt to be sustainable, the discounted value of debt should approach to zero as time approaches to infinite. In other words, the rate of growth of debt should be less than the rate of interest charged on government debt. If this condition holds, the present vale of borrowing
constraint would be satisfied. This can be examined by applying a standard econometric approach. Before empirically examining the issue, let’s now define the components of debt and other related data required in order to assess sustainability of domestic debt under both the approaches.

5.4 Data Description

The data set required for testing the sustainability of domestic public debt is considered over the period from 1960-2000. By dividing the data on aggregate domestic debt into different components, the study tries to assess which component of domestic debt is more vulnerable towards sustainability of current fiscal policy. The data on domestic debt broadly comprises two components: (a) loans raised from the market and, small savings and provident funds raised from the public account {the latter being the principal constituent of other liabilities (PAL)} together constituting the public debt of the central government and (b) other components of ‘other liabilities’ such as reserve funds and other deposits (other than small savings and provident funds) which comprise intergovernmental loans and a minor portion of which is from public. Making a division in the latter component on the basis of loans raised from the public and loans raised from the governmental departments is an arduous task. With a view to getting a clear picture on the components of domestic debt (which one is more vulnerable for the fiscal policy sustainability), the study has made four categories of domestic debt series for the central government out of the above two: (a) market loans and bonds (b) market loans and bonds from consolidated funds plus small savings and provident funds raised from the public account, (c) other components of other liabilities exclusive of small savings and provident funds, (d) total domestic debt which is defined as public debt plus other constituents of other liabilities exclusive of borrowings (ways and means advances and floating loans) from the RBI and (e) total domestic debt exclusive of small savings and borrowings in the form of ways and means advances from the RBI. All the data relating to debt components has been collected from “Long-term fiscal trends in India 1950-51 to 2000-2001: a conspectus”, National Institute of Public Finance and Policy (Jan, 2002); and GDP at market prices is collected from National Accounts Statistics of India 1950-51 to 2000-01, Economic and Political Weekly (EPW) Research Foundation.
The ways and means advances from the RBI as a liability component to the central government does not pose much problem for the unsustainability of fiscal policy for the reasons cited above. Further, with the withdrawal of ad-hoc treasury bills from the year 1997-98, the volume has come down drastically; rather its substitution can make other components of debt unsustainable. This liability is intragovernmental in nature. To the extent that its volume increases it reduces the real primary deficit as it gives rise to accretion of seigniorage revenue to the government. The important point to keep in mind is that the study has defined (in the preceding Chapter 3 & 4) credit from the RBI to the central government as a constituent of domestic debt of the centre. But there is a division of opinion among the economists in India as to consider the monetization of debt as a component of debt or not. According to some economists, since it gives rise to seigniorage revenue, the inclusion of seigniorage revenue would eliminate this part of debt from the total debt components in the government budget constraint. Following this line of argument, economists view that the increase in monetized debt does not constitute a debt, because many a time government does not return the funds to the central bank as it is a government entity and the government just continues to roll over the debt. This means the government incurs fresh borrowings just for paying off old debts. Hence, this component of domestic debt does not involve any burden on the part of the central government, rather constitutes a part of revenue. Its increase escalates price level, thereby reducing the real value of other debt components. Chelliah (1991), for instance, views that although the government does not return the principal amount, pays the interest burden on it. The interest payment paid to the RBI comes back to the government in the form of dividends. The interest liability arising on RBI’s lending to the government gets compensated by the decrease in real value of other components of domestic debt. As such this should not constitute a component of domestic debt of the central government. Thus, the study does not include it as a debt component especially while examining sustainability of debt.

Under the present value of borrowing constraint approach, one needs to consider the appropriate rates of interest as one of the components in the discounting factor in deriving the present value of debt-to-GDP ratio. There are various rates of interest which vary according to the length of their maturity period.
Which rate of interest to be chosen is crucial in assessing sustainability, as the variations in rates of interest may be sensitive to empirical results. Although there are various rates of interest, to minimize the bias, the study has chosen weighted average real market rates of interest, and the average real rates of interest on small savings and provident funds as the two real rates of interest for applying the discounting technique on market debt and on small savings and provident funds respectively. The average of both weighted interest rate on market loans and average rate of interest on small savings is taken to be the rate representing the rate of interest on the sum of market borrowings, small savings and provident funds. But for other components of 'other domestic liabilities' (which is defined as other liabilities exclusive of small savings and provident funds), the study considers the effective rates of interest as the appropriate discounting component in the discounting factor in the context of unavailability of appropriate rates of interest on those components of domestic debt. Economists suggest that the respective rates of interest on government bonds and loans should be considered while discounting different components of debt. Although there are difficulties with the effective rates of interest as they do not take into account the influence of maturity structure on the cost of borrowings, but this is perceived to be a better proxy in the context of unavailability of interest rates on such liabilities. Hence, it is justifiable to discount the other liabilities by the effective rates of interest. To discount the aggregate domestic debt, the same effective rate of interest is also considered for discounting the aggregate domestic debt. Rajaraman et al. (2000) while applying Domar’s cross over formula, have also considered the weighted average of interest rate by defining it as the sum of interest payments by the government in each year divided by aggregate value of debt outstanding at the beginning of respective years so as to compare with the growth rate of the economy in each year.

The problem of effective rates of interest arises on account of the fact that it is difficult to collect data on how much interest payment the government incurs in different years rather than what the government actually pays. A government may

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61 Here, we make a distinction between the discounting component and discounting factor. Discounting components include real interest rates and real growth rates while the discounting factor is the formula applied to compute the discounted debt series.

62 The effective rate of interest is defined as the total interest payment by the central government in period t divided by the total aggregate domestic debt of the central government at the end of the period (t-1).
default in repaying the interest liability on its debt as per maturity. However, the study has considered the rates of interest on respective components of debt along with effective rates of interest on other components of other liabilities exclusive of small savings and provident funds as well as on aggregate domestic debt exclusive of RBI credit since it is difficult to get appropriate rates of interest for discounting these components of debt.

The rates of interest which are used for discounting debt components under the present value budget constraint approach, are also considered for the comparison of rates of interest with the growth rate of economy under the accounting approach to sustainability. The data on rates of interest is collected from various issues of RBI Bulletins and Report on Currency and Finance, Reserve Bank of India (RBI) and the "Handbook of Statistics on the Indian Economy (2004)" published by the RBI. The data on domestic public debt is taken from reports of Ministry of Finance. Let's examine the results under different approaches to sustainability.

5.5 Assessment of Sustainability Under the Accounting Approach
The assessment of sustainability of domestic debt under the accounting approach is examined as follows. The statistics computed under this framework involves a comparison between real rates of interest and the real growth rate of GDP which is presented in Table 5.2. Given the fact that taxable interest earnings of the individuals and commercial banks actually flow back to the government, economists, while assessing sustainability under this approach, usually suggest comparing the net-of-tax real rate of interest with the real growth rate of GDP. If all the interest income denoted by (R) is taxed at the rate of t, then, after-tax, the remaining interest income will be R(1-t). The rate of interest calculated thereon is relevant for comparison with the growth rate of the economy in assessing sustainability. Further, given the limited information on the identity of government security holders and the frequent changes in the tax policy, there is no straightforward method to calculate the real interest rate net-of-taxes on government securities. Obtaining data on net-of-tax yield on government securities is a complex task. For India, it is empirically permissible to ignore the tax rate on
interest earnings since the bulk of interest income is untaxed, and there are schemes under which those who hold their savings in the form of small savings, are not liable to pay taxes on their interest earnings, rather are exempted from income tax. Most of the government bonds are held by commercial banks and other non-banking financial institutions, the bulk of whose interest income are exempted from imposition of taxes (Moorthy et. al, 2000). Therefore, the real rate of interest not accounted for taxes is opted to be the rate to be compared with the real growth rate of the economy under the accounting approach. Since the data relating to the rate of interest on other components of ‘other liabilities’ excluding small savings (SS) and provident funds (PF), is not available, the effective real rate of interest is considered to represent the rates of interest on other components of ‘other liabilities’ other than small savings and provident funds and the same effective rate of interest is taken to represent the rates of interest on total domestic debt of the central government exclusive of borrowings from the central bank. The real rate of interest is computed by subtracting the inflation rate (derived from the rate of growth of GDP deflator) from the nominal rate of interest. With this, a comparison between the rates of interest with the growth rate of the economy is presented in Table 5.2.

Comparison between the growth rate of GDP and rates of interest on different components of debt shows that all the components of domestic debt taken separately, as well as the aggregate domestic debt exclusive of ways and means advances of RBI to the central government, are always sustainable as the real growth rate of GDP exceeds the weighted real rate of interest on market loans, the average real rates of interest on small savings and provident funds and the effective real rates of interest. The growth rate of GDP also exceeds the average of all these three rates of interest which can be taken to represent the rate of interest on the aggregate domestic debt exclusive of the advances from the RBI. But the question that arises here is, in spite of fulfillment of the basic condition of debt sustainability i.e real growth rate of GDP exceeding the real rates of interest, why the debt is found still at a higher level? Perhaps it depicts an unsustainable fiscal position of the central government. This is because of the fact that although the difference between the growth rate of GDP and rate of interest tends to put downward pressure on the past debt-to-GDP ratio, the increase in primary deficit and the
resultant increase in fresh borrowings have forced the domestic debt to be at a higher level. The accumulation of debt has taken place by repressing the rate of interest to a lower level. As a result, this has led to a rise in primary deficit-to-GDP ratio and high level of aggregate domestic debt-to-GDP ratio. This implies that the steady state condition as assumed by this approach does not hold in the context of India. So this indicates that it is the growth rate of debt which is more important for the analysis of sustainability than simply the rates of interest on government borrowings. Under a situation where rate of interest continues to be at a lower level than the growth rate of gdp, and when debt-to-GDP ratio is prevailing at a higher level, a mere comparison of growth rate with the rate of interest does make little sense.

However, it is meaningful to compare the growth rate of the economy with the growth rate of domestic debt. In Table 5.2, it can be observed that if one compares the real growth rates of domestic debt with the real growth rate of the economy, the overall or aggregate real growth rate of debt exceeds the real growth rate of the economy in each period from 1975-80 to 1990-00, except for first half of the 1990s. This indicates that public debt has become unsustainable over a long-run as it is growing up at a higher rate without effective control of the underlying fiscal parameter. For the domestic public debt to be sustainable over the long run, the level of debt-to-GDP ratio requires to be controlled from its steadily increasing path. On the other hand, if one takes a look at the component-wise real growth rates of domestic debt, market debt in the later half of 1990s, becomes more unsustainable and thereby makes the aggregate domestic debt exclusive of debt from the RBI unsustainable, while the growth rate of other liabilities registers a markedly declining trend and is less than the growth rate of real GDP of the economy. This is due to less reliance of the central government on the other liability component of domestic debt. The pressure on market debt increases at the cost of reduction in the ways and means advances of the RBI and other liabilities. The ‘other liabilities’ exclusive of small savings and provident funds (which are found at a high level from the 1975 till 1995) declines in the latter half of the 1990s. But again, even the growth rate of debt ruling below the growth rate of GDP is not a strong condition for sustainability, because corresponding to the low growth rate of aggregate domestic debt in the early 1990s (see Table 5.2), the debt-to-GDP ratio prevails at a
higher level (see Table 5.1). Rather, the ratio of debt-to-GDP itself could indicate unsustainability of debt, while the growth rate shows the debt to be sustainable. Further, when the total domestic debt-to-GDP ratio declines, the growth rate indicator shows that it becomes unsustainable. Hence, this method of evaluating sustainability also suffers from certain drawbacks.

In order to examine this, one needs to look at both the level of debt-to-GDP ratio as well as its growth rate over time. This can be examined under the present value budget constraint approach. This approach to sustainability puts a stronger condition of debt sustainability on the trend path of level of debt-to-GDP ratio as well as the growth rate of debt. This approach explains that debt to be sustainable discounted debt-to-GDP ratio either should tend toward zero or maintain a constant path over time. Otherwise the ratio would explode over time and make the debt level unsustainable. The approach, on the assumption of a given current trend path of fiscal variables, examines the future course of fiscal policy (to be sustainable or unsustainable).

Table 5.2: Assessment of Sustainability Through Accounting Approach

(5 Yearly Averages)

<table>
<thead>
<tr>
<th>Years</th>
<th>Growth rate of RGDP at MP</th>
<th>Growth rate of real market debt</th>
<th>Growth rate of real market debt &amp; SS+PF</th>
<th>Growth rate of real other liabilities exclusive of SS &amp; PF</th>
<th>Growth rate of real SS &amp; PF</th>
<th>Growth rate of real market debt plus aggregate other liabilities</th>
<th>Real primary deficit /RGDP (%)</th>
<th>Real weighted market rates of interest</th>
<th>Real average rates on SS &amp; PF</th>
<th>Real effective interest rates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1961-65</td>
<td>4.81</td>
<td>-0.04</td>
<td>1.15</td>
<td>0.00</td>
<td>2.72</td>
<td>1.15</td>
<td>2.86</td>
<td>-1.76</td>
<td>-1.63</td>
<td>-2.36</td>
</tr>
<tr>
<td>1965-70</td>
<td>2.79</td>
<td>-1.90</td>
<td>-2.91</td>
<td>22.77</td>
<td>-4.62</td>
<td>-0.44</td>
<td>1.25</td>
<td>-2.87</td>
<td>-2.85</td>
<td>-3.30</td>
</tr>
<tr>
<td>1970-75</td>
<td>2.05</td>
<td>-1.93</td>
<td>-0.76</td>
<td>8.97</td>
<td>0.77</td>
<td>1.28</td>
<td>1.90</td>
<td>-5.09</td>
<td>-5.62</td>
<td>-6.00</td>
</tr>
<tr>
<td>1975-80</td>
<td>3.34</td>
<td>8.82</td>
<td>7.93</td>
<td>-61.81</td>
<td>6.72</td>
<td>8.04</td>
<td>2.69</td>
<td>0.77</td>
<td>1.38</td>
<td>0.39</td>
</tr>
<tr>
<td>1980-85</td>
<td>5.27</td>
<td>10.97</td>
<td>9.76</td>
<td>8.91</td>
<td>7.54</td>
<td>9.69</td>
<td>4.01</td>
<td>-0.77</td>
<td>-0.83</td>
<td>-2.60</td>
</tr>
<tr>
<td>1985-90</td>
<td>5.81</td>
<td>11.14</td>
<td>10.90</td>
<td>13.96</td>
<td>8.58</td>
<td>11.78</td>
<td>4.66</td>
<td>3.36</td>
<td>2.06</td>
<td>-0.40</td>
</tr>
<tr>
<td>1990-95</td>
<td>4.62</td>
<td>3.70</td>
<td>4.01</td>
<td>4.52</td>
<td>4.42</td>
<td>4.17</td>
<td>2.17</td>
<td>1.59</td>
<td>1.19</td>
<td>-1.47</td>
</tr>
<tr>
<td>1995-00</td>
<td>6.08</td>
<td>14.92</td>
<td>10.11</td>
<td>2.63</td>
<td>-39.42</td>
<td>8.45</td>
<td>1.14</td>
<td>5.76</td>
<td>5.32</td>
<td>3.22</td>
</tr>
</tbody>
</table>

Note: SS and PF represent small savings and provident funds respectively, and RGDP indicates real GDP. Market debt comprises loans and bonds from the market. All the numerical values in the above table are in real terms. *Source: The statistics in the above table are computed by using the data from 'Long Term Fiscal Trends in India 1950-51-to 2000-2001: A Conspectus', NIPFP (2002) and Handbook of Statistics on the Indian Economy (2003-04), and Various Issues of RBI Bulletins and Reports on Currency & Finance, RBI.*

On the basis of accounting approach to debt sustainability, many economists such as Gupta (1992) and Moorthy et al. (2000), generalize that public debt is sustainable as the rate of growth of the economy exceeds the rate of interest on public debt, but as it is observed from the above data, this criterion has got limited
relevance in the Indian context as it assumes that debt grows at the rate of interest rates. Further, it does not recognize the fact that it is the growth rate of debt which keeps the debt level at a higher level than the rate of interest as long as the growth rate of debt exceeds the rate of interest on public debt. The growth rate of public debt, *ceteris paribus*, changes in accordance with fresh creation and repayment of debts. Further, it is not only the growth rate of debt but also the level at which grows is important. The argument against the application of this condition of debt sustainability is that keeping the rate of interest artificially at a lower level, the government goes on accumulating more and more borrowings under the controlled interest rate regime. This also holds true under a market determined financial regime, as the rate of interest does not increase rather falls in certain years. In this context, the level of higher borrowing itself may indicate an unsustainable fiscal position rather than a mere comparison of rate of interest with the growth rate of the economy. Nevertheless, this serves as a basic criterion in the context of the rate of interest being higher than the growth rate of the economy. Furthermore, there are varied rates of interest which vary according to the maturity structure of debt. But due to the complexities involved in getting the data on various rates of interest (based on their maturity structure), it makes the comparison more tedious. For this reason the simpler procedure economists adopt is to look at the market rates of interest with the growth rate of the economy without taking into consideration the maturity structure of public debt. Under this situation, it makes more sense to make a comparison between the growth rate of debt and the growth rate of the economy as the growth rate of debt is supposed to take care of the rate of interest on public debt irrespective of its maturity structure. Further, both the conditions avoid giving a complete indication on debt sustainability. These criteria obscure the present stance of fiscal policy. The comparison between the growth rate of debt with growth rate of the economy as observed does not take into account the level of debt. The rates of interest and the growth rate of debt may be below the growth rate of the economy but it is the level of debt ultimately, which matters most for the sustenance of fiscal policy. Therefore, there is no doubt that the comparison of growth rate of the economy with rate of interest and the growth rate of debt, over time, can serve as a basic conditions of debt sustainability, but an alternative method devised in the literature called the present value budget constraint approach puts a strong condition of debt sustainability by putting constraint on the
trends of present value of public debt. Although it is not an easy task to develop a strong condition of debt sustainability, it is meaningful to assess sustainability by considering a relatively stronger condition of sustainability than the stability condition under the accounting approach. On this basis, solvency or transversality/intertemporal condition under PVBC approach does deserve some merit. As the condition under this approach is clearly laid down in the analytical framework, let us examine the empirical results under this approach.

5.6 Assessment of Sustainability Under the Present Value of Budget Constraint (PVBC) Approach: An Application of Time Series Econometric Method

In order to examine sustainability of domestic debt, standard econometric tool is applied under the present value budget constraint approach (PVBC). As already explained, the present value budget constraint explains that domestic debt of the central government would be sustainable provided the current outstanding level of debt is equal to the present value of primary surpluses in the future. This means if primary surpluses can be generated to an equivalent amount of current value of stock of government debt, the debt and the fiscal policy are said to be sustainable. Alternatively, the condition implies that the primary surpluses would accrue to the government for ensuring sustainability provided the present value of public debt in the future can tend toward zero or remain constant over an infinite period of time. This is called stability condition under the present value budget constraint approach. This is the case when $\lim_{N \to \infty} B_{1+N} = 0$ in the equation (12). The approach enables one to know whether the current policy of the government is in line with a sustainable fiscal policy.

To assess the sustainability of domestic debt of the central government, the study along with examining different components of discounted value of domestic debt, examines the discounted value of aggregate domestic debt of the central government exclusive of RBI ways and means advances to the central government in relation to the GDP. The series include discounted value of (a) market debt, (b)

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63Primary balance could act as insurance against future unpredictable shocks. An adequate primary surplus would facilitate attaining a virtuous circle of debt reduction, lower interest rates, higher investment and growth. Growth is crucial for the sustainability of public debt (The World Bank, 2004).
market borrowings plus small savings and provident funds, (c) other liabilities other than small savings and provident funds, and (d) total domestic debt of the central government exclusive of RBI’s ways and means advances to the central government, in relation to the level of GDP.

The real rate of interest and growth rates actually experienced in the economy over the years has been considered for discounting the real value of debt-to-real gross domestic product (RGDP) series. This provides computed present value of real domestic debt-to-RGDP ratio. The discounting technique adopted is in line with the one proposed by Wilcox (1989). This is also inherent in the intertemporal budget constraint equation presented above. The discounting technique can explicitly be expressed in the following form.

Let \( \alpha = (r - \eta) \) and rewriting equation (7) we get (13):

\[
b_t = -s_t + (1 + \alpha_{t-1})b_{t-1}
\]

Define \( Q_t = \prod_{j=0}^{N-1} (1 + \alpha_j)^{-1}; Q_0 = 1 \). Multiplying equation (13) throughout by \( Q_t \) gives:

\[
Q_t b_t = Q_{t-1} b_{t-1} - Q_t s_t
\]

Let \( B_t \) be the discounted value of the domestic public debt and \( S_t \) the discounted value of primary surpluses. Then (14) can be expressed as in (15):

\[
B_t = B_{t-1} - S_t
\]

The budget constraint now involves the market value of the government debt, which is expressed in terms of its present value. Equation (15) implies that the change in the discounted value of the debt equals the discounted value of the non-interest deficit. Applying the recursive forward substitution into equation (15) and applying the limit as \( N \) tends to infinite, it yields the previous equation (12) as in (16).

\[
B_t = \lim_{N \to \infty} E_t B_{t+N} + E_t \sum_{j=1}^{N} S_{t+j}
\]

As mentioned above, a sustainable level of debt is defined as a level of real value of government debt as a ratio to RGDP backed by future real primary surpluses to
RGDP ratio of equal present value, \( B_t = E \sum_{j=1}^{N} S_{t+j} \). Alternatively, according to equation (16), the \( \lim_{N \to \infty} B_{t+N} \) must be zero. Buiter and Patel (1997) and Uctum and Wickens (1996) show that the condition \( \lim_{N \to \infty} B_{t+N} = 0 \) is equivalent to the proposition that \( B_t \) follows a stationary path. Testing for the unconditional-mean stationarity of the discounted debt series does not exclude the case where the government is accumulating primary surpluses causing the debt to fall. Therefore, the study, in order to gauge sustainability of debt in India, adopts the standard econometric techniques of unit root test to detect stationarity of the series.

In order to test the stationarity of debt series, at first, three conventional unit root tests viz. Dickey-Fuller (DF), the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) have been applied. Though Dickey-fuller test is applied first, the main advantage of using Augmented Dickey–Fuller test later over the Dickey-Fuller test is that the inclusion of higher order lagged variables in the estimation avoids the problem of serial correlation of the disturbance term in the regression. Dickey and Fuller (1979) suggested that the following equation could be estimated by Ordinary Least Square (OLS) to test the presence of a unit root in a series. Let the series be indicated by the term \( B_t \). Thus, the estimable equation under the DF test can be written in the following form assuming that the second term in the right hand side is zero.

\[
\Delta B_t = \gamma_0 B_{t-1} + \sum_{j=1}^{\delta} \gamma_j \Delta B_{t-j} + \xi_t
\]

The Dickey-Fuller (DF) test for unit root consists of testing whether coefficient on \( B_{t-1} \) is zero. Under the null \( H_0 : \gamma_0 = (\rho - 1)=0 \), the series \( B_t \) contains a unit root and therefore is non-stationary. Under the alternative \( H_1 : \gamma_0 < 0 \), the series is stationary. The Augmented Dickey-Fuller (ADF) test can be performed on the same equation only by adding the lagged differenced terms of the same series i.e. by relaxing the assumption that the second lagged term in the right hand side of the equation is zero. The number of lagged differenced terms of a series is added until the autocorrelation problem gets corrected in the estimation. The lag is determined by AIC criterion. Along with employing Augmented Dickey-Fuller unit root test, Phillips-Perron (PP)'s unit root test is also conducted on the same ADF equation.
The PP test corrects the autocorrelation and heteroscedasticity by correcting the t-statistic of the covariance of error terms in the estimated regression and t-statistics of $B_{t-1}$ term (see Eviews 4.0 package). As a confirmatory test, Kwiatkowski, Phillips, Schmidt and Shin (1992) unit root test which is popularly known as KPSS test is also carried out. The null of KPSS test is stationarity as opposed to the non-stationarity of all the standard testing procedures mentioned.64

5.7 Empirical Result:
The estimation is carried out using Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests allowing for two variations: one without trend and the other with trend. Using the P-value provided by Dickey-Fuller's (1979) significance table, the study evaluates the null hypothesis of unit root. If the null hypothesis is rejected, domestic public debt is sustainable otherwise it is unsustainable.

The unit root tests such as DF (1979), ADF and PP (1988) tests carried out on the discounted value of real market debt to RGDP (RMB), discounted value of real market debt plus small savings and provident funds-to-RGDP ratio (RMBSFP)65, discounted value of real market borrowings and provident funds-to-RGDP ratio (MRBPF)66, discounted value of real total domestic debt exclusive of small savings and ways and means advance of RBI-to-RGDP ratio (denoted as RMBOLEXSS), discounted value of real other liabilities other than SS and PF-to-RGDP ratio (denoted as RMBOLEXSPF) and discounted value of real total domestic debt-to-

64 The KPSS unit root test is based on the assumption that a time series $y_i$ is the sum of a deterministic trend $t$, a random walk $r_t$ and a stationary error $e_t$: $y_i = x_i + r_t + e_t$. The random walk is $r_t = r_{t-1} + u_t$ where $u_t$ are iid $(0,\sigma^2_u)$. In this framework, for the null hypothesis that $y_t$ is trend stationary to be true, the variance of the random walk component, $\sigma^2_u$, should be equal to zero. Testing of the null hypothesis that $y_t$ is stationary around a level, is carried out by omitting the time trend. The test statistic is defined as:

$$\hat{\eta} = T^2 \sum_{t=1}^{T} \frac{S_t^2}{s^2(t)}$$

where $T$ is the sample size, $S_t$ is the sum of the residuals when the series is regressed on an intercept and a time trend, and $s^2(t)$ is a consistent non-parametric estimate of the long-run variance of the error term. Critical values for the KPSS test, $n$, without a trend ($n_0$) or with a trend ($n_1$) are found in Kwiatkowski et al. (1992). We calculate the KPSS test statistics using a number of 3 lags, $l$, in the estimation of the long-run variance of residuals, on the basis of the Kwiatkowski et al. (1992, page 174) criterion of choosing $l$ at the value at which the test statistic settles down.

65 The small savings (SS) and provident funds (PF) are clubbed with market debt as there is a drastic reduction in reliance on small savings and public provident funds of the central government in 1999-00. Otherwise, it wouldn't make sense to apply unit root test on small savings and provident funds.

66 This excludes small savings because the state governments account for a major portion of this fund from the centre and are statutorily required to return this amount to the central government with the interest charges thereon.
RGDP ratio (denoted as RMBOL which is exclusive of ways and means advances of RBI to the central government) are reported in Table 5.3.

The tests clearly indicate that there is presence of unit roots in all the series. The result shows that the statistics of coefficients of all the discounted real value of debt-to-RGDP series are positive. This implies that autoregressive coefficient $\delta = (\rho - 1)$ is positive with all debt series. A positive $\delta$ implies that $\rho$ is greater than one. This implies that all the debt series including aggregate domestic debt are explosive. They are not converging to their mean value. The usual testing of null hypothesis under the critical value is not applicable. The positive sign of statistics provides sufficient proof that the debt series are non-stationary and therefore all the components of domestic debt including the aggregate domestic debt exclusive of debt from RBI have become unsustainable.  

**Table 5.3: Unit Root Test Results on Various Components of Discounted Value of Real Domestic Debt of the Central Government to RGDP Series**

| Real Debt-to-RGDP Variables | Without Trend | | | |
|-----------------------------|--------------|--------------|--------------|
|                            | DF           | ADF          | PP           |
| RMB                         | 3.80         | 2.79(1)      | 3.67(1)      |
| RMBSPF                      | 4.91         | 3.25(1)      | 4.66(1)      |
| RMBPF                       | 3.66         | 2.68(1)      | 3.53(1)      |
| RMBOL                       | 5.75         | 3.42(1)      | 5.40(1)      |
| RMBOLEXSS                   | 4.58         | 3.49(1)      | 4.57(1)      |
| ROLEXSSPF                   | 2.74         | 1.53(1)      | 2.38(1)      |

**Note:** The figures in the table are the computed ADF statistics. The comparison between computed statistics and tabulated critical values are not relevant here. The positive statistics provides ample evidence of explosive behaviour of all the discounted real debt-to-RGDP ratio series. The figures in parentheses under ADF column represent the number of lagged differenced term included with the DF regression while under PP column it represents the truncation lag. The lag for the ADF test is determined on the basis of Akaike Information Criterion (AIC). The exclusion of constant and trend term is determined on the basis of t-statistics according to their conventional significance level.

In order to confirm the above results, the Kwiatkowski, Phillips, Schmidt and Shin (KPSS) unit root test is further employed. The results presented in Table 5.4 show that with a truncation lag of 3, the test rejects the null hypothesis of stationarity in all of the cases as the calculated statistics exceeds the critical

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67 The aggregate domestic debt exclusive of the borrowings from RBI, discounted with respect to the average of all three interest rates weighted average rate of interest on market debt, average rates of interest on small savings and provident funds, and effective rates of interest on other components of other liabilities also yielded the presence of unit root in the series.
values. This strengthens the previous results obtained by using DF, ADF and PP tests without the inclusion of trend in the estimating regression equation. This confirms that none of the components of domestic debt are stationary when tests are carried out with or without the inclusion of trend in KPSS test.

Table 5.4: KPSS Unit Root Test for Different Components of Discounted Real Domestic Debt/RGDP Series

<table>
<thead>
<tr>
<th>Real Debt-to-RGDP Variables</th>
<th>Lags</th>
<th>ETA (mu)</th>
<th>ETA (Tau)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RMB</td>
<td>3</td>
<td>1.035</td>
<td>0.256</td>
</tr>
<tr>
<td>RMBSPF</td>
<td>3</td>
<td>1.031</td>
<td>0.256</td>
</tr>
<tr>
<td>RMBPF</td>
<td>3</td>
<td>1.037</td>
<td>0.251</td>
</tr>
<tr>
<td>RMBOL</td>
<td>3</td>
<td>1.012</td>
<td>0.270</td>
</tr>
<tr>
<td>RMBOLEXSS</td>
<td>3</td>
<td>1.019</td>
<td>0.271</td>
</tr>
<tr>
<td>ROLEXSSPF</td>
<td>3</td>
<td>0.975</td>
<td>0.253</td>
</tr>
</tbody>
</table>

Note: The critical values at 5% level of significance are .463 for ETA (mu) and .146 for ETA (tau).

The overall result from the above unit root tests suggests that none of the components in the aggregate domestic debt excluding government borrowings from the Reserve Bank of India (RBI), and the aggregate domestic debt exclusive of the borrowings from RBI is stationary implying the unsustainability of domestic public debt and hence unsustainability of fiscal policy of the central government in India.

5.8 An Evaluation of Targets of FRBM Bill: An Arithmetic Calibration of Domestic Debt Stability

This section calibrates a stability condition of debt in line with Domar’s formula in order to verify the consistency of fiscal targets with the economic growth rate of India. The application of the stability condition suggests that the following (see Annexure 5.1) would hold in India. Assuming that there is no money-financing of deficits as monetised deficit (m) is abolished, the following possibilities shown in Table 5.5 may hold for the central government in India. Assuming a nominal growth rate of the economy (n) at 16 per cent, in the event of the domestic debt-to-GDP (b) stabilising at 45 per cent, the fiscal deficit would shoot up to the extent of 7.2 per cent of GDP. With the same 16 per cent nominal growth rate, debt-to-GDP ratio can get stabilized at 50 per cent, while the deficit-to-GDP ratio (d) would tend to 8

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68 For lower values of truncation lag, the test has good power even for small samples.
per cent. But this target would be unsustainable for India as evidenced from the above empirical test.

The debt-to-GDP ratio would get stabilized at 45 per cent even with a deficit limit of 2 per cent of GDP as per the target set in FRBM bill, but the nominal growth rate would tend to prevail at 4.44 per cent (see Table 5.5). Similarly, with a fiscal deficit of 3 per cent of GDP, debt-to-GDP in order to get stabilized at 50 per cent, the nominal growth rate would tend to attain 6 per cent. This implies that given a higher level of debt-to-GDP ratio, the target for lowering the fiscal deficit-to-GDP ratio could be achieved at the cost of the growth rate of the economy.

The growth rate of 16 per cent could also be consistent with a deficit-to-GDP ratio of 2 per cent and debt-to-GDP ratio of 12.5 per cent. The same rate of growth of 16 per cent could also be achieved when the debt-to-GDP ratio would stabilize at 50 per cent with a deficit to GDP ratio of 3 per cent. This implies 16 per cent rate of growth in the economy could be achieved by reducing aggregate government debt as well as deficits, both as a percentage to GDP.

**Table 5.5 Stability of Domestic Debt Consistent with Different Growth Rates and Fiscal Indicators of the Economy**

<table>
<thead>
<tr>
<th>b=B/Y</th>
<th>η=ΔY/Y</th>
<th>d=D/Y</th>
</tr>
</thead>
<tbody>
<tr>
<td>45</td>
<td>16</td>
<td>7.2</td>
</tr>
<tr>
<td>50</td>
<td>16</td>
<td>8</td>
</tr>
<tr>
<td>45</td>
<td>4.44</td>
<td>2</td>
</tr>
<tr>
<td>50</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>45</td>
<td>10</td>
<td>4.5</td>
</tr>
<tr>
<td>50</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>45</td>
<td>18</td>
<td>8.1</td>
</tr>
<tr>
<td>50</td>
<td>18</td>
<td>9</td>
</tr>
<tr>
<td>12.5</td>
<td>16</td>
<td>2</td>
</tr>
<tr>
<td>18.75</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>11.11</td>
<td>18</td>
<td>2</td>
</tr>
<tr>
<td>16.67</td>
<td>18</td>
<td>3</td>
</tr>
</tbody>
</table>
If deficit-to-GDP ratio can be contained at 3 per cent, then with a growth rate of 18 per cent, the debt-to-GDP ratio would get down to as low as 16.67 per cent. With the same rate of growth of 18 per cent, debt-to-GDP would come down to 11.11 per cent if the deficit-to-GDP ratio is brought down to 2 per cent of GDP. This reflects various possible targets of fiscal policy which are compatible with different GDP growth rates. In accordance with the expansion and contraction of GDP growth rates, the flexibility and pressure of fiscal restraints are realized in the economy. Given a higher growth rate of the economy, debt can be stabilized at a lower level in proportion to GDP. Thus, the performance of the economy greatly determines the feasible targets of the fiscal policy. Given the above scenario, it seems that the FRBMB is inconsistent in setting its targets.

5.9 Summary and Conclusion
To sum up, examination of sustainability of domestic debt through the accounting approach suggests that all the components of domestic debt as well as the aggregate domestic debt of the central government exclusive of borrowings from RBI are sustainable. In contrast to results under accounting approach, an econometric application under present value budget constraint (PVBC) approach presents opposite results. The standard unit root tests for evaluating sustainability under the PVBC approach suggest that none of the components of domestic debt including aggregate domestic debt of the central government exclusive of borrowings from RBI is sustainable. The results confirm the findings of Buiter and Patel (1992) and Rajaraman et. al. (2000). Hence, the results reinforce the evidence that aggregate domestic debt is unsustainable.

The results differ under different approaches depending upon whether it is accounting approach or PVBC approach. This may put one in a little dilemma as to assess the sustainability of domestic debt of the central government and the sustainability of fiscal policy in India. Since the present value budget constraint approach takes into account the level of debt as well as the growth rates of domestic debt into account in assessing sustainability, this seems to be a more convincing and stronger approach than the accounting approach. On the basis of present value borrowing constraint approach to debt sustainability, the study concludes that the aggregate domestic debt is unsustainable in India and the
government has to be very cautious in exercising its fiscal policies in the future. If the government continuously breaches the intertemporal budget constraint, it would face a catastrophic situation in the future. The study suggests that it is the pattern of fiscal deficits that the government has to worry about. The pattern has resulted in an increase in the overall government debt-to-GDP ratio and interest payment-to-GDP ratio over the decades. The study does not suggest compromising on the total expenditure of the government or raising tax rates excessively to achieve fiscal policy sustainability, but what the government needs to do is that it has to allocate the resources to productive channels which would give rise to desirable returns for meeting desirable expenditure. Expenditure on productive lines would not only give rise to direct returns but also expand the GDP of the economy. An increased GDP can raise the revenue of the government in the form of more taxes as with a rise in GDP of the economy, the tax base of the economy would expand. This would help the government manage its fiscal policy in a more flexible economic environment. However, the stability calibration shows that the central government does not have to worry about the stability of fiscal policy, provided the growth rate is maintained at a higher level. The aggregate public debt to be sustainable, the government has to drastically reduce the deficits and debt level, which in turn may lead to higher growth rate in the economy. India should not aim at expenditure compression but rather should concentrate on expenditure management to ensure that there is reduction in obligatory expenditure and that there is a rise in productive expenditure. The productive investment of government expenditures can achieve higher growth rate target in the economy.

Figure 5.1: Behaviour of Discounted Real Value of Domestic Debt-to-RGDP Ratio

![Figure 5.1: Behaviour of Discounted Real Value of Domestic Debt-to-RGDP Ratio](image-url)
Annexure-5.1 Arithmetic of Debt Stability

\[ D = E - R = \Delta B + \Delta M \] and, \[ D = \Delta B \text{ when } \Delta M = 0; \]

\[ B = \frac{B}{Y}, \quad B = bY \]

\[ \Delta B = b \cdot \Delta Y + Y \cdot \Delta b \]

Dividing \( Y \) throughout the above equation, it would yield;

\[ \frac{\Delta B}{Y} = b \cdot \frac{\Delta Y}{Y} + \frac{Y}{Y} \cdot \Delta b \]

\[ \frac{\Delta B}{Y} = b \cdot \eta + \Delta b \]

\[ \frac{\Delta B}{Y} = \frac{D}{Y} = d; \quad \Delta B = D; \quad \Delta b = d - b \cdot \eta \]

Debt-to-GDP ratio (\( d \)) would get stabilized, when \( \Delta b = 0 \). This is possible when \( d = b \cdot \eta \)

This implies that when debt-to-GDP ratio (\( b \)) gets stabilized at certain level, deficit (\( D \)) would tend to the extent of growth rate (\( \eta \)) times the debt-to-GDP ratio of the economy. In order to reduce the level of debt-to-GDP ratio, the growth rate of economy needs to be improved.