Debt Sustainability in Indian States: A Fiscal R* Analysis

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[1] Disclaimer: This paper has been prepared as a part of the probationary training for the Indian Economic Services (IES). The content of this paper is based on the research and analysis conducted by the author in an academic or professional capacity and is intended for informational purposes only. The views and opinions expressed in this paper are those of the author and do not reflect the official position or policy of the Government of India.

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Abstract

This study evaluates the debt sustainability of Indian states using fiscal gap analysis, clustering techniques, and Fiscal R-Star (R^*_f) calculations. The findings reveal stark disparities, with states like Punjab, West Bengal, Bihar, and Rajasthan facing unsustainable debt due to weak revenues and high expenditures, while Maharashtra and Gujarat maintain stability through better fiscal management. Interest payments further constrain developmental spending in states like Kerala and Punjab. The analysis underscores the impact of inflation dynamics on debt assessments, as higher inflation improves stability in some states while low-inflation states face greater strain. Strengthening fiscal sustainability requires enhanced tax revenues, rationalized expenditures, stricter fiscal responsibility laws, and improved debt management tailored to state-specific economic conditions.

Key Words: *Budget, Debt, State loan and borrowing, Fiscal Federalism*

JEL: H61, H63, H74, H77

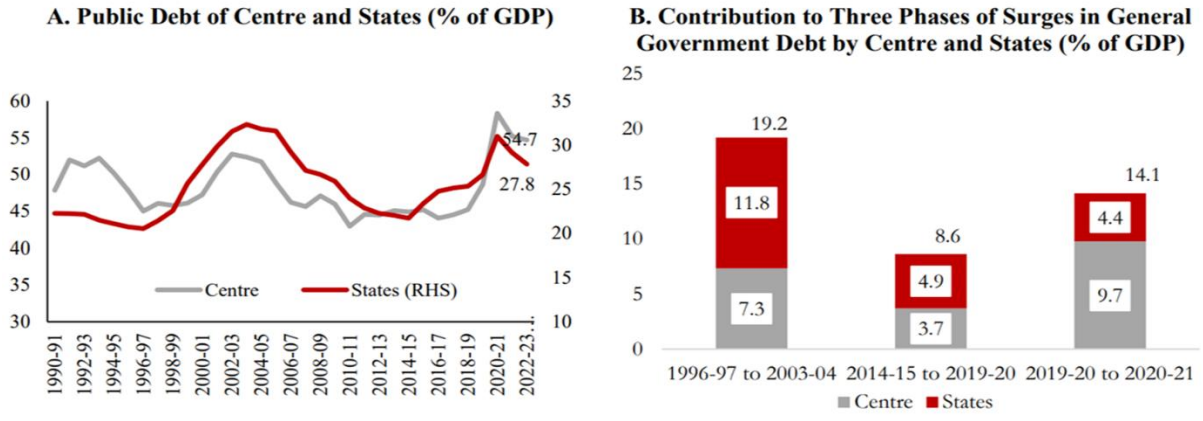
1. Introduction

Debt sustainability is a growing concern for economies worldwide, as both developed and developing nations face escalating fiscal challenges. Advanced economies, including the United States, the Eurozone, and Japan, struggle with high post-pandemic debt levels due to extensive fiscal stimulus, inflationary pressures, and rising interest rates, creating a widening gap between fiscal and monetary policies. Meanwhile, developing countries grapple with limited fiscal space, high borrowing costs, currency volatility, and structural constraints, with cases like Sri Lanka and Argentina highlighting the risks of severe debt distress and economic instability.

The global debt landscape underscores the need for a comprehensive analysis of fiscal health and sustainability. Many nations increasingly rely on debt-financed public spending, whether for infrastructure, social welfare, or crisis management, pushing them onto uncertain fiscal paths. While advanced economies face challenges balancing debt and growth, developing nations remain vulnerable to fluctuating global interest rates and capital flows. These complexities necessitate an in-depth evaluation of debt sustainability at both macro and micro levels to guide effective economic policies and prevent financial crises.

India presents a unique case, sustaining high economic growth while managing its debt levels better than several other emerging markets. However, fiscal deficits, public debt trends, and state-level financial imbalances remain key concerns. Indian states, which play a crucial role in public spending, often struggle with weak revenue generation and excessive borrowing, raising questions about long-term fiscal sustainability. The disparities in fiscal discipline among states make it imperative to analyse their debt management strategies and future implications.

Figure 1: Sheer Scale of State Debt



Note: Data are from the RBI's Handbook of Statistics on Indian Economy for the Centre; and RBI State Finances Report for the states. RE refers to Revised Estimates.

The figure depicts public debt trends for the Centre and States as a percentage of GDP. Panel A shows a steady rise in state debt and cyclical fluctuations in central debt from 1990-91 to 2022-23.

Panel B highlights the Centre's larger contribution to major debt surges, especially during 2019-20 to 2020-21. States drove two-thirds of the rise in general government debt during critical periods (e.g., 1997-2004, 2014-2020). Post-COVID, even as the Centre took on more debt, states still contributed ~30% of the 14.1 ppt spike in debt/GDP (2020-21).

This study introduces *Fiscal R-Star (r_f^*)* as a novel approach to assessing debt sustainability, offering a more dynamic perspective than traditional indicators. Unlike conventional metrics, which often overlook inflation dynamics and state-specific fiscal conditions, r_f^* accounts for variations in real interest rates and inflation, providing a more precise assessment of debt risks. By applying this framework globally, nationally in India, and at the subnational level, this research aims to offer valuable insights into sustainable debt management. The findings will guide policymakers and financial institutions in designing strategies that ensure fiscal stability while fostering economic growth, making this study highly relevant in the face of mounting global debt concerns.

2. Review of Literature

Fiscal sustainability is crucial for public finance, ensuring that governments can meet financial obligations without excessive borrowing. It requires balancing revenues and expenditures to maintain macroeconomic stability and investor confidence while preventing fiscal crises (Alesina & Perotti, 1996). The Intertemporal Budget Constraint (IBC) framework posits that future primary surpluses must match current debt levels to ensure solvency, a principle widely studied in fiscal sustainability research (Blanchard, 1990; Bohn, 1998). Complementing this, the Golden Rule of Public Finance advocates borrowing only for long-term investments rather than operational expenditures, promoting productive debt use for economic growth (Srinivasan & Wallack, 2006).

Globally, fiscal sustainability is key to economic stability, as excessive borrowing can crowd out private investment and trigger financial crises (Parker & Robson, 2000). International institutions such as the IMF and World Bank stress the need for stable debt-to-GDP ratios to prevent unsustainable debt trajectories and adverse global spillovers (IMF, 2013; Reinhart & Rogoff, 2010). Studies also highlight the link between fiscal deficits and long-term economic growth, with unsustainable deficits leading to inflationary pressures and exchange rate instability, especially in developing economies (Debrun et al., 2008; Haldane & Batten, 2003).

In India, fiscal sustainability is shaped by its federal structure, where both central and state governments manage public finances. The Fiscal Responsibility and Budget Management (FRBM) Act, 2003, introduced deficit reduction targets to enforce fiscal discipline at both levels (Government of India, 2003). However, many states continue to face fiscal imbalances due to limited revenue sources and dependence on central transfers, leading to persistent deficits and rising debt burdens (Chakraborty & Gupta, 2012; Ghosh & Ghosh, 2014). The 14th Finance Commission (2015) emphasized state-level fiscal health as vital for sustained public service delivery, particularly in infrastructure, health, and education.

The Reserve Bank of India (RBI) has frequently raised concerns about rising debt-to-GDP ratios at both the central and state levels, highlighting the risk of unsustainable fiscal paths (RBI, 2017). Policy reforms like the Goods and Services Tax (GST) were introduced to enhance revenue collection, yet challenges remain in addressing regional disparities in fiscal performance (Rao & Singh, 2016; Chaudhuri, 2017). Given these complexities, achieving fiscal sustainability in India requires targeted strategies tailored to state-specific economic conditions to ensure long-term financial stability and sustainable development (Patnaik, 2018; Rajaraman et al., 2005).

State Finances in India

Empirical studies on the fiscal sustainability of Indian states have largely focused on revenue generation, expenditure patterns, debt management, and inter-state disparities.

State Finances & Fiscal Disparities

Indian states exhibit significant fiscal disparities, with some maintaining stable finances while others face chronic deficits. Southern states generally perform better due to higher own tax revenues and efficient expenditure management, whereas northern and eastern states rely more on central transfers, making them vulnerable to fiscal shocks (Dholakia & Karan, 2020; NITI Aayog, 2021). The Finance Commission (2021) recommends improved financial management strategies to bridge these gaps and ensure long-term fiscal stability.

Revenue Trends & Taxation Post-GST

The Goods and Services Tax (GST) aimed to enhance fiscal autonomy, but its impact has been uneven. While it reduced tax cascading, revenue-neutrality varied across states, leading to shortfalls in State GST (SGST) collections (Rao & Chakraborty, 2020). The expiry of GST compensation in 2022 has intensified fiscal pressures, particularly for manufacturing-heavy states reliant on indirect taxes (Mukherjee, 2021; RBI, 2022).

Public Expenditure Patterns

Excessive reliance on revenue expenditure (e.g., subsidies, salaries) reduces fiscal space for productive investments, worsening fiscal stress (Buiter & Patel, 2010). States with higher capital expenditure show better long-term growth, despite short-term deficits from upfront investment costs (Mohanty & Panda, 2019). However, stagnation in capital expenditure across several states raises concerns about growth sustainability (RBI, 2021).

Interest Payments & Fiscal Deficit

Rising fiscal deficits have led to unsustainable debt and growing interest payment burdens. States with persistent revenue deficits risk a borrowing cycle to service interest payments, worsening fiscal distress (Misra, 2017). Debt restructuring and higher own-tax revenues are necessary to mitigate these risks, as increasing debt-to-revenue ratios threaten fiscal sustainability (Patnaik & Shah, 2019; RBI, 2022).

Debt Management & Liabilities

Public debt sustainability remains a critical concern, especially in the post-Fiscal Responsibility and Budget Management (FRBM) Act era. Rajaraman, Bhide, & Pattnaik (2005) analysed state-level debt dynamics and found that states with persistent fiscal deficits often resort to borrowing for revenue expenditure, thereby worsening their debt sustainability. Srinivasan & Wallack (2006) argue that post-FRBM amendments, while states have improved their fiscal deficit management, the overall debt burden remains high, particularly for fiscally weaker states. RBI (2023) reports highlight that outstanding liabilities as a percentage of Gross State Domestic Product (GSDP)

remain elevated for several states, raising concerns about their ability to service debt in the long run.

Global Perspectives on Debt Sustainability

Reinhart and Rogoff (2010) argue that excessive public debt slows economic growth and can lead to financial crises. Cecchetti et al. (2011) find that debt thresholds above 90% of GDP reduce economic growth potential, whereas Blanchard (2019) challenges this view, arguing that lower interest rates allow higher debt levels without jeopardizing sustainability. The IMF (2023) and World Bank (2022) highlight that debt sustainability depends on primary fiscal balances and economic growth rates relative to borrowing costs. Studies such as Eichengreen et al. (2020) emphasize that fiscal rules, debt ceilings, and independent fiscal institutions help manage sustainability risks. Krugman (1998) and Wyplosz (2019) argue that managing fiscal deficits effectively requires balancing public expenditure with long-term revenue projections.

Debt Sustainability in India

The Fiscal Responsibility and Budget Management (FRBM) Act (NIPFP, 2022) aims to ensure fiscal discipline at the central and state levels. The RBI's State Finances Reports assess the rising reliance on market borrowings and its impact on debt sustainability. Several studies (Rao & Sen, 2011; NCAER, 2021) analyse India's revenue mobilization efforts. The GST regime's impact on fiscal federalism has been studied by IGIDR (2020), highlighting revenue buoyancy concerns among states. Economic Survey (2023) reports emphasize the need for improved tax efficiency to sustain expenditure without escalating fiscal deficits.

Debt Sustainability in Indian States

State-level debt sustainability is a pressing issue in India. RBI (2023) reports show that many states allocate over 20 per cent of revenue receipts to interest payments, raising concerns about long-term fiscal viability. IEG (2022) emphasizes that states with weak revenue bases depend heavily on borrowing, increasing risks of fiscal distress. NIPFP (2022) explores the role of fiscal deficits and debt accumulation, finding that states with persistent deficits face rising borrowing costs. Madras School of Economics (2023) examines capital expenditure's role in growth, concluding that states investing in infrastructure sustain debt better than those financing revenue deficits. Studies link debt sustainability to economic growth and inequality. Barro (1990) and Aschauer (1989) argue that productive public spending enhances GDP growth. Piketty (2014) highlights the need for progressive taxation to ensure equitable debt management. Indian studies (NIPFP, 2022; IGIDR, 2021) emphasize that mismanaged debt exacerbates inequality by reducing fiscal space for welfare programs.

Methodologies Used in Prior Studies

Empirical research on fiscal sustainability in Indian states has relied on trend analysis, gap analysis, cluster methods, and panel regression models to examine revenue patterns, expenditure trends, and debt dynamics. While these methods provide valuable insights, they have limitations in capturing structural shifts, long-term trends, and real-time fiscal shocks.

Trend and Descriptive Analysis have been widely used to assess fiscal trajectories. The Reserve Bank of India (RBI) has consistently tracked state finances through its annual reports, highlighting shifts in fiscal deficits and debt burdens (RBI, 2021, 2022). Studies by Dholakia & Karan (2020) and Rajan & Roy (2019) show that post-GST tax revenue volatility has contributed to worsening fiscal imbalances. However, these analyses remain largely descriptive and fail to establish causal relationships between fiscal variables. Gap Analysis has been instrumental in evaluating revenue-expenditure mismatches. Research by Rajaraman, Bhide, & Pattnaik (2005) and Patnaik & Shah (2019) identified growing fiscal gaps due to limited own-tax revenue and rising state debt. Panel Regression Models provide a more robust framework for assessing fiscal sustainability determinants. Srinivasan & Wallack (2006) found that high fiscal deficits negatively impact economic growth, while Misra (2017) highlighted how rising interest payments weaken state finances. However, short-term data constraints and statistical limitations, such as autocorrelation and multicollinearity, often undermine the accuracy of these models (Mukherjee, 2021).

3. The Fiscal R-Star Analysis

Existing methodologies, while insightful, struggle to account for growth-adjusted borrowing capacity and state-specific fiscal constraints. The Fiscal R-Star (R^*_f) approach* offers a more dynamic framework by integrating primary balance, debt levels, and growth-inflation differentials to assess fiscal stress. Unlike traditional indicators, Fiscal R-Star identifies the implicit interest rate at which a state's debt remains stable, allowing for a more nuanced assessment of sustainability across diverse economic conditions. By bridging the gaps in existing studies, Fiscal R-Star enhances predictive accuracy and provides a forward-looking measure of state-level debt sustainability, making it a critical tool for policymakers seeking to maintain fiscal discipline.

The concept of Fiscal R-Star has been widely explored in economic literature as a crucial tool for assessing the sustainability of public debt and the interaction between fiscal and monetary policies. Fiscal R-Star is defined as the real interest rate that stabilizes a country's debt-to-GDP ratio, assuming output grows at its potential and inflation remains at the target level (Blanchard, 2019). This metric provides valuable insights into whether fiscal policies are on a sustainable trajectory and how they interact with monetary policy in achieving macroeconomic stability.

3.1 Benefits of Fiscal R-Star Analysis

One of the key advantages of Fiscal R-Star analysis is its ability to quantify the tensions between fiscal and monetary policy. By comparing Fiscal R-Star with the natural rate of interest (monetary r-star), policymakers can assess whether debt stabilization is compatible with monetary objectives (Rachel & Summers, 2019). A positive fiscal-monetary gap, where the monetary r-star exceeds Fiscal R-Star, indicates a scenario where achieving both debt sustainability and price stability may require significant policy adjustments (International Monetary Fund [IMF], 2024).

Additionally, Fiscal R-Star provides a standardized measure for evaluating fiscal sustainability across countries and time periods. Studies have shown that historically, episodes of high fiscal-monetary gaps such as in the post-World War II period were associated with significant fiscal and monetary challenges (Cecchetti et al., 2023). The metric also helps in assessing whether countries with high debt burdens, like Japan or Italy, need fiscal consolidation or monetary support to stabilize their debt dynamics (Jordà et al., 2022).

3.2 Limitations of Fiscal R-Star Analysis

Despite its analytical usefulness, Fiscal R-Star analysis faces several limitations. One major challenge is its reliance on accurate estimations of economic fundamentals such as potential output growth, inflation expectations, and the primary balance path (Gagnon, 2021). These variables are highly dynamic and subject to revision, leading to uncertainty in Fiscal R-Star estimates.

Another limitation is the assumption that fiscal policy is exogenously determined and unresponsive to rising debt levels. However, in reality, governments often adjust fiscal policies in response to changing debt dynamics, which may make Fiscal R-Star a less precise predictor of debt sustainability (Bohn, 1998). Moreover, while Fiscal R-Star is useful for advanced economies with stable fiscal and monetary institutions, its application in emerging markets—where fiscal policy is often more volatile may require modifications to account for country-specific risks (Eichengreen et al., 2020).

4. Research Gaps and Need for the Present Study

Research on fiscal sustainability in Indian states remains fragmented, often analysing revenue and expenditure separately without assessing their combined impact (Ghosh, 2018; Chakraborty & Sahoo, 2016). Short time-series data (5–10 years) further limits insights into long-term trends, especially post-GST and FRBM amendments (Mukherjee, 2021; Chakraborty & Dash, 2017). Methodologically, many studies use regression models without addressing statistical biases like heteroscedasticity and multicollinearity, leading to unreliable estimates (Rajan & Roy, 2019; Patnaik

& Shah, 2019). Addressing these gaps requires an integrated approach, longer datasets, and advanced econometric techniques to ensure robust fiscal assessments.

Traditional methodologies provide insights but fail to quantify the sustainability threshold of state debt in a growth-inflation framework. Fiscal R-Star (r_f^*) overcomes these gaps by integrating primary balance, debt levels, and growth-inflation dynamics, offering a forward-looking measure of debt stability. Unlike static fiscal deficit targets, Fiscal R-Star helps determine the implicit interest rate at which a state's debt remains stable, making it a superior tool for assessing fiscal risks. By addressing the shortcomings of past studies, this approach enhances predictive accuracy and provides a dynamic, data-driven framework for evaluating state-level fiscal sustainability in India.

4.1 Scope and Importance of the Study

Existing research on fiscal sustainability in Indian states remains fragmented, analysing revenue and expenditure separately without assessing their combined impact on debt sustainability (Ghosh, 2018; Chakraborty & Sahoo, 2016). Short-term data (5–10 years) limits insights into long-term fiscal trends, failing to capture sustained policy effects like GST and FRBM amendments (Mukherjee, 2021; Chakraborty & Dash, 2017). Methodologically, many studies use regressions without addressing econometric issues like heteroscedasticity and multicollinearity, leading to biased results (Rajan & Roy, 2019; Patnaik & Shah, 2019). A more integrated approach with longer datasets and advanced statistical techniques is needed for robust fiscal assessments.

4.2 Fiscal R-Star as a Novel Approach

To the best of my knowledge, despite extensive research on state finances, no prior study has applied Fiscal R-Star (r_f^*) to assess debt sustainability at the subnational level in India. Traditional indicators such as debt-to-GDP ratios and fiscal deficits offer a static view of fiscal health but fail to capture the dynamic relationship between growth, inflation, and debt stability. Fiscal R-Star overcomes these limitations by integrating primary balance, debt levels, and macroeconomic conditions, offering a forward-looking measure of fiscal sustainability.

This study further innovates by comparing Fiscal R-Star under two scenarios: one using actual state inflation rates and the other assuming a common 4% inflation rate. This reveals how inflation differentials affect debt stabilization, a dimension previously unexamined in state finance literature. The results provide a more precise ranking of states' fiscal risks, distinguishing between those on a sustainable path and those requiring immediate intervention.

By incorporating Fiscal R-Star into Indian state finances, this study bridges a crucial research gap, offering policymakers a dynamic tool to assess and manage fiscal sustainability effectively. This approach not only improves fiscal risk evaluation but also aligns state-level fiscal policies with broader macroeconomic stability and sustainable growth objectives.

4.3 Addressing Research Gaps in State Finances:

This study addresses key gaps in state-level debt sustainability research by providing a comprehensive, long-term analysis of fiscal health across Indian states. Unlike prior fragmented studies, it integrates revenue, expenditure, fiscal deficits, and liabilities for a holistic assessment. Covering 2011–12 to 2023–24, it captures structural shifts, especially post-GST. Advanced statistical techniques like gap analysis, and Fiscal R-Star enhance robustness. By highlighting regional disparities, the study offers valuable insights into varied fiscal capacities and sustainability challenges across states.

5. Research Objectives

I. To explore the status of state finances in India.
   - How are Indian state governments managing the finances?
     - Method used: Descriptive Statistics

II. To overview and assess the performance of state governments.
   - Are all states performing and functioning art uniform level or is there any discrepancy?
     - Method used: Gap Analysis

III. To analyse the states, particularly from debt sustainability perspective.
   - Will the State governments be able to sustain the economy with debt and growth?
     - Method used: Fiscal R* analysis

6. Methodology

This research aims to explore the debt sustainability of Indian states and Union Territories (UTs) by analysing key financial variables over a span of more than a decade (2011-12 to 2023-24). Specifically, it investigates the dynamics between debt and economic growth with a focus on the inflation rate. The analysis leverages descriptive statistics, trend analysis, gap analysis, cluster analysis, and Fiscal R-Star modelling to provide an in-depth understanding of the fiscal and debt health of states and UTs in India.

6.1 Data Source:

The data used for this study has been sourced from the Handbook of Indian States published by the Reserve Bank of India. The dataset includes financial statistics from 2011-12 to 2023-24 for all 22 states and UTs in India. The selected variables for analysis cover key aspects of fiscal health, which are:

Indicator	Description
1. GSDP (constant)	Gross State Domestic Product at constant prices
2. GSDP (current)	Gross State Domestic Product at current prices
3. GVA (constant)	Gross Value Added at constant prices
4. GVA (current)	Gross Value Added at current prices
5. Fiscal Deficit	Difference between total revenue and total expenditure
6. Revenue Deficit	Excess of revenue expenditure over revenue receipts
7. Interest Payments	Amount paid as interest on borrowings
8. Capital Expenditure (CAPEX)	Spending on asset creation and infrastructure
9. Own Tax Revenue	State's revenue from taxation
10. Own Non-Tax Revenue	Revenue from non-tax sources
11. Outstanding Liabilities	Total debt and liabilities of the state
12. Number of Workers	Total workforce in the state
13. Gross Capital Formation	Investment in assets for future production
14. State Installed Power Capacity	Total power generation capacity
15. Inflation Rate	Rate of increase in general price level

Table 1: Key Economic Indicators

6.2 Data Analysis Tools and Techniques:

6.2.1 Descriptive Statistics and Trend Analysis: Descriptive statistics (mean, median, standard deviation) and trend analysis were employed to understand the overall trends and variability of the selected financial indicators across the 22 states. This helped identify the historical patterns in fiscal health, including revenue generation, expenditure levels, and debt management.

6.2.2 Gap Analysis: Gap analysis was conducted by calculating key financial ratios to assess the fiscal sustainability of each state/UT in comparison to its Gross State Domestic Product (GSDP). The ratios include:

1. Revenue to GDP Ratio
2. Public Debt to GDP Ratio
3. Capital Expenditure to GDP Ratio
4. Interest Payments to GDP Ratio
5. Fiscal Deficit to GDP Ratio
6. Primary Deficit to GDP Ratio

These ratios help evaluate the effectiveness of fiscal management, the burden of debt, and the capacity to finance capital projects through internal revenue generation.

6.2.3 Fiscal R* Analysis: The concept and calculation idea has been taken from the International Monetary Fund (IMF)'s working paper by Bolhuis, M. A., Koosakul, J., & Shenai, N. (2024). This study focuses on calculating the Fiscal R-Star (∗) using data from 22 Indian states spanning the financial years 2011-12 to 2023-24. The dataset includes state-level macroeconomic indicators, including inflation rates, interest payments, outstanding liabilities, Gross Value Added (GVA), labour force participation, gross capital formation, and installed power capacity.[3]

(I) Fiscal Policy Responsiveness Analysis

To evaluate fiscal policy responsiveness, two regression models were estimated:

(I.I) Fiscal Reaction Function (Debt Stabilization Test)

Based on Bohn (1998) and Mauro et al. (2015), the relationship between the primary balance and debt was analysed using:

$$PB_t = \rho_1 d_{t-1} + \alpha_1 (Q_t - Q_t^*) + \epsilon_t$$

where represents the output gap. A statistically significant indicates a stable debt trajectory.

(I.II) Fiscal Policy Activeness Test

A second regression examined whether the primary balance adjusts towards the debt-stabilizing primary balance:

$$PB_t = \rho_2 PB_{DS} + \alpha_2 (Q_t - Q_t^*) + \epsilon_t$$

If is p_2 equal to 1, fiscal policy is actively adjusting to stabilize the debt. If p_2>1, the debt ratio is mean-reverting.

(II) Calculation of Fiscal R*

The final step involved computing Fiscal R-Star, the debt-stabilizing real interest rate, using:

$$r_f^* = \bar{g} + (1 + \bar{\pi} + \bar{g}) \cdot \frac{\bar{pb}}{\bar{d}}$$

More formally, Fiscal R-Star is the unobserved real interest rate that would achieve a stable ratio of public debt to GDP (d) for a given inflation target ($\bar{\pi}$) and expected constant path of the primary

[3] The detailed methodology is mentioned in the appendix

balance as a percentage of potential GDP (pb) and the trend growth rate of potential output ($\bar{g}$) at a given time.

Where R^*_f increases as the target debt-to-GDP ratio declines or when the primary balance, inflation target, and real growth rate increase.

This methodology enables a comprehensive assessment of fiscal sustainability by integrating macroeconomic, fiscal, and econometric analyses. By estimating Fiscal R-Star, we provide insights into the long-term viability of state-level fiscal policies in India and their implications for debt sustainability and policy effectiveness.

7. Results & Discussion

This section presents the findings of the study, which examines the fiscal sustainability of Indian states through a comprehensive analytical framework. The study employs a combination of descriptive analysis, debt clustering techniques, regression-based fiscal policy assessment, and Fiscal R-Star estimations to assess the current state of public finances at the subnational level. By integrating multiple approaches, the analysis provides a deeper understanding of debt accumulation patterns, fiscal policy responsiveness, and the sustainability of state finances.

The discussion begins with a descriptive evaluation of state-wise debt trends, identifying key variations in debt-to-GSDP ratios, fiscal deficits, and revenue patterns across regions. This is followed by a clustering analysis, which categorizes states into distinct groups based on their fiscal characteristics, highlighting commonalities and disparities in debt sustainability. The regression analysis examines whether states actively adjust their primary balances in response to rising debt, providing insights into the fiscal behaviour of different state governments. Lastly, the Fiscal R-Star estimation is conducted to determine the required primary balance for debt stabilization, considering both actual and expected inflation scenarios.

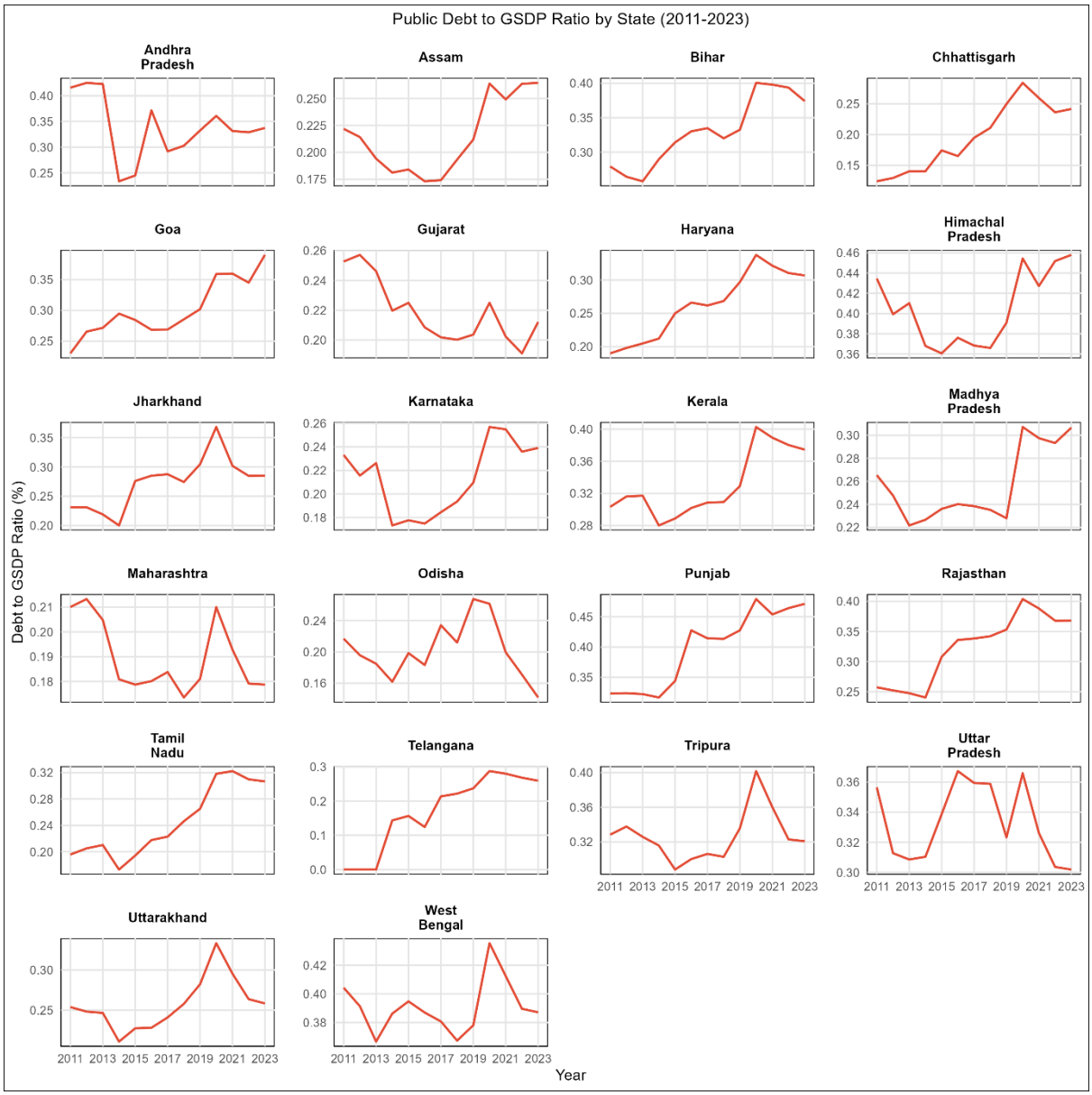
7.1 Descriptive Statistics

The descriptive statistics for 22 selected Indian states provide insights into their economic and demographic characteristics. The interpretation is based on key statistical measures such as mean, standard error, median, standard deviation, skewness, and kurtosis.

The analysis of Gross State Domestic Product (GSDP) at current prices highlights economic disparities among Indian states. Andhra Pradesh, Karnataka, and Maharashtra exhibit high mean values with significant variation, while states like Goa and Tripura show lower dispersion. Right-skewed distributions in Bihar, Punjab, and Kerala indicate economic inequality, whereas

Chhattisgarh and Odisha display near-normal distributions. Maharashtra, Tamil Nadu, and Gujarat emerge as high-economic-activity states with substantial variability, while smaller states show more stable patterns.

The public debt analysis reveals varying fiscal health across states. Andhra Pradesh, Bihar, and Gujarat report high and fluctuating debt levels, while Goa and Himachal Pradesh maintain relatively stable debt burdens. Haryana and Jharkhand show moderate variability, whereas Karnataka exhibits substantial debt fluctuations. The findings underscore state-wise financial disparities, with debt levels correlating with economic activity. High-debt states face greater fiscal risks, necessitating targeted policy interventions for sustainable debt management.



Source: Public debt and GSDP (Current) data sourced from RBI Handbook of Statistics. The debt-to-GSDP ratio is calculated by the author.

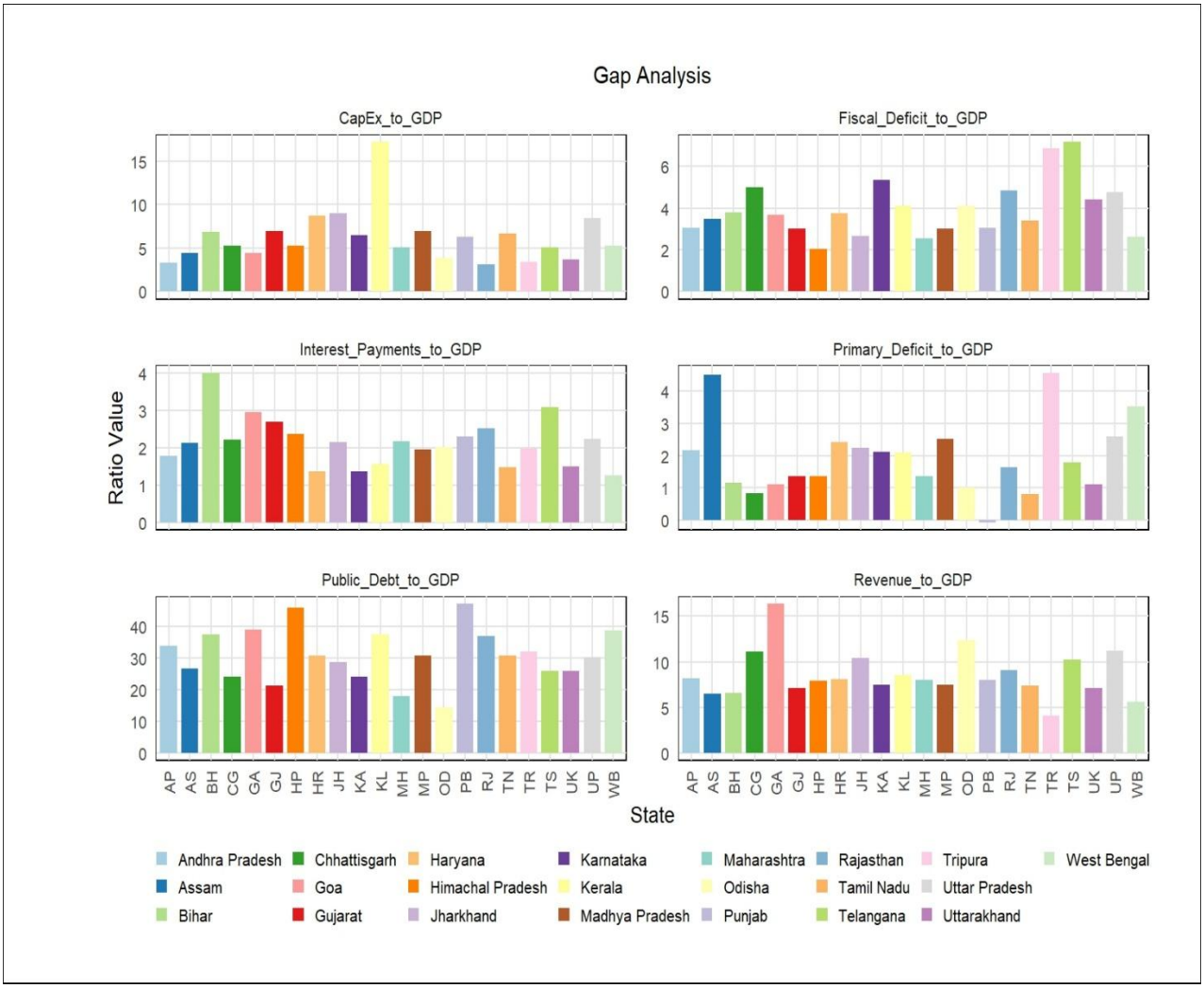
This figure illustrates the trend in the ratio of public debt to Gross State Domestic Product (GSDP) for various Indian states from 2011 to 2023. Each facet represents a state, allowing for a comparison of debt sustainability across different regional economies. The y-axis represents the debt-to-GSDP ratio, expressed as a percentage.

7.2 Gap Analysis

The fiscal landscape of Indian states exhibits stark contrasts in revenue generation, debt burdens, and expenditure patterns, impacting overall debt sustainability. Odisha (12.36%) and Uttar Pradesh (11.24%) maintain strong revenue-to-GDP ratios, benefiting from robust tax collection, while West Bengal (5.58%) struggles with weak revenue bases and heavy reliance on central grants. High debt-to-GDP ratios in Punjab (47.14%) and Himachal Pradesh (45.79%) reflect severe fiscal distress due to legacy debt and weak revenue growth, whereas states like Odisha (14.18%) and Maharashtra (17.87%) maintain more sustainable debt levels. Capital expenditure, crucial for long-term growth, is highest in Jharkhand (8.96%) and Haryana (8.72%), while states like Rajasthan (3.07%) lag in infrastructure investment. Interest payments pose significant fiscal constraints for Bihar (4%) and Telangana (3.08%), limiting their ability to fund development, while Delhi (0.28%) enjoys lower debt-servicing costs. High fiscal deficits in Telangana (7.16%) and Tripura (6.86%) indicate excessive reliance on borrowing. Primary deficits, excluding interest payments, highlight fiscal imbalances, with Assam (4.51%) showing excessive spending beyond revenue capacity. Meanwhile, Punjab's rare primary surplus (-0.06%) suggests short-term fiscal discipline despite a high debt burden. States like Odisha, Maharashtra, and Gujarat demonstrate stronger fiscal health through balanced revenue and debt management, while Punjab, Bihar, and West Bengal face acute fiscal stress due to high deficits and debt-servicing costs. The gap analysis underscores the need for prudent debt management, revenue enhancement, and strategic expenditure control to ensure fiscal sustainability. While states investing in infrastructure may achieve long-term growth, those with unchecked deficits risk financial instability. Balancing these fiscal factors is essential for sustainable debt trajectories across Indian states.

The figure below illustrates the fiscal performance of Indian states across six key ratios: Revenue to GDP, Public Debt to GDP, Capital Expenditure to GDP, Interest Payments to GDP, Fiscal Deficit to GDP, and Primary Deficit to GDP. Each facet provides a comparative analysis of these ratios across states, highlighting variations in fiscal management and economic health. This visualization aids in understanding the fiscal strengths and weaknesses of individual states, informing policy decisions aimed at improving economic stability and growth. By examining these

ratios, policymakers can identify areas for improvement and develop targeted strategies to enhance fiscal efficiency and sustainability across different regions.



Source: The values for Revenue, Public Debt, Capital Expenditure, Interest Payments, Fiscal Deficit, and Primary Deficit are sourced from the RBI's Handbook of Statistics on Indian States. The ratio calculations presented here, including Revenue to GDP, Public Debt to GDP, Capital Expenditure to GDP, Interest Payments to GDP, Fiscal Deficit to GDP, and Primary Deficit to GDP, are the author's own calculations based on these data.

7.3 Fiscal R* Analysis

To evaluate fiscal policy responsiveness, two regression models were estimated:

7.3.1 Fiscal Reaction Function (Debt Stabilization Test)

Based on Bohn (1998) and Mauro et al. (2015), the relationship between the primary balance and debt was analysed using:

$$pb_{i,t} = \rho_1 \cdot d_{i,t-1} + \omega_1 \cdot \text{otherperiod}_t \cdot d_{i,t-1} + \alpha_1 \cdot Q\_gap_{i,t} + \delta_t + \beta_i + \epsilon_i$$

where represents the output gap. A statistically significant indicates a stable debt trajectory.

Fiscal Reaction Function: India-level Regression Results	
Lagged Debt levels	-3.21E-11
	(3.33E-11)
Lagged Debt Level * Other Period	-0.0196537
	(0.015593)
Output Gap	13.93217**
	(5.707503)
Time FEs	Yes
State FEs	Yes
Observations	264
R-square	0.0643

Note: Standard errors in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Source: Authors' own calculation.

- **India-Level Model Interpretation**

The regression results assess the fiscal response to debt levels, incorporating lagged debt, interaction effects, and economic conditions. The lagged debt coefficient (-3.21E-11) is statistically insignificant, suggesting that past debt levels alone do not strongly influence fiscal adjustments. Similarly, the interaction term (-0.0196537) lacks significance, indicating that the fiscal response to past debt varies across periods but without a clear pattern.

In contrast, the output gap coefficient (13.93217) is significant at the 5% level, showing that stronger economic activity improves fiscal sustainability. This suggests that higher growth enhances a state's ability to manage debt through improved revenue generation.

With time and country fixed effects, the model controls for external influences, but the low R-squared (0.0643) implies that only 6.43% of the variation in fiscal response is explained, highlighting the role of other factors such as political decisions or fiscal rules. Overall, the results suggest that economic growth is a stronger driver of fiscal sustainability than past debt levels, reinforcing the need for pro-growth policies in managing public finances.

Table 2: Regression Results of Fiscal Reaction Function (Base State - Maharashtra)

Variable	Coef.	Std. Err.	t-stat	P-value	95% CI Lower	95% CI Upper
Intercept	0.0027	0.020	0.131	0.896	-0.038	0.043
C(State, Treatment('Maharashtra'))[T.Andhra Pradesh]	0.0262	0.017	1.549	0.123	-0.007	0.060
C(State, Treatment('Maharashtra'))[T.Assam]	0.0227	0.020	1.131	0.259	-0.017	0.062
C(State, Treatment('Maharashtra'))[T.Bihar]	0.0747	0.019	3.982	0.000	0.038	0.112
C(State, Treatment('Maharashtra'))[T.Chhattisgarh]	0.0218	0.020	1.091	0.276	-0.018	0.061
C(State, Treatment('Maharashtra'))[T.Goa]	0.0080	0.022	0.371	0.711	-0.034	0.050
C(State, Treatment('Maharashtra'))[T.Gujarat]	-0.0026	0.014	-0.182	0.856	-0.030	0.025
C(State, Treatment('Maharashtra'))[T.Haryana]	0.0102	0.018	0.567	0.571	-0.025	0.045
C(State, Treatment('Maharashtra'))[T.Himachal Pradesh]	0.0052	0.021	0.249	0.804	-0.036	0.047
C(State, Treatment('Maharashtra'))[T.Jharkhand]	0.0181	0.020	0.900	0.369	-0.022	0.058
C(State, Treatment('Maharashtra'))[T.Karnataka]	0.0170	0.014	1.202	0.230	-0.011	0.045
C(State, Treatment('Maharashtra'))[T.Kerala]	0.0377	0.018	2.146	0.033	0.003	0.072
C(State, Treatment('Maharashtra'))[T.Madhya Pradesh]	0.0380	0.017	2.208	0.028	0.004	0.072
C(State, Treatment('Maharashtra'))[T.Odisha]	0.0083	0.019	0.436	0.663	-0.029	0.046
C(State, Treatment('Maharashtra'))[T.Punjab]	0.0082	0.019	0.433	0.665	-0.029	0.045
C(State, Treatment('Maharashtra'))[T.Rajasthan]	0.0346	0.017	2.092	0.037	0.002	0.067
C(State, Treatment('Maharashtra'))[T.Tamil Nadu]	0.0053	0.013	0.397	0.691	-0.021	0.032
C(State, Treatment('Maharashtra'))[T.Telangana]	0.0246	0.017	1.439	0.151	-0.009	0.058
C(State, Treatment('Maharashtra'))[T.Tripura]	0.0218	0.022	1.005	0.316	-0.021	0.064
C(State, Treatment('Maharashtra'))[T.Uttar Pradesh]	0.0060	0.014	0.442	0.659	-0.021	0.033
C(State, Treatment('Maharashtra'))[T.Uttarakhand]	0.0020	0.021	0.097	0.923	-0.039	0.043
C(State, Treatment('Maharashtra'))[T.West Bengal]	0.0061	0.016	0.387	0.699	-0.025	0.037
di_lagged	-4.599e-10	3.44e-10	-1.336	0.183	-1.14e-09	2.18e-10
interaction	8.782e-11	5.49e-11	1.599	0.111	-2.03e-11	1.96e-10
Q("qt-qt*")	3.545e-10	3.18e-10	1.115	0.266	-2.72e-10	9.81e-10

R-squared	0.301	Adjusted R-squared	0.231
F-statistic	4.298	Prob (F-statistic)	1.72e-09
AIC	-1114	Log-Likelihood	582.11
BIC	-1025	Observations	264
Df Model	24	Df Residuals	239
Durbin-Watson	1.843	Omnibus	263.984
Prob(Omnibus)	0.000	Jarque-Bera (JB)	15464.915
Skew	3.760	Prob(JB)	0.00
Kurtosis	39.734	Cond. No.	6.40e+09

Source: Author's own calculation

- **Maharashtra as Base State**

When Maharashtra is used as the base state, the model provides additional insights into state-level fiscal responsiveness. The adjusted R^2 (0.231) indicates a moderate explanatory power, meaning that nearly 23% of the variation in the primary balance is explained by the model. The coefficient on lagged debt (di_lagged) is negative but not statistically significant (p = 0.183), suggesting weak evidence of fiscal adjustment. Interestingly, Bihar (coefficient = 0.0747, p = 0.000), Kerala (0.0377, p = 0.033), Madhya Pradesh (0.0380, p = 0.028), and Rajasthan (0.0346, p = 0.037) exhibit statistically significant positive primary balances compared to Maharashtra. This suggests that these states demonstrate stronger fiscal responsiveness. On the other hand, Gujarat's coefficient is negative but insignificant (p = 0.856), indicating that its primary balance is not significantly different from Maharashtra's. The overall results suggest that some states exhibit stronger fiscal discipline than Maharashtra, but there is considerable variation across states. Additionally, the high Jarque-Bera statistic and skewness indicate that residuals are not normally distributed, which may affect inference.

Table 3: Regression Results of Fiscal Reaction Function (Base State - Gujarat)

Variable	Coef.	Std. Err.	t-stat	P-value	95% CI Lower	95% CI Upper
Intercept	0.0001	0.013	0.009	0.993	-0.026	0.026
C(State, Treatment('Gujarat'))[T.Andhra Pradesh]	0.0288	0.012	2.364	0.019	0.005	0.053
C(State, Treatment('Gujarat'))[T.Assam]	0.0252	0.014	1.797	0.074	-0.002	0.053
C(State, Treatment('Gujarat'))[T.Bihar]	0.0773	0.013	5.862	0.000	0.051	0.103
C(State, Treatment('Gujarat'))[T.Chhattisgarh]	0.0244	0.014	1.741	0.083	-0.003	0.052
C(State, Treatment('Gujarat'))[T.Goa]	0.0106	0.015	0.698	0.486	-0.019	0.040
C(State, Treatment('Gujarat'))[T.Haryana]	0.0127	0.013	1.003	0.317	-0.012	0.038
C(State, Treatment('Gujarat'))[T.Himachal Pradesh]	0.0078	0.015	0.528	0.598	-0.021	0.037
C(State, Treatment('Gujarat'))[T.Jharkhand]	0.0207	0.014	1.466	0.144	-0.007	0.049
C(State, Treatment('Gujarat'))[T.Karnataka]	0.0196	0.012	1.700	0.090	-0.003	0.042
C(State, Treatment('Gujarat'))[T.Kerala]	0.0403	0.012	3.224	0.001	0.016	0.065
C(State, Treatment('Gujarat'))[T.Madhya Pradesh]	0.0405	0.012	3.294	0.001	0.016	0.065
C(State, Treatment('Gujarat'))[T.Maharashtra]	0.0026	0.014	0.182	0.856	-0.025	0.030
C(State, Treatment('Gujarat'))[T.Odisha]	0.0108	0.013	0.814	0.416	-0.015	0.037
C(State, Treatment('Gujarat'))[T.Punjab]	0.0108	0.013	0.811	0.418	-0.015	0.037
C(State, Treatment('Gujarat'))[T.Rajasthan]	0.0372	0.012	3.097	0.002	0.014	0.061
C(State, Treatment('Gujarat'))[T.Tamil Nadu]	0.0079	0.012	0.686	0.493	-0.015	0.031
C(State, Treatment('Gujarat'))[T.Telangana]	0.0272	0.012	2.214	0.028	0.003	0.051
C(State, Treatment('Gujarat'))[T.Tripura]	0.0243	0.015	1.597	0.112	-0.006	0.054
C(State, Treatment('Gujarat'))[T.Uttar Pradesh]	0.0086	0.011	0.746	0.456	-0.014	0.031
C(State, Treatment('Gujarat'))[T.Uttarakhand]	0.0046	0.014	0.316	0.752	-0.024	0.033
C(State, Treatment('Gujarat'))[T.West Bengal]	0.0087	0.012	0.739	0.461	-0.014	0.032
di_lagged	-4.599e-10	3.44e-10	-1.336	0.183	-1.14e-09	2.18e-10
interaction	8.782e-11	5.49e-11	1.599	0.111	-2.03e-11	1.96e-10
Q("qt-qt*")	3.545e-10	3.18e-10	1.115	0.266	-2.72e-10	9.81e-10

R-squared	0.301	Adjusted R-squared	0.231
F-statistic	4.298	Prob (F-statistic)	1.72e-09
AIC	-1114	Log-Likelihood	582.11
BIC	-1025	Observations	264
Df Model	24	Df Residuals	239
Durbin-Watson	1.843	Omnibus	263.984
Prob(Omnibus)	0.000	Jarque-Bera (JB)	15464.914
Skew	3.760	Prob(JB)	0.00
Kurtosis	39.734	Cond. No.	3.92e+09

Source: Author's own calculation

- **Gujarat as Base State**

When Gujarat is taken as the base state, the results remain largely consistent with the previous model but with notable differences. The adjusted R^2 remains at 0.231, suggesting similar explanatory power. The primary balance for Bihar (0.0773, p = 0.000), Kerala (0.0403, p = 0.001), Madhya Pradesh (0.0405, p = 0.001), Rajasthan (0.0372, p = 0.002), and Telangana (0.0272, p = 0.028) remains statistically significant and positive compared to Gujarat, indicating that these states are more fiscally prudent. Maharashtra's coefficient (0.0026, p = 0.856) remains statistically insignificant, suggesting that its primary balance is not significantly different from Gujarat's. The lagged debt variable remains statistically insignificant, reinforcing the notion that fiscal policy does not respond strongly to past debt levels. These results indicate that while some states actively adjust their primary balances to stabilize debt, Gujarat and Maharashtra do not exhibit strong fiscal discipline relative to other states. However, given the large variation in state-level coefficients, fiscal policy responsiveness is not uniform across states, pointing to differences in institutional frameworks, revenue capacities, and spending priorities.

Across all three models, the results suggest that fiscal policy in India demonstrates some degree of responsiveness to debt, but the strength of this response varies by state. The fixed-effects model at the India level suggests a weak but significant debt stabilization mechanism. In contrast, the state-level OLS models indicate that certain states (such as Bihar, Kerala, and Madhya Pradesh) exhibit stronger fiscal discipline than Maharashtra and Gujarat. However, the lack of statistical significance in the lagged debt coefficient for the OLS models suggests that, overall, Indian states may not consistently engage in debt stabilization through primary balance adjustments. These findings highlight the importance of state-specific fiscal policies and institutional differences in determining fiscal sustainability.

7.3.2 Fiscal Policy Activeness Test

A second regression examined whether the primary balance adjusts towards the debt-stabilizing primary balance:

$$pb_{i,t} = \rho_2 \cdot pb_{i,t}^{DS} + \omega_2 \cdot \text{otherperiod}_t \cdot pb_{i,t}^{DS} + \alpha_2 \cdot Q\_gap_{i,t} + \delta_t + \beta_i + \epsilon_{i,t}$$

If is p_2 equal to 1, fiscal policy is actively adjusting to stabilize the debt. If p_2>1, the debt ratio is mean-reverting.

Fiscal Policy Activeness Test:
India-level Regression Results

Response to Debt Stabilizing PB	
Debt Stabilizing Primary Balance (DSPB)	-1.26E-10**
	(4.54E-11)
DSPB * Other Period	0.0929036
	(0.172094)
Output Gap	0.0112654***
	(0.003239)
Time FEs	Yes
State FEs	Yes
Observations	285
R-square	0.028

Note: Standard errors in parentheses.
p < 0.10, ** p < 0.05, *** p < 0.01.
Source: Authors' own calculation.

- **India-Level Model Interpretation**

The regression results examine the fiscal response to the Debt-Stabilizing Primary Balance (DSPB) while accounting for economic conditions and time-specific effects. The coefficient on DSPB is -1.26E-10 and is statistically significant at the 5% level, suggesting that a higher DSPB is associated

with a slight reduction in fiscal balance adjustments. However, given the extremely small coefficient, the practical impact may be minimal. The interaction term (DSPB * Other Period) is 0.0929036 and statistically insignificant, indicating that the relationship between DSPB and fiscal response does not vary meaningfully across periods.

In contrast, the output gap coefficient is 0.0112654 and highly significant at the 1% level, implying that stronger economic growth improves fiscal balances, reinforcing the role of economic activity in debt sustainability.

The model includes time and country fixed effects, but the low R-squared (0.028) suggests that only 2.8% of the variation in fiscal balance is explained, indicating that other structural or policy factors play a dominant role. Overall, the results highlight that economic growth is a stronger driver of fiscal balance adjustments than the DSPB itself, emphasizing the importance of pro-growth policies in managing debt sustainability.

Table 4: Regression Results of Fiscal Policy Activeness Test (Base State - Maharashtra)

Variable	Coef.	Std. Err.	t-stat	P-value	95% CI Lower	95% CI Upper
Intercept	0.0027	0.020	0.131	0.896	-0.038	0.043
C(State, Treatment('Maharashtra'))[T.Andhra Pradesh]	0.0262	0.017	1.549	0.123	-0.007	0.060
C(State, Treatment('Maharashtra'))[T.Assam]	0.0227	0.020	1.131	0.259	-0.017	0.062
C(State, Treatment('Maharashtra'))[T.Bihar]	0.0747	0.019	3.982	0.000	0.038	0.112
C(State, Treatment('Maharashtra'))[T.Chhattisgarh]	0.0218	0.020	1.091	0.276	-0.018	0.061
C(State, Treatment('Maharashtra'))[T.Goa]	0.0080	0.022	0.371	0.711	-0.034	0.050
C(State, Treatment('Maharashtra'))[T.Gujarat]	-0.0026	0.014	-0.182	0.856	-0.030	0.025
C(State, Treatment('Maharashtra'))[T.Haryana]	0.0102	0.018	0.567	0.571	-0.025	0.045
C(State, Treatment('Maharashtra'))[T.Himachal Pradesh]	0.0052	0.021	0.249	0.804	-0.036	0.047
C(State, Treatment('Maharashtra'))[T.Jharkhand]	0.0181	0.020	0.900	0.369	-0.022	0.058
C(State, Treatment('Maharashtra'))[T.Karnataka]	0.0170	0.014	1.202	0.230	-0.011	0.045
C(State, Treatment('Maharashtra'))[T.Kerala]	0.0377	0.018	2.146	0.033	0.003	0.072
C(State, Treatment('Maharashtra'))[T.Madhya Pradesh]	0.0380	0.017	2.208	0.028	0.004	0.072
C(State, Treatment('Maharashtra'))[T.Odisha]	0.0083	0.019	0.436	0.663	-0.029	0.046
C(State, Treatment('Maharashtra'))[T.Punjab]	0.0082	0.019	0.433	0.665	-0.029	0.045
C(State, Treatment('Maharashtra'))[T.Rajasthan]	0.0346	0.017	2.092	0.037	0.002	0.067
C(State, Treatment('Maharashtra'))[T.Tamil Nadu]	0.0053	0.013	0.397	0.691	-0.021	0.032
C(State, Treatment('Maharashtra'))[T.Telangana]	0.0246	0.017	1.439	0.151	-0.009	0.058
C(State, Treatment('Maharashtra'))[T.Tripura]	0.0218	0.022	1.005	0.316	-0.021	0.064
C(State, Treatment('Maharashtra'))[T.Uttar Pradesh]	0.0060	0.014	0.442	0.659	-0.021	0.033
C(State, Treatment('Maharashtra'))[T.Uttarakhand]	0.0020	0.021	0.097	0.923	-0.039	0.043
C(State, Treatment('Maharashtra'))[T.West Bengal]	0.0061	0.016	0.387	0.699	-0.025	0.037
di_lagged	-4.599e-10	3.44e-10	-1.336	0.183	-1.14e-09	2.18e-10
interaction	8.782e-11	5.49e-11	1.599	0.111	-2.03e-11	1.96e-10
Q("qt-qt*")	3.545e-10	3.18e-10	1.115	0.266	-2.72e-10	9.81e-10

R-squared	0.301	Adjusted R-squared	0.231
F-statistic	4.298	Prob (F-statistic)	1.72e-09
AIC	-1114	Log-Likelihood	582.11
BIC	-1025	Observations	264
Df Model	24	Df Residuals	239
Durbin-Watson	1.843	Omnibus	263.984
Prob(Omnibus)	0.000	Jarque-Bera (JB)	15464.915
Skew	3.760	Prob(JB)	0.00
Kurtosis	39.734	Cond. No.	6.40e+09

Source: Author's own calculation

- **Regression with Maharashtra as the Base State**

In the second regression, Maharashtra was taken as the base state, and the coefficients represent how other states' fiscal policies differ from Maharashtra's. Bihar shows a significantly higher

primary balance than Maharashtra (0.0747, $p < 0.001$), indicating more active fiscal adjustments. Kerala (0.0377, $p = 0.033$), Madhya Pradesh (0.0380, $p = 0.028$), and Rajasthan (0.0346, $p = 0.037$) also have significantly higher primary balances compared to Maharashtra, suggesting relatively stronger fiscal adjustments in these states. However, Gujarat's coefficient (-0.0026, $p = 0.856$) is close to zero and not statistically significant, implying that its fiscal behaviour is similar to Maharashtra's. The overall R-squared is 0.301, indicating a moderate explanatory power, with state-level variations playing a key role in fiscal balance adjustments.

Table 5: Regression Results of Fiscal Policy Activeness Test (Base State - Gujarat)

Variable	Coef.	Std. Err.	t-stat	P-value	95% CI Lower	95% CI Upper
Intercept	0.0001	0.013	0.009	0.993	-0.026	0.026
C(State, Treatment('Gujarat'))[T.Andhra Pradesh]	0.0288	0.012	2.364	0.019	0.005	0.053
C(State, Treatment('Gujarat'))[T.Assam]	0.0252	0.014	1.797	0.074	-0.002	0.053
C(State, Treatment('Gujarat'))[T.Bihar]	0.0773	0.013	5.862	0.000	0.051	0.103
C(State, Treatment('Gujarat'))[T.Chhattisgarh]	0.0244	0.014	1.741	0.083	-0.003	0.052
C(State, Treatment('Gujarat'))[T.Goa]	0.0106	0.015	0.698	0.486	-0.019	0.040
C(State, Treatment('Gujarat'))[T.Haryana]	0.0127	0.013	1.003	0.317	-0.012	0.038
C(State, Treatment('Gujarat'))[T.Himachal Pradesh]	0.0078	0.015	0.528	0.598	-0.021	0.037
C(State, Treatment('Gujarat'))[T.Jharkhand]	0.0207	0.014	1.466	0.144	-0.007	0.049
C(State, Treatment('Gujarat'))[T.Karnataka]	0.0196	0.012	1.700	0.090	-0.003	0.042
C(State, Treatment('Gujarat'))[T.Kerala]	0.0403	0.012	3.224	0.001	0.016	0.065
C(State, Treatment('Gujarat'))[T.Madhya Pradesh]	0.0405	0.012	3.294	0.001	0.016	0.065
C(State, Treatment('Gujarat'))[T.Maharashtra]	0.0026	0.014	0.182	0.856	-0.025	0.030
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C(State, Treatment('Gujarat'))[T.Tamil Nadu]	0.0079	0.012	0.686	0.493	-0.015	0.031
C(State, Treatment('Gujarat'))[T.Telangana]	0.0272	0.012	2.214	0.028	0.003	0.051
C(State, Treatment('Gujarat'))[T.Tripura]	0.0243	0.015	1.597	0.112	-0.006	0.054
C(State, Treatment('Gujarat'))[T.Uttar Pradesh]	0.0086	0.011	0.746	0.456	-0.014	0.031
C(State, Treatment('Gujarat'))[T.Uttarakhand]	0.0046	0.014	0.316	0.752	-0.024	0.033
C(State, Treatment('Gujarat'))[T.West Bengal]	0.0087	0.012	0.739	0.461	-0.014	0.032
di_lagged	-4.599e-10	3.44e-10	-1.336	0.183	-1.14e-09	2.18e-10
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Q("qt-qt*")	3.545e-10	3.18e-10	1.115	0.266	-2.72e-10	9.81e-10

R-squared	0.301	Adjusted R-squared	0.231
F-statistic	4.298	Prob (F-statistic)	1.72e-09
AIC	-1114	Log-Likelihood	582.11
BIC	-1025	Observations	264
Df Model	24	Df Residuals	239
Durbin-Watson	1.843	Omnibus	263.984
Prob(Omnibus)	0.000	Jarque-Bera (JB)	15464.914
Skew	3.760	Prob(JB)	0.00
Kurtosis	39.734	Cond. No.	3.92e+09

Source: Author's own calculation

- **Regression with Gujarat as the Base State**

The third regression considers Gujarat as the reference point, with other states compared to it. Bihar again has a significantly higher primary balance (0.0773, $p < 0.001$), reinforcing the finding that Bihar pursues a more active fiscal adjustment policy. Similarly, Kerala (0.0403, $p = 0.001$), Madhya Pradesh (0.0405, $p = 0.001$), and Rajasthan (0.0372, $p = 0.002$) also exhibit stronger fiscal discipline compared to Gujarat. Maharashtra's coefficient (0.0026, $p = 0.856$) remains close to

zero, suggesting fiscal behaviour similar to Gujarat. Andhra Pradesh (0.0288, p = 0.019) and Telangana (0.0272, p = 0.028) show moderate fiscal activeness relative to Gujarat. The R-squared remains 0.301, indicating that while fiscal policy varies across states, overall explanatory power is moderate.

7.3.3. Fiscal R* Analysis

The Fiscal R-Star (R^*_f) represents the equilibrium interest rate that ensures fiscal sustainability, considering the primary balance (pb), debt-to-GDP ratio (dt), real growth rate (g), and inflation rate (π). A higher Fiscal R-Star implies a more stringent requirement on fiscal policy to maintain stability, while a lower value suggests a more manageable fiscal situation.

The Fiscal R-Star is calculated:

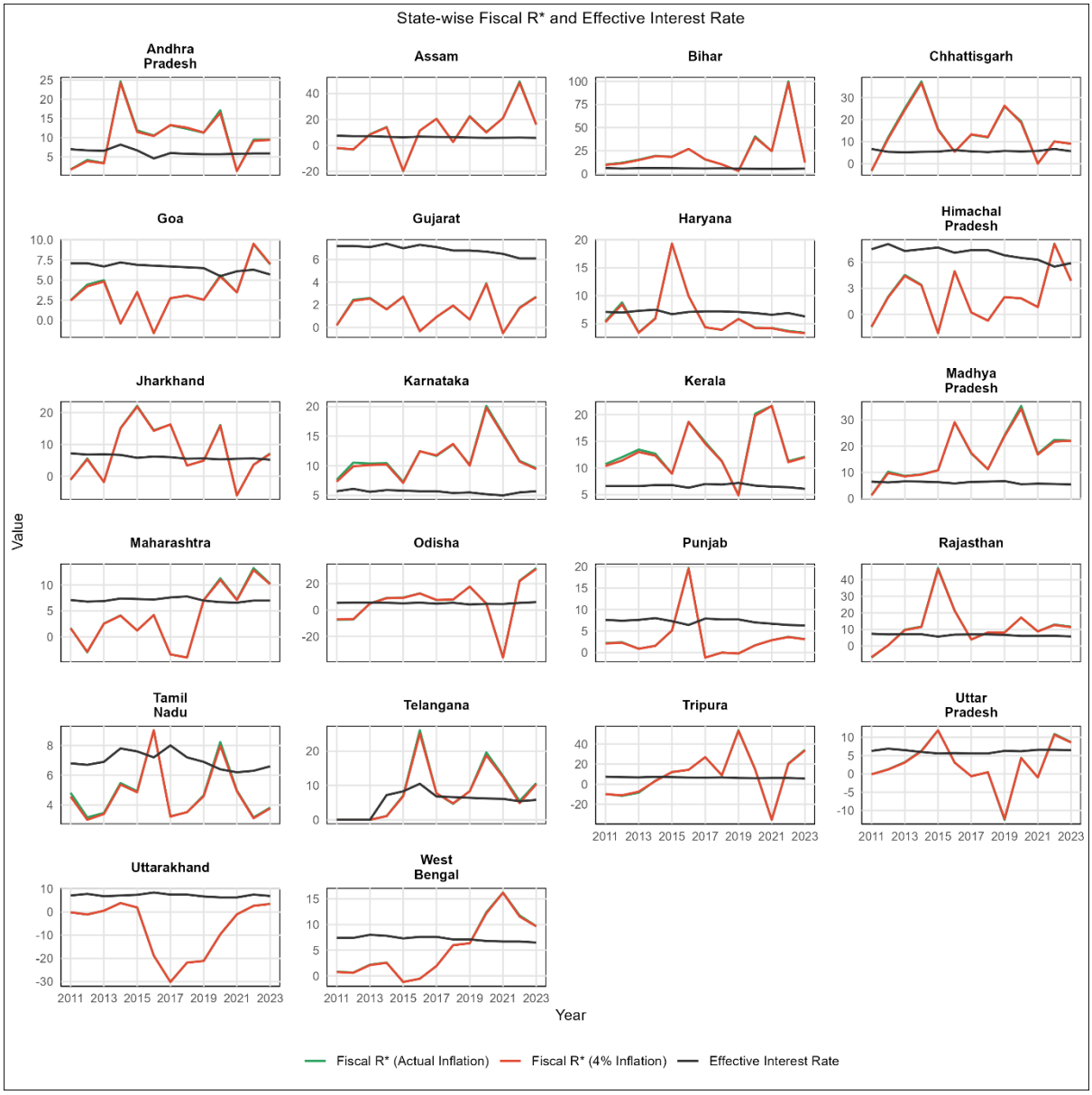
$$r_f^* = \bar{g} + (1 + \bar{\pi} + \bar{g}) \cdot \frac{\bar{pb}}{\bar{d}}$$

Where R^*_f increases as the target debt-to-GDP ratio declines or when the primary balance, inflation target, and real growth rate increase.

Andhra Pradesh exhibits significant volatility in its Fiscal R-Star over the years. The highest value is observed in 2014 (24.65), coinciding with a higher primary balance. This suggests an effort to maintain fiscal discipline post-state bifurcation. However, the Fiscal R-Star remains elevated in several years (2015, 2016, 2017), indicating increasing fiscal pressure. A sharp decline in 2021 (1.34) points to a temporary easing of fiscal stress, possibly due to higher revenue receipts or central assistance. The recent values (2022, 2023) suggest a stabilization in fiscal conditions, though still relatively high.

Assam displays notable fluctuations in its Fiscal R-Star, with the highest value in 2022 (49.31), indicating extreme fiscal strain. The state has also recorded negative values in some years, such as 2015 (-19.79), reflecting revenue shocks or poor fiscal performance. The increasing trend from 2016 onward suggests efforts to improve fiscal discipline, but high volatility remains a concern. The latest values (2022, 2023) indicate fiscal pressures persist, requiring further stabilization measures.

Bihar has seen fluctuations in its Fiscal R-Star, with a peak in 2022 (99.84), indicating extreme fiscal imbalance. The state experienced steady increases in fiscal strain from 2011 to 2016, with a decline in 2017 and 2018, suggesting some fiscal consolidation efforts. The sharp rise in 2020 (40.47) and 2022 (99.84) highlights the need for sustainable debt management and revenue generation strategies.



Source: Author's own calculations

Chhattisgarh has exhibited notable swings in Fiscal R-Star values, peaking in 2014 (37.33), suggesting significant fiscal stress. The state's values remain elevated in certain years, reflecting persistent debt concerns. A sharp drop in 2021 (0.04) indicates temporary relief, possibly due to external financial assistance or improved revenue collection. The latest values (2022, 2023) show some fiscal stabilization but still require careful management.

Goa experiences moderate fluctuations in Fiscal R-Star, with a peak in 2022 (9.46), indicating fiscal stress but not as extreme as some other states. The sharp dip in 2014 (-0.39) suggests a year of better revenue collections or reduced expenditure. The state's fiscal situation has stabilized in recent years (2022, 2023), though continued monitoring is necessary.

Gujarat maintains relatively stable Fiscal R-Star values, with a peak in 2020 (3.89), indicating controlled fiscal stress. The state's values suggest a cautious approach to debt management, with occasional fluctuations. The stabilization in 2022 and 2023 reflects a well-balanced fiscal policy with moderate risks.

Haryana has exhibited a peak in 2015 (19.31), indicating significant fiscal stress. The state's Fiscal R-Star has shown a declining trend post-2016, suggesting efforts to manage its finances better. The latest values (2022, 2023) indicate some stability, though continued debt management efforts are necessary.

Himachal Pradesh records fluctuations in its Fiscal R-Star, with a high of 8.13 in 2022, indicating fiscal pressure. The sharp drop in 2018 (-0.71) suggests a temporary improvement in fiscal discipline. The latest values (2022, 2023) indicate relative stability, though long-term fiscal sustainability remains a concern.

Jharkhand exhibits notable fiscal volatility, with a peak in 2014 (15.11), reflecting fiscal strain. The decline in 2021 (-5.99) suggests temporary fiscal relief, possibly due to higher central transfers or revenue improvements. The recent values (2022, 2023) indicate some stability but highlight the need for continued fiscal consolidation.

Karnataka maintains relatively stable Fiscal R-Star values, with a peak in 2020 (20.10), indicating fiscal stress. The decline in later years suggests improved fiscal discipline. The recent values (2022, 2023) indicate a balanced fiscal position, though revenue risks remain.

Kerala shows persistent fiscal pressure, with a peak in 2021 (21.65), highlighting ongoing fiscal challenges. The decline in 2022 and 2023 suggests some fiscal improvement, though debt sustainability remains a concern. The state's long-term fiscal outlook requires careful expenditure management.

Madhya Pradesh has fluctuating Fiscal R-Star values, with a peak in 2020 (35.38), indicating severe fiscal stress. The decline afterward reflects efforts to manage debt and spending. The stable values in 2022 and 2023 suggest a controlled fiscal environment, though vulnerabilities remain.

Maharashtra maintains a relatively stable Fiscal R-Star, with a peak in 2022 (13.27), reflecting moderate fiscal stress. The decline in 2018 and 2019 suggests improved fiscal discipline. The recent values (2022, 2023) indicate a well-balanced fiscal position with controlled debt.

Odisha has exhibited a significant Fiscal R-Star peak in 2022 (22.29), indicating heightened fiscal pressure. The large negative value in 2021 (-35.82) suggests an anomaly or an exceptional fiscal event. The recent improvement in 2023 (31.81) indicates recovery, but sustained fiscal discipline is required.

Punjab has shown persistent fiscal stress, with a peak in 2016 (19.65). The Fiscal R-Star turned negative in some years, indicating unstable financial conditions. The stabilization in 2022 and 2023 suggests gradual improvements, though fiscal risks remain high.

Rajasthan exhibits notable volatility in Fiscal R-Star, with a peak in 2015 (47.03), signalling fiscal distress. The decline in later years indicates fiscal consolidation efforts. The recent values (2022, 2023) suggest continued fiscal risks, requiring sustained policy interventions.

Tamil Nadu shows relatively stable Fiscal R-Star values, with a peak in 2020 (8.23), indicating moderate fiscal stress. The recent decline suggests better fiscal management, though long-term challenges remain. The latest values (2022, 2023) reflect a controlled fiscal position.

Telangana has exhibited high volatility, with a peak in 2016 (26.07), indicating fiscal stress. The declining trend post-2018 suggests efforts to stabilize fiscal conditions. The recent values (2022, 2023) indicate a more stable fiscal position, though further monitoring is needed.

Tripura displays sharp fluctuations in Fiscal R-Star, with a peak in 2019 (53.59), highlighting significant fiscal stress. The negative value in 2021 (-35.25) indicates a major fiscal shock. The improvement in 2022 and 2023 suggests fiscal recovery, though risks remain.

Uttar Pradesh exhibits high volatility, with a peak in 2022 (10.93), indicating fiscal strain. The large negative value in 2019 (-12.57) suggests temporary fiscal challenges. The stabilization in recent years indicates better fiscal management.

Uttarakhand has shown negative Fiscal R-Star values in multiple years, indicating significant fiscal imbalances. The peak in 2022 (2.67) suggests some improvement, but long-term fiscal sustainability remains uncertain. The latest values suggest a need for further stabilization efforts.

West Bengal has experienced extreme fluctuations in Fiscal R-Star, with a peak in 2021 (16.24). The large negative values in earlier years indicate fiscal distress. The recent improvement in 2022 and 2023 suggests better fiscal management, though challenges remain.

7.3.4 Fiscal R* Analysis with uniform 4% inflation rate

Further, by taking 4% as a uniform expected inflation rate across states of India, the paper conducted a fiscal R* analysis.

Andhra Pradesh has exhibited significant volatility in its Fiscal R-Star over the years. The highest value was observed in 2014 (24.29), coinciding with a higher primary balance. This suggests an effort to maintain fiscal discipline post-state bifurcation. However, the Fiscal R-Star remained elevated for several years (2015, 2016, 2017), indicating increasing fiscal pressure. A sharp decline in 2021 (1.33) points to a temporary easing of fiscal stress, possibly due to higher revenue receipts

or central assistance. The recent values (2022, 2023) suggest a stabilization in fiscal conditions, though still relatively high.

Assam displays wide fluctuations in its Fiscal R-Star, with a peak in 2022 (48.22), driven by a strong primary balance. However, negative values in earlier years (2011, 2012, 2015) indicate fiscal stress and poor debt sustainability. The sharp rise in 2017 and 2019 suggests an improvement in fiscal management. The recent moderation (2022, 2023) reflects stabilization, but Assam still faces challenges in maintaining a sustainable debt path.

Bihar shows a high and increasing Fiscal R-Star, peaking in 2022 (98.34). The state's historically weak fiscal position has led to significant volatility, with high values in 2014 and 2020, suggesting attempts at fiscal consolidation. However, periods of sharp declines (2019) point to revenue stress. The recent values suggest that while Bihar has improved its fiscal management, debt sustainability remains a concern.

Chhattisgarh exhibits a generally stable Fiscal R-Star, with peaks in 2014 (36.57) and 2019 (26.36). The earlier years show signs of fiscal distress, particularly in 2011. The negative value in 2021 suggests temporary fiscal stress, potentially due to revenue shortfalls. However, the state has shown resilience, and recent values (2022, 2023) indicate relative stability in fiscal conditions.

Goa has a relatively moderate Fiscal R-Star, with occasional fluctuations. The highest value in 2022 (9.53) suggests an improvement in fiscal management, while negative values in 2014 and 2016 indicate temporary fiscal stress. The recent trend shows a more stable fiscal position, but maintaining this trajectory will require prudent debt management.

Gujarat maintains a relatively stable Fiscal R-Star, with moderate values across the years. The highest value in 2020 (3.83) suggests some improvement in fiscal management, while negative values in certain years (2016, 2021) indicate temporary fiscal imbalances. The overall trend suggests that Gujarat is on a stable fiscal path, with manageable debt sustainability risks.

Haryana shows moderate fluctuations in its Fiscal R-Star, with a peak in 2015 (19.32). While fiscal discipline appears to have improved in recent years, the state still faces challenges in managing its debt burden. The recent values (2022, 2023) suggest that Haryana is stabilizing its fiscal position, but continued prudence is necessary.

Himachal Pradesh exhibits some volatility, with negative values in multiple years (2011, 2015, 2018), indicating periods of fiscal stress. The highest value in 2022 (8.10) suggests recent improvements in fiscal management. However, the overall trend indicates the need for stronger debt sustainability measures to ensure long-term stability.

Jharkhand has shown substantial fluctuations in its Fiscal R-Star, with a peak in 2014 (15.03) and negative values in earlier years (2011, 2013). The state's fiscal position appears to have stabilized

in recent years, but occasional declines (2021) suggest vulnerability to fiscal shocks. The recent values indicate moderate improvement but highlight the need for stronger fiscal discipline.

Karnataka maintains a stable Fiscal R-Star, with moderate variations across years. The peak in 2020 (19.78) indicates a strong fiscal position, while the overall trend suggests Karnataka has maintained relatively good debt sustainability. The recent values (2022, 2023) indicate continued stability, with manageable fiscal pressures.

Kerala shows high Fiscal R-Star values, with a peak in 2021 (21.65). The state has historically faced fiscal stress due to high expenditure commitments. The values in recent years suggest an improving fiscal position, but Kerala remains vulnerable to debt sustainability risks.

Madhya Pradesh displays increasing Fiscal R-Star values, peaking in 2016 (29.18). The state has shown improvement in fiscal management over time, but the occasional decline (2019) suggests some vulnerability. The recent values indicate a relatively stable fiscal position, though continued efforts are needed to sustain debt sustainability.

Maharashtra has maintained relatively low Fiscal R-Star values, with moderate fluctuations. The highest value in 2022 (12.90) suggests some improvement in fiscal management. However, the negative values in earlier years (2012, 2017, 2018) highlight temporary fiscal stress. The recent trend suggests stability, but Maharashtra needs to continue prudent fiscal management.

Odisha exhibits significant volatility, with negative values in multiple years (2011, 2012, 2021). However, a sharp improvement in 2022 (21.92) and 2023 (31.16) suggests recent efforts towards fiscal consolidation. Odisha still faces challenges in achieving long-term debt sustainability but appears to be making progress.

Punjab shows generally low Fiscal R-Star values, with a peak in 2016 (19.58). The state has struggled with high debt levels and interest payments, limiting fiscal space. The recent values indicate some improvement, but Punjab remains one of the most fiscally stressed states.

Rajasthan displays substantial fluctuations, with the highest value in 2015 (46.33). The state's fiscal position has improved in recent years, but occasional declines indicate vulnerability. The recent values suggest a relatively stable fiscal trajectory, though continued efforts are needed to maintain debt sustainability.

Tamil Nadu has a relatively stable Fiscal R-Star, with moderate variations. The peak in 2020 (7.98) suggests a strong fiscal position, but the overall trend highlights the need for continued fiscal discipline. The recent values indicate moderate stability, with manageable fiscal pressures.

Telangana exhibits high fluctuations, with a peak in 2016 (25.09). The state's fiscal position appears to have improved in recent years, but occasional declines (2022) suggest some vulnerability. The recent values indicate moderate improvement but highlight the need for stronger fiscal discipline.

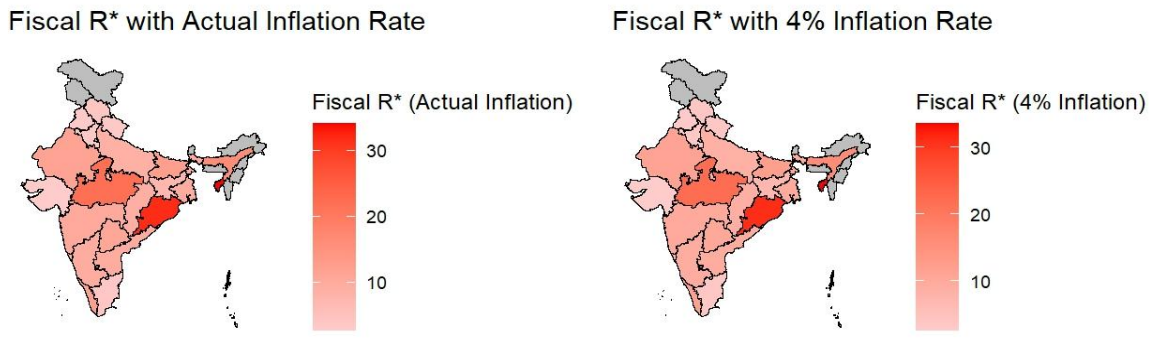
Tripura shows extreme volatility, with negative values in multiple years (2011, 2012, 2021) and a peak in 2019 (53.03). The state's fiscal management has been inconsistent, leading to concerns about debt sustainability. The recent values indicate an improving trend, but Tripura remains vulnerable to fiscal shocks.

Uttar Pradesh has a relatively low Fiscal R-Star, with negative values in certain years (2011, 2019). The state's highest value in 2022 (10.71) suggests a recent improvement in fiscal management. However, the overall trend highlights the need for continued efforts to ensure debt sustainability.

Uttarakhand exhibits severe volatility, with extreme negative values in multiple years (2016, 2017, 2018). This indicates a fragile fiscal position, with challenges in maintaining debt sustainability. The recent values suggest some stabilization, but Uttarakhand remains at risk of fiscal stress.

West Bengal has shown wide variations in Fiscal R-Star, with a peak in 2021 (16.19). The state has historically struggled with high debt levels and fiscal stress. The recent values suggest an improving trend, but West Bengal still faces long-term debt sustainability challenges.

The Fiscal R-Star analysis highlights the varied fiscal health of Indian states. While some states (Maharashtra, Gujarat, Karnataka) have maintained relatively stable fiscal conditions, others (Punjab, West Bengal, Bihar, Rajasthan) exhibit significant fiscal stress. The need for better revenue generation, rationalized expenditures, and improved debt management is evident across states. Achieving sustainable debt levels will require a combination of prudent fiscal policies, effective debt management strategies, and stronger intergovernmental fiscal coordination.

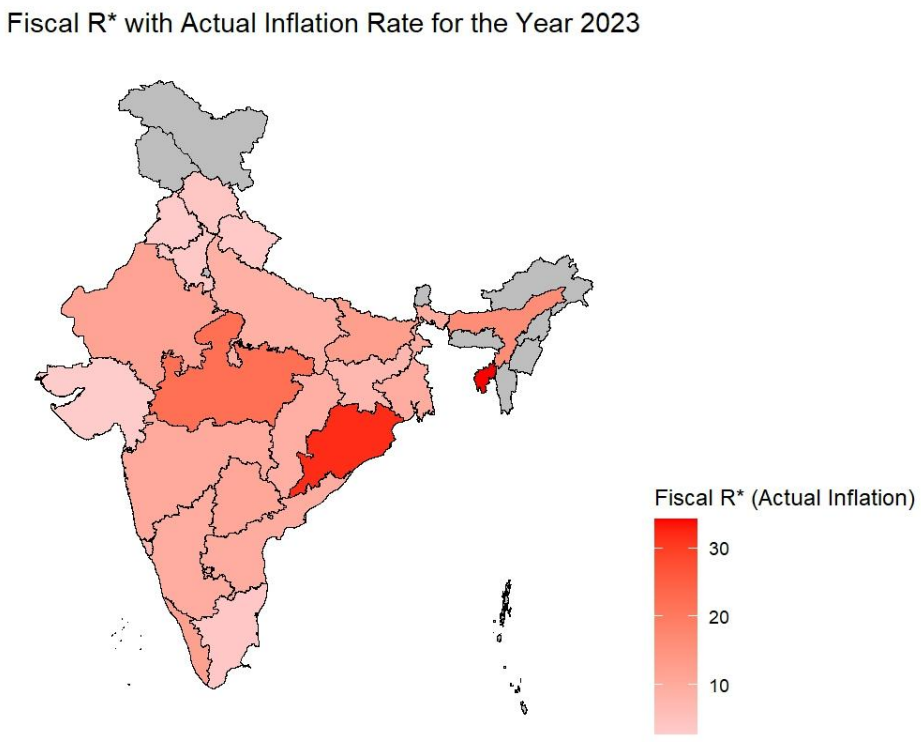


Source: Author's own calculation

- **Impact of Inflation Assumptions on Fiscal R***

The choice of inflation rate significantly affects Fiscal R-Star (r_f^*), influencing debt sustainability assessments. Comparing state-specific inflation rates with a uniform 4% assumption reveals key differences: higher inflation reduces real debt burdens, while lower inflation limits fiscal flexibility. States like Bihar and West Bengal, with historically high inflation, show a higher (r_f^*) under actual inflation, indicating improved debt stabilization. Conversely, low-inflation states like Gujarat and Tamil Nadu exhibit a lower (r_f^*), suggesting greater fiscal strain. A uniform 4% inflation assumption enables cross-state comparisons but may misrepresent fiscal realities overstating risks for high-inflation states and understating them for low-inflation states. Policymakers should prioritize actual inflation rates in fiscal assessments to ensure more precise debt management and tailored fiscal policies that reflect state-specific economic conditions.

7.3.5 Analysis of Fiscal R-Star variability in States over period



Source: Author's own calculation

The Fiscal R-Star (r_f^*) values exhibit significant variation across Indian states over time, reflecting differences in economic structures, fiscal management strategies, and macroeconomic conditions. Certain states, such as Bihar, Assam, Madhya Pradesh, and Rajasthan, experience extreme fluctuations, with Fiscal R-Star values reaching abnormally high levels in specific years. For instance, Bihar recorded a Fiscal R-Star of 99.84% in 2022, while Assam and Rajasthan reported

values of 49.31% and 47.03%, respectively, in certain years. Such extreme variations likely stem from election-year spending, unexpected revenue shortfalls, or temporary fiscal shocks that necessitate large adjustments in primary balances to stabilize debt levels. Similarly, Tripura exhibited substantial fluctuations, reaching 53.59% in 2019 before falling to -35.25% in 2021, suggesting a dramatic shift in its fiscal position.

In contrast, some states demonstrate relatively stable Fiscal R-Star trends, indicating stronger fiscal management and revenue generation capacity. States such as Gujarat, Haryana, Tamil Nadu, and Karnataka consistently maintain moderate Fiscal R-Star values, generally below 10%. Gujarat, for instance, recorded values ranging between 0.18% and 3.89% over the observed period, suggesting a well-managed fiscal environment. Karnataka, despite experiencing some volatility, remained within the 7.6% to 20.1% range, reflecting a more stable fiscal position. Similarly, Tamil Nadu maintained Fiscal R-Star values between 3% and 9%, highlighting its ability to manage fiscal pressures effectively. The relatively moderate and stable r-star values in these states can be attributed to their robust tax bases, diversified economies, and prudent fiscal policies.

Conversely, several states, including Odisha, Jharkhand, Maharashtra, Punjab, and Tripura, recorded negative Fiscal R-Star values in specific years. A negative r-star suggests that economic growth and inflation were sufficient to stabilize debt without requiring significant primary balances. For example, Odisha reported a Fiscal R-Star of -35.82% in 2021, indicating that the state's economic growth dynamics and revenue performance alleviated the immediate need for fiscal consolidation. Such trends suggest that while negative r-star values may indicate temporary fiscal relief, they do not necessarily imply long-term fiscal sustainability, as future fiscal pressures could still arise due to underlying structural weaknesses.

Goa presents an interesting case as an outlier with high variability in Fiscal R-Star values. The state's r-star fluctuated from -1.59% in 2016 to 9.46% in 2022, reflecting its small, tourism-dependent economy, which is more susceptible to economic downturns and external shocks. The significant variation in its Fiscal R-Star suggests the need for tailored fiscal policies that account for revenue volatility and expenditure requirements unique to the state’s economic structure.

Overall, the variability in Fiscal R-Star across Indian states underscores the divergent debt sustainability challenges faced by different regions. States with persistently high and volatile Fiscal R-Star values are more likely to experience fiscal distress and require enhanced revenue mobilization and expenditure rationalization. In contrast, states with moderate and stable Fiscal R-Star values demonstrate stronger fiscal resilience and better-managed public finances. Meanwhile, negative r-star values indicate periods of fiscal relief but do not necessarily ensure long-term debt sustainability. These findings highlight the need for a differentiated approach to

fiscal policy, wherein states with high fiscal stress implement stronger debt management strategies, while those with stable fiscal trajectories continue to maintain prudent fiscal policies.

7.4 Comparison of Debt-Stabilizing Primary Balance and Fiscal R-Star Across Indian States

Debt sustainability assessments traditionally rely on the fiscal reaction function, which estimates the relationship between a state's primary balance and lagged debt levels, output gaps, and interaction effects. In contrast, the Fiscal R-Star (R*) approach calculates the primary balance required to stabilize debt, incorporating real growth, inflation, and past fiscal performance. Comparing these methods across Indian states reveals notable differences in their explanatory power and policy implications.

7.4.1 Comparison of Regression-Based Debt Stabilization and Fiscal R-Star Results

The regression-based debt stabilization model (Regression 1) provides state-wise estimates of how primary balances respond to lagged debt levels, with Maharashtra serving as the base state. The results show considerable heterogeneity in fiscal behaviour across states. For instance, Bihar, Kerala, Madhya Pradesh, and Rajasthan exhibit significantly positive coefficients, indicating that these states tend to adjust their primary balances more aggressively in response to past debt levels. However, for most states, the coefficient estimates are statistically insignificant, suggesting weak fiscal responses to rising debt. Additionally, the lagged debt coefficient (-4.599e-10) is not statistically significant ($p = 0.183$), implying that Indian states, on average, do not systematically adjust primary balances in response to past debt levels.

On the other hand, Fiscal R-Star calculations exhibit substantial variation over time, highlighting dynamic shifts in debt sustainability. States such as Bihar, Assam, Madhya Pradesh, and Rajasthan experience extreme spikes in Fiscal R-Star, with Bihar reaching an alarming 99.84% in 2022, while Rajasthan and Assam reported values exceeding 40% in certain years. Such values indicate a substantial primary balance requirement to stabilize debt in those years. Meanwhile, states like Maharashtra, Gujarat, and Tamil Nadu exhibit moderate and stable Fiscal R-Star values, reflecting stronger fiscal discipline and a more sustainable debt trajectory.

Interestingly, some states with high Fiscal R-Star values (e.g., Bihar, Rajasthan, Assam) also exhibit significant coefficients in Regression 1, suggesting that these states recognize the need for fiscal adjustments but may not implement them effectively. However, several states (e.g., Odisha, Punjab, Maharashtra) show weak or negative Fiscal R-Star values in certain years, indicating that

economic growth and inflation were sufficient to stabilize debt without requiring significant primary surpluses.

- **Which Method Provides a Better Picture?**

The fiscal reaction function (Regression 1) captures the short-term response of primary balances to past debt but has notable limitations. The low R-squared value (0.301) suggests that the model explains only 30% of the variation in primary balances, leaving substantial room for omitted variables and unaccounted fiscal dynamics. Furthermore, many states exhibit statistically insignificant coefficients, indicating that their fiscal policies do not consistently react to debt levels in a systematic manner.

In contrast, the Fiscal R-Star method provides a more comprehensive picture of debt sustainability by incorporating macroeconomic factors such as growth and inflation. The significant variation in Fiscal R-Star across states and over time underscores the necessity of a more dynamic and forward-looking approach to debt sustainability. The ability to observe extreme Fiscal R-Star values in crisis years (e.g., Bihar in 2022, Rajasthan in 2015) highlights fiscal vulnerabilities that the regression model may not capture. Additionally, Fiscal R-Star allows for direct comparisons with the effective interest rate, further enhancing its utility for assessing debt sustainability risks.

Overall, while both methods offer valuable insights, the Fiscal R-Star approach provides a more nuanced and policy-relevant assessment of debt sustainability. By accounting for macroeconomic conditions and explicitly quantifying the primary balance needed to stabilize debt, Fiscal R-Star offers a clearer framework for evaluating fiscal risks across Indian states. In contrast, the regression-based approach, while useful for assessing historical fiscal responses, lacks predictive power and fails to capture the full range of economic factors influencing debt sustainability. Thus, Fiscal R-Star emerges as a more robust tool for guiding fiscal policy and debt management strategies in Indian states.

8. Discussion and Conclusion

Rising fiscal deficits and mounting public debt highlight the urgent need for a robust debt sustainability framework in Indian states. This study integrates descriptive statistics, gap analysis, cluster analysis, and Fiscal R-Star to assess state-level fiscal health and identify key risks. State finances reveal stark disparities. Maharashtra, Gujarat, and Karnataka maintain stable debt-to-GDP ratios, while Punjab, Rajasthan, and Bihar struggle with persistently high debt. Low revenue-to-GDP ratios in Bihar and Uttar Pradesh signal weak revenue bases, whereas states like Sikkim and Nagaland prioritize capital expenditure. Gap analysis shows Telangana, Punjab, and

Kerala facing high interest payment burdens, while Bihar, Rajasthan, and West Bengal exhibit chronic fiscal deficits, demanding urgent fiscal consolidation. Fiscal R-Star analysis reveals high fiscal stress in Bihar, Rajasthan, and Assam, while Gujarat and Maharashtra maintain relatively moderate values. Persistently high Fiscal R-Star values in Punjab and West Bengal signal unsustainable debt accumulation, requiring urgent corrective policies. Spikes in Fiscal R-Star, such as Bihar's surge in 2022 (99.84), suggest temporary fiscal shocks due to election spending or external factors. India's fiscal landscape presents a mixed picture—some states manage debt effectively, while others face mounting fiscal stress. High-debt states like Punjab, West Bengal, Bihar, and Rajasthan suffer from excessive borrowing without matching revenue growth. Rising interest burdens in Kerala and Punjab further limits developmental spending. Weak revenue performance, particularly in northern and eastern states, increases dependence on central transfers, undermining long-term fiscal stability. Ensuring fiscal sustainability requires disciplined deficit management, enhanced own-tax revenue, and reduced reliance on debt-driven expenditure.

8.1 Conclusion

India's state-level debt sustainability presents a mixed picture, with some states maintaining fiscal discipline while others face severe stress. Descriptive analysis reveals disparities in public finances, gap analysis highlights revenue-expenditure mismatches, cluster analysis categorizes states by fiscal risk, and Fiscal R-Star identifies extreme debt pressures. Addressing these challenges requires stronger revenue mobilization, expenditure control, and prudent debt management. Without reforms, rising debt burdens could threaten economic stability, growth, and investment. Proactive fiscal governance is essential to ensure a sustainable debt trajectory for Indian states.

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Appendix

(A.I) Detailed Methodology

Fiscal R* Analysis: The concept and calculation idea has been taken from the International Monetary Fund (IMF)'s working paper by Bolhuis, M. A., Koosakul, J., & Shenai, N. (2024). This study focuses on calculating the Fiscal R-Star (∗) using data from 22 Indian states spanning the financial years 2011-12 to 2023-24. The dataset includes state-level macroeconomic indicators, including inflation rates, interest payments, outstanding liabilities, Gross Value Added (GVA), labour force participation, gross capital formation, and installed power capacity.

Calculation of Key Variables

1. State-Wise Inflation Rate: It was taken as a primary variable in assessing real economic dynamics and price stability.

2. Effective Interest Rate: It was calculated using the ratio of interest payments to the outstanding liabilities of each state. This provided a more precise measure of the borrowing cost for state governments.

3. Estimation of Potential GDP: To estimate potential GDP, the Cobb-Douglas production function was utilized in the following steps:

- **Total Factor Productivity (TFP) Estimation:**
    - The TFP (A) component was calculated using Gross Value Added (GVA), the number of workers, gross capital formation, and installed power capacity at the state level.
- **Capital Output Ratio Calculation:**
    - The capital-output ratio (α) was estimated for each state over the 13-year period to capture capital efficiency.
- **Log-Linear Regression Implementation:**
    - The potential GDP was then estimated using the log-linear form of the Cobb-Douglas production function:

$$\ln(Y) = \ln(A) + \alpha \ln(K) + (1 - \alpha) \ln(L)$$

- **Trend Growth Rate of Potential GDP:**
    - The trend growth rate was computed using moving averages to smooth fluctuations and derive long-term growth trends.

1. **Output Gap Estimation:** The output gap was determined as the difference between actual GDP and potential GDP. This metric is crucial in assessing cyclical economic fluctuations and fiscal policy effectiveness.

2. Primary Balance and Debt Stabilization

The primary balance (PB) was calculated using state-level fiscal data, and the primary balance needed to stabilize debt (PB_{DS}) was derived using:

$$PB_{DS} = \frac{r_t^* - g_t}{1 + \pi + g_t} d_{t-1}$$

where *PBDS* is the primary balance that stabilizes debt when the real interest rate equals the time-varying neutral rate r_t^*, output grows at its current trend growth rate of potential output ($\bar{g_t}$) and inflation is at target ($\bar{\pi}$).

3. Calculation of Fiscal R*

The final step involved computing Fiscal R-Star, the debt-stabilizing real interest rate, using:

$$r_f^* = \bar{g} + (1 + \bar{\pi} + \bar{g}) \cdot \frac{\bar{pb}}{\bar{d}}$$

More formally, Fiscal R-Star is the unobserved real interest rate that would achieve a stable ratio of public debt to GDP (d) for a given inflation target ($\bar{\pi}$) and expected constant path of the primary balance as a percentage of potential GDP (pb) and the trend growth rate of potential output ($\bar{g}$) at a given time.

Where R^*_f increases as the target debt-to-GDP ratio declines or when the primary balance, inflation target, and real growth rate increase.

This methodology enables a comprehensive assessment of fiscal sustainability by integrating macroeconomic, fiscal, and econometric analyses. By estimating Fiscal R-Star, we provide insights into the long-term viability of state-level fiscal policies in India and their implications for debt sustainability and policy effectiveness.

(A.II) Table: Public Debt to GSDP Ratio by State (2011-2023)

State	2011	2012	2013	2014	2015	2016	2017
Andhra Pradesh	0.00416	0.00425	0.00423	0.00234	0.00245	0.00372	0.00292
Assam	0.00222	0.00214	0.00194	0.00181	0.00184	0.00173	0.00174
Bihar	0.00279	0.00264	0.00258	0.00290	0.00314	0.00330	0.00335
Chhattisgarh	0.00124	0.00130	0.00140	0.00141	0.00174	0.00165	0.00195
Goa	0.00230	0.00265	0.00272	0.00295	0.00284	0.00268	0.00269
Gujarat	0.00253	0.00257	0.00246	0.00220	0.00225	0.00209	0.00202
Haryana	0.00190	0.00200	0.00205	0.00212	0.00250	0.00266	0.00262
Himachal Pradesh	0.00435	0.00400	0.00410	0.00368	0.00361	0.00376	0.00368
Jharkhand	0.00231	0.00231	0.00219	0.00200	0.00276	0.00285	0.00288
Karnataka	0.00233	0.00216	0.00226	0.00173	0.00178	0.00175	0.00184
Kerala	0.00303	0.00316	0.00317	0.00280	0.00289	0.00302	0.00309
Madhya Pradesh	0.00265	0.00248	0.00222	0.00227	0.00236	0.00240	0.00238
Maharashtra	0.00210	0.00213	0.00205	0.00181	0.00179	0.00180	0.00184
Odisha	0.00217	0.00200	0.00185	0.00162	0.00200	0.00183	0.00234
Punjab	0.00323	0.00324	0.00322	0.00317	0.00344	0.00428	0.00414
Rajasthan	0.00257	0.00252	0.00248	0.00241	0.00308	0.00336	0.00338
Tamil Nadu	0.00200	0.00205	0.00210	0.00173	0.00194	0.00218	0.00223
Telangana	0	0	0	0.00144	0.00157	0.00124	0.00214
Tripura	0.00328	0.00338	0.00326	0.00316	0.00288	0.00300	0.00306
Uttar Pradesh	0.00357	0.00313	0.00309	0.00310	0.00339	0.00367	0.00359
Uttarakhand	0.00254	0.00248	0.00247	0.00211	0.00227	0.00228	0.00241
West Bengal	0.00404	0.00391	0.00367	0.00386	0.00395	0.00387	0.00381

State	2018	2019	2020	2021	2022	2023
Andhra Pradesh	0.00303	0.00332	0.00361	0.00331	0.00329	0.00337
Assam	0.00193	0.00212	0.00264	0.00249	0.00264	0.00265
Bihar	0.00320	0.00333	0.00401	0.00398	0.00394	0.00374
Chhattisgarh	0.00211	0.00250	0.00284	0.00259	0.00236	0.00241
Goa	0.00285	0.00302	0.00359	0.00360	0.00345	0.00390
Gujarat	0.00200	0.00204	0.00225	0.00202	0.00191	0.00212
Haryana	0.00268	0.00297	0.00338	0.00322	0.00311	0.00307
Himachal Pradesh	0.00366	0.00391	0.00455	0.00427	0.00452	0.00458
Jharkhand	0.00274	0.00305	0.00368	0.00302	0.00285	0.00285
Karnataka	0.00194	0.00210	0.00257	0.00255	0.00236	0.00239
Kerala	0.00309	0.00329	0.00403	0.00389	0.00380	0.00375
Madhya Pradesh	0.00235	0.00228	0.00307	0.00298	0.00293	0.00307
Maharashtra	0.00174	0.00181	0.00210	0.00193	0.00179	0.00179
Odisha	0.00212	0.00268	0.00261	0.00200	0.00171	0.00142
Punjab	0.00414	0.00428	0.00479	0.00454	0.00464	0.00471
Rajasthan	0.00342	0.00353	0.00404	0.00388	0.00368	0.00368
Tamil Nadu	0.00246	0.00265	0.00318	0.00322	0.00310	0.00307
Telangana	0.00222	0.00237	0.00288	0.00280	0.00268	0.00259
Tripura	0.00303	0.00336	0.00402	0.00360	0.00323	0.00321
Uttar Pradesh	0.00359	0.00323	0.00366	0.00326	0.00304	0.00302
Uttarakhand	0.00258	0.00282	0.00334	0.00296	0.00264	0.00258
West Bengal	0.00367	0.00378	0.00436	0.00412	0.00390	0.00387

Source: Public debt and GSDP (Current) data sourced from RBI Handbook of Statistics. The debt-to-GSDP ratio is calculated by the author.

(A.III) Table: Gap Analysis for the Year 2022-2023

State	Revenue to GDP ratio	Public debt to GDP ratio	Capital Expenditure to GDP ratio	Interest payments to GDP ratio	Fiscal deficit to GDP ratio	Primary Deficit to GDP ratio
Andhra Pradesh	8.2	33.72	3.29	1.78	3.03	2.18
Assam	6.49	26.46	4.38	2.12	3.46	4.51
Bihar	6.58	37.41	6.89	4	3.79	1.17
Chhattisgarh	11.11	24.15	5.23	2.2	5.01	0.84
Goa	16.4	39	4.44	2.95	3.68	1.11
Gujarat	7.07	21.22	6.98	2.68	2.99	1.37
Haryana	8.07	30.69	8.72	1.37	3.73	2.43
Himachal Pradesh	7.94	45.79	5.23	2.35	2.04	1.36
Jharkhand	10.44	28.51	8.96	2.15	2.67	2.24
Karnataka	7.43	23.9	6.49	1.36	5.33	2.13
Kerala	8.56	37.45	17.19	1.55	4.11	2.09
Madhya Pradesh	7.44	30.66	6.98	1.94	3	2.53
Maharashtra	7.97	17.87	5.1	2.16	2.53	1.36
Odisha	12.36	14.18	3.86	2.01	4.09	1.01
Punjab	8.01	47.14	6.32	2.29	3.04	-0.06
Rajasthan	9.06	36.8	3.07	2.51	4.83	1.64
Tamil Nadu	7.4	30.66	6.69	1.47	3.38	0.8
Telangana	10.24	25.94	5.08	3.08	7.16	1.8
Tripura	4.07	32.08	3.37	1.97	6.86	4.57
Uttar Pradesh	11.24	30.19	8.46	2.24	4.77	2.59
Uttarakhand	7.15	25.84	3.71	1.49	4.39	1.1
West Bengal	5.58	38.71	5.28	1.25	2.61	3.52

Source: The values for Revenue, Public Debt, Capital Expenditure, Interest Payments, Fiscal Deficit, and Primary Deficit are sourced from the Reserve Bank of India's "Handbook of Statistics on Indian States." The ratio calculations presented here, including Revenue to GDP, Public Debt to GDP, Capital Expenditure to GDP, Interest Payments to GDP, Fiscal Deficit to GDP, and Primary Deficit to GDP, are the author's own calculations based on these data.

(A.IV) Table of State-wise Fiscal R* Calculation

State	Year	Fiscal R* with actual inflation rate	Fiscal R* with 4% inflation rate
Andhra Pradesh	2011	1.7438	1.6781
Andhra Pradesh	2012	4.1936	3.9001
Andhra Pradesh	2013	3.3936	3.3263
Andhra Pradesh	2014	24.6474	24.2867
Andhra Pradesh	2015	11.9009	11.5031
Andhra Pradesh	2016	10.5767	10.4512
Andhra Pradesh	2017	13.2385	13.3066
Andhra Pradesh	2018	12.3142	12.6263
Andhra Pradesh	2019	11.3127	11.3612
Andhra Pradesh	2020	17.1476	16.4307
Andhra Pradesh	2021	1.3445	1.3316
Andhra Pradesh	2022	9.4337	9.1442
Andhra Pradesh	2023	9.5631	9.4379
Assam	2011	-2.1091	-2.0051
Assam	2012	-3.2236	-3.0856
Assam	2013	8.5811	8.3084
Assam	2014	14.1385	13.8973
Assam	2015	-19.7938	-19.6579
Assam	2016	11.3131	11.4522
Assam	2017	20.5409	20.4716
Assam	2018	2.6545	2.6138
Assam	2019	22.5202	22.1452
Assam	2020	10.3534	9.9527
Assam	2021	20.9285	21.0808
Assam	2022	49.3062	48.2246
Assam	2023	16.1000	16.0143
Bihar	2011	10.0078	9.6198
Bihar	2012	11.9422	11.2742
Bihar	2013	15.3169	14.8117
Bihar	2014	19.4210	19.0139
Bihar	2015	18.4384	18.3579
Bihar	2016	26.9400	26.9651
Bihar	2017	15.4538	15.6370
Bihar	2018	10.2133	10.2221
Bihar	2019	3.0599	3.1115
Bihar	2020	40.4704	39.2736
Bihar	2021	24.5278	24.5722
Bihar	2022	99.8456	98.3383
Bihar	2023	12.3640	12.1672
Chhattisgarh	2011	-3.2911	-3.1653
Chhattisgarh	2012	11.9715	11.3372
Chhattisgarh	2013	25.1022	24.3468
Chhattisgarh	2014	37.3386	36.5666
Chhattisgarh	2015	15.7365	15.3351
Chhattisgarh	2016	5.4003	5.4251
Chhattisgarh	2017	13.1757	13.3351
Chhattisgarh	2018	11.9800	12.1491
Chhattisgarh	2019	26.0201	26.3640
Chhattisgarh	2020	19.2658	18.6254
Chhattisgarh	2021	0.0439	0.0440

Source: Author's own calculation

State	Year	Fiscal R* with actual inflation rate	Fiscal R* with 4% inflation rate
Chhattisgarh	2022	10.1414	10.0851
Chhattisgarh	2023	9.0412	9.0848
Goa	2011	2.4957	2.4531
Goa	2012	4.4444	4.2322
Goa	2013	4.9919	4.8217
Goa	2014	-0.3966	-0.3854
Goa	2015	3.5259	3.5064
Goa	2016	-1.5930	-1.5766
Goa	2017	2.7538	2.7581
Goa	2018	3.0707	3.1035
Goa	2019	2.5696	2.5630
Goa	2020	5.5921	5.4516
Goa	2021	3.4830	3.4769
Goa	2022	9.4606	9.5292
Goa	2023	6.9531	7.0155
Gujarat	2011	0.1855	0.1835
Gujarat	2012	2.4420	2.3458
Gujarat	2013	2.5997	2.5541
Gujarat	2014	1.6151	1.5956
Gujarat	2015	2.7326	2.7119
Gujarat	2016	-0.3320	-0.3277
Gujarat	2017	0.9134	0.9228
Gujarat	2018	1.9165	1.9390
Gujarat	2019	0.6985	0.7000
Gujarat	2020	3.8938	3.8321
Gujarat	2021	-0.5080	-0.5033
Gujarat	2022	1.7556	1.7146
Gujarat	2023	2.7193	2.6815
Haryana	2011	5.4645	5.2589
Haryana	2012	8.8093	8.4634
Haryana	2013	3.4346	3.3697
Haryana	2014	5.9752	5.8952
Haryana	2015	19.3156	19.3156
Haryana	2016	9.9548	9.9224
Haryana	2017	4.3564	4.3529
Haryana	2018	3.8842	3.9168
Haryana	2019	5.8574	5.8430
Haryana	2020	4.2795	4.2130
Haryana	2021	4.2389	4.1825
Haryana	2022	3.6989	3.5926
Haryana	2023	3.3761	3.2986
Himachal Pradesh	2011	-1.4649	-1.4121
Himachal Pradesh	2012	2.0301	1.9467
Himachal Pradesh	2013	4.5365	4.4179
Himachal Pradesh	2014	3.3968	3.3378
Himachal Pradesh	2015	-2.1737	-2.1676
Himachal Pradesh	2016	4.9721	4.9465
Himachal Pradesh	2017	0.2173	0.2166
Himachal Pradesh	2018	-0.7134	-0.7392

Source: Author's own calculation

State	Year	Fiscal R* with actual inflation rate	Fiscal R* with 4% inflation rate
Himachal Pradesh	2019	1.9769	1.9853
Himachal Pradesh	2020	1.8530	1.8334
Himachal Pradesh	2021	0.8531	0.8392
Himachal Pradesh	2022	8.1396	8.1040
Himachal Pradesh	2023	3.8924	3.8592
Jharkhand	2011	-1.1227	-1.0652
Jharkhand	2012	5.5724	5.2943
Jharkhand	2013	-1.8013	-1.7679
Jharkhand	2014	15.1169	15.0316
Jharkhand	2015	22.0921	21.8570
Jharkhand	2016	14.4380	14.2589
Jharkhand	2017	16.2510	16.2657
Jharkhand	2018	3.3611	3.3694
Jharkhand	2019	4.9051	4.9008
Jharkhand	2020	16.1101	15.8229
Jharkhand	2021	-5.9904	-6.0064
Jharkhand	2022	3.6239	3.5598
Jharkhand	2023	7.1610	7.0522
Karnataka	2011	7.6281	7.3101
Karnataka	2012	10.5315	9.9079
Karnataka	2013	10.3811	10.1188
Karnataka	2014	10.4493	10.2263
Karnataka	2015	7.2751	7.1083
Karnataka	2016	12.4747	12.4311
Karnataka	2017	11.6755	11.7766
Karnataka	2018	13.6102	13.6932
Karnataka	2019	10.1650	10.0256
Karnataka	2020	20.1072	19.7824
Karnataka	2021	15.4496	15.2293
Karnataka	2022	10.8372	10.6964
Karnataka	2023	9.5830	9.4372
Kerala	2011	10.7359	10.3586
Kerala	2012	12.0352	11.4115
Kerala	2013	13.4597	12.9981
Kerala	2014	12.6901	12.3139
Kerala	2015	8.9568	8.9398
Kerala	2016	18.6816	18.6275
Kerala	2017	14.8595	14.5763
Kerala	2018	11.3327	11.2391
Kerala	2019	4.9615	4.8659
Kerala	2020	20.1665	19.7852
Kerala	2021	21.6515	21.6515
Kerala	2022	11.2794	11.0934
Kerala	2023	12.1121	11.9971
Madhya Pradesh	2011	1.2874	1.2402
Madhya Pradesh	2012	10.2663	9.7525
Madhya Pradesh	2013	8.6538	8.4812
Madhya Pradesh	2014	9.2795	9.1603
Madhya Pradesh	2015	10.8468	10.8084

Source: Author's own calculation

State	Year	Fiscal R* with actual inflation rate	Fiscal R* with 4% inflation rate
Madhya Pradesh	2016	29.0505	29.1789
Madhya Pradesh	2017	17.2352	17.4330
Madhya Pradesh	2018	11.2151	11.2629
Madhya Pradesh	2019	24.1242	23.8160
Madhya Pradesh	2020	35.3849	34.2769
Madhya Pradesh	2021	17.1198	16.8345
Madhya Pradesh	2022	22.4421	21.7712
Madhya Pradesh	2023	22.1465	22.0674
Maharashtra	2011	1.6884	1.6367
Maharashtra	2012	-2.9978	-2.8742
Maharashtra	2013	2.5598	2.5200
Maharashtra	2014	4.1311	4.0791
Maharashtra	2015	1.2209	1.2168
Maharashtra	2016	4.2101	4.1951
Maharashtra	2017	-3.3978	-3.3947
Maharashtra	2018	-3.9836	-4.0167
Maharashtra	2019	7.0817	7.0566
Maharashtra	2020	11.2954	11.0088
Maharashtra	2021	7.1731	7.0969
Maharashtra	2022	13.2725	12.8981
Maharashtra	2023	10.2446	10.1485
Odisha	2011	-7.3311	-7.0687
Odisha	2012	-7.2349	-6.8497
Odisha	2013	5.0179	4.8715
Odisha	2014	9.1915	8.9532
Odisha	2015	9.4296	9.2159
Odisha	2016	12.6548	12.5468
Odisha	2017	7.5646	7.6939
Odisha	2018	7.8532	7.9549
Odisha	2019	17.8182	17.7248
Odisha	2020	4.9168	4.7518
Odisha	2021	-35.8246	-36.1017
Odisha	2022	22.2950	21.9254
Odisha	2023	31.8170	31.1579
Punjab	2011	2.1813	2.0967
Punjab	2012	2.3742	2.2744
Punjab	2013	0.8762	0.8608
Punjab	2014	1.5662	1.5430
Punjab	2015	5.1002	5.1239
Punjab	2016	19.6577	19.5865
Punjab	2017	-1.1854	-1.1888
Punjab	2018	-0.0262	-0.0264
Punjab	2019	-0.2355	-0.2327
Punjab	2020	1.6785	1.6598
Punjab	2021	2.8640	2.8541
Punjab	2022	3.6536	3.5886
Punjab	2023	3.1108	3.0721
Rajasthan	2011	-6.9777	-6.6553
Rajasthan	2012	0.4498	0.4357

Source: Author's own calculation

State	Year	Fiscal R* with actual inflation rate	Fiscal R* with 4% inflation rate
Rajasthan	2013	9.8266	9.5761
Rajasthan	2014	11.7413	11.4846
Rajasthan	2015	47.0344	46.3337
Rajasthan	2016	21.4776	21.2129
Rajasthan	2017	3.9453	3.9724
Rajasthan	2018	8.1027	8.2235
Rajasthan	2019	8.2095	8.1176
Rajasthan	2020	17.2253	17.1636
Rajasthan	2021	8.8072	8.7918
Rajasthan	2022	12.9654	12.6432
Rajasthan	2023	11.6335	11.3947
Tamil Nadu	2011	4.8230	4.5680
Tamil Nadu	2012	3.1751	3.0149
Tamil Nadu	2013	3.4725	3.4014
Tamil Nadu	2014	5.4756	5.3723
Tamil Nadu	2015	4.9311	4.8593
Tamil Nadu	2016	9.0068	9.0145
Tamil Nadu	2017	3.2506	3.2264
Tamil Nadu	2018	3.5208	3.5297
Tamil Nadu	2019	4.6537	4.5878
Tamil Nadu	2020	8.2306	7.9781
Tamil Nadu	2021	4.9789	4.9263
Tamil Nadu	2022	3.1724	3.1176
Tamil Nadu	2023	3.8288	3.7825
Telangana	2011	0.0000	0.0000
Telangana	2012	0.0000	0.0000
Telangana	2013	0.0000	0.0000
Telangana	2014	1.0998	1.0453
Telangana	2015	7.0716	6.8304
Telangana	2016	26.0793	25.0920
Telangana	2017	7.7195	7.7329
Telangana	2018	4.6602	4.8131
Telangana	2019	8.3517	8.2939
Telangana	2020	19.6220	18.7481
Telangana	2021	12.8138	12.4828
Telangana	2022	5.4793	4.8393
Telangana	2023	10.6906	10.3659
Tripura	2011	-9.6802	-9.8930
Tripura	2012	-11.5517	-10.9970
Tripura	2013	-8.4238	-7.4062
Tripura	2014	3.5323	3.1147
Tripura	2015	11.9536	12.1454
Tripura	2016	14.3126	14.2903
Tripura	2017	26.8346	26.9221
Tripura	2018	8.8815	8.8694
Tripura	2019	53.5910	53.0300
Tripura	2020	15.0479	14.6661
Tripura	2021	-35.2520	-35.3775
Tripura	2022	20.5353	20.0893
Tripura	2023	34.2269	33.6739

Source: Author's own calculation

State	Year	Fiscal R* with actual inflation rate	Fiscal R* with 4% inflation rate
Uttar Pradesh	2011	-0.1191	-0.1175
Uttar Pradesh	2012	1.2548	1.1706
Uttar Pradesh	2013	3.2094	3.0972
Uttar Pradesh	2014	6.3284	6.1900
Uttar Pradesh	2015	11.9367	11.9212
Uttar Pradesh	2016	3.1150	3.0868
Uttar Pradesh	2017	-0.6324	-0.6387
Uttar Pradesh	2018	0.4439	0.4457
Uttar Pradesh	2019	-12.5733	-12.3171
Uttar Pradesh	2020	4.3834	4.2885
Uttar Pradesh	2021	-0.9638	-0.9534
Uttar Pradesh	2022	10.9337	10.7182
Uttar Pradesh	2023	8.6900	8.5919
Uttarakhand	2011	-0.1435	-0.1423
Uttarakhand	2012	-1.1068	-1.0589
Uttarakhand	2013	0.5640	0.5459
Uttarakhand	2014	3.8796	3.8216
Uttarakhand	2015	1.9364	1.9706
Uttarakhand	2016	-18.7759	-18.7700
Uttarakhand	2017	-30.1675	-30.1635
Uttarakhand	2018	-21.8370	-21.8370
Uttarakhand	2019	-21.0627	-21.1129
Uttarakhand	2020	-9.6288	-9.6526
Uttarakhand	2021	-1.0037	-0.9930
Uttarakhand	2022	2.6800	2.6345
Uttarakhand	2023	3.4992	3.4614
West Bengal	2011	0.8015	0.7406
West Bengal	2012	0.6445	0.5876
West Bengal	2013	2.1728	2.0899
West Bengal	2014	2.5803	2.5349
West Bengal	2015	-1.1933	-1.1993
West Bengal	2016	-0.5645	-0.5629
West Bengal	2017	1.9131	1.9143
West Bengal	2018	5.9778	5.9566
West Bengal	2019	6.3608	6.3491
West Bengal	2020	12.3901	12.1897
West Bengal	2021	16.2451	16.1925
West Bengal	2022	11.7734	11.5532
West Bengal	2023	9.6820	9.6483

Source: Author's own calculation