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**SUSTAINABILITY AND THRESHOLD VALUE OF
PUBLIC DEBT OF CENTRE AND ALL STATE
GOVERNMENTS IN INDIA**

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Sustainability and Threshold Value of Public Debt of Centre and All State Governments in India

K. R. Shanmugam and P.S. Renjith

Abstract

This paper

This study examines the sustainability and the threshold level of public debt of Centre and all State Governments in India using the latest data from 1990-91 to 2020-21 and statistical methods and threshold regression method. The results of these methods suggest that the current levels of public debt of both the Centre and all States are unsustainable, and the debt sustainability threshold is about 40 percent for the Centre and 22 percent for all States. There is a greater need for the Centre and all States to control their debt levels as they are currently growth reducing. The simulation exercises based on the debt dynamics suggest that the Indian economy (nominal) should grow at 12 percent and the fiscal deficit target should be 2 percent each for the Centre and all States from 2023-24 onwards so that the Centre will attain the debt sustainability target before 2027-28 and all States in 2030-31. The relevant policy strategy for all Governments is revenue augmentation and containing public expenditures including unproductive subsidies.

Keywords: *Sustainable Debt, Bohn Model, Penalized Spline, threshold model*

JEL Codes: *H63, C23, D72, E62, H72*

Preface

Madras School of Economics (MSE) established the Centre for Public Finance (CPF), which started functioning from April 1, 2021. This Centre is financed by the Government of Tamil Nadu. Its activities are guided by an Advisory Council (headed by me). The Centre focuses on both theoretical and empirical issues of public finance, covering the following areas: deficit financing and public debt, monetary and fiscal interactions, tax policy and reforms, public expenditure management, public investment appraisal and cost benefit analysis, public enterprises reform, intergovernmental transfers, local finances and environmental issues.

Apart from general research activities, the Centre is committed (i) to review the Tamil Nadu Economy and State Finances every year, (ii) to conduct an Annual Conference on topics related to public finance and policy and (iii) to conduct Training Programs on public finance. It will also undertake specific studies on public finance funded by the Government of Tamil Nadu and other National and International agencies.

During the academic year 2021-22, the Centre organized "Virtual Meeting on Improving the Presentation of Tamil Nadu Budget Document" on April 29, 2021 and conducted 5-day Training Programs on Public Finance for 15 batches covering a total of 270 Group A and Group B officials of Government of Tamil Nadu through online mode (from August 31, 2021 to December 31, 2021). It organized a two-day national Conference on "Issues of Public Finance" during January 20-21, 2023. It has also initiated several research studies.

The study "Sustainability and Threshold Value of Public Debt of Centre and All State Governments in India", by K.R. Shanmugam and P.S. Renjith is the Twelfth working paper of the CPF. This study empirically demonstrates that the current levels of public debt of Centre and All States are unsustainable because the sustainability threshold is estimated at 40 percent for the Centre and 22 percent for all States. Further, the existing debt level is growth-reducing. This study simulates that maintaining the nominal growth of 12 percent, both the Centre and All States should target for 2 percent fiscal deficit so that the Centre can attain the debt sustainability target in 2027-28 and all States in 2030-31.

**C.Rangarajan
Chairman**

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K. R. Shanmugam
P.S. Renjith

INTRODUCTION

Public debt sustainability is an important public policy issue for any national or sub-national Government. The Government borrows when its revenues fall short of its expenditure commitments. The fiscal deficit in the budget reflects the net borrowing or debt of the Government. The public debt is the total debt (or liabilities) or accumulation of debt over the years. Many economists believe that debt is one way to raise money for development. Borrowing can enable the Government to finance important development programs/projects (Hakura, 2020).

If a Government productively employs its debt amounts to finance social and infrastructure development projects, which can trigger economic growth and bring higher income in future, it can be able to service its debt with increased income. In such a case, the public debt is not at all an issue for the Government. This is, in fact, true for many Governments in developed countries with high level of debt-GDP ratio. For instance, as per the World Development Indicators of World Bank, the five year (2017-2021) average debt-GDP was 244.43 percent in Japan, 126.04 percent in Singapore, 117.87 percent in USA and 104.16 percent in France. These countries have a high tax-GDP ratio. But in some other countries, the situation is entirely different. They find it difficult to service their debt obligations. Therefore, fiscal/debt sustainability matters.

If the Government is able to meet all its current and future debt obligations without external financial assistance or going into default, the debt is considered sustainable (IMF, 2011). Alternatively, if the debt growth over the period is less than the interest-growth differential, then the debt is not considered detrimental. Another definition is that the debt is sustainable if the current level of debt is not exceeding the present value of all future primary surpluses (Blanchard *et. al.*, 1991).

If debt-GDP ratio exceeds certain prudent limits, it becomes unsustainable, and this will lead to excessive burden of debt servicing for future. Excessive debt (i.e., debt overhang) will lead to debt trap, which is bad for growth, development and stability; it can negatively affect the capital stock accumulation and economic growth through higher long term interest rates, higher distortionary tax rates, inflation, and a general constraint on countercyclical fiscal policies (Rugy and Salmon, 2020). In the worst case, it can cause the Government to default, which could cause the borrowing Government to lose market access and suffer from the higher cost of future borrowing.

Debt unsustainability is not a new phenomenon. Recent decades have also witnessed the debt crises of many economies, vis a vis the East Asian Economic Crisis 1997-2001, the Russian Economic Crisis of 1992-97, the Latin American Debt Crisis in Mexico, Brazil and Argentina during 1994-2002, the Euro-Sovereign Debt crisis (2008 onwards), the Global Financial crisis of 2008 (Srinivas, 2018) and Sri Lanka and Pakistan being the latest examples.

The spread of the COVID-19 virus has caused the recession in the world economy and also pushed up the overall amount of debt worldwide to unprecedented levels (Kose *et. al.*, 2021). India is of no exemption. The recurring episodes of the pandemic, and corresponding increased public spending coupled with an output contraction in the post-pandemic period has resulted in a surge in its public debt-GDP ratio.

According to Economic Survey of India (2021-22), the Centre's debt relative to GDP would reach 60.2 percent and all States' debt ratio would reach about 30 percent at the end of 2022-23. The New Fiscal Responsibility and Budget Management (FRBM) Review Committee suggested a 40 percent debt-GDP limit for the Centre Government and 20 percent for all States together. Studies such as Srivastava *et. al.*, (2021) and Tiwari (2012) show that the combined debt of Central and State Governments in India is unsustainable.

Against this backdrop, this study attempts to empirically analyse the debt sustainability conditions of the Centre and all States together in India from 1990-91 to 2020-21. The rest of this study proceeds as follows. The next section briefly reviews both theoretical and empirical studies on public debt sustainability. The subsequent section discusses the trends in total outstanding liabilities of the Centre and States over the years. The following two sections present and discuss the empirical results of debt sustainability and debt threshold value and provide a few simulation exercises results using the debt dynamics of the Centre and all States to find out when they will achieve the debt sustainability target. The final section suggests the policy strategies to control debt and achieve a sustainable level of debt in both the Centre and all States.

A BRIEF REVIEW OF LITERATURE

Theoretical Literature

Conceptually, debt sustainability is a situation where the debt does not accumulate at a rate considerably exceeding the Government's capacity to service it (IMF, 2011). On the theoretical front, there are three schools' of thoughts on debt/deficit financing in the literature: (i) Classical or Ricardian Equivalence theorem, (ii) Keynesian theorem and (iii) Neo-classical theorem.

The Ricardian Equivalence theorem argues that fiscal deficit does not matter except for smoothing the adjustment to expenditure or revenue shocks. Given that households are forward-looking, they will realize that they need to pay higher taxes in the future so that their total tax burden remains unchanged. As a result, they will reduce their consumption and increase savings to meet their future tax burden. This view rests on the inter-temporal budget constraint of the government and on the permanent income hypothesis.¹

¹. The first principle of public finance states that public debt must be sustainable in the sense that outstanding debt today must be equal to the present value of Government's future surpluses. The second principle states that the households do not base their consumption on current income but on

The Keynesian theorem envisages that deficit financing can boost aggregate demand and thereby stimulate economic growth. That is, an increase in Government spending financed by borrowing would cause the output to expand through a multiplier process and financing in this kind predominantly implies a re-allocation of resources from taxpayers to the bond-holders. Hence, this is beneficial for the economy.

The neo-classical view considers that the deficit financing will adversely affect the economy as the component of revenue deficit in the fiscal deficit implies Government dis saving, which if not offset by the corresponding increase in private savings will pull down the overall savings, exerting pressure on the interest rates which will eventually distort the rate of growth.

Thus, there is no consensus among economists on whether deficit financing is good or bad or neutral (Rangarajan and Srivastava, 2005). It needs to be resolved empirically, i.e., it is necessary to examine whether public debt is beneficial or not and if beneficial, then up to what level? However, on the empirical front also, there is no universal agreement on how public debt sustainability can be assessed (Akhmadev *et. al.*, 2018).

Sometimes, economists interchangeably use the term “solvency” with sustainability. Solvency refers to the ability of any Government to pay its debt or meet its long-term financial obligations.² This definition looks closer to the definition of sustainability and indicates that fiscal or debt sustainability is mostly about maintaining solvency. The solvency conditions are:

- (i) The debt-GDP ratio should never exceed a certain threshold. A thumb rule is stable or declining debt-GPT ratio.

permanent income so that they will not raise consumption as long as their income increases temporarily.

². A Government is solvent when its budget constraints are fulfilled, i.e., the net present value of its future primary balance must be as high as the net present value of its outstanding debt.

³. The IBC is $d_t^* = \sum_{j=1}^{\infty} \frac{1}{(1+r)^j} E_t [s_{t+j}]$, where $d_t^* = (1 + r_t) \cdot d_{t-1}$ is the stock of the debt-output

- (ii) The debt and the interest payments cannot be postponed forever. This means no “Ponzi Game”, which means that the state does not serve its debt with new debt on a regular basis.
- (iii) Government has to have enough resources in the future to meet its debt obligations. This essentially means that the budget should aim for primary surplus.

These rules do not have to be followed every year, but they are broad guidelines to be followed.

Literature on Empirical Approaches

(i) Traditional Domar Approach: Traditional studies employed the Domar (1944) stability condition: “As long as the real economic growth (g) is greater than the real interest rate (r), the Government can have a positive primary deficit such that its debt will not rise and so the debt is sustainable”. This debt dynamic equation is given as:

$$d_t = p_t + d_{t-1} \left[\frac{(1+r)}{(1+g)} \right] = f_t + d_{t-1} \left[\frac{1}{(1+g)} \right] \quad (1)$$

where d_t is the debt-GDP ratio at year t, p_t is the primary balance relative to GDP, and f_t is the fiscal deficit-GDP ratio. When the primary deficit is zero and $r=g$, the debt-GDP ratio remains constant. If $r>g$, the debt-GDP ratio will rise and is unsustainable.

This approach was extended later by considering the inter-temporal budget constraint (IBC) of the Government (i.e., outstanding debt today must be equal to the current value of future primary surpluses) and also additional indicators (growth, liquidity, creditworthiness, fiscal burden, fiscal space, etc.) and renamed as “Indicator approach” (Blanchard *et. al.*, 1991; Pattnaik *et. al.*, 2003).³

³. The IBC is $d_t^* = \sum_{j=1}^{\infty} \frac{1}{(1+r)^j} E_t [s_{t+j}]$, where $d_t^* = (1 + r_t) \cdot d_{t-1}$ is the stock of the debt-output ratio in the beginning of period t, $E_t [.]$ denotes the expectation operator conditional on the information available at time t, and s_t is the primary surplus-GDP ratio. The IBC of the Government requires that the present value of public debt asymptotically converges to zero, and

However, this approach was criticized as it applied the condition on a year-to-year basis and didn't validate whether IBC of the Government is satisfied or not.

(ii) Modern Time Series Approach: This approach on debt sustainability utilizes statistical/econometric tests. The pioneer of this approach was the seminal work of Hamilton and Flavin (1986). It introduced the unit root test (using the popular Augmented Dickey-Fuller Test) to check whether the public debt series (in the US) was stationary or not (i.e., whether the series of public debt contains a bubble term), which was later widely adopted to examine the mean reversal process of debt series (Fève and Henin, 2000; Makrydakis *et. al.*, 1999; Uctum and Wickens, 2000). Uctum, Thurston and Uctum (2006) used the unit root test to check debt sustainability in G7, selected Latin American and Asian countries and found that the debt was sustainable only in G-7 countries.

Trehan and Walsh (1991) employed another test to analyse whether a quasi-difference of public debt ($D_t - \nu D_{t-1}$) with $0 \leq \nu < 1 + r$, (where r is the interest rate) is stationary and whether public debt and primary surpluses (S_t) are cointegrated. If the public debt is quasi-difference stationary and public debt and primary surpluses are co-integrated (or alternatively, if total expenditure and revenue receipts are co-integrated), then the public debt is sustainable (Greiner and Fincke, 2009).⁴ The co-integration approach gained popularity as a test for debt sustainability and was greatly accepted in literature (Quintos, 1995; Martin, 2000; Goyal *et. al.*, 2004; Lusinyan and Thornton, 2009; Gabriel and Sangduan, 2011).

the interest rate r is resorted to in order to discount the stream of public debt, and this plays an important role.

⁴ If total expenditures and revenues establish long run relationship, then they are co-integrated. Since the deviation between these components leads to deficit and debt, the co-integration between total expenditure and revenues is in general consistent with the co-integration between primary balance and public debt.

Despite their wider applicability, the time series approaches were criticised because: (i) the unit root test is very sensitive to structural breaks and the results could be misleading when structural breaks present (Uctum *et. al.*, 2006); (ii) rejecting a unit root in real debt or in the debt to GDP ratio is a very difficult task and (iii) the IBC may well be satisfied even if the components of the budget are not co-integrated and even if debts or deficits, revenues or spending are differencing stationary (Bohn, 2007).

(iii) Bohn's Model Based Approach: In order to overcome some of the drawbacks of time series approaches, Bohn (1995) constructed a general equilibrium model with a stochastic version of IBC. Following this stochastic framework, he formulated a model based approach in 1998 to test whether the primary surplus-GDP ratio (s_t) is positive and, at least, a linearly rising function of the debt-GDP ratio (d_t) as:

$$s_t = \alpha + \psi d_t + \varepsilon_t \quad (2)$$

In (2), ε is the random error and α and ψ are parameters to be estimated. A positive and statistically significant value of ψ indicates that debt is sustainable i.e., the initial stock of debt is equal to the sum of the present discounted values of the primary surpluses.

Later, Bohn (1998) utilized the Barro (1979) tax-smoothing hypothesis according to which public deficits should be used in order to keep tax rates constant, which in turn minimizes the excess burden of taxation. Hence, normal expenditure can be financed by regular revenues, and hence deficits will be incurred as a result of financing unexpected spending. Based on this, he derived the following fiscal rule or reaction function:

$$s_t = \alpha + \psi d_t + \phi_1 yvar_t + \phi_2 gvar_t + \varepsilon_t \quad (3)$$

In (3), $yvar$ accounts for fluctuations in revenues and reflects the deviation of real GDP from its trend, computed using the Hodrick-Prescott (HP) filter. Positive values for $yvar$ indicate booms and negative

values indicate recessions.⁵ The *gvar* reflects the deviation of real primary spending from its normal value with positive values indicating expenditures above the normal level and vice versa (Greiner and Fincke, 2009).⁶

This model received great attention in the literature because of its intuitiveness (*i.e.*, if Governments run into debt today, they would have to take corrective actions in the future by increasing the primary surplus) and robust statistical properties (the positive response of primary surplus to public debt implies a mean reverting process).⁷ It was later extended by researchers by adding other determinants of primary balance, incorporating unobserved heterogeneity factors using panel data structures, and specifying non-linearity and time-varying coefficients in the model.

In the non-linear context, the Bohn model (for usual time series data) can be re-written as:

$$s_t = \alpha + \psi_t d_{t-1} + \phi_1 yvar_t + \phi_2 gvar_t + \varepsilon_t \quad (4)$$

In (4), the reaction coefficient ψ_t is time-varying. Mathematically, any non-linear model can be approximated by a linear model with time-varying coefficients. This approximation is good under certain smoothness assumptions. Empirical estimations using these linear approximations employ the popular penalized spline (p-spline) method. The functional forms or smoothness can be shaped by deviation on individual points (*i.e.*, changing points which are termed as knots). To

⁵. The Hodrick-Prescott (HP) filter is a data smoothing technique. It removes short-term fluctuations associated with the business cycle. Removal of these short term fluctuations reveals the long term trend.

⁶. *Yvar* and *gvar* are business cycle variables accounting for fluctuations in GDP and primary spending respectively. They are considered as the other determinants of primary surplus.

⁷. Because higher debt ratios lead to an increase in the primary surplus relative to GDP, making the debt ratio decline and return to its mean.

avoid the endogeneity issues, Greiner and Fincke (2009) replaced d_t with d_{t-1} .

(iv) Debt Sustainability Threshold Model: Ghosh *et. al.*, (2013) introduced the concept of 'fiscal fatigue'. It happens when public debt achieves some threshold and departs from this threshold value when the primary balance does not adjust to debt. Therefore, it is essential to test for the responsiveness of primary balance to lagged levels of debt relative to GDP in different regimes, using the threshold regression method. The threshold model allows coefficients (of region-varying variables) to differ across regions. Those regions are identified by a threshold variable being above or below a threshold value. It uses the conditional least squares to estimate the parameters of the model. The threshold value is estimated by minimizing the SSR obtained for all alternate thresholds.⁸

Later, some argue that higher debt amounts may lead to higher growth or welfare in the debt amounts are invested on development projects (Ghosh, 1998; Greiner and Fincke, 2015). They suggest for testing whether the public debt is growth inducing or not, using either a threshold regression method or an estimation of a quadratic model where the dependent variable is real growth and independent variables are debt-GDP ratio and its squared term or spline method (Greiner and Fincke, 2009).

Empirical Studies

Handful of empirical studies used the above approaches to verify whether the public debt is sustainable or not in various countries. For instances, Kaur *et. al.*, (2014) used the indicator approach to verify the debt sustainability of Indian states; Hakkio and Rush (1991) and Jha and

⁸. In the threshold model. The threshold variable may be one of the region varying variables or region invariant variables. If the dependent variable is a function of its own lags, the model is called threshold auto-regression model (TAR). If the lagged dependent variable is used as the threshold variable, the model becomes self-exciting threshold model (SETAR).

Sharma (2004) analysed the sustainability by verifying the cointegrating relationship between public revenue and expenditure.

Abiad and Ostry (2005) employed the extended version of Bohn model to test the debt sustainability of 31 emerging market countries from 1990 to 2002. Greiner and Kauermann (2008) used the p-spline method and found that debt is sustainable in Germany and not in Italy. Griener and Fincke (2009) used the Bohn framework and p-spline technique to analyse the debt sustainability issue of the USA and 6 Euro countries (Austria, France, Germany, Italy, The Netherlands, Portugal) and 6 developing countries (Botswana, Costa Rica, Mauritius, Panama, Rwanda, and Tunisia). Except in France, the debt was sustainable in the USA and 5 Euro countries. Debt was sustainable in only Botswana and Rwanda and in all other 4 developing countries, it was unsustainable.

Tiwari (2012) used the Bohn framework and spline methodology and found that debt is unsustainable in India from 1970 to 2009. Shanmugam and Renjith (2021) used panel version of Bohn framework and p-spline technique to test the debt sustainability of 20 Indian states. Lixin (2019) employed the threshold estimation and found that from 1985 to 2015, China's public and external debt were both sustainable. Srivastava *et. al.*, (2021) estimate the sustainability threshold for the general Government debt-GDP ratio for India using a threshold regression, in which the primary balance-GDP ratio (s_t) is the dependent variable and is related to lagged debt-GDP ratio (region varying variable) and other determinants of s_t (region invariant variables). It shows 59.3 percent threshold level for India. Shanmugam and Shanmugam (2022) show that the sustainable debt threshold limit for Tamil Nadu state is 18.36 per cent. See Afonso (2005), Neck and Sturm (2008), Fincke and Greiner (2011) and D'Erosmo *et. al.*, (2016) for a review of empirical studies.

Studies examining the debt-growth relationship at the international, national and the sub-national levels provide four alternative

conclusions on the effect of debt on economic growth: (i) growth is independent of debt (e.g., Paniza and Presbitero, 2014), (ii) growth is a positive function of debt (e.g., Fincke and Greiner, 2015), (iii) growth is a negative function of debt (e.g., Hussain *et. al.*, 2015), and (iv) the relationship between the public debt and economic growth is positive when the debt level is low and if the debt exceeds the sustainability threshold, the relationship is negative (Kumar and Woo, 2010; Megarsa, 2015). That is, the relationship is non-linear (Reinhart and Rogoff, 2010). The advantage of last approach is that it is useful to compute the threshold level of public debt.⁹

In the Indian context, the debt-growth relation was studied by many researchers mainly under two schools: the orthodox school (Rakshit, 2000; Patnaik, 2001) and the Keynesian school (Butter and Patel, 1992; Lahiri and Kannan, 2002). Studies such as Bal and Rath (2014) and Manik and Khan (2018) assessed the debt-growth relation in the Indian context for different time periods with no uniformity in their results.

TRENDS IN PUBLIC DEBT OF CENTRE AND ALL STATES TOGETHER IN INDIA

India is a federal country with a central Government and many state Governments. Indian Constitution assigns different borrowing powers to central and state Governments. The central Government debt comprises domestic debt and external debt.¹⁰ The public account liabilities are also considered as central debt, which includes NSSF, provident funds, reserve funds of railways, post and telecommunication etc. State Governments are allowed to borrow only from the domestic market and

⁹. The threshold level of debt is obtained from the regression: $\text{Growth rate} = \alpha + \beta \text{ debt-GSDP} + \gamma \text{ debt-GSDP}^2$ or from threshold regression model.

¹⁰. Domestic debt of Centre includes market loans-dated securities, floating rate debt, inflation index bonds, treasury bills, 14-day intermediate treasury bills, cash management bills, securities issued to international financial institutions, market stabilization scheme, compensation and other bonds, securities against small savings etc. The external debt is from multilateral agencies like Asian Development Bank etc.

raise loans and advances from the central Government. They have no power to raise loans outside India except loans for externally aided projects intermediated by the central Government.¹¹ The public account debt of state includes small savings, provident funds, reserve funds, deposits bearing interest and deposits not bearing interest etc.

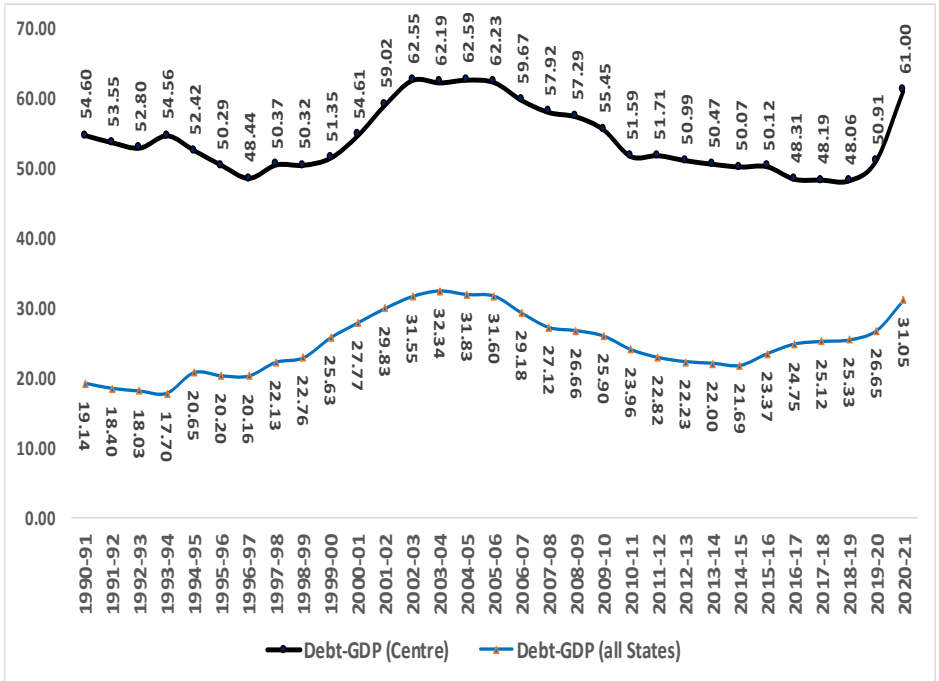
The outstanding liabilities (or debt) of the Centre Government was Rs. 3,14,558 crore in 1990-91 and increased to Rs.6,75,676 crore in 1996-97. It further increased to Rs. 19,94,421 crore in 2004-05 and Rs.62,42,519 crore in 2014-15 and further to Rs. 120,79,018 crore in 2020-21 (not shown).¹² In 1990-91, all States' debt was Rs. 1,10,289 crore and it increased to Rs. 2,81,207 crore in 1996-97 and to Rs. 10,14,065 crore in 2004-05 and further to Rs. 27,03,759 crore in 2014-15. In 2020-21, it reached Rs. 61, 49,126 crore.

The debt-GDP (2011-12 series) of the Centre declined from 54.60 percent in 1990-91 to 48.44 percent in 1996-97, but the debt-GDP of all States increased marginally from 19.14 percent to 20.16 percent (Figure 1). Government finances have deteriorated since the mid-1990s in India due to reform induced losses in revenues from customs and excise duties, poor tax performance and low tax buoyancy, and increased Government spending, particularly due to the implementation of the recommendations of the fifth pay commission. As a result, the debt-GDP ratio of the Centre started increasing continuously to reach the peak of 62.59 percent in 2005-06 and that of States to 32.34 percent in 2003-04.

¹¹. The internal debt of state Government consists of market loans, loans from Financial Institutions like commercial banks, NABARD, LIC, NCDC etc. (mostly project funding), ways and advances from RBI (and overdraft), special securities issued to NSSF etc. The loans and advances comprise non-plan loans, loans for state/union territory plan schemes, loans for central plan schemes, loans for centrally sponsored schemes, loans for special schemes and other loans.

¹². The data sources for the study are: (i) For all fiscal variables, Indian Public Finance Statistics till 2015-16 and RBI from 016-17 onwards; and (ii) GDP data from MOSPI (NAS).

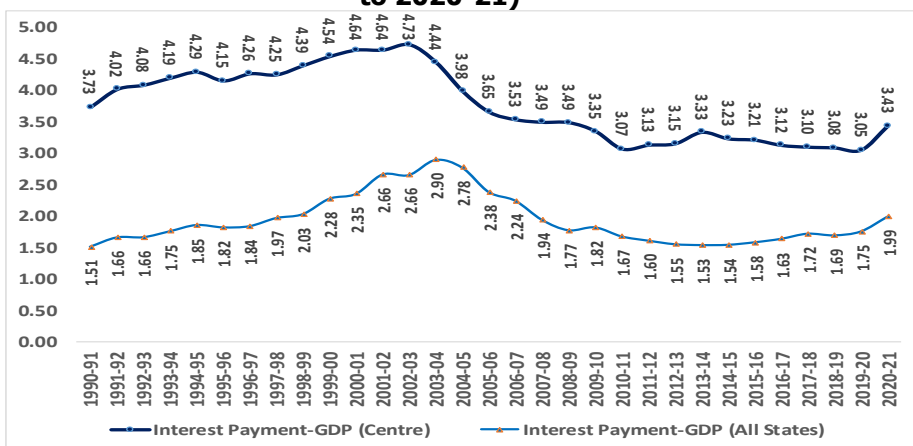
Figure 1: Outstanding Liabilities to GDP of Centre and All States (1990-91 to 2020-21)



Thereafter, both started to decline continuously due to various fiscal measures, including the implementation of the FRBM Act in 2003 by the Government of India and subsequently by all State Governments (starting from Karnataka in 2002 to Sikkim in 2010). The Centre's debt GDP declined to 50.07 percent and States' debt-GDP to 21.69 percent in 2014-15. The Centre's debt-GDP continued to decline to 48.06 percent in 2018-19 while the States' debt-GDP continued to increase to 25.33 percent. The COVID-19 pandemic created further trouble and they increased further to 61.00 percent and 31.05 percent respectively in 2020-21 (Figure 1).

The interest of the Centre relative to GDP increased from 3.77 percent in 1990-91 to 4.44 percent in 2003-04. At the same time, the States' interest-GDP ratio increased from 1.51 percent to 2.90 percent. After that they declined to 3.08 percent and 1.69 percent respectively in 2018-19. But they increased to 3.43 percent and 1.99 percent in 2020-21(Figure 2). The path of interest to GDP clearly indicates that it increased (decreased) whenever the debt-GDP ratio increased (decreased) in both cases of Centre and All States.

Figure 2: Interest-GDP Ratio of Centre and All States (1990-91 to 2020-21)



The trends in revenue receipts and total expenditures (primary expenditure+ interest payment) relative to GDP of Centre and States together, as shown in Figure 3 explain the movement of debt-GDP ratio of Centre and States over the years. The gap between the total expenditures-GDP ratio and the revenue receipts-GDP ratio of Centre was larger from 1996-97 to 2003-04. This was the period when the debt-GDP ratio started increasing continuously. After that, the gap declined till 2007-08 and then started increasing. During this period, the debt-GDP ratio of the Centre decreased continuously. The gap between revenues and total expenditure increased in 2019-20 and again significantly in 2020-21 due to the pandemic. For all States, more or less, a similar trend exists.

(ii) Co-integration Test: It examines whether the Government revenues and total expenditures relative to GDP are co-integrated or not. It basically examines whether they move together such that the resultant of their relationship produces a stationary series (Hamilton and Flavin, 1986). Table 2 indicates that these two series for Centre are not co-integrated at 5 percent level of significance. Two series for all States are also not co-integrated. These results imply that the debt is not sustainable in the case of both the Centre and all States.

Table 3: Results of Johansen's Cointegration (Rank) Test*

Unrestricted Cointegration Rank Test (Trace)					
Hypothesized No. of CE(s)	No.	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
(i) Centre					
None		0.2924	12.1851	15.4947	0.1483
Atmost 1		0.0854	2.4995	3.8415	0.1139
(ii) States together					
t-statistics		0.3258	11.3796	15.4947	0.1892
t-statistics		0.0121	0.3409	3.8415	0.5593

Note: Trace test indicates no cointegration at the 0.05 level for Centre and States; * Max test also provides similar results and so not reported. ** Mackinnon (1996) p-values.

(iii) Bohn Model Based Non-linear Test: As discussed in Section 2 (equation 4) above, this test is basically to test whether the primary surplus-GDP ratio (s_t) is positive and, at least, a linearly rising function of the debt-GDP ratio (d_{t-1}). Table 3 presents the penalized spline estimation results of both Centre and States Governments. As expected, the parameter of business cycle variable $yvar$ is positive and significant and that of $gvar$ is negative and significant at 1 percent level of significance, indicating that the GDP above its normal value has increased the primary surplus while the primary spending above its normal value has reduced the primary surplus of Indian States. In the case of Centre, $yvar$ is positive and $gvar$ is negative as expected, but only the parameter of $gvar$ is statistically significant at 5 percent level.

As expected, the parameter associated with the lagged debt-GDP ratio is positive in both cases, but it is not statistically significant at 5 percent level, implying that the public debt is unsustainable in both the Centre and States. Thus, all the three modern statistical tests confirm that the public debt of both the Centre and the States is not sustainable. This result deserves policy intervention.

Table 3: p-spline Estimation Results of Debt Sustainability Equation for Central and States Governments in India (Dependent variable: Primary Deficit to GDP percent, s_t)

Variables	Notation	Central Govt	All States Govt
		Co-efficient (t-value)	Co-efficient (t-value)
(1)	(2)	(4)	(5)
Intercept	d^i	-3.6150 (-2.445)	-1.483 (-0.805)
Lagged Debt-GDP ratio (percent)	d^c_{t-1}	0.0238 (1.735)	-
	d^s_{t-1}		0.0238 (0.690)
Real GDP gap	$yvar_t$	0.00001 (1.514)	0.00001 (3.596)
Real Primary Expenditure Gap	$gvar^c_t$	-0.00001 (-5.372)	-
	$gvar^s_t$		-0.00001 (-3.903)
edf (ref. edf)		1.500	6.539
F [p-value]		9.680 [0.027]	6.237[0.000]
R-sq.(adj)		0.758	0.773
GCV		0.490	0.173
DW Statistics		1.870	1.837
N		30	30

(iv) Debt Sustainability Threshold: Table 4 presents threshold regression results, in which the lagged debt-GDP ratio (d_{t-1}) is the threshold variable. This model considers a single threshold dividing the sample into two regimes or regions as relevant. It considers that the behaviour of the primary deficit relative to GDP may change if the debt-GDP ratio crosses a certain threshold. The sustainable debt-GDP threshold for Centre is 48.44 percent, which is higher than the 40 percent norm given by the new FRBM Review Committee for the Centre. It is noted that the current level of debt of the Centre is about 61 percent of

GDP. This is significantly higher than the threshold level. It is observed from Table 4 that when debt-GDP of the Centre increased by one unit, the primary balance increased by about 3.2 unit in region 1 where the debt level was below the threshold and by 0.03 unit in region 2 where the debt exceeded the threshold. However, parameters associated with this viable in both regions are not significant. $yvar$ and $gvar$ are regime invariant variables in this model. As expected, they have positive and negative effects respectively and both effects are significant.

Table 4: Threshold Regression Results for Centre and States (1991-92 to 2020-21)

Dependent Variable: Primary Deficit to GDP percent (s_t)					
Threshold Variable: Lagged Debt-GDP ratio percent (d_{t-1})					
Variables	Notation	Centre Govt		States Govt	
		Coefficient	t-stat.	Coefficient	t-stat.
Region 1		$d_{t-1} < 48.4419$		$d_{t-1} < 21.999$	
Lagged Debt-GDP ratio	d_{t-1}	3.2835	0.912	0.1537	3.464
Constant	\hat{d}	-161.225	-0.929	-	-
Region 2		$48.4419 \leq d_{t-1}$		$21.999 \leq d_{t-1}$	
Lagged Debt-GDP ratio	d_{t-1}	0.0361	1.307	0.1073	3.387
Constant	\hat{d}	-2.7936	1.853	-	-
Region Invariant Variables					
Real GDP gap	$yvar$	0.000002	3.576	0.000001	3.400
Real Primary Expenditure Gap	$gvar$	-0.00001	-4.764	-0.00001	-4.589
Constant	\hat{d}	-	-	-3.8523	-4.568
Sum Squared Resid.	SSR	9.312		6.449	
Akaike Info Criterion	AIC	2.068		1.634	
R Square	R^2	0.8094		0.5629	
Durbin-Watson Statistics	d stat	1.764		1.666	

In the case of all States, the sustainable debt-GDP is 21.99 percent, which is slightly higher than the 20 percent norm given by the new FRBM Review Committee. The current level of debt-GDP of the States is about

31 percent. This is significantly higher than the threshold level. It may trigger suitable responses by policymakers to reduce the primary deficit-GDP ratio if the debt-GDP ratio crossed the prudent norm of 22 percent (in our case). In Table 4, when debt-GDP of the States increased by one unit, the primary balance increased by 0.15 unit in region 1 where the debt level was below the threshold and by about 0.11 unit in region 2 where the debt exceeded the threshold. As expected, $yvar$ and $gvar$ have similar effects as in Table 3.

(v) Debt-Growth Relationship and Debt Threshold: To examine the impact of the debt-GDP ratio on (real) growth of economy, the growth rate in percentage is regressed on debt-GDP and its squared term. This non-linear form is useful to find out the debt threshold, a value up to this debt-GDP ratio is growth inducing and beyond this it is not growth inducing (i.e., growth reducing). Table 5 depicts the non-linear relation between growth and debt-GDP for both the Centre and all States from 1991-92 to 2020-21. The debt-GDP coefficient is positive, while its squared term's coefficient is negative in both cases. The threshold level is computed using the formula: $\text{threshold} = \text{Coefficient of Debt-GDP} / 2 \times \text{Coefficient of Debt-GDP}^2 = 0.3467 / (2 \times 0.0044) = 39.4$ percent for the Centre, which is closer to the debt sustainability threshold value of 40 percent given by the new FRBM committee. For the States the threshold value is $= 0.5573 / (2 \times 0.0126) = 22.12$ percent, which is equal to the debt sustainability threshold value of 21.99 percent given in the threshold regression model in Table 4.

Table 5: Non-Linear Relation Between Growth and Debt-GDP: Centre and States (Dependent variable: Real GDP Growth)

Variables	Central Govt		States Govt	
	Coefficient	t-statistics	Coefficient t	t-statistics
Debt-GDP	0.3467	3.063	0.5573	4.007
Debt-GDP Square	-0.0044	-2.136	-0.0126	-2.419
Intercept	0.0000	0.000	0.0000	0.000
R Square				
Debt Threshold	39.4		22.12	

SIMULATION MODEL EXAMINING THE PERIOD OF ATTAINING THE DEBT THRESHOLD TARGET

The above analyses clearly indicate that the current levels debt of Centre and all States are unsustainable and they are significantly higher than the debt sustainability threshold level of 40 (≈ 39.4) percent and 22 percent respectively. These levels are growth reducing. There is a greater need to cut down its debt ratio by about one third in both cases. This section examines whether the Centre and all States will attain the sustainable level of debt or not and when they will reach it? For this purpose, it employs the following debt dynamic equation given in (1) above:

$$d_t = f_t + d_{t-1} \left[\frac{1}{(1+g)} \right]$$

In this equation, the debt-GDP ratio (d_t) at the end of a fiscal year depends on (i) fiscal deficit-GDP ratio (f_t), (ii) last year debt-GDP ratio (d_{t-1}) and (iii) nominal growth rate (g_t). Subtracting d_{t-1} on both sides, we get:

$$d_t - d_{t-1} = f_t + d_{t-1} \left[\frac{1}{(1+g)} \right] - d_{t-1} = f_t - d_{t-1} \left[\frac{g}{(1+g)} \right] \quad (5)$$

The left side is the change in debt-debt ratio between two successive years (i.e., between year t and previous year $t-1$). Using this standard debt dynamic formula, we simulate debt-GDP level in future

period, given assumptions on f_t and g_t and previous year debt (d_{t-1}) with different assumptions on these three components to see when the Centre and all States will achieve the sustainable level of debt?

The following initial values of debt to GDP, fiscal deficit and nominal growth of the Indian economy from the recent RBI and MOSPI documents are used:

For the Centre: (i) debt to GDP ratio for 2020-21: 61 percent; (ii) fiscal deficit for 2021-22: 6.9 percent. For all States: (i) debt-GDP for 2020-21: 31.1 percent; (ii) fiscal deficit for 2021-22: 3.7 percent. For both: (iii) nominal growth for 2020-21: -1.3646 percent and for 2021-22: 19.51 percent.

In fact, the average real GDP growth was 6.31 percent during 2016-17 to 2019-20, 6.41 percent during 2011-12 to 2019-20 and 6.8 percent during 2004-05 to 2019-20 (Table 6). From 2004-05 to 2010-11, the average rate was 7.29 percent and from 2009-10 to 2016-17 it was 7.14 percent. Thus, the recent trend indicates 6 to 7 percent average (real) growth of Indian economy. Assuming an inflation of 4 percent, the nominal growth will be 10-11 percent. Given the global scenario, it is difficult to push beyond 12 percent. While both the Centre and all State Governments gave up in recent years, the FRBM norm of 3 percent fiscal deficit level for the Centre and 3 percent for all States can be assumed.

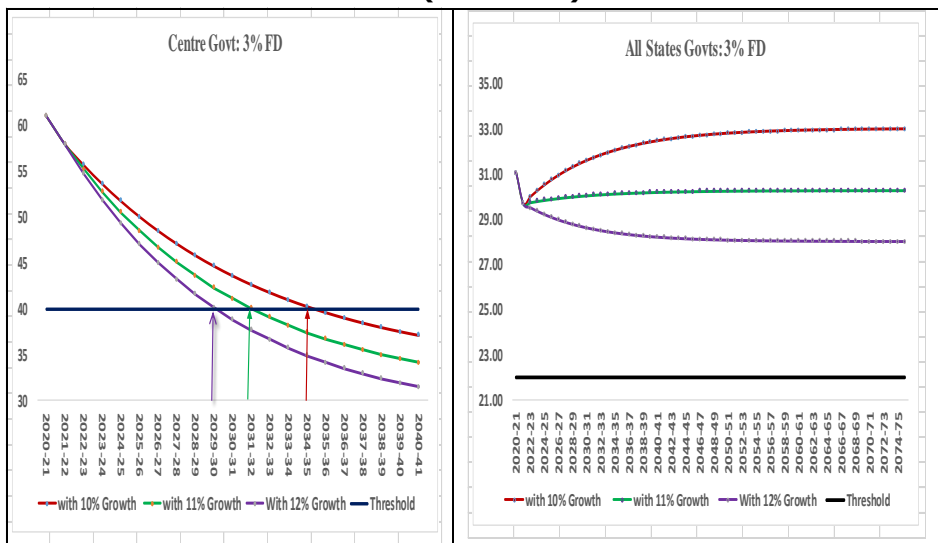
Table 6: Average Annual GDP (Real) Growth in India

Period	2017-18 to 2020-21	2016-17 to 2020-21	2016-17 to 2019-20	2011-12 to 2019-20	2004-05 to 2019-20	2004-05 to 2010-11	2009-10 to 2016-17
GDP Growth	2.60	3.73	6.31	6.41	6.80	7.29	7.14

In exercise 1, the nominal annual growth rate is assumed to be 10 percent from 2022-23 onwards and the fiscal deficit is assumed at 3

percent each for the Centre and also for all States from 2022-23 onwards initially. The Centre’s debt-GDP will continuously decline and reach the sustainability threshold level of 40 percent in 2034-35 (i.e., after 13 years).¹³ But all States’ debt-GDP will start increasing and will marginally increase every year even after 2074-75, i.e., even after 53 years with 10 percent growth (Figure 4). In fact, it will stabilize from 2090-91 at 33 percent (not shown). It is noted in Figure 4 that the Centre’s Debt-GDP will reach the threshold level in 2031-31 with 11 percent growth and in 2029-30 with 12 percent growth.

Figure 4: Simulation Results of Debt-GDP of Centre and all States (Exercise 1)

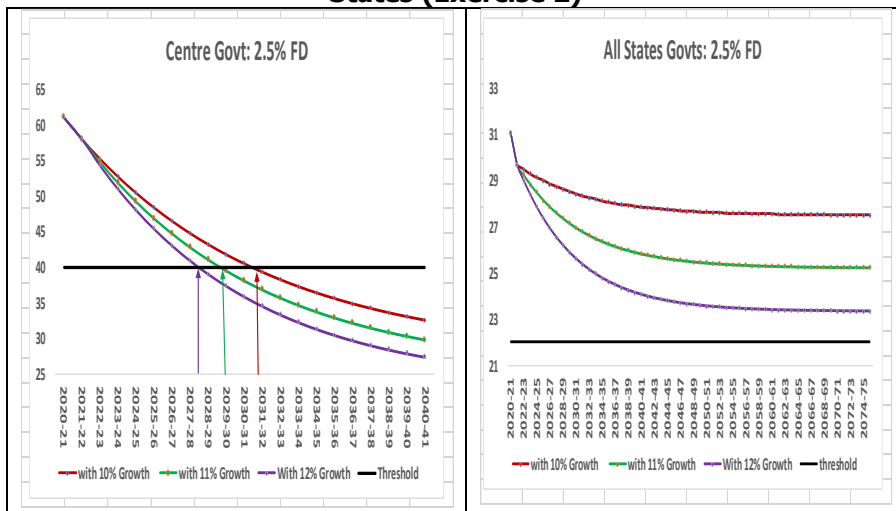


In exercise 2, three alternative growth rates are assumed, but 2.5 percent fiscal deficit each for the Centre and all States is assumed. The Centre’s debt-GDP will reach the target level in 2030-31 with 10

¹³. Assuming 4 percent fiscal deficit, the Centre’s debt-GDP will not reach the threshold even after 100 years with 10 percent nominal growth, but will reach the threshold in 2072-73 with 11 percent growth and in 2038-39 with 12 percent growth.

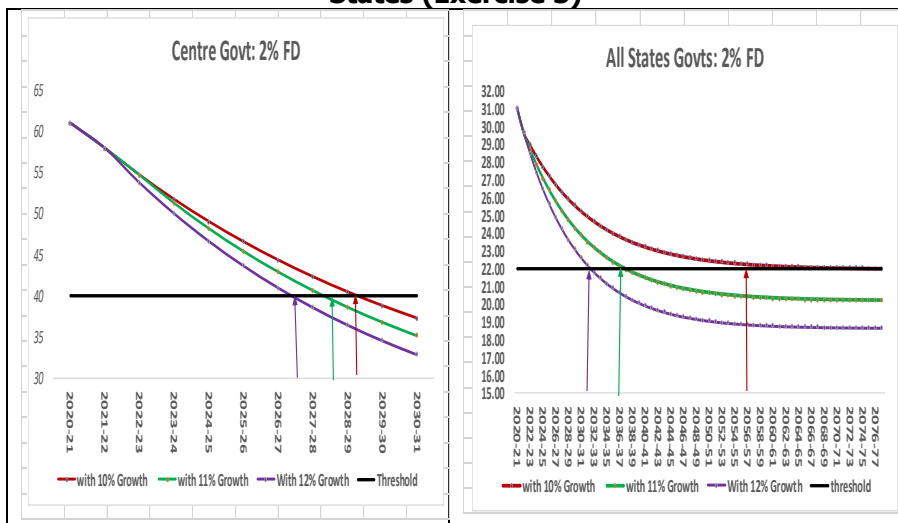
percent nominal growth, in 2029-30 with 11 percent nominal growth and in 2028-29 with 12 percent growth (Figure 5). All States' debt-GDP start declining but till 2074-75 it will not reach the threshold level with three alternative growth scenarios.

Figure 5: Simulation Results of Debt-GDP of Centre and all States (Exercise 2)



In exercise 3, 2 percent fiscal deficit assumed for Centre as well as for all States. The Centre's debt-GDP will reach the target level before 2029-30 with 10 percent growth, before 2028-29 with 11 percent growth and before 2027-28 with 12 percent growth (Figure 6). All States' debt-GDP will achieve the target level of 22 percent in 2031-32 with 12 percent growth, 2035-36 with 11 percent growth, and around 205-51 with 10 percent growth.

Figure 6: Simulation Results of Debt-GDP of Centre and all States (Exercise 3)



Therefore, by targeting at least 12 percent nominal growth and 2 percent fiscal level, the centre will achieve its sustainable threshold debt level before 2027-28 and the all States around 2030-31. In order to use the fiscal deficit for investment purposes, both the Centre and all States should target a revenue surplus from 2022-23 onwards.

STRATEGIES TO CONTROL DEBT AND REACH THE SUSTAINABLE LEVEL

The results of the study suggest the following policy viewpoints:

- (i) Our analysis clearly indicates that the sustainability threshold level of debt is about 40 percent for the Centre and 22 percent for all States. Beyond these levels were growth reducing that is not good for the country. Maintaining a sustainable level of debt will be growth inducing, which will help the country to increase its own revenues further, if they are buoyant;

- (ii) The reduction of debt-GDP ratio will automatically reduce the interest relative to GDP for both the Centre and all States. This will obviously further improve the fiscal status of the country as this saving can be spent on growth-inducing investments.
- (iii) The country should aim to attain 12 percent or above nominal growth rate to create buoyancy in tax revenues and additional resources to control the debt level. This requires critical analysis of component (or sector) wise GDP and come out with a clear-cut short term and long-term growth inducing strategies/interventions on high weightage component to sustain growth at higher level. Increasing the share of manufacturing in the total GDP, strengthening the contribution of services sector, increasing export share, attracting more FDI will help the country to grow faster. It is also noticed that India's economic performance depends on the world economy. The global environment for trade is becoming increasingly a matter of concern. Many international agencies, including OECD also forecast a secular slowdown in growth in developed countries. Environmental considerations can also act as a damper on the growth path of even developing countries.
- (iv) Apart from aiming for higher growth, debt sustainability is possible only if the fiscal deficit is brought down to 2 percent of GDP from 2023-24 onwards for the Centre as well as for all States. Therefore, the appropriate policy strategy is revenue augmentation or containing (wasteful) expenditures including unproductive subsidies or both by both Centre and States. Fiscal stability is critical for sustained growth. Since the tax-GDP ratio of our country is about half of developed countries' tax-GDP ratio. There is a greater scope to increase revenues by increasing the rates of all taxes. Otherwise, major reforms are required to increase the tax base to increase the tax-GDP ratio. As many States are providing various subsidies and freebies, they need to restructure their subsidies to avoid wasteful expenses.
- (v) Considering the fact that the Public Sector Undertakings are already fiscally stressed, which could have been one of the reasons for higher

level of debt, it is absolutely necessary to restructure their finances so that the debt sustainably is achieved.

We hope that this study is useful to policymakers, and other stakeholders to understand the debt dynamic in both the Centre and all States at aggregate level in India and take appropriate policy strategies to attain and maintain debt sustainability so that the economy can grow faster and the fiscal stability is maintained.

REFERENCES

- Abiad, M. A. and M.J.D. Ostry (2005), Primary Surpluses and Sustainable Debt Levels in Emerging Market Countries, *IMF Policy Discussion Paper*, 05(6), 3-18
- Afonso, A. (2005), Fiscal Sustainability: The Unpleasant European Case, *FinanzArchiv/ Public Finance Analysis*, 19-44.
- Akhmadeev, R. G., O. A. Bykanova and T. B. Turishcheva (2018), Brics' Foreign Debt Burden and Its Impact on Core Institutional Basis, *Journal of Reviews on Global Economics*, 7, 345-359.
- Bal, D. P. and B. N. Rath (2014), Public Debt and Economic Growth in India: A Reassessment, *Economic Analysis and Policy*, 44(3), 292-300.
- Barro, R. J. (1979), On the Determination of the Public Debt, *Journal of Political Economy*, 87(5, Part 1), 940-971.
- Blanchard, O. J., J. C. Chouraqui, R. Hagemann and N. Sartor (1991), *The Sustainability of Fiscal Policy: New Answers to An Old Question* (NBER Working Paper, R1547).
- Bohn, H. (1995), The Sustainability of Budget Deficits in a Stochastic Economy, *Journal of Money, Credit and Banking*, 27(1), 257-271.
- Bohn, H. (1998), The Behavior of US Public Debt and Deficits, *The Quarterly Journal of Economics*, 113(3), 949-963.

- Bohn, H. (2007), Are Stationarity and Cointegration Restrictions Really Necessary for The Intertemporal Budget Constraint? *Journal of Monetary Economics*, 54(7), 1837-1847.
- Buiter, W. H. and U. R. Patel (1992), Debt, Deficits and Inflation: An Application to the Public Finances of India, *Journal of Public Economics*, 47(2), 171-205.
- D'Erosmo, P., E.G. Mendoza and Jing Zhang (2016), What is Sustainable Public Debt? *Handbook of Macroeconomics 2*: 2493-2597.
- Domar, E. D. (1944), The Burden of the Debt and the National Income, *American Economic Review*, 34(4), 798-827.
- Fève, P. and P. Henin (2000), Assessing Effective Sustainability of Fiscal Policy within the G-7, *Oxford Bulletin of Economics and Statistics*, 62, 75–195.
- Fincke, B., and A. Greiner (2011), Debt Sustainability in Germany: Empirical Evidence for Federal States, *International Journal of Sustainable Economy*, 3(2), 235-254.
- Fincke, B. and A. Greiner (2015), Public Debt and Economic Growth in Emerging Market Economies, *South African Journal of Economics*, 83(3), 357-370.
- Gabriel, V.J., and P. Sangduan (2011), Assessing Fiscal Sustainability Subject to Policy Changes: A Markov Switching Cointegration Approach, *Empirical Economics*, 41, 371–385.
- Ghosh, S. (1998), Can Higher Debt Lead to Higher Welfare? A Theoretical and Numerical Analysis, *Applied Economic Letters*, 5 (2) 111-116.
- Ghosh, A.R., J.I. Kim, E.G. Mendoza, D. O. Jonathan and S. Q. Mahvash (2013), *Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies* (NBER Working paper 16782).
- Goyal, R., J.K Khundrakpam and P. Ray, (2004), Is India's Public Finance Unsustainable? Or, Are The Claims Exaggerated? *Journal of Policy Model*, 26, 401–420.
- Greiner, A. and B. Fincke (2009), *Public Debt and Economic Growth* (11), Springer Science and Business Media.

- Greiner, A. and B. Fincke (2015), *Public Debt, Sustainability and Economic Growth*, Springer International Publishers.
- Greiner, A. and G. Kauermann (2008), Debt Policy in Euro Area Countries: Evidence for Germany and Italy Using Penalized Spline Smoothing, *Economic Modelling*, 25(6), 1144-1154.
- Hakkio, C. S. and M. Rush, (1991), Is the Budget Deficit Too Large? *Economic Inquiry*, 29, 429-445.
- Hakura, Dalla (2020), What is Debt Sustainability? *Finance and Development*, September, IMF's Strategy, Policy and Review Department, 60-61.
- Hamilton, J. and M. Flavin (1986), On the Limitations of Government Borrowing: A Framework for Empirical Testing, *American Economic Review*, 76(4), 808-819.
- Hussain, M. E., M. Haque and R. S. Igwike (2015), Relationship between Economic Growth and Debt: An Empirical Analysis for Sub-Saharan Africa, *Journal of Economics and Political Economy*, 2(2), 262.
- IMF (2011), *Modernizing the Framework for Fiscal Policy and Public Debt Sustainability Analysis* (IMF Policy Papers), Washington D.C.
- Jha, R., and A. Sharma (2004), Structural Breaks, Unit Roots, and Cointegration: A Further Test of The Sustainability of the Indian Fiscal Deficit, *Public Finance Review* 32(2), 196–219.
- Kaur, B., A. Mukherjee, N. Kumar and A. P. Ekka (2014), Debt Sustainability at the State Level in India, *Indian Economic Review*, 53, 93-129.
- Kumar, M. and J. Woo (2010), *Public Debt and Growth* (IMF Working Papers 10/174).
- Kose, M. A., F. Ohnsorge and N. Sugawara (2021), A Mountain of Debt: Navigating the Legacy of the Pandemic, World Bank Document.
- Lahiri, A. K. and R. Kannan (2002), *India's Fiscal Deficits and their Sustainability in Perspective*, National Institute of Public Finance and Policy.

- Lixin, Sun (2019), The Structure and Sustainability of China's Debt, *Cambridge Journal of Economics*, 43(3), 695-715.
- Lusinyan, L. and J. Thornton (2009), The sustainability of South African Fiscal Policy: An Historical Perspective, *Applied Economics*, 41(7), 859-868.
- Mackinnon, J. G. (1996), Numerical Distribution Functions for Unit Root and Cointegration Tests, *Journal of Applied Econometrics*, 11, 601-618.
- Makrydakis, S., E. Tzavalis and A. Balfoussias (1999), Policy Regime Changes and the Long-Run Sustainability of Fiscal Policy: An Application to Greece, *Economic Modelling*, 16, 71-86.
- Manik, N. and N. A. Khan (2018), Public Debt and Economic Growth in India: Evidence from Granger Causality Test, In *Challenges and Issues in Indian Fiscal Federalism* (123-142), Springer, Singapore.
- Martin, G. (2000), U.S. Deficit Sustainability: A New Approach Based On Multiple Endogenous Breaks, *Journal of Applied Econometrics*, 15, 83-105.
- Megarsa, K. A. (2015), The Laffer Curve and The Debt-Growth Link in Low Income Sub-Saharan African Economies, *Journal of Economic Studies*, 42(5), 878-892.
- Neck, R. and J. E. Sturm (2008), Sustainability of Public Debt: Introduction and Overview, *Sustainability of Public Debt*, 1-13.
- Panizza, U. and A. F. Presbitero (2014), Public Debt and Economic Growth: Is there a Causal Effect?, *Journal of Macroeconomics*, 41, 21-41.
- Patnaik, P. (2001), Fiscal Deficits and Real Interest Rates: A Reply, *Economic and Political Weekly*, 36(30), 2898-2899.
- Patnaik, R. K., A. Prakash and B.S. Mishra (2003), *Sustainability of Public Debt in India: An Assessment in the Context of Fiscal Rules* (In 6th Workshop on Public Finance, Bank of Italy, Italy, 679-735).

- Quintos, C. (1995), Sustainability of the Deficit Process with Structural Shifts, *Journal of Business and Economic Statistics*, 13(4), 409–417.
- Rakshit, M. (2000), On Correcting Fiscal Imbalances in the Indian Economy: Some Perspectives, *Money and Finance*, 2(2), 19-58.
- Rangarajan, C. and D. K. Srivastava (2005), Fiscal Deficits and Government Debt: Implications for Growth and Stabilization, *Economic and Political Weekly*, 2919-2934.
- Reinhart, C. M. and K. Rogoff (2010), Growth in a Time of Debt, *American Economic Review: Papers and Proceedings*, 100, 573-578.
- Shanmugam, K. R. and P.S. Renjith (2021), Empirical Analysis on Sustainability of Public Debt in Indian States, *London Journal of Research in Humanities and Social Studies*, 21(10), 31-45.
- Shanmugam, K. R. and K. Shanmugam (2022), *Sustainability and Threshold Value of Public Debt in Tamil Nadu* (Madras School of Economics Working Paper 226).
- Srinivas, V. (2018), Major Financial Crisis from Great Depression to Great Recession
http://nationalarchives.nic.in/sites/default/files/new/Final_Major_Financial_Crisis-i_0.pdf
- Srivastava, D.K., M. Bharadwaj, T. Kapur and R.Trehan (2021), Examining Sustainability of Government Debt in India: Post COVID Prospects, *Journal of Advanced Studies in Finance*, Volume XII, Summer, 1(23): 51 – 62, DOI: 10.14505/jasf.v12.1(23).05.
- Tiwari, A. K. (2012), Debt Sustainability in India: Empirical Evidence Estimating Time-Varying Parameters, *Economics Bulletin*, 32(2), 1133-1141.
- Trehan, B., and C. E. Walsh (1991), Testing Intertemporal Budget Constraints: Theory and Applications to US Federal Budget and Current Account Deficits, *Journal of Money, Credit and Banking*, 23(2), 206-223.

- Uctum, M. and M. Wickens (2000), Debt and Deficit Ceilings, and Sustainability of Fiscal Policies: An Intertemporal Analysis, *Oxford Bulletin of Economics and Statistics*, 62, 197–222.
- Uctum, M., T. Thurston and R. Uctum (2006), Public Debt, The Unit Root Hypothesis and Structural Breaks: A Multi-Country Analysis, *Economica*, 73(289), 129-156.

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