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K. R. Shanmugam
K. Shanmugam

CENTRE FOR PUBLIC FINANCE
MADRAS SCHOOL OF ECONOMICS
Gandhi Mandapam Road
Chennai 600 025
India

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K. R. Shanmugam
Director and Professor, Madras School of Economics
shanmugam@mse.ac.in

and

K. Shanmugam
Former Chief Secretary of Government of Tamil Nadu and Senior Research Fellow of Madras School of Economics.

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India

Phone: 2230 0304/2230 0307/2235 2157
Fax: 2235 4847/2235 2155
Email : info@mse.ac.in
Website: www.mse.ac.in

Sustainability and Threshold Value of Public Debt in Tamil Nadu

K. R. Shanmugam and K. Shanmugam

Abstract

This study examines the sustainability and the threshold level of public debt in Tamil Nadu using statistical methods and threshold regression method. The results of these methods suggest that the current level of debt in the state is unsustainable, and the debt sustainability threshold is about 18.5 percent which is slightly lower than the 20 percent norm given by Fiscal Responsibility and Budget Management Review Committee for all Indian states. Since the roadmap suggested by the Fifteenth Finance Commission is not the sustainable level, the state should control its debt as it is not currently growth inducive. The simulation exercise based on the debt dynamics of the state suggests that the state economy should grow at 14 percent and fiscal deficit target should be 2 percent from 2023-24 onwards to attain the debt sustainability target in 2035-36 and with 16 percent growth the state could reach the target in 2030-31. The relevant policy strategy for the state is to increase its own revenue-GSDP ratio by 0.75 percent and contain its revenue expenditures by 0.75 percent from 2023-24.

Keywords: *sustainability, threshold value, public debt, FRBM*

JEL Codes: *Q54, H63, C23, D72*

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 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 the 5-day Training Programs on Public Finance for (270) 15 batches of Groups A and Group B officials of Government of Tamil Nadu through online mode (from August 31 ,2021 to December 31, 2021). It has also initiated about 10 research studies.

The study "Sustainability and Threshold Value of Public Debt in Tamil Nadu" by Dr. K.R. Shanmugam and Mr. K. Shanmugam is the third working paper of the Centre. After empirically verifying that the current debt level in Tamil Nadu is unsustainable, this study suggests that the debt sustainability threshold is 18.5 percent and that the state needs to ensure 14 percent nominal growth of economy and maintain 2 percent fiscal deficit from 2023-24 onwards to achieve the target in 2035-36 and with 16 percent growth it will reach the target in 2030-31.

C. Rangarajan
Chairman, MSE

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The authors are grateful to Dr. C. Rangarajan, the Chairman of Madras School of Economics for giving us the opportunity to work on this study for the Centre for Public Finance funded by the Government of Tamil Nadu and providing useful suggestions and comments on the earlier version of the paper.

K. R. Shanmugam
K. Shanmugam

INTRODUCTION

Public debt sustainability and fiscal discipline are important for economic stability of any national or sub-national Government. When its revenues fall short of its expenditure commitments, the Government borrows to finance its excess expenditures. The net borrowing of the Government is reflected in fiscal deficit. The public debt is the total liabilities or borrowings of the Government. The deficit financing and public debt are common features of public finance policy of any Government. Many economists believe that debt is one way to raise money for development. That is, borrowings can enable the Government to finance important development programs and projects (Hakura, 2020).

If the debt amounts can be used to finance the social and infrastructure development projects, these projects can trigger economic growth and lead to higher income in future, which may offset the cost of debt servicing. Therefore, the debt is not an issue for a Government if it generates enough surplus resources in future to service its debt.[1] The public debt is considered sustainable if the Government is able to meet all its current and future obligations without external financial assistance or going into default. In a lucid sense, it is basically about good housekeeping (Blanchard et al., 1991).[2]

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 capital stock accumulation and economic growth via heightened long

1. This is true for many Governments in developed countries with high level of debt-GDP ratio. For instances, the five-year (2015-2019) average debt-GDP was 231.94 percent in Japan, 111.06 percent in Singapore, 106.34 percent in USA and 102.01 percent in Belgium.

2. There is a broad acceptance that the debt within limit and used appropriately on critical investment area and also used as instrument of counter cyclical fiscal policy can be always a beneficial option for any Government. However, views differ on the efficacy of public debt influencing private investment.

term interest rates, higher distortionary tax rates, inflation, and a general constraint on countercyclical fiscal policies which may lead to increased volatility and lower growth rates (Rugy and Salmon, 2020). Sometimes, it can make the Government to default which can cause borrowing Government to loss market access and suffer from higher cost of borrowing.

According to Economic Survey (2021-22), the general Government debt relative to GDP in India would reach 90 percent at the end of 2022-23 and the centre's debt would be 60.2 percent. Studies indicate that the combined debt of central and state Governments in India is unsustainable. For instance, a recent study by Srivastava et al., (2021) showed that the sustainable level of debt-GDP ratio for India was only 59.3 percent (in 2018-19). The Fiscal Responsibility and Budget Management (FRBM) Review Committee headed by Dr. N. K. Singh suggested that 60 percent is the sustainable level for India and 40 percent for the centre. This essentially means that the sustainable limit for all states combined debt-GDP is only 20 percent. However, the budget speech of Dr. Palanivel Thiaga Rajan, Minister for Finance and Human Resource Management, Government of Tamil Nadu for 2022-2023 on 18th March 2022 indicates that the total outstanding debt of Tamil Nadu state will reach Rs. 6.53 lakh crore (i.e., debt-GSDP ratio of 26.3 percent) at the end fiscal year 2022-23. It also states that this is within limits set by the 15th Central Finance Commission (FC). Further, the average real rate of growth of Tamil Nadu economy (2004-05 base) from 2005-06 to 2011-12 was 10.3% and it declined drastically to 6.43% (2011-12 base) from 2012-13 to 2021-22.[3]

In this context, the following questions that are emerged are: (i) whether the public debt in Tamil Nadu is sustainable or not?; (ii) whether the debt-GSDP of Tamil Nadu is growth inducing or not?; (iii) what is the

3. During 2005-06 to 2011-12, the all India GDP (2004-05 prices) grew at 8.2%; but during 2012-13 to 2021-22, it (2011-12 prices) declined to 5.48%.

debt threshold for Tamil Nadu?; (iv) why the limits set by the FC for Tamil Nadu differ from the limit sets by the FRBM Review Committee for Indian states? (v) what are the causes for high level of public debt? and what are fiscal policy strategies required for the state to get rid of debt trap?

This study attempts to provide answers to these questions. The next Section briefly discusses the economic perspectives of public debt and reviews relevant empirical studies on debt sustainability. Following two Sections explain the sources and causes of public debt and compare the term solvency with sustainability. Then, the trend in public debt in Tamil Nadu is discussed. The subsequent sections empirically analyse the sustainability issue, measure the debt sustainability threshold and examine the relation between growth and public debt and measure the debt threshold, which is growth inducing. Then, an interstate comparison of public debt in India is made. The next section provides a few simulation exercises results using the debt dynamics of the state to find out when the state will achieve the debt sustainability target. The final Section suggests the policy strategies to control debt and reach the sustainable level in Tamil Nadu.

PUBLIC DEBT: ECONOMIC PERSPECTIVES

Theoretical Views: 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). There are three main theoretical views on debt/deficit financing in the literature:

(i) the Ricardian view is that budget deficits today require higher taxes in the future when a Government cuts taxes without changing the present or future public spending. 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 (popularly known as Ricardian Equivalence theorem) is based on the inter-temporal budget constraint of the government and on the permanent income hypothesis.[4]

(ii) the Keynesian view envisages that deficit financing can boost aggregate demand and thereby stimulate the 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.[5]

(iii) the neo-classical view considers that the component of revenue deficit in the fiscal deficit implies a reduction in Government saving or an increase in Government dissaving and thus, distorting 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).

Empirical Models: Traditional studies employed the Domar (1944) stability condition: "As long as the real economic growth is greater than the real interest rate, the Government can have a positive primary deficit

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

5. Inter-generational re-distribution is the main justification for popular "Golden Rule" in public finance. This rule views that Governments should finance public investments that yield long-term benefits by public deficits in order to make future generations contributing to the financing. As future generations will enjoy the benefits from today's investment, their contribution to the financing is justified.

such that its debt will not rise and so the debt is sustainable". This approach was extended later to consider the inter-temporal budget constraint (IBC) of the Government and also with additional indicators (growth, liquidity, creditworthiness, fiscal burden, fiscal space, etc.) and renamed as "Indicator approach" (Blanchard et al., 1991; Pattnaik et al., 2003).[6] 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.

The modern empirical approach on debt sustainability utilizes the statistical tests. The pioneer in this approach was the seminal work of Hamilton and Flavin (1986), which introduced the unit root 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).

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). [7]

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6. The IBC is $d_t^* = \sum_{j=1}^{\infty} \frac{1}{(1+r)^j} E_t\left[s_{t+j}\right]$, where d_t^* = $(1 + r_t)$. 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 the interest rate r is resorted to in order to discount the stream of public debt, and this plays an important role.

7. However, the time series approaches were criticized because: (i) the unit root test is very sensitive to structural breaks and the results could be misleading (Uctum et al., 2006); (ii) it is very difficult to reject a unit root in real debt or in the debt to GDP ratio and (iii) rejection of sustainability based on these two tests are invalid because 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).

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Another model-based test that has gained popularity is Bohn (1995). This approach is basically to test whether the primary balance-GDP ratio (s_t) is positive and, at least, a linearly rising function of the debt-GDP ratio (d_t). Later, Bohn (1998) utilized the Barro (1979) tax-smoothening 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:

$$s_t = \alpha + \psi\, d_t + \phi_1 yvar_t + \phi_2 gvar_t + \varepsilon_t \qquad (1)$$

where $yvar$ 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. 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.

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).[8] Accordingly, 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 can be re-written as:

$$s_t = \alpha + \psi_t\, d_{t-1} + \phi_1 yvar_t + \phi_2 gvar_t + \varepsilon_t \qquad (2)$$

8. 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.

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

A few studies such as Srivastava et al., (2021) estimate the sustainability threshold for Government debt-GDP ratio 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). The threshold model allows coefficients (of region-varying variable(s)) 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. [9]

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; Uctum et al., (2006) used the unit root test to test the debt sustainability in G7 countries, selected Latin American and Asian countries and found that the debt was sustainable only in G-7 countries. Hakkio and Rush (1991) and Jha and 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

9. 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).

from 1990 to 2002. Greiner and Kauermann (2008) used penalized spline method and found that debt is sustainable in Germany and not in Italy. Griener and Fincke (2009) used Bohn framework and p-spline technique to analyse the debt sustainability issue of 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 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 during 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 during 1985 to 2015, China's public and external debt are both sustainable. See Afonso (2005), Neck and Sturm (2008), Fincke and Greiner (2011) and D'Erosmo et al., (2016) for a review of empirical studies.

Some studies argue that higher debt may lead to higher growth or welfare or investment (Ghosh, 1998; Greiner and Fincke, 2015). Empirical studies examining the debt-growth relationship at the international, the 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 the 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. The advantage of the last approach is that it is useful to compute the threshold level of public debt.

SOURCES AND CAUSES OF PUBLIC DEBT

Indian Constitution assigns different borrowing powers to central and state Governments. The central Government debt comprises domestic debt and external debt. The domestic debt 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 (National Small Saving Fund (NSSF) etc. The external debt is from multilateral agencies like International Development Association (IDA), International Bank for Re-construction and Development (IBRD), Asian Development Bank (ADB) etc. 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 from the domestic market (i.e., internal debt) and 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. 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. Since 2005-06 due to the 12^{th} FC, central loans are restricted to external loans. The public account debt of state includes small savings, provident funds, reserve funds, deposits bearing interest and deposits not bearing interest etc. However, financing of the deficit through public account is not under the total control of the State Governments.

Governments borrow, in general, for various reasons. A major cause for high level of debt is low economic growth. The economic growth is always volatile. If the actual growth is below potential growth (due to structural or cyclical reasons), aggregate demand has to be increased by more public spending, However, the impact of increased spending stimulus depends on how it is financed. If it is financed through high taxes, this will reduce private disposable income, which in turn will reduce private expenditure that will reduce aggregate demand. The net increase in demand is uncertain in this case. Alternatively, it can be financed through additional borrowings. But source of borrowings matters: if from RBI, it is less costly but will increase inflation; if from domestic sources, the interest rate may go up; and if from external sources, the exchange rate will increase. Another main cause of borrowing is political reason. Government borrows to spent more to woo voters, particularly at the time of election years: before election in order to attract voters and after election in order to fulfil election promises.

SOLVENCY AND SUSTAINABILITY

Sometimes, economists interchangeably use "solvency" with "sustainability". Solvency refers to the ability of any Government to pay its debt or meet its long term financial obligations.[10] 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 would never exceed a certain threshold. A thumb rule is stable or declining debt-GDP ratio.
(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.

10. 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.

(iii) Government has to have enough resources in 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.

PUBLIC DEBT IN TAMIL NADU

The outstanding liabilities (or debt) of Tamil Nadu Government was Rs. 17,124 crore in 1996-97 and increased to Rs.43,915 crore. It further increased to Rs. 1,11,657 crore in 2011-12 and to Rs. 5,12,555 crore in 2020-21 (Table 1). Debt relative to GSDP (2011-12 base series) increased from 14.82 percent in 1996-97 to 23.13 percent in 2003-04. Then, it continuously declined to 16.92 percent in 2011-12 due to various fiscal measures including the implementation of FRBM Act. After that, it continuously increased to 26.94 percent in 2020-21 (Figure 1).[11] It is noticed that after 2015-16, it exceeded 20 percent level as suggested as sustainable level for Indian states by the FRBM Review Committee.

11. If we use actual GSDP series (i.e., Up to 1998-99, the 1993-94 base series; 1999-00 to 2003-04, the 1999-00 series; and 2004-05 to 2010-11, the 2004-05 series), it was 19.19 percent in 1996-97 and increased to 28.11 percent in 2003-04. That is, till 2011-12, it shows relatively a high value (Figure 1). We consider the 2011-12 base series for taking ratio and measuring the growth.

Table 1: Major Fiscal Indicators for Tamil Nadu

Year	GSDP* (Current)	GSDP(2011-12 Series)$		Outstanding Liabilities	Primary Deficit	Interest Payment	Primary Expenditure	Revenue Expenditure	Revenue Receipts
		Current	Constant						
1996-97	89237	115548	252208	17124	-969	1476	13589	13065	11961
1997-98	103550	134081	272894	19377	-358	1763	15163	14951	13587
1998-99	118209	153062	285798	23058	-2655	2122	17239	17698	14261
1999-00	134185	163555	303264	28430	-2671	2711	19313	20728	16328
2000-01	146796	178926	321073	33421	-1953	3124	20629	21753	18317
2001-02	148861	181444	316049	37933	-1227	3513	20369	21557	18818
2002-03	158155	192772	321593	43915	-2609	4133	23879	25688	20837
2003-04	175371	213756	340848	49445	-891	4700	25172	25271	23706
2004-05	219003	246669	379878	55144	-815	4755	30050	29155	28452
2005-06	257833	290404	432894	62310	2308	4559	32544	32009	33960
2006-07	310526	349753	498743	66320	1550	5506	40965	38265	40913
2007-08	350819	395136	529319	71072	2400	6086	46133	42975	47520
2008-09	401336	452035	558176	83662	-2585	5963	59561	53590	55042
2009-10	479733	540336	618606	99180	5140	6667	63571	59375	55844
2010-11	584896	658783	699757	111657	-8706	7940	79664	72916	70188
2011-12	751486	751486	751486	127128	-8404	8871	96786	83838	85202
2012-13	854825	854825	791824	147416	-6314	10205	106199	97067	98828
2013-14	968530	968530	851976	166681	-8178	12405	116834	109824	108036
2014-15	1072678	1072678	893915	191847	-12613	14550	136400	128828	122420
2015-16	1176500	1176500	967562	223030	-15236	17391	144928	140993	129008
2016-17	1302639	1302639	1036762	283394	-35637	20533	179417	153195	140231
2017-18	1465051	1465051	1125793	326518	-13828	26012	168582	167874	146280
2018-19	1630209	1630209	1204667	368736	-18578	28757	199232	197200	173741
2019-20	1797229	1797229	1278559	423743	-28199	31980	208109	210435	174526
2020-21	1902689	1902689	1296659	512555	-50595	37147	236157	236402	174076

Source: CAG Report on Finance Accounts and State Government Budget Documents (various years).

Note: *Actual Series: Up to 1998-99, the 1993-94 base series; 1999-00 to 2003-04, the 1999-00 series; 2004-05 to 2010-11, the 2004-05 series and since 2011-12, the 2011-12 series.
$ From 1996-97 to 2010-11, the back series converted into 2011-12 base series by EPW Research Foundation.

The trends in revenue receipts, revenue expenditures and total expenditures (primary expenditure+ interest payment) relative to GSDP as shown in Figure 2 explain the movement of debt-GSDP ratio. The gap between the revenue expenditure-GSDP ratio and the revenue receipts-GSDP ratio was larger till 2003-04. After that revenue receipts-GSDP ratio exceeded the revenue expenditure-GSDP ratio till 2008-09 and again in 2011-12 and 2012-13. At the time, the debt-GSDP ratio showed a declining trend. Since 2013-14, the revenue expenditure relative to GSDP continuously exceeded the revenue receipts relative to GSDP and the gap between them widened. The gap between total expenditure and revenue

receipts also widened (Figure 2). This was the period where the debt-GSDP ratio started increasing continuously.

Figure 1: Outstanding Liabilities to GSDP and Interest to Revenue Receipts of Tamil Nadu (1996-97 to 2020-21)

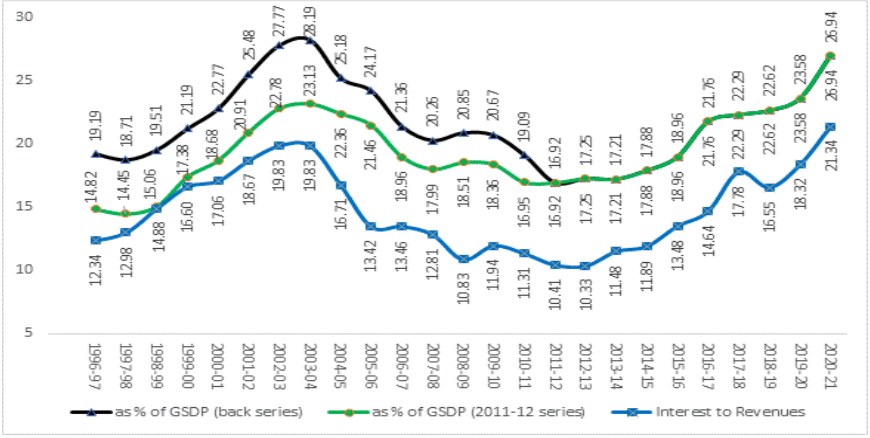
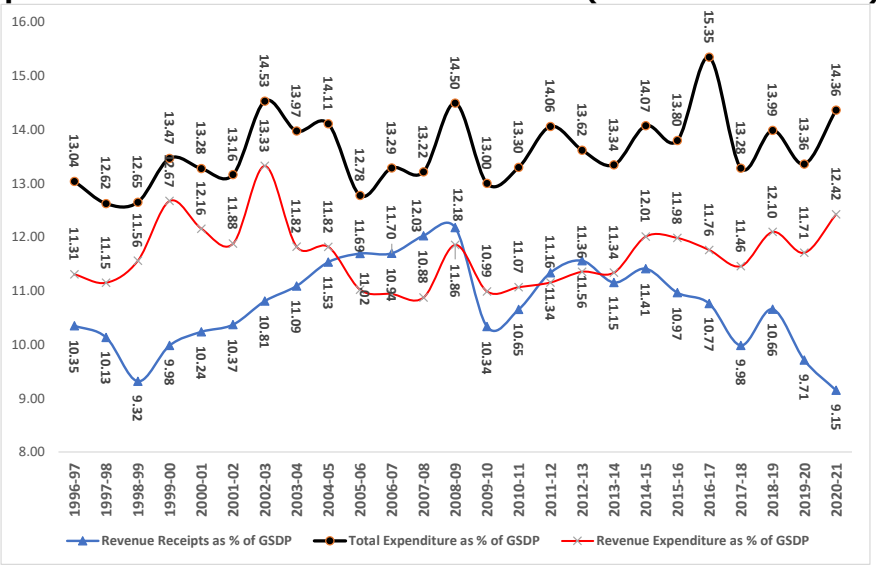


Figure 2: Revenue Receipts, Revenue Expenditures and Total Expenditures Relative to GSDP of Tamil Nadu (1996-97 to 2020-21)



It is noticed that the states' GSDP (real) growth stagnated from 2001-02 to 2003-04 resulting in increased borrowing. Thereafter, the GSDP growth picked up and recorded the highest growth of 15.21 percent in 2006-07 (Figure 3). Due to this high growth which was also supported by austerity measures including the implementation of FRBM act in 2003, the debt was kept under control. After 2013-14 again the economic growth slowed down touching the lowest level in 2020-21 due to COVID-19 pandemic. During this period, there was a steady increase in debt level with a spike in 2016-17 for meeting the debt takeover of power utility by the state Government. Except between 2010-11and 2012-13 and in 2018-19, the revenue receipts relative to GSDP stagnated in the rest of the years accentuating the problems of revenue deficit and fiscal deficit (Figure 4). It is also observed that the path of interest to revenue receipts is almost the same as the path of debt-GSDP ratio (Figure 1).

Figure 3: Annual Growth Rates of Real GSDP and Real Outstanding Liabilities

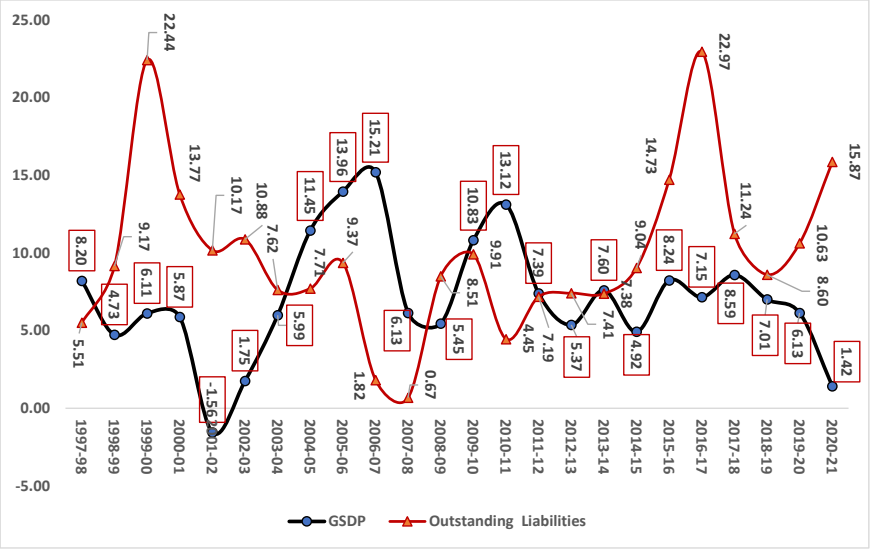
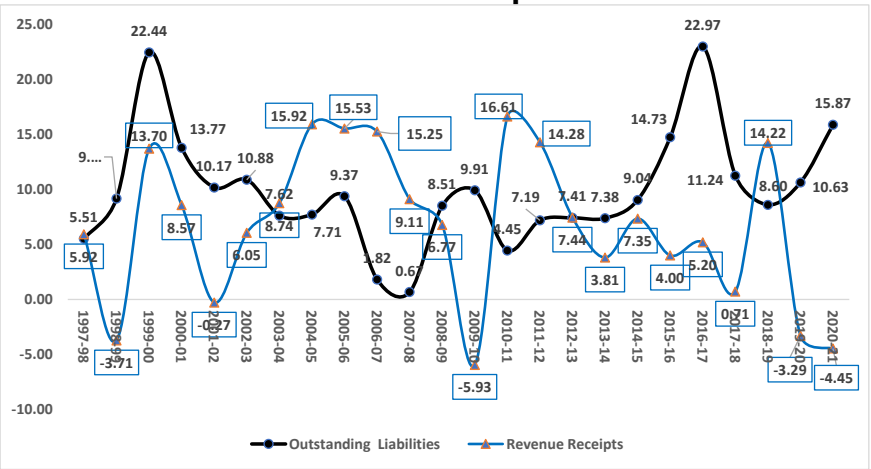


Figure 4: Growth Rates of Real Outstanding Liabilities and Real Revenue Receipts



Thus, widening of fiscal gap is due to prolonged slow economic growth with consequential fall in revenue receipts (due to fall in own revenues and reduced devolution by 14th and 15th Finance Commissions). Further restructuring the debt of power utilities, implementation of GST, impact of demonetization and of late the adverse impact of COVID-19 aggravated the problem. These cumulative effects forced the state to lend more to meet the gap in the revenue account. As a result, the commitment to interest payment increased. It also seems that the state has not taken effort to control the revenue expenditures after 2013-14.

EMPIRICAL TESTS FOR DEBT SUSTAINABILITY

(i) Unit Root Test: The simplest modern statistical test on debt sustainability is to check whether the debt-GSDP series is stationary or not. Table 2 reports the Augmented Dicky-Fuller (ADF) test results. The debt-GSDP ratio in Tamil Nadu has unit root, i.e., it is not stationary, indicating that the debt is unsustainable.

Table 2: Stationary (ADF) Test Results for Debt-GSDP Ratio (1996-97 to 2020-21)

Augmented Dickey-Fuller Test Statistics	t-statistics	Prob.*
	-1.2890	0.6166
Test Critical Values	1% level	-3.7529
	5% level	-2.9981
	10% level	-2.6388

Note: *Mackinnon(1996) one-sided p-values

(ii) Co-integration Test: It examines whether the government revenue and total expenditures reltive to GSDP 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 3 indicates that these two series are not co-integrated at 5 percent level of significance. This means that the debt in Tamil Nadu is not sustainable.

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

(i)Unrestricted Cointegration Rank Test (Trace)				
Hypothesized No. of CE(s)	Eigenvalue	Trace Statistics	0.05 Critical Value	Prob.**
None	0.2927	9.3697	15.4947	0.3323
Atmost 1	0.0593	1.4049	3.8415	0.2359

Note: Trace test indicates no cointegration at the 0.05 level; * Max test also provides similar results and so not reported.

** Mackinnon-Haug-Michelis (1999) p-values.

(iii) Bohn Model Based Non-linear Test: As explained above (and in equation 2), 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 4 presents the penalized spline estimation results. As expected, the coefficient of business cycle variable *yvar* is positive and that of gvar is negative. But only the latter is statistically significant at 5 percent level, indicating that the primary spending above its normal value

has reduced the primary surplus in the state. Although the parameter associated with lagged debt-GDP ratio is positive, it is not statistically significant even at 10 percent level, implying that the public debt is unsustainable in Tamil Nadu. Thus, all the three modern statistical tests confirm that the public debt in Tamil Nadu is not sustainable.

Table 4: p-spline Estimation Results of Debt Sustainability Equation for Tamil Nadu

(Dependent variable: Primary Balance to GSDP%, s_t)

Variables	Notation	Coefficient (t value)
Intercept	$\hat{\alpha}$	-2.26100 (-1.011)
Lagged Debt-GSDP ratio (%)	d_{t-1}	0.01436 (0.204)
Real GSDP gap	yvar	0.00001 (1.050)
Real Primary Expenditure Gap	gvar	-0.00009 (-3.618)
edf.		5.16
F (p-value)		2.659 (0.070)
R-sq.(adj)		0.744
GCV		0.3546
N		24

ESTIMATING DEBT SUSTAINABILITY THRESHOLD

Table 5 presents threshold regression results, in which the lagged debt-GSDP ratio is the threshold variable. The sustainable debt-GSDP for Tamil Nadu is estimated at 18.36 percent, which is slightly less than the 20 percent norm given by FRBM Review Committee for all Indian states.

Table 5: Threshold Regression Results (1997-98 to 2020-21)

Dependent Variable: Primary Deficit to GSDP % (s_t) Threshold Variable: Lagged Debt-GSDP ratio % (d_{t-1})				
Variables	**Notation**	**Coefficient**	**t-statistics**	**Prob.**
$d_{t-1} < 18.3553$ (Region 1)				
Lagged Debt-GSDP ratio (%)	d_{t-1}	0.227	2.500	0.012
$18.3553 \leq d_{t-1}$ (Region 2)				
Lagged Debt-GSDP ratio (%)	d_{t-1}	0.182	2.514	0.012
Region Invariant Variables				
Real GSDP gap	yvar	-0.0001	-0.521	0.602
Real Primary Expenditure Gap	gvar	0.0001	4.494	0.000
Constant	$\hat{\alpha}$	-2.908	-1.903	0.057
Sum Squared Resid.	SSR	6.408		
Akaike Info Criterion	AIC	-21.691		

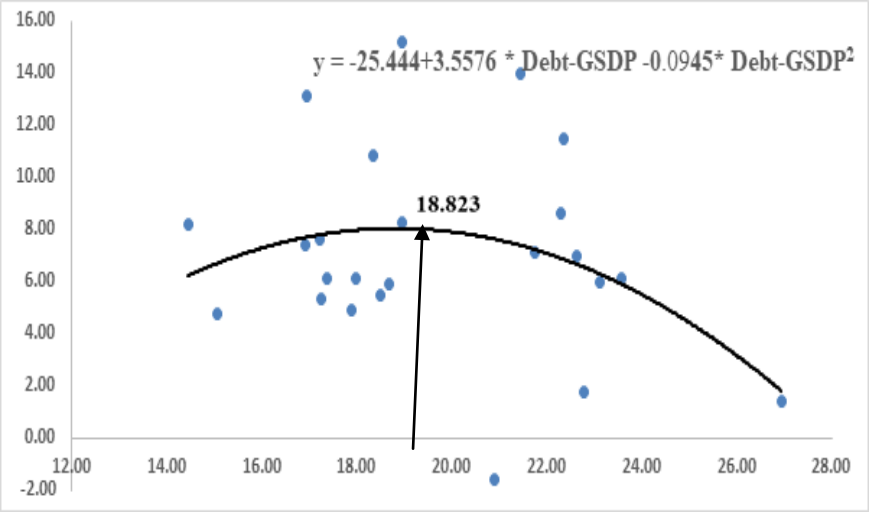
This model considers a single threshold dividing the sample into two regimes or regions as relevant. It considers that the behaviour of primary balance relative to GSDP may change if the debt-GSDP ratio crosses a certain threshold. It may trigger suitable responses by policymakers to reduce primary deficit-GSDP ratio if the debt-GSDP ratio crossed the prudent norm of 18.36% (in our case). It is observed from Table 5 that when debt-GSDP increased by one unit, the primary balance increased by 0.23 unit in region 1 where the debt level was below the threshold; and by 0.18 unit in region 2 where the debt exceeded the threshold.

EXAMINING DEBT-GROWTH RELATIONSHIP AND DEBT THRESHOLD

To examine the impact of debt-GSDP ratio on growth of economy, the growth rate in percentage is regressed on debt-GSDP and its squared term. This non-linear form is useful to find out the debt threshold, a value up to this debt-GSDP ratio is growth inducing and

beyond this it is not growth inducing (i.e., growth reducing). Figure 5 depicts the non-linear relation between growth (y_t) and debt-GSDP for Tamil Nadu from 1997-98 to 2020-21. The debt-GSDP coefficient is positive, while its squared term's coefficient is negative. The threshold level is computed using the formula: threshold = Coefficient of Debt-GSDP / 2 x Coefficient of Debt-GSDP^2 =3.5576/2*0.0945) = 18.82 percent, which is closer to the value of 18.36 percent given in threshold regression model.

Figure 5: Debt Threshold for Tamil Nadu (1997-98 to 2020-21)

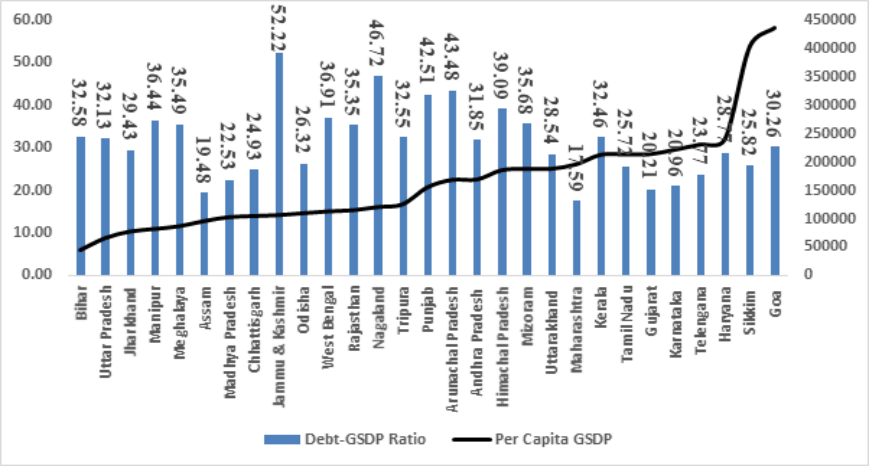


DEBT PROFILE AND PER CAPITA INCOME: AN INTERSTATE COMPARISON

Figure 6 shows the debt profile and per capita income of Indian states in 2019-20. Bihar was the poorest income state with Rs. 45,071 while the Goa was the richest one with Rs. 4, 35,959. The per capita income of Goa was 9.67 times of the per capita income of Bihar. Thus, per capita income varied widely among Indian states. However, irrespective of their income, all states resorted to borrowing. If we go by the norm of the FRBM Review Committee, only Maharashtra (17.59%), Assam (19.48%)

and Gujarat (20.21%) meet this norm. Jammu & Kashmir had the highest debt-GSDP ratio (52.22 percent), followed by Nagaland (46.72 percent) and Arunachal Predesh (43.48 percent). Tamil Nadu ranked 7th in per capita income, but 8th in low debt-GSDP ratio.

Figure 6: Debt Profile and Per Capita Income of Indian States in 2019-20



Source (Basic Data): RBI's State Finance: A Study of State Budgets and Mospi.

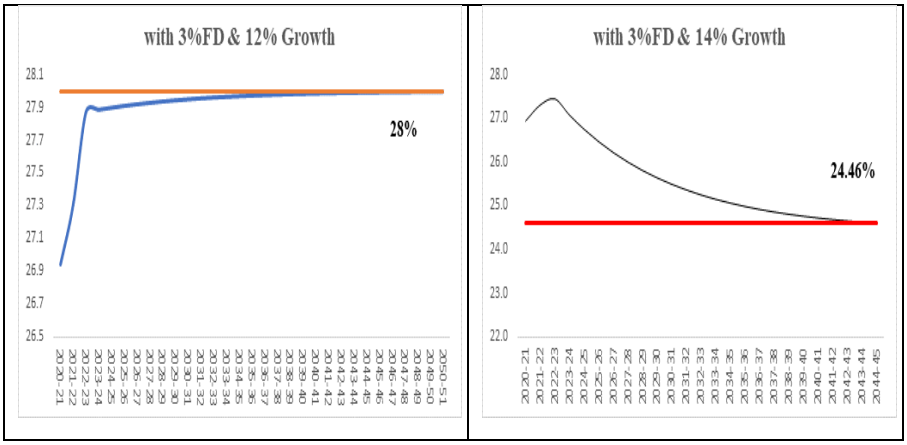
SIMULATION MODEL EXAMINING THE PERIOD OF ATTAINING THE DEBT THRESHOLD TARGET

The debt-GSDP ratio (d_t) at the end of a fiscal year depends on (i) fiscal deficit-GSDP ratio (f_t), (ii) last year debt-GSDP ratio (d_{t-1}) and (iii) nominal growth rate (g_t). The change in debt-GSDP ratio between two successive years is given by: $(d_t - d_{t-1}) = f_t - d_{t-1}\ (g_t/(1+g_t))$. Using this standard debt dynamic formula, one can project or simulate debt-GSDP level in future period, given assumptions on f_t and g_t and previous year debt (d_{t-1}). We have done a few simulation exercises using different assumptions on these three components to examine whether Tamil Nadu Government will achieve the sustainable level of debt or not and if yes, when it will reach?. The following initial values of debt to GSDP, fiscal deficit and nominal growth of Tamil Nadu economy from the recent budget documents are used: (i) debt to GSDP ratio for 2020-21: 26.94

percent; (ii) fiscal deficit for 2021-22: 3.79 percent and for 2022-23: 3.49 percent; and (iii) growth for 2021-22: 14.56 percent.

In exercise 1, the nominal annual growth rate is assumed to be 12 percent from 2022-23 onwards (based on last 10 years' actual average growth of economy of 11.3 percent) and the fiscal deficit is assumed at 3 percent from 2023-24 onwards. In exercise 2, the higher growth of 14 percent is used, other things remaining the same. Simulations based on above debt dynamics formula (exercise 1) indicate that debt-GSDP ratio will rise to 27.9 percent in 2022-23 and continue till 2030-31 and then it will stabilise at 28 percent beyond 2050-51, i.e., it will never reduce even after 100 years (Figure 7). In exercise 2, the debt-GSDP will initially rise to 27.4 percent in 2022-23. After that it will continuously decline to reach 24.6 percent in 2042-43 and thereafter it will stabilise for a longer period.

Figure 7: Simulation Results of Debt-GSDP Ratio, given f_t, g_t and d_{t-1}



In exercise 3, when a still higher growth of 16 percent is used from 2022-23, the debt-GSDP ratio will continuously decline to reach 21.8 percent in 2049-50 and thereafter it will stabilise. Beyond 16 percent growth is a difficult task as it is highly ambitious, given the historical

growth path. [12] Therefore, the other possibility to control debt is to reduce the fiscal deficit target. If we assume 2.5 percent fiscal target and 14 percent nominal growth, the debt-GSDP will continuously decline and will stabilise at 20.4 percent from 2056-57. This is the target level suggested in FRBM Review Committee. Even if we assume 16 percent growth, it will reach the sustainable level of 18.4 percent in 2045-46. Finally, when we assume 2 percent fiscal deficit target the debt-GSDP ratio will reach the sustainable level in 2035-36 with 14 percent nominal growth and will reach the sustainable level in 2030-31 with 16 percent growth (Table 6).[13] It is noticed that with 14 percent growth the state will attain the 20 percent norm of FRBM Review Committee in 2030-31 and with 16 percent nominal growth it will attain 20 percent target in 2027-28.

Thus, ensuring 14 percent growth of economy, the state should target for a revenue surplus from 2023-24 onwards such that it contains its fiscal deficit to only 2 percent level to obtain the sustainable debt level of about 18 percent before 2035-36. The relevant policy strategy for the state is to increase its own revenue-GSDP ratio by 0.75 percent and contain its revenue expenditures by 0.75 percent (or increasing 1 percent own revenue-GSDP ratio and decreasing Revenue expenditure-GSDP ratio by 0.5 percent or any other combination) so that the state will reduce its fiscal deficit to 2 percent from 2023-24. [14]

12. Further 3 percent fiscal deficit target means that the Government should cut the fiscal deficit from 3.49 percent projected for 2022-23 by about 0.,5 percent in 2023-24 and maintain the same level thereafter.

13. If we assume 2 percent fiscal deficit target and 12 percent growth, the debt-GSDP target of 18.8 percent will be met only in 2057-58.

14. In 2020-21, the GSDP was Rs. 19,02,689 crore. If it is assumed to increase by 14.56 percent in 2021-22, 14 percent in next two years, it will become Rs. 28,32,765 crore in 2023-24. 0.75 percent of this will be Rs. 21246 crore. This is roughly about 8% of revenue expenditure or 18 percent of own revenues of the state.

Table 6: Simulation Results to achieve the Sustainable Debt-GSDP ratio

Year	14% Growth & 2% Fiscal Deficit					16% Growth & 2 % Fiscal Deficit				
	f_t	d_t	g_t	1+g	$d_t - d_{t-1}$	f_t	d_t	g_t	1+g	$d_t - d_{t-1}$
2020-21	4.61	26.9	-	-	-	4.61	26.9	-	-	-
2021-22	3.79	27.3	0.1456	1.1456	0.367	3.79	27.3	0.1456	1.1456	0.367
2022-23	3.49	27.4	0.14	1.14	0.137	3.49	27.0	0.16	1.16	-0.276
2023-24	2	26.1	0.14	1.14	-1.370	2	25.3	0.16	1.16	-1.728
2024-25	2	24.9	0.14	1.14	-1.202	2	23.8	0.16	1.16	-1.490
2025-26	2	23.8	0.14	1.14	-1.054	2	22.5	0.16	1.16	-1.284
2026-27	2	22.9	0.14	1.14	-0.925	2	21.4	0.16	1.16	-1.107
2027-28	2	22.1	0.14	1.14	-0.811	**2**	**20.5**	**0.16**	**1.16**	**-0.954**
2028-29	2	21.4	0.14	1.14	-0.712	2	19.6	0.16	1.16	-0.823
2029-30	2	20.7	0.14	1.14	-0.624	2	18.9	0.16	1.16	-0.709
2030-31	**2**	**20.2**	**0.14**	**1.14**	**-0.548**	**2**	**18.3**	**0.16**	**1.16**	**-0.611**
2031-32	2	19.7	0.14	1.14	-0.480					
2032-33	2	19.3	0.14	1.14	-0.421					
2033-34	2	18.9	0.14	1.14	-0.370			-		
2034-35	2	18.6	0.14	1.14	-0.324					
2035-36	**2**	**18.3**	**0.14**	**1.14**	**-0.284**					

STRATEGIES TO CONTROL DEBT AND REACH THE SUSTAINABLE LEVEL

From the above analyses, the following policy viewpoints emerge:

(i) Although the current level of debt-GSDP (i.e., above 25 percent) is within the limit set by the Fifteenth Finance Commission considering the pandemic, it is not the sustainable debt level for Tamil Nadu. Our analysis clearly indicates that the debt level beyond about 18.8 percent was growth reducing that is not good for the state. Maintaining sustainable level of debt will be growth inducing, which will help the state to increase its own revenues further, if they are buoyant;

(ii) Reducing the debt level to sustainable level will also bring down the cost of debt servicing due to reduced interest payments. From Figure 1, it is observed that when debt-GSDP ratio was about 18 percent in 2014-15, the interest (Rs. 14550 crore) to revenue receipts was 11.5

percent (i.e., it is 1.35 percent of GSDP) and when the debt-GSDP increased to 26.94 percent in 2020-21, the interest (Rs. 37147 crore) to revenue receipts increased to 21.24 percent (i.e., 1.95 percent of GSDP). The difference in interest is more than Rs.22500 crore. Thus, the reduction of debt-GSDP ratio will automatically reduce the interest relative to GSDP. The net reduction in the interest relative to GSDP in the year of attaining sustainable level of debt will be 0.6 percent. This will obviously further improve the fiscal status of the state as this saving can be spent on growth inducing investments.

(iii) The state should aim to attain 14 percent or above nominal economic 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 GSDP 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.

(iv) Apart from aiming for higher growth, the debt sustainability is possible only if the fiscal deficit is brought down to 2 percent of GSDP from 2023-24 onwards. Therefore, the appropriate policy strategy is revenue augmentation or containing expenditures or both. We suggest that own revenue can be increased by 0.75 percent and expenditures can be decreased by 0.75 percent. The revenue augmentation within the limited scope of the state is possible only through better tax compliance, revision of tax on transport (motor vehicle), and by augmenting non-tax revenues.[15] On the expenditure side, it is inevitable to cut down unproductive subsidies and expenses besides better targeting of welfare schemes through efficient data management.

(v) Considering the fact that the state's Public Sector Undertakings, particularly power utility and State Transport undertakings are already fiscally stressed, which could have been one of the reasons for higher

15. During 1996-97 to 2020-21, the non-tax revenue relative to GSDP ranged between 0.71 percent and 1.26 percent. In 2022-23, it is estimated at around 0.65 percent. This component can be increased to 1.25 percent by revising user fees, charges etc suitably.

level of debt in the state, it is absolutely necessary to restructure their finances so that the state can attain the debt sustainably.

We hope that this study is useful to policymakers, and other stakeholders to understand the debt dynamic in Tamil Nadu state and take appropriate policy strategies to attain and maintain the debt sustainability so that the economy can grow faster and the state finances will improve.

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