Examining the Public Debt-Growth Relationship and Debt Sustainability: Evidence from India

THESIS

Submitted in partial fulfilment of the requirements for the degree of

DOCTOR OF PHILOSOPHY

by

PRATIBHA SAINI
2017PHXF0429P

Under the Supervision of

Prof. Krishna Muniyoor
Associate Professor
Department of Economics and Finance
Birla Institute of Technology & Science, Pilani – 333 031(Rajasthan)

BITS Pilani
Pilani | Dubai | Goa | Hyderabad

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE
PILANI - 333031 (RAJASTHAN) INDIA
2023

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE

PILANI - 333031 (RAJASTHAN) INDIA

CERTIFICATE

This is to certify that the thesis entitled **"Examining the Public Debt-Growth Relationship and Debt Sustainability: Evidence from India"** submitted by **Pratibha Saini** ID. No. **2017PHXF0429P** for the award of Ph.D. of the Institute embodies original work done by her under my supervision.

Signature of the Supervisor

Name in capital letters : **PROF. KRISHNA MUNIYOOR**

Designation : Associate Professor, HOD
Department of Economics & Finance
Birla Institute of Technology & Science
PILANI - 333031(Rajasthan)

Date: _____

To the Lord of Love and Compassion, Krishna!

Acknowledgments

I want to express my gratitude to Prof. Souvik Bhattacharyya, Vice Chancellor, BITS Pilani, for making available all the necessary facilities for the successful completion of the study. I am highly grateful to Prof. Sudhir Kumar Barai, Director, BITS Pilani, for his inspiration. My sincere thanks to Prof. Shamik Chakraborty, Associate Dean, Academic Graduate Studies and Research Division (AGSRD), and Prof. Krishna Muniyoor (Head, Department of Economics and Finance) for providing me with all the research facilities. I gratefully acknowledge the support I have received from Dr. Rahul Arora, DRC Convenor in getting all the formalities done smoothly.

I extend my sincere thanks to Prof. Jitendra Panwar (former Associate Dean, AGSRD), Prof. Shilpi Garg (former Nucleus Member, AGSRD), Prof. Arun Kumar Giri (former Head, Department of Economic and Finance), Prof. Geetilaxmi Mohapatra (former DRC convener) for providing a favorable academic environment and for always being approachable and supportive throughout my research journey.

I express my sincere gratitude to my supervisor Prof. Krishna Muniyoor for his valuable guidance and support throughout my doctoral journey. Without his direction and contribution, this thesis would never have been possible. His wisdom and expertise have been instrumental in shaping the direction and focus of this research.

I am incredibly thankful to Prof. Arun Kumar Giri and Dr. Rajan Pandey for providing valuable inputs as Doctoral Advisory Committee members. Their constructive criticism, insightful comments, and valuable suggestions have greatly improved the quality of my

research. I am also grateful to all the faculty members, research scholars, and staff members (Mr. Suresh and Mr. Sushil Kumar Saini) of the department for their support and help.

At the home front, expressing enough gratitude seems impossible for me towards my parents, Mr. H. S. Saini and Mrs. Sudarshana Saini, for providing me with unfailing support, and continuous encouragement throughout my life. They have always been my source of motivation and inspiration, and without their sacrifices and encouragement, I would not be where I am today. Their love and guidance have been the driving force behind my success, and I am truly blessed to have them as parents. I extend my heartfelt appreciation to my brothers, Parikshit Saini and Piyush Saini, for their love, affection, and constant support. Their belief in my abilities and their wise counsel have been invaluable. I am extremely grateful to Manu and Taru, who have become an integral part of my life. Through all the ups and downs they have been there for me. I cannot express my appreciation enough for the unwavering support they have provided and for being a constant source of strength for me.

Getting through my thesis required more than academic support, and I feel indebted to Arshveer Kaur, Stuti Chug, and Shail Saharan for listening to me and, at times, having to tolerate me over the past four and a half years. I cannot begin to express my gratitude and appreciation for their friendship and unwavering personal support during the time I spent at the University.

Finally, my greatest gratitude to God for letting me through all the difficulties, and making me a humble and compassionate human.

PRATIBHA SAINI

Abstract

Public debt is indispensable for developing economies, particularly in the initial stages of economic development, as these economies lack sufficient resources to guarantee full employment. In order to achieve full employment, government borrowing is expected to boost the demand for labour by expanding investment in infrastructure and other key sectors of the economy. However, a prolonged period of a high debt-to-gross domestic product (GDP) ratio often poses challenges if it is unsustainable for an economy. Public debt is unsustainable if the present value of a country's future surplus is not enough to repay the public debt and service costs (Finance and Development, 2020). Consequently, future generations will likely bear the brunt of public debt accumulation.

Among other emerging economies, while examining the composition of India's external and internal public debt, internal debt as a proportion of the GDP has increased consistently. In contrast, a downturn has been detected in the government's external financing during the period 2011-2017. Since 2017, the country's external borrowings have begun to rise. In addition to the global financial crisis (2008) and recurrent business activity slumps, the recent pandemic has created an anomalous setback. Amid these uncertainties, efforts by the central government to curtail the debt to 40 per cent of GDP by 2025, however, appears impossible. Further, due to the COVID-19 crisis, the fiscal deficit and debt-to-gross state domestic product (GSDP) ratio have increased to more than 3 per cent and 31 per cent, respectively, in the year 2020-21, considered unsustainable.

In concern to this, the study aims to investigate the relationship between public debt and India's economic growth; to examine the determinants of public debt accumulation in India;

and determine the debt threshold and debt sustainability at the national level as well as at the state level.

Briefly, the data for achieving the objectives mentioned above are sourced from various databases such as World Development Indicators (WDI, World Bank), World Economic Outlook (WEO, IMF) study, Reserve Bank of India, Indiastat, and various other sources. The prominent methods used in the study to accomplish the objectives are a) the Autoregressive Distributed Lag (ARDL) Bound Test, Bayer and Hanck for examining co-integration among the variables, b) the Granger Causality test for checking the direction of the causality, c) Autoregressive Moving Average for forecasting, d) Structural Equation Modelling (SEM) technique for determining the factors of debt, e) Quantile regression technique for examining the non-linear relationship among the variables, and f) construction of index using PCA approach.

The study's findings suggest a statistical relationship between public debt and economic growth in the long run. The test results confirm the unidirectional causality, running from public debt to economic growth in the case of India. The results further reveal that among various macroeconomic variables, debt servicing, inflation, and military expenditure are India's key determinants of debt. Moreover, as expected, economic development negatively affects public debt, suggesting that public debt accumulation tends to decrease with the progress in economic development. India has already crossed the debt threshold of 74.07 per cent, partly triggered by the acceleration of public expenditure during the COVID-19 pandemic. Furthermore, while rising public debt negatively affects primary surplus, sound institutional quality significantly reduces this effect and stimulates economic growth.

While investigating the optimal level of debt, beyond which further accumulation can negatively affect the growth of each state, the study discovered that the effect of each factor varies with the state-specific level of debt. This implies that the policy implementation should

be heterogeneous across the states. The results of the debt sustainability index revealed that almost half of India comes under the unsustainable debt category. Mostly, the states falling under the northern and southern regions are severely affected by the COVID-19 pandemic. The crises lead to a high rise in debt and a reduction in revenue generation. The study suggests that Pondicherry is a highly debt-sustainable state, while Jammu and Kashmir fall under the highly unsustainable state.

Policymakers can adopt a more prudent approach in curbing the soaring debt and keeping to the path of sustainable growth. Although the risk for India is moderate, the unprecedented rise in public debt has become a major cause for concern, and it poses a severe threat to achieving sustainable growth. It is believed that the timely implementation of policies to improve fiscal sustainability could help increase the country's liquidity position. In addition, it is essential to favour public debt's productive utilization to impact economic growth positively. The study highlights the need for considering a threshold level of public debt beyond which the economy cannot acquire funds on credit. It is acknowledged that the increased debt after a specific limit could negatively impact economic growth. The government should focus on expanding its primary surplus so that debt servicing can be improved and timely debt repayments can be made to avoid the burden of increased interest liabilities.

Keywords

Public Debt, Sub-national Debt, External Debt, Internal Debt, Economic Growth, Economic Development, Debt Threshold, Debt Sustainability, Fiscal Deficit, Institutional Quality, HDI, Bayer-Hanck, ARDL, Structural Equation Modelling, Quantile Regression, Index, States, Region, India

Table of Contents

Chapter/Section No **Page No.**

List of Tables

List of Figures

List of Abbreviations

ARDL	Autoregressive Distributed Lag
ARMA	Autoregression and Moving Average
CF	Consolidated Fund
DCRF	Debt Consolidation and Relief Facility
DSI	Debt Sustainability Index
DSS	Debt Swap Scheme
ECT	Error Correction Term
EU	European Union
EXIM	Export Import
FC	Finance Commission
FDI	Foreign Direct Investment
FRBM	Fiscal Responsibility and Budget Management
FXR	Foreign Exchange Reserve
GDP	Gross Domestic Product
GFCF	Gross Final Consumption Expenditure
GFCF	Gross Fixed Capital Formation
GNI	Gross National Expenditure
GSDP	Gross State Domestic Product
HDI	Human Development Index
IIF	International Financial Institutions
IMF	International Monetary Fund
MENA	Middle-East and North Africa
NRI	Non-Residents Indian
OECD	Organisation of Economic Co-operation and Development
OLS	Ordinary Least Square
PCA	Principal Component Analysis
RBI	Reserve Bank of India
SADC	South African Development Community
SEM	Structural Equation Modelling
UT	Union Territory
VAR	Vector Autoregression
WDI	World Development Indicators

CHAPTER 1

Introduction

1.1 Background

Debt is an obligation. In general, debt is incurred by individuals, households, and governments. If the government incurs the debt, it is called public debt. In other words, it is an obligation for the future generation to repay the principal and the interests. In economics parlance, public debt is a widely used mechanism to offset the difference between government revenue and expenditure as a proportion of GDP. It is defined either narrowly or broadly. While the narrow definition of public debt includes the budgetary deficit of the central government, the broader definition refers to all the outstanding liabilities of central, state and local governments at a particular period.

According to conventional wisdom, a country incurs debt when it witnesses war or unforeseen calamities. Typically, public debt as a percentage of GDP in developing or low-income countries is more than in developed or industrialized countries. It is one of the instruments of fiscal policy. Strictly speaking, it has two components: principal and interest payments. The debtor pays both principal and interest at a predetermined date to the creditor. It is worth noting that a country may be indebted to many creditors.

Note: Public debt and debt has been used interchangeably in the thesis. Here, debt implies public debt only.

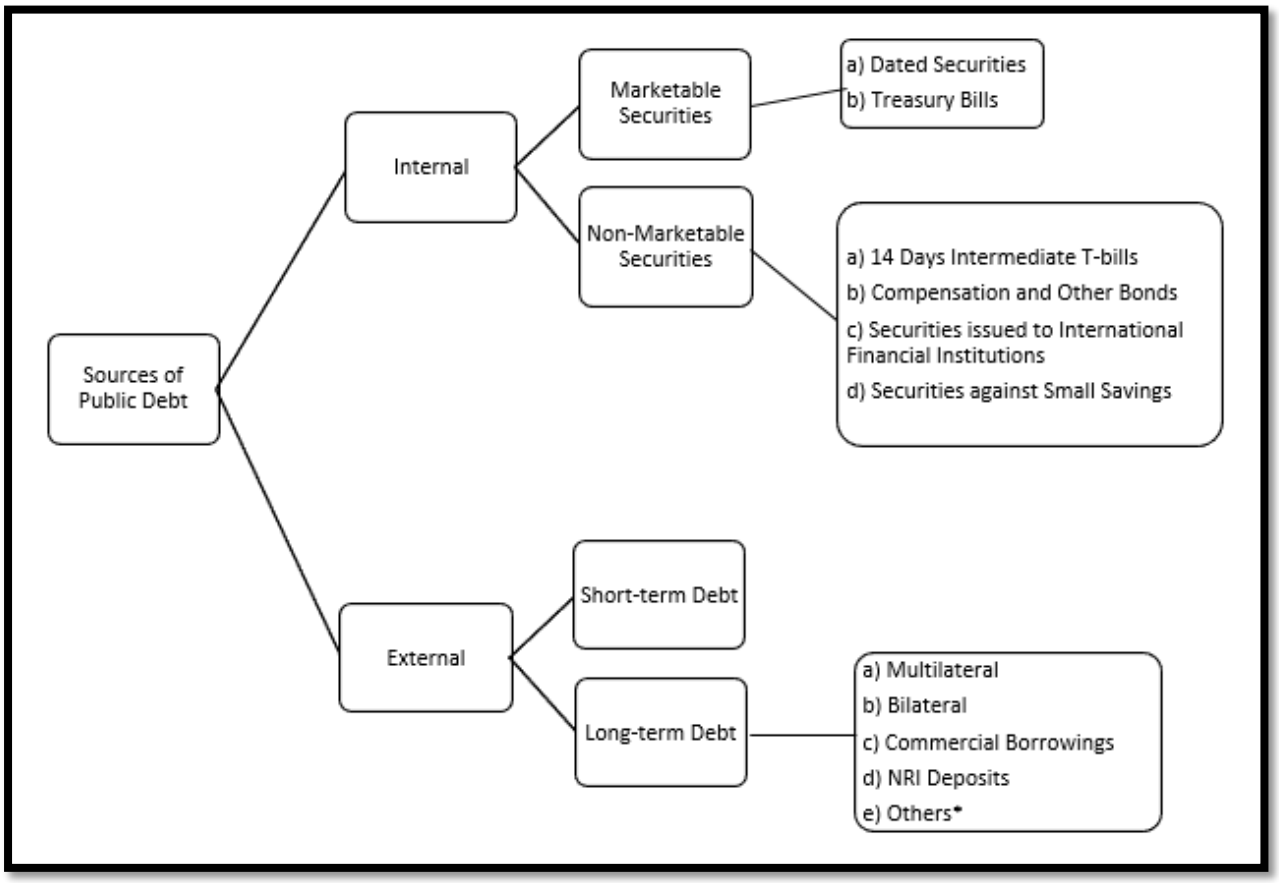
The remaining part of this chapter is structured as follows. Section 2 provides the different sources of public debt, broadly touching upon both internal and external sources of public debt. Section 3 explains the nexus between economic growth and public debt and the role of crisis in affecting public debt and economic growth. Section 4 highlights the determinants of public debt, including many macroeconomic factors, specifically focusing on economic development and natural resource rents. Section 5 elaborates on debt threshold and debt sustainability issues among Indian states and India as a whole. Section 6 lays out the rationale for undertaking this study. Section 7 presents the objectives of the study, followed by an overview of the data sources and methods used in the thesis given in section 8. Section 9 explains the significance of the study. The last section gives the outline of the remaining chapters of the thesis.

1.2 Sources of Public Debt

As illustrated in Figure 1.1, there are two sources of debt: internal and external. All the central government liabilities engaged against India's Consolidated Fund of India (CFI) are considered central government debt or public debt. Public debt can be classified into two terms that are internal and external debt, based on the sources of the debt accumulation, as shown in Figure 1.1. Internal debt comprises marketable and non-marketable debt. While marketable debt consists of the government's dated securities and treasury bills, non-marketable debt includes 14 days' intermediate treasury bills (T-bills) granted to different state governments, union territories, and central banks. It also consists of the issue of securities against small savings, special securities to public sector banks and EXIM banks, securities to international financial institutions (IIF), Reserve funds and deposits, compensation and other bonds, etc. Total liabilities represent the outstanding debt due to the fiscal operations and consolidations of the central government (Ministry of Finance, 2022).

Figure 1.1

Sources of Public Debt



Source: Author's elaboration from Budget documents of the Government of India (2022)

External debt is classified in two major terms, i.e., short-term debt and long-term debt. Long-term debt comprises multilateral, bilateral, commercial borrowings, NRI deposits, and others. Here, others* represent the borrowings from international financial institutions such as the IMF, World Bank, and other foreign commercial banks and foreign governments. Public debt is generally measured as a country's gross domestic product (GDP) ratio. The ratio tends to rise when an economy records low inflation (high real interest rate) and growth rates.

1.3 Public Debt: Exploring the Relationship

1.3.1 Public Debt and Economic Growth: The Nexus

Most economists consider public borrowing necessary for emerging economies to enhance their economic stability and sustainable growth, as such economies are often constrained by financial resources, particularly in the initial phases of development. From a macroeconomic perspective, public debt is a double-edged sword. On the one hand, government borrowing is indispensable for developing economies, as these economies lack sufficient resources to guarantee full employment. To achieve full employment, government borrowing is expected to boost the demand for labour by expanding investment in infrastructure and other key sectors of the economy. In short, public debt is justified as it provides long-term benefits to the nation.

On the other hand, as noted by Krugman (1988), beyond the desired level, public debt, which differs across countries, often poses a major threat to achieving potential growth because it involves an enormous repayment cost in the future. As a result, substantially high public debt is likely to put the nation in a perpetual debt trap, leading to inefficient utilisation of funds and increased service costs (Pegkas, 2018; Mhlab & Phiri, 2019). A prolonged high debt-to-gross domestic product (GDP) ratio often poses challenges if it is unsustainable for an economy. Public debt is unsustainable if the present value of a country's future surplus is not enough to repay the public debt and service costs. As a consequence, future generations are likely to bear the brunt of public debt accumulation.

In the aftermath of the global financial crisis in 2008, it is increasingly being recognised that the sluggish growth of the business, coupled with the crippling level of public debt, tends to stifle not only the ability of a country to honour the obligation of debt repayment but also its fiscal policies (Alper & Forni, 2011). In sum, an excessive level of public debt can potentially

affect the stability of an economy, capital formation, and consumption expenditure (Pegkas, 2018).

1.3.2 Debt and Crisis

It is worth noting that a series of crises in the past has played a significant role in slowing down the growth of emerging economies (Klein and Salvatore, 2013). Previously, the global financial crisis and post-war crisis left the under-developed and developing economies in deep recession and made them dependent on borrowings for survival. Likewise, the world economies are drowning due to the COVID-19 crisis (Salvatore, 2020). Moreover, the economic growth prospects remain highly uncertain as variants of COVID-19 are spreading quickly in many countries—the continuous occurrence of new variants of the coronavirus creating prolonged economic disruptions. The resurgence of economies from such an unprecedented crisis varies depending on the dynamic and effective policy implementation (International Monetary Fund, 2021).

Concerning the ongoing COVID-19 pandemic, IMF predicts high debt-GDP ratios for several economies, including developed and developing economies. It is reasonable to argue that the impact of the COVID-19 pandemic on public debt is enormous. For instance, considering the prevailing crisis, introducing emergency spending measures in 2020 due to a persistent rise in COVID-19 cases was inevitable. Several economies collapsed due to the unexpected and sudden lift in healthcare expenses. The governments are still facing a slowdown in their potential GDP growth. Such disruptions and health crises make economies more vulnerable, pushing them into the vicious circle of debt accumulation. The global pandemic has increased the debt liability of many economies to an extent higher than ever. Consequently, the question of the fiscal stability of economies has again been raised. The same question arises regarding the stability and sustainability of India and Indian states.

1.4 Factors Determining Public Debt

1.4.1 Economic Development and Other Macroeconomic Factors

An analysis of the current studies on public debt provides vital cues about several factors that cause public debt accumulation. Two aspects have been identified: internal and external (Forslund et al., 2011; Pablo and Alex, 2015; Abdullahi et al., 2015). Among internal and external factors, significant factors include military expenditure, capital formation, corruption, debt servicing, inflation, trade, foreign direct investment, and external shocks. As an internal factor, military expenditure resulting from cross-border disputes and terrorism plays a crucial role in incrementing public debt. It is regarded as an unproductive investment as it yields nothing in return except hostility.

Interestingly, recent literature suggests that corruption, among other drivers, is another significant factor influencing an economy's debt positioning and economic growth (Cooray et al., 2016; Benfratello et al., 2018). The incidence of corruption paves the way for the shadow economy, which tends to reduce tax revenues and increase debt issuance. It is reasonable to assume that a more corrupt and irresponsible government worsens the credibility of an economy. The prevalence of corruption affects the quality of welfare programmes and investment projects, leading to the inefficiency of public resources.

Unequivocally, the choice of borrowing from external sources depends on the ongoing terms of trade with other countries. If any, the prevailing external shocks also affect the economy and its decision on further debt accumulation. Moreover, the lending rate of interest at which the government borrows funds imperatively determines an economy's future borrowings. Interestingly, these drivers are interconnected, influencing the role of each other

in determining the indebtedness of the economy. In addition, to accelerate economic growth, it is necessary to concentrate on the development at the foundation.

In economics parlance, it is acknowledged that improving socioeconomic conditions is likely to enhance the overall welfare of the people and thereby create more productive resources in the economy. The existing literature has not widely discussed the relationship between public debt and economic development. Further, the factors affecting public debt accumulation have not been discussed thoroughly in India.

1.4.2 Natural Resource Rents as Another Important Factor of Debt

World Bank describes how recording the contribution of natural resources to economic growth is essential. It suggests that the revenues from natural resources generally account for an ample proportion of GDP in resource-abundant countries. Natural resources are non-reproducible; hence they give rise to economic rents. Rents can be explained as earnings above the cost of extraction or harvesting of natural resources. Such rents from non-renewable resources viz-a-viz minerals, oil, fossil fuels, and extensive harvesting of forests lead to liquidation in the country on the cost of capital stock. Sometimes countries utilize the rents from these non-renewable resources to aid the current consumption rather than investing in future projects to offset the extinction, indicating the borrowing against the future. The pioneered study by Gelb (1988) on the resource curse hypothesis empirically tested the relationship between natural resources and economic growth, while Auty (1993) introduced the concept of the natural resource curse. The pioneering study concluded that oil resource windfalls had worsened economic growth for some economies.

One of the reasons for the negative nexus between economic growth and natural resources can be the falling global prices of natural resources. Reduced earnings due to the fall

in prices unfavourably affect resource-dependent economies' growth. It was recognized that the endowed economies increase their spending during booms in the expectation of high revenues. Also, the cost of extraction of these resources is much high. Therefore, the deficits are financed through borrowings. It is known as 'boom-based borrowing capacity' since booming economies seem attractive to creditors.

Such economies use their natural resource windfalls as collateral for their credit needs. Thus, whenever prices decline, they become incapable of settling their debts. Resource-backed debts got popularized because economies can procure funds in exchange for the future income flow from natural resource windfalls. However, unrestricted borrowings increase the debt level and discourage investors from further investments. Eventually, high dependence on natural resource revenues entangles the economies in the debt trap and debt overhang phenomenon when the revenue declines. Further, a few studies suggest that the natural resource hypothesis is invalid for all economies. Developing and developed resource-abundant economies have exploited their resources to surge public investment and succeeded in improving their economic growth rate. For instance, exemplary policy implementation and high institutional quality helped Botswana reduce its fiscal deficit and sustain economic growth using resource rents.

Taking India's case, as per World Atlas, it is one of the top nine global resource-abundant economies. The natural resources rents in India contribute about 2.5% of the country's GDP, and India is the 17th largest export economy globally. Further, in their panel study, Ampofo et al. (2020) find that the resource curse phenomenon exists in India too, which implies that natural resource rents negatively affect India's economic growth. The economy's total natural resource rents began to decline after the global financial crisis in 2008 till 2016, from

7.1 per cent of GDP to 1.72 per cent of GDP. However, it started rising slightly each year after 2016. While the debt-GDP ratio has grown since 2010, it rose to 89.6 per cent of GDP in 2020.

Debt sustainability has become an issue of concern for the economy over the last decade. The debt-GDP ratio has constantly been rising without any prominent rise in the economy's revenues. The expenditures cross the government's revenues yearly, resulting in higher fiscal deficits and making the economy more debt-dependent and less debt sustainable.

1.5 Debt Sustainability: Cause for Concern

1.5.1 Debt Threshold and Unsustainability

A consistent increase in public debt beyond a certain threshold limit or repaying capacity raises serious concerns about the ability of governments to honour their obligations (Afonso and Tovar, 2013; Égert, 2015). Furthermore, economists elucidate that if public debt surpasses a threshold limit, called unsustainable public debt, it is more likely to disrupt the long-term growth prospects by way of crashing the value of the currency, inflation, and high cost of borrowing (Krugman 1998; Tamborini and Tomaselli, 2020; Kassouri et al., 2021; Sharaf, 2022). The current debt levels of many developing countries such as Argentina, Tunisia, Egypt, Kenya, Sri Lanka, and Belarus are much beyond what their governments could repay and in a debt default. Notably, the threshold level of public borrowing varies across countries.

IMF (2002) defines public debt sustainability as “if it satisfies the present value budget (i.e., solvency) constraint without a major correction in the balance of income and expenditure are given the costs of financing it faces in the market.” In other words, if the government of an economy can suffice its entire current and forthcoming commitments without any irregular financial assistance or going into a debt default, it is considered debt sustainable. The debt sustainability of an economy can be measured through different methods such as Growth-

Interest Rate Differential, Inter-temporal Budget Constraint, Indicator approach, etc. (Domar, 1944; Bohn, 2007; Ghosh et al., 2013; Pradhan, 2019; Joy and Panda, 2021; Ramu, 2021; Grosu et al., 2022).

Fiscal imbalance or the large stock of public debt concerning the size of an economy does not cause any concern provided that they are used for critical public goods and held in domestic currency. Public debt in a foreign currency threatens debt sustainability because it requires the concerned government and the country to generate enough export surpluses and foreign currency reserves to service external debt. The example can be taken from the debt burden of the USA or Japan, or some of the EU countries, where debt stocks are primarily held in domestic currency.

The Indian policymakers learned a hard lesson, especially after the 1991 external payment crisis, that shifting the composition of debt stock held in foreign currency to home currency is preferable. A compositional shift like this has kept the issue of debt sustainability at bay for the last two decades; also, Singh (1999) reveals that in the case of India, the effect of domestic debt is neutral. However, the recent crisis, low revenues, and rise in inflation have brought the issue of debt sustainability into the focus for policymakers. The rising stock of public debt denominated in the home currency will be problematic if it causes runaway inflation, resulting in the currency's debasement. Domestic debt more than a threshold can become problematic for the economy. The economic crisis of Venezuela is a classic example of it. This is probably the most prominent and only cause of worry for policymakers of an economy when more than 95% of public debt is held in domestic currency.

Estimating the debt threshold by quadratic specification will probably show a non-linear relationship between the debt-to-GDP ratio and GDP growth. The essence of the

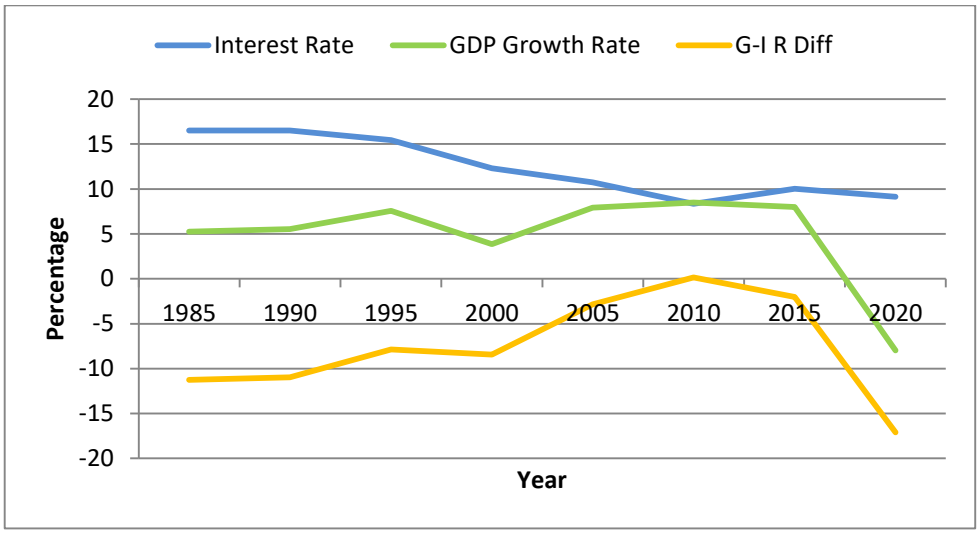
nonlinear relationship highlights an optimal level of public debt ratio beyond which either economic growth starts declining or the country heads toward a debt default—exploring why a higher debt level exerts negative pressure on GDP growth after the threshold is important. In addition, the compensation to the state governments for the loss of revenue arising due to the implementation of the GST Act 2017 ended in 2022. The state governments have depended on GST compensation for their cash flow requirements for the last five years. Terminating GST compensation will amend the revenue composition of the states adversely, especially those with a larger share of such receipts in their total revenue. An end to this compensation will increase the cash flow uncertainty and lead to a large increase in market borrowings.

A substantial rise in India's public debt over the past decade with a parallel increase in the government's size has caught researchers' attention once again to examine debt sustainability via debt threshold estimation exceeding which debt can impair India's economic growth. It may become an impediment to the future surge. The growth of the public debt generally confides on two parameters, i.e., the interest liability on public debt and the volume of the primary deficit/surplus. When the primary balance is scant, both primary deficits and interest rate obligations supplement to further accretion of public debt in an economy. However, if the economic growth rate is higher than the interest rate, it aids in neutralizing the influence of the primary deficit on debt rise. The difference between growth and interest rates is known as Growth-Interest Rate Differential in economic terms.

Figure 1.2 shows how the growth-interest rate differential has increased throughout the decades, connoting the unsustainable debt increase. Later in 2017, interest rates and growth began to decline, but the difference between the two is still rising to date. Besides, to prevent the COVID-19 pandemic, the announcement of continuous lockdown for months and suspension of all economic activities except necessities crumbled economic growth.

Figure 1.2

Economic Growth-Interest Rate Differential



Source: Computed from World Development Indicators Data, World Bank (2022)

1.5.2 Institutional Quality and Unsustainability

Subsequently, with the ongoing pandemic, the rise in debt is inevitable (Pigou, 1928; Mabugu et al., 2013; Mhlaba and Phiri, 2019; Jomo and Chowdhury, 2020). Further, such a continuous rise in debt pushes the economy towards crossing its debt threshold, which is considered unsustainable. The recent literature postulated that institutional quality also plays an instrumental role in determining the effects of public debt accumulation on economic growth (Acemoglu et al., 2001; Butkiewicz and Yanikkaya, 2006; Siba, 2007; Sani et al., 2019). With profound institutional quality, public debt can expand economic activities significantly (Law and Habibullah, 2006; Law et al., 2013).

When the institutional quality of a country is poor, the public debt stemming from the government's borrowing results in futile projects without generating economic activities adequately (Jalles, 2011), implying that prudent institutions facilitate the optimum utilization of public debt (Presbitero, 2008; Daud and Podivinsky, 2014). The absence of strong

institutions is the key factor attributable to macroeconomic vulnerability, leading to debt defaults and economic stagnation (Ciocchini et al., 2003). For instance, demonetization in India in 2016 was clear evidence of the country's prevailing high corruption and black money. In addition, increasing armed conflicts at the border and political and social unrest have made the government divert the borrowed funds to defence expenditures. All these are somehow the results of imprudent and poor institutions in the country, leading to widened fiscal imbalances and increased borrowing needs. Further, other economies with better institutional qualities compared to India have improved from public debt (Jalles, 2011; Kim et al., 2017).

1.6 Rationale for the Study

The question arises here: Is public debt good for low-income and emerging market economies such as India? Many economists recommend funding through public debt, commonly for emerging and low-income countries. The reason being these economies are confronted with fundamental problems in common such as slow growth of tax revenue, the inefficiency of public spending, excessive intervention of bureaucracy, low level of public and private investment, low export competitiveness, and a weak institutional environment (Cochrane 2011; Swamy 2015a; Pegkas 2018). Therefore, public debt is critical in financing infrastructure and welfare programmes in the initial stages of economic development (Abbas and Christensen, 2010). It also helps low-income and emerging economies to achieve untapped potential through full employment equilibrium. More importantly, it is an essential fiscal tool to maintain macroeconomic stability.

Public debt can be defended as long as a country can meet its future obligations, including principal and interest payments. In other words, a country’s public debt is sustainable if it is within the boundary of its debt-repaying capacity (Afonso and Tovar, 2013; Égert, 2015). One of the fundamental features of public debt sustainability is that it varies across countries

and time, depending on economic growth, the stock of foreign exchange reserves, fiscal prudence, inflation, and several other macroeconomic factors.

Krugman (1988) pointed out that debt beyond a threshold level has a detrimental economic impact. The continuous accumulation of public debt imposes a massive burden on future generations through enormous outstanding repayments (Teles and Cesar Mussolini, 2014). Put simply, public debt beyond a country's carrying capacity will likely culminate into a vicious circle of debt accumulation, eventually leading to a persistent downturn in economic activities (Alper and Forni, 2011; Pegkas, 2018; Mhlab and Phiri, 2019). Chang and Chiang (2009) suggest a transition from one regime to another when the debt has a threshold of 97.82%.

The investigation of debt sustainability in the Indian context gained relevance in the late 1990s. However, the empirical testing of debt sustainability was only based on the borrowings of the central government. Indian states were left unfocused. Moreover, the existing literature is focused on estimating debt sustainability using a particular indicator. The composite effect of several indicators is not given much attention. Therefore, from the above discussion, it is evident that a state-wise assessment of the debt sustainability of India is necessary at this stage, and that too by investigating the composite effect of various indicators. Further, India must be analysed from a debt sustainability perspective by considering the central and states' combined liabilities.

1.7 Research Objectives

Based on the above discussion, the following objectives have been formulated for the study:

- To reinvestigate the relationship between public debt and economic growth in India.
- To examine the determinants and sustainability of public debt in the Indian economy.

- To determine the public debt sustainability of Indian states and the factors that aggravate Indian states' indebtedness.

1.8 Significance of the Study

The study has significant policy implications for the Indian economy. Investigating the relationship between India's economic growth and public debt will help policymakers take a more cautious approach to halt the rising debt and keep to the sustainable growth path. The study considers the role of institutional quality, which will help policymakers understand how institutional quality affects growth by interacting with public debt. The study also helps explain the role of developmental factors such as HDI, employment, and social sector expenditure in determining public debt. This will help policymakers understand ground-level factors that influence public debt and make policies so that the country becomes more self-reliant, generates more employment, and improves labour productivity.

The study is significant as it highlights the debt threshold and sustainability areas, which could help better understand the points at which further debt accumulation can hamper the Indian economy. The study also discusses the status of and variation in Indian state indebtedness. It constructs a debt sustainability index which could help make policies according to the graveness of the debt position of a particular state and also by considering the state-specific factors of debt.

1.9 Organisation of the Study

The thesis consists of six chapters. Chapter 1 discusses the introduction to the thesis and briefly explains the research objectives established on the gaps in the existing literature. It highlights

the rationale and significance of the study, the overview of data methods and sources used, and the organisation of the study.

Chapter 2 gives an overview of the trends and patterns of public debt in India and Indian states. It discusses the trends and patterns of relevant study variables over the last few years. India's debt and economic growth trends are described and graphically presented. Changes in aggregate liabilities and gross state domestic product are explained by using a tabular representation. Then, the chapter explains the changes in revenue and expenditure of the Indian state governments. In the end, the status of India's public debt is compared with the global economy.

Chapter 3 presents a detailed review of existing literature on the nexus between public debt and economic growth, the channels or factors of public debt accumulation, and debt sustainability. Then the relevant literature on the same topics concerning India and India's sub-nations is presented. It explains the theoretical linkage between public debt, expenditure, and economic growth. The chapter summarizes the recent literature briefly. Lastly, research gaps are stated and explained.

Chapter 4 explains the research process used for conducting the study. The chapter also elaborates the research framework adopted to achieve the each objective. The variables, research methods selected for studying each objective, and the econometric procedures are then defined. The various sources from which data is gathered are also described.

Chapter 5, in the beginning, comprehends the results and findings of the studies related to the nexus between public debt and India's economic growth. Next, it provides the empirical results of the effects of the COVID-19 pandemic on economic growth and public debt. Then the chapter further moves to the findings of various determinants of public debt accumulation, such as economic development, natural resource rents and other macroeconomic variables,

and debt sustainability in India, and lastly it illustrates and explains the results related to Indian states' indebtedness and where all the states stand in the ranking of debt sustainability.

Chapter 6 is the compilation of conclusions and policy implications drawn from the study of each thesis objective. It also includes the limitations and future scope of work. The last section represents a list of references for conducting the research and the appendices.

CHAPTER 2

India's Public Debt: Trends and Patterns

2.1 Introduction

This chapter shows the trends and patterns of the variables throughout the last few years. The chapter will explain the trends of various variables of interest in the study. First, India's debt and economic growth trends are described and graphically presented. Next, aggregate liabilities and gross state domestic product changes are explained using a tabular representation. Later,

the chapter demonstrates the patterns in revenue and expenditure of the Indian state governments. Lastly, India's public debt status is compared with the global economy.

2.2 Pattern of Public Debt and Economic Growth

Public debt has considerably increased during the last two decades, particularly in many developing economies, mainly due to cross-border tension and recurrent global recessions. Regarding developing economies, a rise in public debt is extremely risky because these economies face several problems in common such as weak formal institutions, corruption, unlimited supplies of the unskilled workforce, and low labour productivity. The economics literature argues that these constraints impede economic growth and fret the new private investment (Bulow and Rogoff, 1989; Atique and Malik, 2012; Hayati and Rahman, 2012).

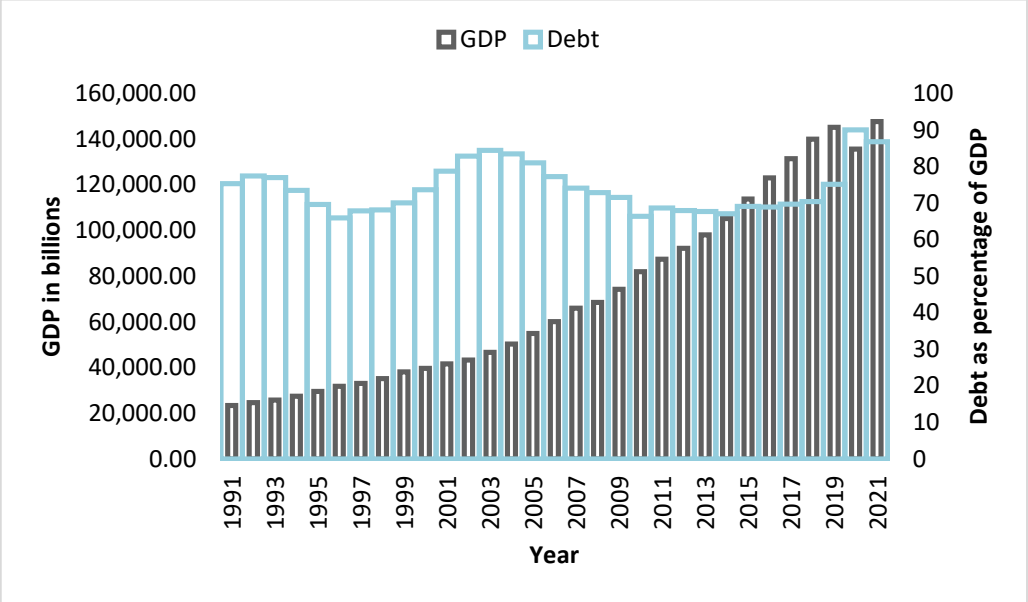
Currently, most developing economies are confronted with two critical issues. First, the limited fiscal space, which is the difference between the current level of debt and threshold limit of debt, limited sources of new tax revenues, increase in fiscal deficits, and low foreign exchange earnings, push developing economies to fiscal fatigue. Second, the occurrence of economic and financial crises at the end of the '90s and the beginning of the 21st century made developing economies extremely fragile and vulnerable to debt accumulation. Specifically, since the onset of the COVID-19 pandemic, there has been a substantial increase in the debt-to-GDP ratio of developing economies, paving the way for macroeconomic instability.

Considering India, a developing economy, Figure 2.1 shows how the debt liability of India has increased over the years and how the government of India started procuring funds through internal sources more than external sources leading to a decrease in external borrowings and a rise in internal borrowings (as represented in Figure 2.2). According to the status report by the Reserve Bank of India, the government's public borrowing stood at 68.2% of GDP in 2017-18, and now it has risen to nearly 90% in 2020-21. As a result of increasing

external debt, India has begun to substitute domestic debt for external debt (Hanson, 2007; Panizza, 2008).

Figure 2.1

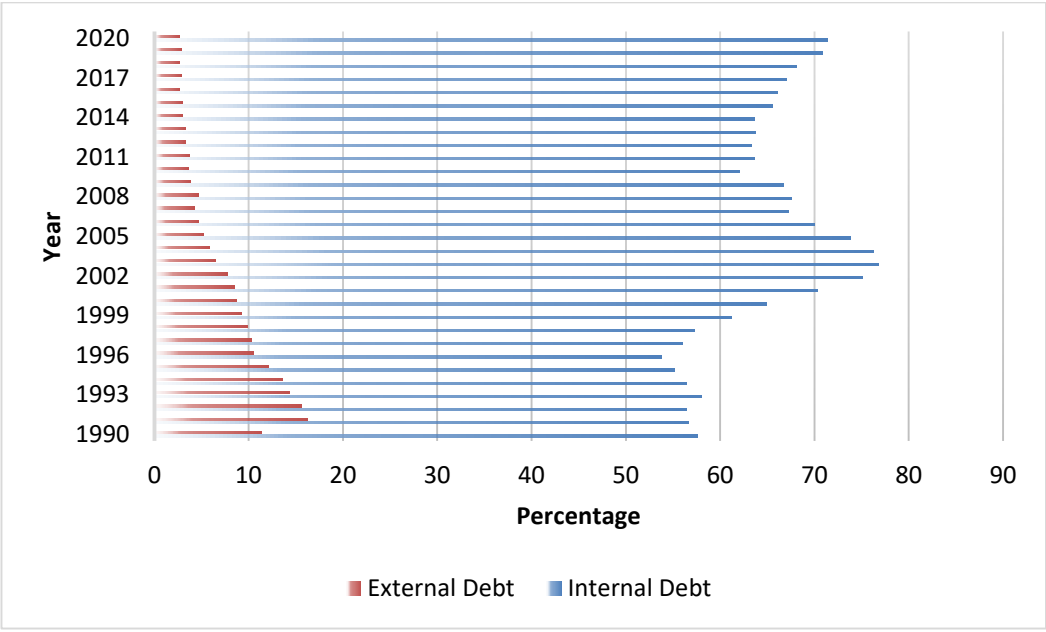
GDP and Debt-to-GDP



Source: Computed from World Economic Outlook data, International Monetary Fund (2022)

Figure 2.2

Combined Liabilities of Centre and States



Source: Computed from Public Debt Statistics data, Reserve Bank of India (2022)

Examining internal and external public debt composition shows that India's internal debt as a percentage of GDP has been increasing consistently. In contrast, a declining trend has been observed in the government's external borrowing during the period from 2011 to 2017. Since 2017, the country's external debt has begun to rise slowly. It is to be noted that India's outstanding external debt has surpassed its foreign exchange reserves. While foreign exchange reserves reached US $440 billion, the outstanding external debt increased from US $471 billion in March 2017 to US $544 billion in March 2019, at a compound annual growth rate of 7.47%. Amid the COVID-19 pandemic and increasing global uncertainty, efforts by the union government to reduce the debt to 40 per cent of GDP by 2025 appears to be a difficult task.

When using borrowed funds, it is significant whether the fiscal policies, be it fiscal prudence or profligacy, foster economic activities without affecting debt sustainability (Mauro et al., 2013). In a typical economic system, fiscal profligacy and fiscal prudence represent the economy's unsustainable and sustainable budgetary position. In its simplest sense, the term profligacy depicts too much public spending, whereas the measure of fiscal prudence tightens public spending. Therefore, funds procured through borrowings must be spent prudently to maintain debt sustainability.

When the present discounted value of the future surpluses is parallel to the existing debt liability, it indicates fiscal prudence. On the contrary, if the values are unequal, it denotes fiscal profligacy. Empirically, fiscal prudence or profligacy can be tested by examining the fiscal responses of the policies to the change in the debt-GDP ratio. Analysis of primary expenditure, fiscal revenue, interest liability, gross domestic product, and public debt of an economy gives

the idea of the current fiscal position. Moreover, Mauro et al. (2013) suggest that the occurrence of any crisis also affects the fiscal position of an economy. The authors reviewed the pre and post-periods of crises such as World War I and II, crude oil shocks, and global financial crisis. With the mounting public debt and low or negative primary balance, it is widely agreed that emerging economies may shift from prudence to profligacy. A deeper understanding of the global macro-economy indicates that fiscal policy was hardly prudent or sustainable for the post-war period due to low revenues and low expenditure.

In the late 1970s, when crude oil shocks occurred, fiscal profligacy policy was adopted in many countries, mainly due to the global economic slump. However, after the 1990s fiscal consolidation efforts, prudent behaviour was noted till the late 2000s. It is observed that strong fiscal prudence was followed in many emerging economies, particularly after the year 2000. Interestingly, the fiscal prudence continued until the global financial crisis of 2008. Nonetheless, post the 2008 crisis, the response of primary surplus became inconsistent with the change in debt for many economies (Mauro et al., 2013).

With the outbreak of the COVID-19 pandemic and subsequent rise in health expenditure, International Monetary Fund (2020a) projected that the fiscal deficit of general global governments as a percentage of Global GDP would increase from 3.9 per cent in 2019 to 12.7 per cent in 2020. This is mainly due to the combined effect of magnified fiscal deficit and reduced global GDP. Given the global macroeconomic structure, the ambitious target of achieving a 3 per cent fiscal deficit as a percentage of GDP in 2020-21 has been shifted to 2022-23 with an increase of 0.1 per cent, i.e., 3.1 per cent.

Let us now take the case of India. To some extent, Indian states have maintained their fiscal deficit goals by curtailing expenditures in recent years. Interestingly, it can be seen from the data on budgeted gross fiscal deficits of the Indian states presented just before and after the

pandemic outbreak. For example, the gross fiscal deficit as a percentage of the states' combined gross state domestic product was 2.4 per cent before the pandemic, and it came out to be 4.6 per cent after the pandemic. With a steady increase in public borrowing, the occurrence of any crisis in the world makes an economy less resilient and even more vulnerable to external shocks. As a result, the government is required to borrow more to bear the extra expenditure and rising budget deficit.

The rise in healthcare expenditure, frequent interruption of economic activities, and unemployment have made all the economies fiscally fragile and unstable. The central government of India has initiated a series of actions to tackle the COVID-19 crisis. In addition to the infusion of capital in public sector banks and reviving the core sectors, the government has provided distinct socio-economic aids to the lower and weaker sections of the economy, such as free distribution of food grains, cash transfers in the bank accounts, health insurance of the medical staff, etc. These additional assistances resulted in increased expenditure over and above the budgeted amount, leading to an increased financial burden on the government.

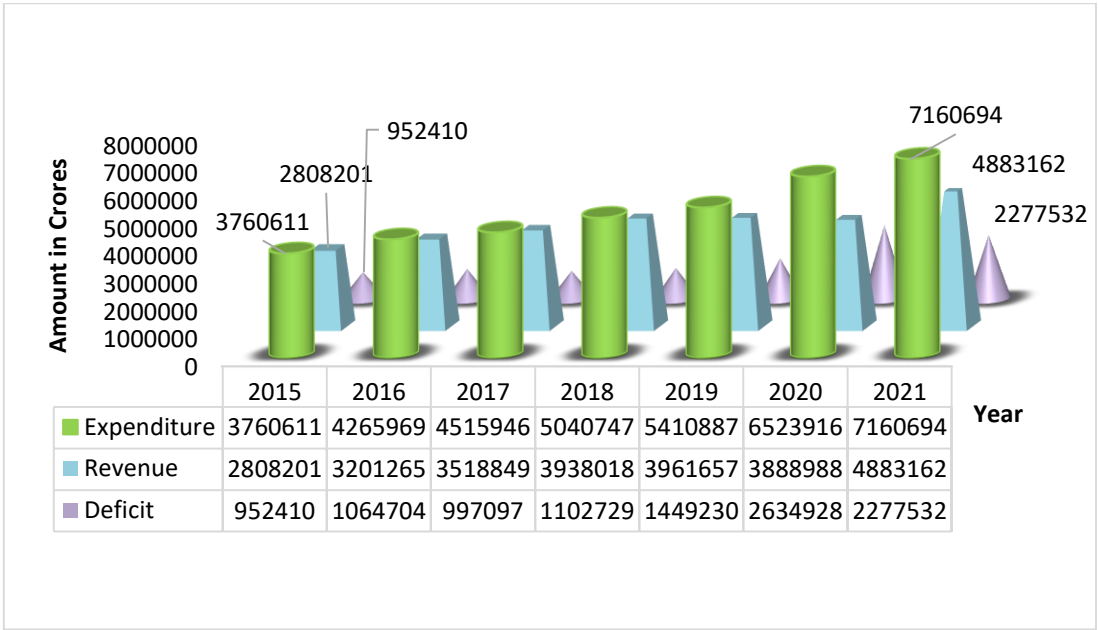
Recently, IMF has forecasted that the fiscal deficit of the Indian general government to rise from 8.2 per cent to 13.1 per cent of GDP amidst the COVID-19 crisis. The crippling effects of the shortened economic activity are evident in the government finances because of the unbalanced responses of the expenditure and revenues. While the major sources of revenue generation depend on the magnitude of the economic activity, expenditures are generally sticky. Interestingly, the lower tax revenues coupled with rising public expenditure have amplified the fiscal deficit ratio to GDP. The data relating to Indian government finances show disruption in revenues besides a contraction in output and increased public expenditure, which led to a mounting fiscal deficit backend to the unanticipated mounting of the government debt (Patra, 2020).

2.3 Size of the Government

As discussed above, public spending or the size of the government is an important aspect of the debt-growth nexus. The government's size (expenditure) either helps uplift the economy or suppresses it, depending on its use. Studies reveal that oversized governments weaken the economy by financing the increased expenditure through massive borrowings, raising taxes, or printing currency. In contrast, small governments suppress the economy by compromising on providing public goods, necessary infrastructure, services, etc. Hence, an optimum government size is required for an efficient economy. However, in the case of India, the trend shows (Figure 2.3) how expenditure has been rising above the revenues over the years, implying an increased fiscal deficit.

Figure 2.3

Combined Receipts, Expenditure, and Gross Fiscal Deficit of Centre and States



	2015	2016	2017	2018	2019	2020	2021
Expenditure	3760611	4265969	4515946	5040747	5410887	6523916	7160694
Revenue	2808201	3201265	3518849	3938018	3961657	3888988	4883162
Deficit	952410	1064704	997097	1102729	1449230	2634928	2277532

Source: Computed from Handbook of Statistics on Indian Economy data, Reserve Bank of India (2022)

The government of India finances the fiscal deficit through various sources, such as domestic financing, including bank and non-bank credits and external financing. In recent

years, the government has started procuring funds more through domestic or internal sources rather than external sources, which has led to a sharp rise in internal debt.

2.4 Growth, Liabilities, and Fiscal Deficit of Indian States

The sub-national's debt profile remained easy till the late 1990s. It began to rise apparently and reached a level of 31.4 per cent in the years 2003-04. Simultaneously, the finances of the central government also deteriorated substantially. For this reason, the centre introduced the "Fiscal Responsibility and Budget Framework" (FRBM) Act, 2003. Later, all the states gradually enacted individual FRBM acts for themselves. The act expects the states to uphold a zero-revenue deficit, a 3% fiscal deficit to GDP ratio, and a level of debt at 20% of GDP. The Act was complemented with various fiscal consolidation schemes recommended by Finance Commission (FC), such as the Debt Swap Scheme (DSS), Debt Consolidation and Relief Facility (DCRF), and Debt ceilings in the financial years 2002-2004, 2005-2008, and 2009-10 respectively (Misra et al., 2021).

Whereas most sub-national governments stick to the debt targets marked by the 13th Finance Commission, few states continue to retain the unsustainable debt-GDP ratio. Moreover, the states which have accomplished the targets given by the FRBM act are in suspect about their sustainability due to the recent slowdown in the economy, poor performance of the public sector, fluctuations in the financial markets, dependency on grants-in-aid, loans by the centre to the states financed from international agencies, etc. All these happenings have made the debt position of India and Indian states worse.

Budget at a Glance 2022-23 report reveals that from 2011-12 till 2018-19, the total liability to GSDP ratio fluctuated with a 1 or 2 percentage increase or decrease each year. In the year 2020-21, on average, total liability to GSDP rose to 53 per cent from 46 per cent in

the year 2019-20 (Table 2.1). A sharp decline in the percentage of total liability to GSDP can be seen in 2019-20, even when the total liability increased. This indicates that the states were trying to accelerate their GSDP growth, which resulted in the total liability to GSDP ratio reduction. However, the ratio inflated due to the pandemic for consecutive years. Total liabilities of states include total public debt, which is a sum of internal debt and loans and advances from the central government, insurance and pension funds, provident funds, and other obligations.

Table 2.1

Aggregate Liabilities and GSDP of the State Governments

(Rs in crore)

Year	Internal Debt	Loans & Advances from Central Govt.	Total Public Debt	Insurance and Pension Funds	Provi-dent Funds	Other Obliga-tions*	Total Liabili-ties	GSDP at current prices	% of total liability to GSDP
								Base Year 2004-05	
2010-11	*16535	2032	18567	358	6291	4756	29972	58073	52
								Base Year 2011-12	
2011-12	20789	1903	22692	384	8335	4845	36256	77945	47
2012-13	22796	1839	24635	454	9954	5205	40248	86537	47
2013-14	24715	1775	26490	505	11893	5758	44646	97400	46
2014-15	26525	1675	28200	602	14028	5484	48314	102681	47
2015-16	30452	1579	32031	671	16846	5798	55346	116102	48
2016-17	34018	1489	35507	775	18588	5803	60673	126230	48
2017-18	37418	1405	38823	909	20010	8462	68204	142292	48
2018-19	42222	1292	43514	974	25233	9340	79061	158688	50
2019-20	45465	1237	46702	1006	26156	9709	83573	179866	46
2020-21	52469	1302	53771	1085	27222	10875	92953	176282	53

Source: Union Budget Documents & CGA, India

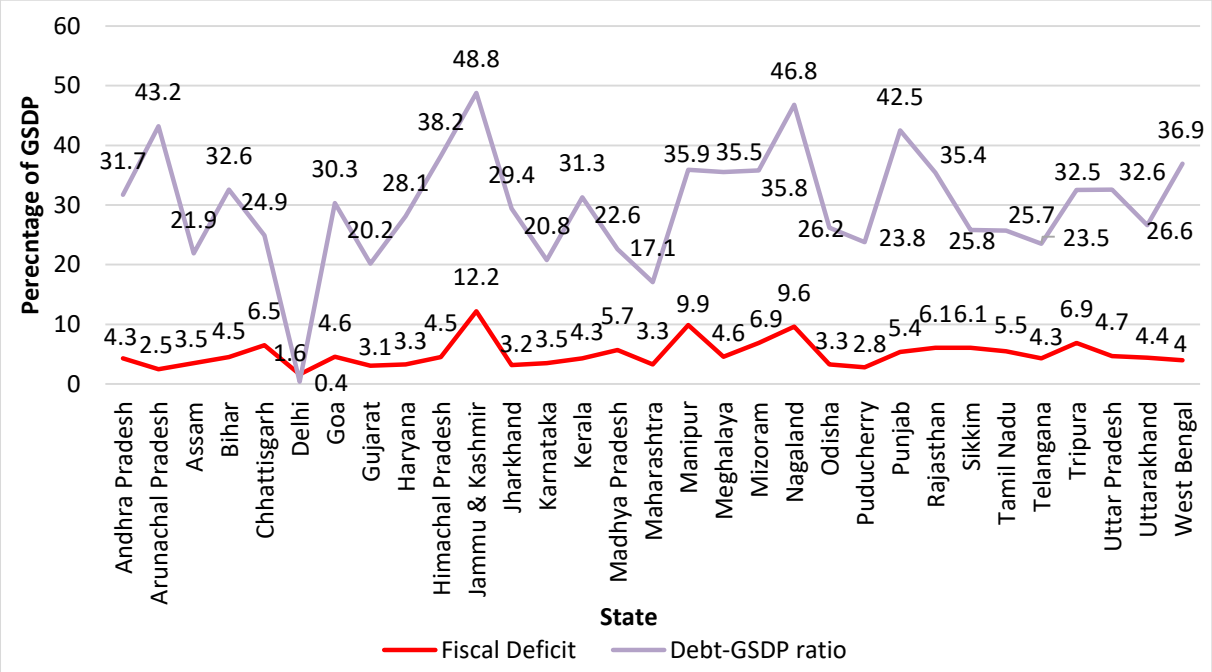
Particularly, in India's case, state governments have substantial powers with an equivalent expansion in the activities resulting in higher expenditure. Additionally, limited resources often seem insufficient, corresponding to the rising expenditure, which forces the state governments to find new ways to finance the deficits (Hernandez et al., 2012). Due to the pandemic, the sagging revenues have invited additional borrowings to balance the expenditure on essential socio-economic services such as public health and medical, sanitation, water supply, irrigation, road, transport, etc. (Reserve Bank of India, 2021). Apart from that, earlier implementation of UDAY and waiver of farm loans also have significantly surged the debt-Gross State Domestic Product (GSDP) ratio.

Figure 2.4 shows how the fiscal deficit has increased above a sustainable value of 3 per cent. The debt-GSDP ratio of states has risen to 31 per cent in 2020-21, which is much higher than the targeted value of 20 per cent to be reduced by 2022-23. The social sector expenditure

of all the states in India accounts for 6.9 per cent of GDP and 43. 4 per cent of aggregate expenditure in the year 2019-20, and it rose to 8.6 per cent of GDP and 45.6 per cent of aggregate expenditure in the year 2020-21 (Budget documents of state governments).

Figure 2.4

GSDP and Fiscal deficit of states (2020-21)



Source: Author's elaboration from the Reserve Bank of India data (2022)

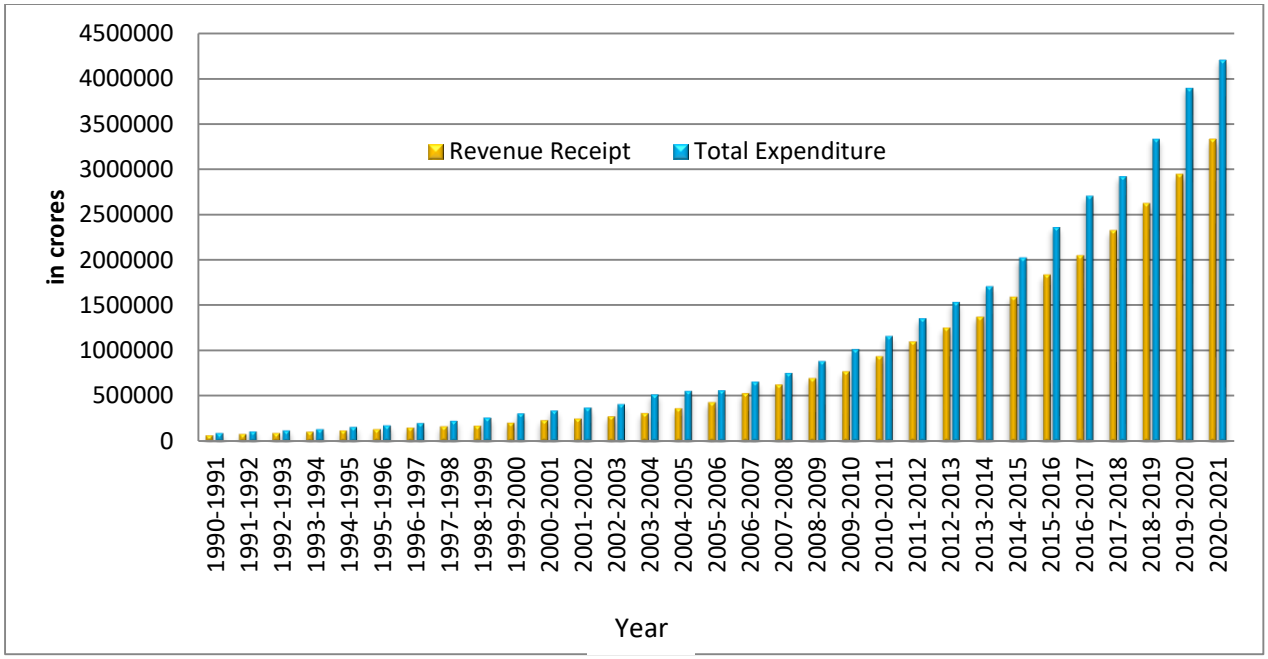
2.5 Revenue and Expenditure of Indian States

The interest (on loans) payments to revenue receipts of the state government are also rising at a fixed rate, implying an abrasion of state debt sustainability. Even though the central government of India provides back-to-back loans to the states to compensate for the shortfalls in revenues, the borrowings are needed. Figure 2.5 shows how the difference between revenues and expenditures has increased over the years. These circumstances and the high debt level of state governments have become a cause of concern for the Indian economy. Therefore, it seems

legitimate to lay out policies that take into account the major forces that aggravate the state government's indebtedness.

Figure 2.5

Aggregate Revenue Receipts and Expenditures of States



Source: Author's elaboration from Reserve Bank of India Data (2022)

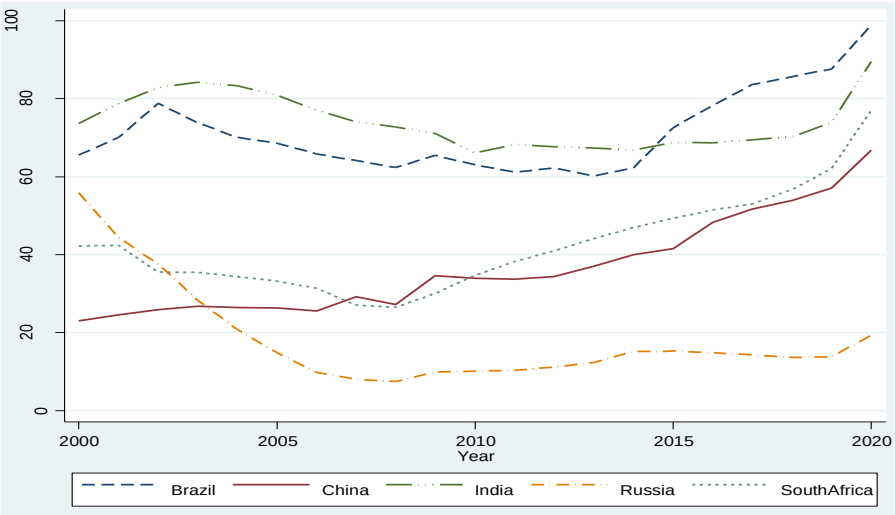
Furthermore, Cunningham (2003) points out that the growth factors can vary with the growth rates of different countries. Similarly, there is a possibility that the impact of particular variable changes with the level of debt of a certain state government. A variable with explicit average impact might play a distinct role depending on a state's indebtedness level. For instance, a state government with high revenues might not need high debts; therefore, revenues will have a low average effect on the debt. On the contrary, a state government with the same high revenues and credibility can think of investing in bigger projects and might increase its debt beyond a sustainable level. The existing empirical literature lacks insight into whether the impact of variables varies with the level of debt or not.

2.6 India and the Global Economy

There has been a substantial increase in the public debt of many emerging economies such as India, China, and Brazil. In addition to the global financial crisis of 2008 and frequent downturns in business activities, the COVID-19 pandemic has created an unprecedented setback for several economies, particularly emerging economies, in their efforts to mitigate the economic damage of mounting public debt. As shown in Figure 2.6, which plots the ratio of gross debt to gross domestic product (GDP) in Brazil, Russia, India, China, and South Africa (popularly termed 'BRICS' countries), Brazil's gross debt as a percentage of GDP increased from 60% in 2013 to a historic 99% in 2020. Considering the sheer size of China's economy, it is unsurprising that public debt as a percentage of GDP in China has almost doubled in the last ten years. Similarly, public debt in India as a percentage of GDP increased by 23 points between 2014 and 2020.

Figure 2.6

Gross Public Debt to GDP ratio in BRICS from 2000 to 2020.



Source: Author's illustration from Fiscal Monitor, International Monetary Fund (2020)

Since the onset of the global financial crisis in 2008, public debt in South Africa has increased from 27% in 2007 to 77% in 2020. For many emerging economies, crossing the desired level of public debt is a major cause for concern. As mentioned earlier, the COVID-19

pandemic and subsequent fiscal constraints will likely make these emerging economies more fragile and less resilient to macroeconomic instability.

2.7 Summary

The chapter thoroughly reviews the status of India at present concerning the public debt. It gives an overview of the current state of expenditure, revenues, fiscal deficit, and debt of the state governments of India. It also compares India's debt burden and GDP with the other BRICS member countries. The chapter concludes that after the COVID-19 pandemic, the general government borrowings have raised nearly 90 per cent in 2020-21. The fiscal deficit of the individual states has also increased from 2.4 pre-pandemic to 4.6 post-pandemic making the state governments more dependent on debt.

To strike a balance between fiscal deficit and public expenditure, India may adopt the path of deficit monetization, indicating that the Reserve Bank of India will finance the deficit. Considering India's history of fiscal profligacy, the country needs fiscal dominance and a supportive role to be played by monetary policy (Kar and Naidu, 2020).

CHAPTER 3

Review of Literature – Public Debt, Economic Growth and Debt Sustainability

3.1 Introduction

This chapter briefly reviews two distinct schools of thought on public debt: Classical and Keynesian. It also briefs the theoretical linkage of expenditure, debt, and economic growth. Next, it moves to the literature that illustrates public debt's determinants. This is followed by previous literature on the concepts of natural resource rents, debt thresholds, debt sustainability, and institutional quality. The next section of the chapter focuses on the studies in the context of India and Indian states. Finally, research gaps found after studying the existing literature are listed and explained.

3.2 Theoretical Framework

While the classical school of thought has taken a pessimistic approach to the role of public debt in an economy, Keynesians are optimistic about public debt. The classical school of thought proponents argued that public expenditure should be limited within its means. Since the economy operates under a 'laissez faire' system, the role of government is restricted to maintaining law and order, military, and infrastructures such as roads and irrigation. Like households, the government should strictly follow the measures of fiscal prudence. However, public debt should be incurred during unforeseen situations such as war or natural calamities. This proposition stems from the belief of classical economists that deficit spending has nothing to do with economic growth; rather, it negatively affects production by diverting private savings. In his *Study in Public Finance,* Pigou (1928) pointed out that the routine expenses of

the government should be met by tax revenue and public debt is recommended for financing unforeseen outlays.

David Ricardo argued that if public spending is financed by debt, many people will treat the debt as deferred taxation. Consequently, people tend to save more by curtailing current consumption to pay off deferred tax, commonly termed as the "Ricardian equivalence theorem." In general, it is observed that classical economists were more concerned about the incidence of public debt. Similar to the classical view, some notable scholars posited that the expansion of debt burdens future generations by reducing income and high-interest rates (Buchanan and Buchanan, 1958; Meade, 1958; Modigliani, 1961; Diamond, 1965).

The classical views on public debt influenced many countries for decades. The world economies witnessed unprecedented challenges, such as World War I, the Great Depression, and World War II at the end of the nineteenth century, which aggressively pushed the government to adopt aggressive spending. Keynes and Keynesians adopted an optimistic approach to public debt, suggesting that deficit spending is an effective healing mechanism for a free economy reeling from symptoms of depression such as unemployment, lack of private investment, and excessive saving. Deficit spending, according to Keynes, stimulates the economy by bridging the gap between demand and supply. The central problem of the depression-induced economy is that it lacks an effective policy to boost unused production capacity. Therefore, deficit spending creates 'effective demand' in the economy.

3.3 Relationship between Debt on Economic Growth

The relationship between public debt and economic growth has been studied extensively in the economics literature (Barro, 2002; Panizza, 2008; Reinhart and Rogoff, 2010). Numerous studies have focused on the adverse impact of debt on economic growth in the long run by

suggesting changes required in the tax structure to finance interest liabilities (Diamond, 1965; Drine and Nabi, 2009; Kumar and Woo, 2010; Checherita-Westphal and Rother, 2012; Swamy, 2015a). More recent studies suggest that public debt is likely to reduce consumer's income, consumption, savings, and capital stock formation in the country, which in turn will affect economic growth (Pattillo et al., 2004; Cochrane, 2011; Pegkas, 2018). In the following paragraphs, detailed analysis of various empirical studies is provided.

Table 3.1

Summary of Recent Literature on Debt and Economic Growth Nexus

Author	Scope	Methodology	Findings
Dzigbede and Pathak (2020)	31 OECD	Generalised Economic Growth Model	A low debt-GDP ratio is better than a higher one.
Azad et al. (2021)	Sri Lanka	ARDL Model	External debt provides a boost to economic growth, while debt servicing is negatively related with economic growth.
Wei and Han (2021)	South Africa	ARDL Model	Public debt has negative relationship with economic growth and inflation.
Truby et al. (2022)	EU Countries	ARDL Model	The connection between debt and economic growth is non-linear.
Wen and Zhang (2022)	Turkey	Markov-switching model	The country's debt-growth relationship is nonlinear.

Source: Author's compilation

An empirical study of the debt-growth nexus in 38 developed and emerging economies between 1970 and 2008 by Kumar and Woo (2015) indicates that debt and growth are negatively related, conforming to the theoretical literature. More clearly, a 10% rise in a country's public debt is likely to reduce its growth by 0.2%, mainly due to the decline in labour productivity and investment. In an analysis of 12 European countries during the period from 1970 to 2008, Checherita-Westphal and Rother (2012) show that private investments, public investments, and total factor productivity are three channels through which debt retards

economic growth. Panizza and Presbitero (2014), in their analysis of 17 countries in the Organization for Economic Co-operation and Development (OECD), support the general argument that a prospective fall in economic prosperity could lead to a rising public debt to GDP ratio. Swamy (2015a) also shows that economic growth uniformly causes debt.

Conversely, it is pointed out that public debt facilitates the formation of gross fixed capital and overall production level, which augments the nation's disposable income in the short run (Elmendorf & Mankiw, 1999). However, the outcome of public debt is different in the long run. High public debt might affect the effective utilisation of public expenditure due to increased uncertainties from a possible hike in the future interest rate and a contraction in private investment (Cochrane, 2011; Teles & Cesar Mussolini, 2014).

It is to be noted that trade openness and the quality of the institutions can leverage, to some extent, the effect of public debt on economic growth (Kourtellos et al., 2013). Drine and Nabi (2009), in their analysis of 27 developing countries over the period from 1970 to 2005, show that a rise in external debt leads to a decline in production efficiency. Similarly, upon examining 61 developing nations from 1996 to 1998, Pattillo et al. (2004) report that the adverse effect of high debt on economic growth works through a substantial change in capital formation.

It is worth noting that an analysis of panel data on 24 developed and 59 developing nations from 1970 to 2002 by Schclarek (2005) shows a reverse relationship between debt and economic growth in the case of developing economies, unlike developed nations. Moreover, the export of goods and investment positively contribute to GDP growth. In a study of the linkages among growth, productivity and government debt in the context of 155 nations, Afonso and Tovar (2013) note that the debt to GDP is negatively associated with economic

growth. More importantly, while fiscal consolidation stimulates growth, financial crisis acts as an impediment to economic recovery.

A few scholars are of the view that foreign exchange reserves are a relevant macroeconomic variable, implying that currency misbalance and dependency on external funding will have an adverse impact on the performance of economic growth during economic crises (Llaudes et al., 2010; Calvo et al., 2013; Feldkircher, 2014). However, evidence suggests that the relationship between growth and foreign exchange reserves is statistically insignificant in economies with higher foreign reserves (Berkmen et al., 2012). Similarly, Llaudes et al. (2010) observe that holding a higher level of foreign exchange reserves paves the way for diminishing returns.

While Anyanwu and Erhijakpor (2004) reveal a significant negative impact of debt on economic growth in Nigeria for the period from 1970 to 2003, Ogunmuyiwa (2011) notes a fragile and weak association between debt and growth. Égert (2015) argues that the relationship between debt and growth could weaken when economies move towards high indebtedness. As shown by Abbas and Christensen (2010), a medium level of domestic debt contributes positively to growth in low-income and emerging countries. On the contrary, high domestic debt will likely impede better economic performance.

An empirical study in India suggests that debt affects economic growth through interest liability in the future (Rangarajan and Srivastava, 2005). As shown by Kannan and Singh (2007), a crippling level of public debt has an adverse effect on interest rates, output, and trade balance, in the long run, gradually negatively affecting economic growth. Moreover, increasing public debt will likely reduce public expenditure, further aggravating economic growth (Pradhan, 2016). In brief, most studies focus on the change in debt servicing, exports,

and total factor production to determine the relationship between debt and economic growth (Bal and Rath, 2014).

The analysis of the prior research has led to the identification of two key issues that require further study. First, although the relationship between public debt and economic growth is widely examined, the long-run relationship between these two variables is often inconclusive. Similarly, the direction of causality is quite ambiguous in the case of developing economies. Second, though limited, the literature on the debt-growth nexus in India seldom considers the role of other macroeconomic variables in determining the causal relationship between public debt and economic growth.

3.4 Determinants of Public Debt Accumulation in India

This section provides a brief overview of studies examining various factors contributing to public debt. Although limited, the extant literature on the determinants of public debt primarily zeros in on panel studies or a single component of public debt. Abiad and Ostry (2005) elucidated that primary balance stabilizes debt accumulation in emerging economies. In a study by Burger and Warnock (2006), it is reported that economic growth and fiscal balance are the two factors that negatively affect public debt accumulation. Similarly, a study by Mendoza and Ostry (2008), based on the experience drawn from emerging economies, suggested that the primary balance reacts positively at a low level of debt, while at a high level, the response declines. It is worth noting that Folorunso and Falade (2013) concluded that there exists bidirectional causality between public debt and fiscal balance.

Generally, with an increase in debt, the economy becomes incapable of repaying its existing debts, leading to a rise in interest rates for further accumulation. However, it is difficult to draw a relationship between debt servicing and interest rates regarding debt. Concerning the

empirical studies, Ghosh et al. (2013) confirmed that interest rate is an essential function of the debt servicing ratio and the level of debt. As expected, Corsetti et al. (2014) showed that the inability to repay the existing debt affects interest rates nonlinearly and later results in further debt accumulation. Pablo and Alex (2015), in their study of 15 OECD countries for the period using SVAR, presented that the rates of interest and foreign exchange rates react positively to the level of debt in countries with restricted policies.

Taking insights from Sinha et al. (2011) and Swamy (2015), it is found that foreign direct investment (FDI) can lower the amount of public debt. This is because if a country is desirable to foreign investors and is willing to invest its resources to improve the economy, the government doesn't need to finance these activities and can avoid borrowing to cover public expenses. As a result, the government can reduce its involvement in financing economic activities.

Furthermore, capital formation is important for the development of an economy. However, the extent to which the private sector or government supports capital formation can affect public debt differently. In this context, Swamy (2015) observed a positive impact of gross fixed capital formation on public debt, while Omrane and Omrane (2017) found the opposite. If the private sector takes the lead in capital formation, it can have a similar effect as FDI, reducing the need for government financing and thus lowering public debt. However, if the government finances capital formation, public debt may increase.

Based on the evidence drawn from a sample of 27 emerging and 49 advanced economies, Burger and Warnock (2006) confirmed that inflation and the size of the country are positively related to the debt market. Claessens et al. (2007), in a panel study of 48 developed and emerging countries from 1993-2000, showed that foreign exchange rates and low inflation positively affect the local government debt. According to them, flexible exchange rates favour the broader local bond markets.

While drawing evidence from Pakistan, Mahmood and Rauf (2008) found that the depreciation of the rupee affects external debt adversely. According to Hilscher et al. (2022), inflation may be viewed as an important determinant of debt in the United States. Recent studies suggested the negative relationship between inflation and public debt (Dumitrescu, 2014; Bittencourt, 2015; Omrane Belguith and Omrane, 2017; Cherif and Hasanov, 2017). However, Sadik-zada et al. (2019) reveal that inflation does not significantly affect public debt.

A review of extant studies further showed that the quality of the institutions and country size are the two significant determinants of the level of debt within an economy (Burger and Warnock, 2006; Claessens et al., 2007; Lavigne, 2011; Gurinovich and Smirnikova, 2021). The size of the country, which is measured in terms of government spending, institutional quality, and corruption, is interrelated. More aptly, government spending gets affected due to the tax evasion practices within an economy, which paves the way for mounting public borrowing (Friedman et al., 2000).

Moreover, in capital-intensive projects, government officials are more intended to take bribes leading to higher levels of debt accumulation for financing such projects (Kaufmann et al., 2011). Less impressive is that corruption tends to reduce institutional qualities and transparency in an economic system, making it difficult for the government to monitor the actual public spending, such as capital expenditure, social welfare, and military expenditure, which absorb a significant part of the borrowings (Gupta et al., 2001). As Lavigne (2011) and Cooray et al. (2017) noted, corruption and poor institutional quality deteriorate debt.

Regarding the relationship between economic development and public debt, the existing literature does not precisely give any insights. Interestingly, economic growth has always been considered one of the proxies for measuring economic development in economics research (Kim et al., 2006; Hall and Sargent, 2011; Cárdenas-García et al., 2015). Likewise,

the association between economic growth and public debt (either harmful or positive) has been proven by many studies (Afonso and Jalles, 2013; Bittencourt, 2015; Globan and Matošec, 2016; Al-Fawwaz, 2016). However, the empirical studies undertaken in India primarily zero in on the relationship between public debt and economic growth, excluding the role played by economic development (Bal and Rath, 2014; Swamy, 2015b; Dash and Rath, 2016; Kaur et al., 2018). It is widely argued that economic growth is the common factor between public debt and economic development. Given that, the possibility of a linkage between economic development and public debt increases.

From the above description of the literature review, the conclusion that can be drawn is: first, the factors explaining the composition of public debt vary from country to country significantly, and the existing literature is mainly focused on the external factors. The studies touching upon both the factors -external and internal- that influence public debt, particularly in the Indian context, is hard to find. Second, as mentioned earlier, the existing literature does not consider the effect of economic development as a factor in public debt. Hence, it is essential to pinpoint the significant factors influencing India's public debt.

Further, it is acknowledged that the role of economic development is vital in determining the level of debt. Third, the selected approach to measuring the relationship between public debt and economic development is quite distinct from the methods used in the previous studies. The methodology is based on a path diagram and structural equations between the exogenous and endogenous variables to determine each variable's relevance as the determinant of public debt.

3.5 Natural Resource Rents as a Factor of Public Debt

Many theoretical and empirical studies have investigated the factors that affect public debt. However, in their research, Manzano and Rigobon (2001) mentioned that Sachs and Warner (1997) identified the natural resources curse allied to debt overhang. They observed that resource-rich economies use resource deposits as collateral to avail of credits or loans. Accordingly, economies end up in excessive debt when a substantial commodity price crash happens. Therefore, natural resource-abundant economies witnessed a slower growth rate than resource-scarce economies Sachs and Warner (1997).

Kretzmann and Nooruddin (2005) pointed out that the resource-rich economy fails due to tarnished fiscal policies and elevated public debt procured through collateral. The high oil price rise led to a sharp and irresponsible surge in lending in the 1970s. Later on, when the oil prices dipped in the 1980s, it resulted in an imminent debt crisis and bleak economic growth (Lederman and Maloney, 2006). Moreover, the unsatisfactory performance and immense debt liabilities of economies retaining ample natural resources stem from poor dealing by the financial sector (Meissner et al., 2010). However, any windfall in commodity prices helps curtail external debt (Arezki and Brückner, 2012).

Investing in public capital from the revenues generated through natural resources is considered suitable for economic growth. However, any borrowings against future natural resource earnings without savings will incline an economy towards a debt trap and unsustainability (Melina et al., 2016). Sadik-zada et al. (2019), in their study of 184 developing nations, found that natural resource rents of oil and mineral and interest rates significantly affect public debt rise.

Apart from the total natural resource rents, the studies have confirmed that economic growth, trade openness, inflation, unemployment rate, etc., also play a significant role in determining the level of debt. Tiruneh (2004) postulates that GDP per capita is one of the most

critical factors influencing debt. Hall and Sargent (2011) confirm that with the increase in the economic growth of the US, its debt-GDP ratio tends to decline. Identical results were reported by Bittencourt (2015), implying that a 1% rise in GDP growth results in a 0.7% reduction in external debt. Swamy (2015a), using Granger causality, finds a causal relationship between GDP growth and public debt. A few more studies suggested that a rise in GDP (taken as a proxy for economic growth) helps economies reduce their debt liabilities (Globan and Matošec, 2016; Al-Fawwaz, 2016).

A few studies have produced contrary results suggesting that a rise in GDP growth for underdeveloped and developing economies also leads to increased debt (Forslund et al., 2011; Kiptoo, 2012). The reason for such findings is that increased GDP growth increases creditworthiness and helps under-developed and developing economies procure funds through debt easily for investing in projects for future surges.

The existing studies have found ambiguous results linking public debt and trade openness. Some have suggested a positive linkage, saying trade openness surges public debt (Awan, 2015; Swamy, 2015b; Omrane Belguith and Omrane, 2017). Calvo et al. (2003) conclude that it is less challenging for more open economies to obtain foreign borrowing. On the other hand, Forslund et al. (2011), in their study concerning 104 economies, did not find any significant relationship between trade openness and public debt.

Hall and Sargent (2011) found that the debt level declined due to inflation. Similarly, Aizenman and Marion (2011); Dumitrescu (2014) identified that inflation significantly negatively affects public debt. Moreover, Bittencourt (2015) reveals that an increase of 6% in inflation will reduce the debt-GDP ratio by 20%. Omrane Belguith Omrane (2017), in their study of Tunisia, finds that inflation reduces the public debt level. In contrast, Forslund et al. (2011) found no statistically significant relationship between inflation and public debt.

Similarly, Sadik-zada et al. (2019) found no significant linkage between public debt and inflation. Furthermore, Lavigne (2011); and Cooray et al. (2017) find in their studies that low institutional quality and corruption positively affect the debt level. Also, Sadik-zada et al. (2019), in their study of 184 countries to find out the drivers of public debt, confirm that unemployment does not play a significant role in determining debt.

Even though the extent of literature has investigated the role of distinctive factors that affect public debt growth using peculiar methodologies and in the context of distinct economies. Studying the literature, though, reveals that the effect of total natural resource rents on public debt has received less focus. Moreover, Manzano and Rigobon (2001), Lederman and Maloney (2006), and Sadik-zada et al. (2019) are the few studies that have attempted to examine the relationship between public debt and oil or mineral resource rents. In addition, they do not consider the whole natural resource rents.

3.6 Debt Threshold and Debt Sustainability

The relationship between economic growth and public debt has been debated and discussed widely in the economic literature (Law et al., 2021; Mohsin et al., 2021; Makhoba et al., 2022). For instance, a study by Presbitero (2010), while analyzing low and middle-income economies from 1990 to 2007, suggested that public debt negatively affects economic growth up to a threshold limit, estimated to be 90 per cent of GDP. The threshold limit of public debt is instrumental in determining the positive and negative relationship between public debt and economic growth. Woo and Kumar (2010) provide empirical evidence for the effect of a debt threshold on the economic growth of 38 developed and developing countries from 1970 to 2007. It may be interesting to note that, apart from a set of macroeconomic factors, country-specific factors, such as institutional qualities and economic policies, influence the non-linear impact of the debt.

The study by Cecchetti et al. (2011) also raises the same research question about the threshold level beyond which the debt becomes unsustainable and detrimental to economic growth. The study is based on 18 OECD economies from 1980 to 2010 and shows that the debt threshold level is 85 per cent for all the OECD countries. The empirical findings of the investigation support the previous inferences of Reinhart and Rogoff (2010) and Drine and Nabi (2010). Further, the study also pointed out that the other forms of debt, such as household debt, will have the same effect as the public debt on economic growth if the debt surpasses 85 per cent of GDP. Using quadratic and spline models, Pattillo et al. (2011) examine the non-linear effects of external public debt on economic growth for 93 emerging economies from 1969 to 1998. Interestingly, the study reveals that the threshold limit of foreign debt ranges between 35 and 40 per cent for the sample countries.

Based on 12 Euro countries for 1990-2010, Checherita-westphal et al. (2012) show that debt significantly positively affects economic growth in the short run. However, using the dynamic threshold approach, it is found that the positive impact reduces to zero and becomes insignificant beyond a debt point of 67 per cent of GDP. The study concluded that the debt-GDP ratio above 95 per cent adversely affects growth, and at above 70 per cent, the economy starts trembling due to long-term interest rates if the debt goes beyond 70 per cent of the GDP.

The primary rationale for exploring the country-specific factors is discussed by Panizza and Presbitero (2013), postulating that a few countries witness a negative relationship between debt and economy even at a low level of debt-GDP ratio, presumably due to debt distress. In contrast, a few countries record magnificent growth experiences with a high level of debt-GDP ratio. It is striking to note that these results suggest that the role of country-specific factors while estimating the debt threshold for each country should not be ruled out. Égert (2015), based on the dataset employed by Reinhart-Rogoff, examines the debt-growth nexus when the

public debt increases beyond 90 per cent of GDP. It also indicates that the negative effect of debt starts if it ranges between 20 per cent and 60 per cent of the GDP. As mentioned, the various alternative models substantially affect the non-linear relationship between debt and economic growth.

Lopes Da Veiga (2016), based on data from 52 African countries from 1950-2012, investigates the impact of debt on economic growth and inflation. Overall, the study's results suggested that the relationship between debt and economic growth has an inverted U-shaped behaviour, indicating that public debt positively affects economic growth up to a certain limit and beyond which the increase in public debt has adverse effects. With an average inflation rate of 5.3 per cent, maximum economic growth can be gained, provided that the debt threshold level is limited to 30 per cent of GDP. Interestingly, the results obtained for South African Development Community (SADC) are similar to that of the North African countries, achieving the highest growth below 30 per cent of the debt threshold, corresponding to an inflation rate of 11 per cent.

Table 3.2

Summary of Literature on Debt Threshold

Author	Scope	Methodology	Findings

Reinhart and Rogoff (2010)	20 Developed and 24 Emerging Economies	Mean Comparison	While the relationship is weak below the 90% threshold, debt adversely affects economic growth falls if debt is above 90%. The threshold values are similary for both advanced emerging economies.
Caner et al. (2010)	24 Economies	Threshold Regression	The debt threshold is 77% for advanced economies and 64% for emerging economies.
Cechhetti et al. (2011)	26 Developed and Developing Economies	Growth Regression	Huge debt is not good for GDP. The public debt threshold is 85%, and the household debt threshold is 85%.
Checherita-Westphal and Rother (2012)	12 Euro Area Economies	Panel Fixed Effect	Debt has non-linear relationship with growth with a tipping point between 90–100%. The negative effects of high debt may begin as early as levels of 70-80%.
Kaur and Mukherjee (2012)	India	Bohn's Sustainability Model	The debt threshold for Inida holds at 61%.
Cordella et al. (2015)	79 Developing Economies	Threshold Regression	The relationship between debt and growth turns negative at moderate debt levels, but the effect is positive at very low levels of debt.
Law et al. (2021)	71 Developing Countries	Dynamic Panel Threshold Regression	Threshold debt value for developing nations is 51.65 per cent.

Source: Author's compilation

From a theoretical perspective, Chudik et al. (2017) examine the relationship between economic growth and debt expansion, providing tests for estimating the threshold effects of debt after considering the heterogeneity issues across 40 countries and the cross-sectional dependencies. It is found that the error of cross-sectional dependence greatly influences the measurement of debt threshold analysis. Importantly, as mentioned previously, the study does not reveal any evidence for a universal debt threshold across countries.

In recent years, the massive and mounting public debt seriously threatens macroeconomic stability and debt sustainability. Generally, low or moderate public debt is

regarded as neither unsustainable nor contradictory to economic growth. However, an increase in public debt beyond a certain limit is likely to crowd out potential investment, cut down consumption, and lower output growth and employment rate (Ehigiamusoe and Lean, 2020). This is because, as Ehigiamusoe and Lean (2020) noted, an unsustainable public debt slackens the positive effect of financial development on growth. Notably, financial development positively impacts the economic growth of countries with a low level of public debt. In contrast, the effect gets compromised with the mounting level of debt. An increase in debt beyond a threshold of 50 per cent impairs economic activities and is assumed unsustainable (Egert, 2015; Afonso and Jalles, 2013).

Table 3.3

Summary of Recent Literature on Public Debt Sustainability

Author	**Scope**	**Methodology**	**Findings**
Foreign Studies			
Mahdavi (2014)	48 States of the US	Panel Fixed Effect	United States' debt levels are sustainable.
Mahmood et al. (2014)	SAARC	Bohn's Sustainability Model	All four countries face debt sustainability issues, and immediate action is required.
Agnello and Sousa (2015)	89 Countries	Bohn's Sustainability Model	Policies of financial liberalisation will accelerate the expansion of the national debt. International capital flow restrictions would slow the increase of the public debt, whereas entry hurdles would speed it up.
Joy and Panda (2020)	BRICS	Bohn's Sustainability Model	Political factors influence BRICS debt sustainability.
Indian Studies			
Tiwari (2012)	India	P-spline	Indian is debt unsustainable.

Kaur and Mukherjee (2012)	India	Bohn's Sustainability Model	Existence of a non-linear relationship between debt and economic growth for India, and the debt in the country is sustainable. However, at greater debt levels, the effect on growth is detrimental. The debt-to-GDP ratio of 61% is considered the cutoff point for India.
Shashtri and Shehrawat (2015)	India	OLS	Debt is not sustainable in India.
Kaur et al. (2018)	Indian States	Panel FE Model	In the long run debt is sustainable for Indian states.
Renjith and Shanmugam (2018)	20 Indian States	Panel FE Model	Only for 12 Indian states debt is sustainable and unsustainable for 8 Indian states.
Akram and Rath (2020)	Indian States	Dynamic OLS	Fragile fiscal sustainability is observed for most states. Political alignment does not play a significant role in affecting fiscal sustainability, except in a few states.
Ramu (2021)	Karnataka	Bohn's Sustainability Model	Debt sustainable.
Misra et al. (2021)	26 Indian States	Bohn's Sustainability Model	Debt is just sustainable for Indian states with possible indications of unsustainability.

Source: Author's compilation

3.7 Role of Institutional Quality in Debt Sustainability

The most recent literature sheds light on institutional quality, inter alia, as one of the critical factors influencing emerging nations' economic performance and reasons for why countries are heavily indebted. Based on the data from 114 developing economies, Fan (2009) validates the importance of institutional quality and policy structure in determining the relationship between debt and economic growth. Similarly, taking insights from Jalles (2011), which is based on 72 developing nations for a period from 1970 to 2005, countries with a low degree of corruption can utilize their funds more efficiently. In a way, these results are consistent with the findings

of Daud and Podivinsky (2014), which reveal the existence of uncertain effects of institutional quality in the context of Malaysia.

Focusing on the role of the shadow economy and corruption in mounting debt, Cooray et al. (2017) show that these factors complement each other in aggravating the effect of debt. Further, it shows that the shadow economy is likely to reduce government revenues, paving the way for further accumulation of public debt. Additionally, Kim et al. (2017) find that corruption significantly affects the debt-growth nexus. According to Tarek and Ahmed (2017), while analyzing the debt-growth nexus in the context of Middle-East and North African (MENA) regions, political stability, sound regulatory environment, the rule of law, and the absence of violence tend to have an analytically significant influence on debt aggregation.

3.8 Studies in the Indian Context

In the extant literature, a few studies investigate debt sustainability in the Indian context using techniques such as the indicator-based approach, co-integration approach, or Bohn approach (Tronzano, 2013; Renjith and Shanmugam, 2018; Kaur et al., 2018). There are two strands of literature concerning the debt threshold limit for India. While the first strand of literature indicates that India's debt is sustainable (Pattnaik et al., 2003; Moorthy et al., 2000; Tronzano, 2013; Kaur et al., 2018; Misra et al., 2021), the second strand of literature supports the general view that public debt is beyond the sustainable level in India (Lahiri and Kannan, 2000; Ahluwalia, 2002; Jha and Sharma, 2004; Kaur and Mukherjee, 2012; Shastri and Sahrawat, 2015).

One significant study postulates that India's debt is unsustainable (Kaur and Mukherjee (2012). The study uses data from 1980-12 to find the non-linear linkage between general government debt and India's economic growth. The results reveal the debt threshold level of

61 per cent, beyond which debt negatively affects growth. The findings also assert that the threshold limit is lower than the original debt liability of 66 per cent of GDP, which is a cause for concern, and it raises a question about the fiscal sustainability of India.

It is clear from the above literature review that studies in the Indian context produce contrary results and disagree on the debt sustainability of India. Moreover, no recent literature is found after Kaur and Mukherjee (2012) which computes the debt threshold of India by considering current trends in the debt rise. Also, the existing studies use traditional techniques to measure debt sustainability and threshold. Regarding institutional quality, the existing literature lacks examining the role of institutional quality in influencing public debt, economic growth, and primary surplus in India.

3.9 Studies Focusing on the Indian States

The available literature that focuses on the factors of the state government debt is not vast, but it makes a relevant contribution. A few notable studies which focus on the determinants of state governments and local governments' debt include (Benito and Bastida, 2004; Ashworth et al., 2005; Plekhanov and Singh 2007, Baber and Gore, 2008; Veiga and Veiga, 2014; Galinski 2015; Balaguer-Coll et al., 2016; Renjith and Shanmugan, 2020; Akram and Rath, 2020a). Apart from this, some existing studies cover the debt sustainability of the Indian States, such as (Dholakia et al. 2004; Rajaraman and Pattnaik, 2005; Makin and Arora, 2012). Dholakia et al. (2004) suggest a debt to GSDP threshold of 35% for sustainability and a tolerable limit of 20%, explained as interest payment to revenue receipt. The study also reveals that more than 50% of the states have crossed the threshold. Misra et al. (2021) suggest that Indian states are concerned about debt sustainability and are approaching unsustainability. Though, the forces that aggravate the Indian state's indebtedness are virtually non-existent to the best of my knowledge.

3.9.1 Factors Contributing to the State Governments' Debt

Many elements contribute to the state government's indebtedness, such as the rising need to develop the states, establish smart cities, provide necessary infrastructure, education, and health facilities, improve tourism demand, etc. (Budget documents of state governments). The level of debt varies from state to state, depending upon the state-specific factors. Following Cropf and Wendel (1988), all the elements can be categorized as social-economic, financial, and political factors, which can be classified as controllable and uncontrollable factors.

Socio-economic forces

Socioeconomic factors such as economic activity or gross state domestic product, unemployment, tourism, and population affect the level of debt (Veiga and Veiga, 2014). Some of these factors are controllable because the state governments have the power to control them. While it is being supported that a high level of debt negatively affects economic growth, Noga et al. (2018) suggest that a low level of public debt does not positively impact respective countries' socioeconomic development.

Rao (2017) indicates that the level of economic activity or the gross state domestic product (GSDP) influences government expenditure and level of state debt. In their research for BRICS nations, Haber and Neck (2006) find that unemployment significantly affects the debt sustainability of an economy. The high unemployment rate obligates the government to employ more funds in the social-welfare resolutions and eventually raise the debt burden. Higher unemployment also indicates the economy's unproductiveness and low revenue generation (Haber and Neck, 2006; Joy and Panda, 2020).

Abbott et al. 2015 explained that state governments use debt to smoothen expenditure during economic slowdowns or business cycles. Veiga and Veiga (2014) indicate that higher

unemployment surges the debt. The state's density represents urbanization and affects the environment and the state finances (Hortas-Rico and Solé-Ollé, 2010). Benito et al. (2010) find a negative relationship between population density and the level of debt. The study suggests high population density lowers total expenditure, leading to low debt requirements.

States with increased tourism must spend more on infrastructure and services than those with low tourism activity. Hence, they borrow more to match the extra expenditure (Benito and Bastida, 2004). Increasing social sector expenditure (education, social security, water supply, sanitation, housing, etc.) stimulates the debt-GSDP ratio (Reserve Bank of India, 2020).

Fiscal/financial forces

Fiscal or financial factors include controllable variables such as investments, savings, and state/local government grants, and uncontrollable variables such as interest payments, own revenue, fiscal deficit, etc. (Veiga and Veiga, 2014). The local government can procure funds through long and short-run debts to support capital expenditures. Balaguer-Coll et al. (2016) claim a positive relationship between capital expenditure (investment) and debt, suggesting an increase in capital expenditure with a simultaneous rise in debt.

Giménez et al. (2003) point out that local governments with more revenues are less likely to experience pressure borrowings. The imbalance in the state government's expenditures and revenues also plays a significant role in rising debt, questioning debt sustainability (Rao, 2017). Akram and Rath (2020b) apprehend that the unevenness in India's state indebtedness arises due to several factors such as population, geographical peculiarities, limited own tax revenues, and non-tax revenues. Further, fiscal deficits worsen the states' debt positions and later affect debt sustainability (Akram and Rath, 2020b). Azizi et al. (2012) elaborate that if the public debt growth rate is higher than the interest rate, the government is

servicing its interest payments by accumulating further debt. It also implies that the government is generating own low revenues to repay its dues (Azizi et al., 2012).

Political forces

A few studies postulate that political forces may influence fiscal sustainability and public debt (Neck and Getzner, 2001; Skilling and Zeckhauser, 2002; Alt and Lassen, 2006). Benito and Bastida (2004) confirm that in the year in which elections have been held, the local government's borrowing rate increases. In addition, rising debt is also considered a result of the political strategies to influence the policies of future governments (Ashworth et al., 2005). Put differently, when a particular ruling government has a higher possibility of defeat in the future, it tends to accumulate more debt at present (Pettersson-Lidbom, 2001). Balaguer-Coll et al. (2013) note that local governments with less power accumulate high debt unethically to provide more services to the citizens.

3.9.2 Variation in States' Expenditure and Debt

Rao (2015) noticed that the variation in expenditure and public debt of the states arises due to various factors such as population, forest, geographical features, and revenues through tax and non-tax sources. Consequently, inequality can be observed across the Indian states in government expenditure and debt accumulation. The central government provides grant and implement many schemes sponsored centrally to wipe out the imbalances (Rao, 2015; Rao, 2017). Akram and Rath (2020a), in their study to find the relationship between economic growth and optimal government size in the context of India, suggest that population growth, capital formation, employment rate, and political alignment are the key variables that cause the variation in size of the expenditure of the states. Eventually, these state-specific characteristics lead to a variation in the state's public debt.

The concerns related to the public debt sustainability of Indian states, the factors contributing to the state's indebtedness, and the causes of variation in debt accumulation by the states are less focused upon in the existing literature. The literature in the context of other countries suggests that socio-economic, political, and fiscal factors affect the states' debt position. Moreover, some of the studies done before 2015 suggested that debt is sustainable for India or most of the Indian states. However, a recent study by Misra et al. (2021) finds that the Indian states are approaching debt unsustainability.

3.10 Research Gaps

- The nexus between India's public debt and economic growth was last studied in 2014; after that, many economic and financial changes have happened within the economy; hence, it is necessary to revisit this nexus to analyze the current status.
- The relationship between public debt and economic development has not been widely discussed in the existing literature, specifically in the Indian context.
- Hardly any pertinent studies exist that address both internal and external factors that affect general government public debt, especially in the Indian context.
- The existing literature produces contrary results and disagrees with the debt sustainability of India. Moreover, no recent literature is found after Kaur and Mukherjee (2012), which computes the debt threshold of India by considering current trends in the debt rise. Also, the existing literature lacks examining the role of institutional quality in influencing public debt sustainability, economic growth, and primary surplus in India.
- Limited studies were found in the context of Indian states' debt position and debt sustainability. Also, the reason for the variation in the debt position of the states has not

been discussed much. Most of the studies are focused on the impact of external debt on the economy taken by the central government and do not consider the combined debt consequences for both governments.

- The forces aggravating the Indian state's indebtedness are almost non-existent.
- The existing literature has not addressed how the impact of macroeconomic factors changes to the change in debt level. Further, how each state performs relatively on the debt sustainability index is also not focused.

CHAPTER 4

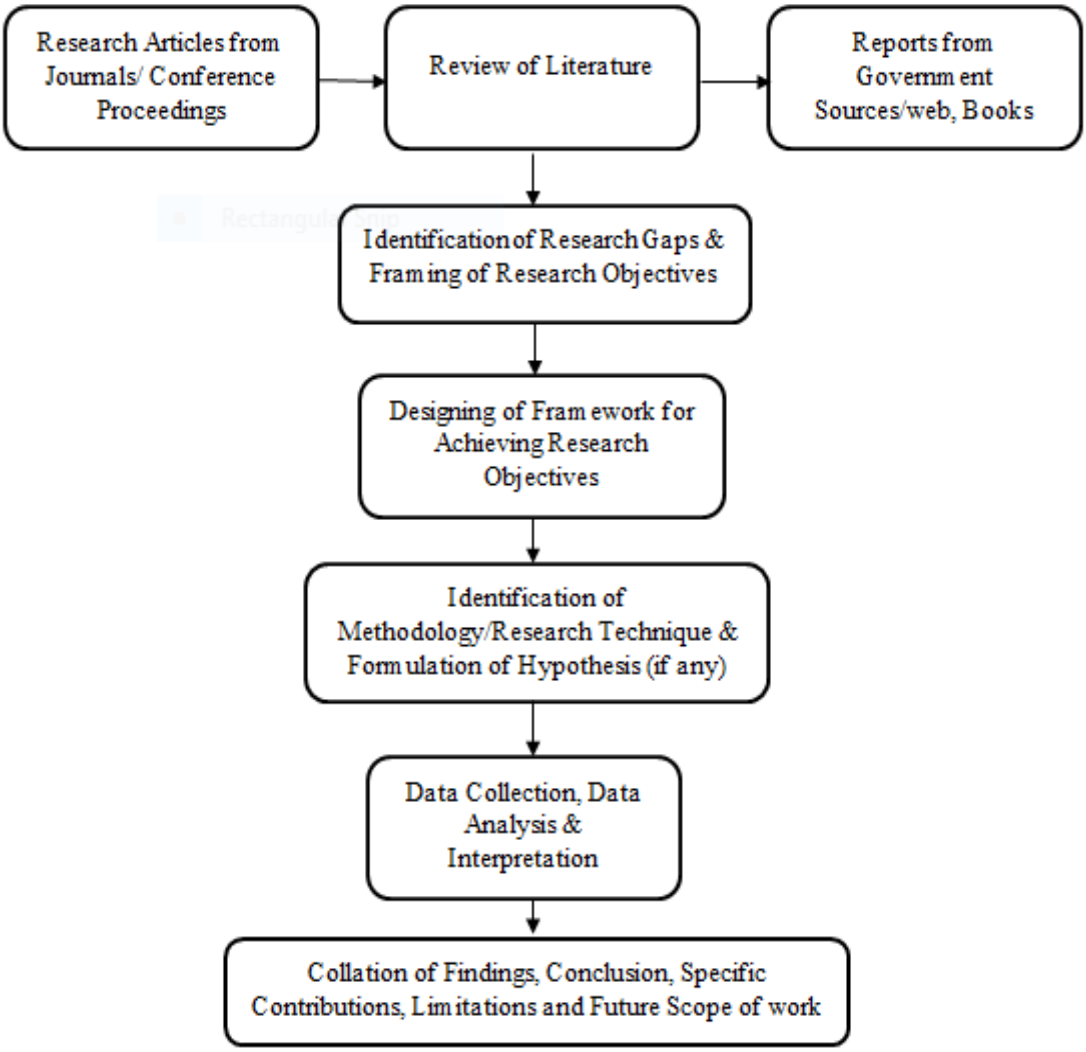
An Overview of the Data, Variables, and Methods

4.1 Introduction

This chapter discusses the research process of the study in the beginning. Then, the development of a research framework adopted to achieve each objective is explained. Lastly, the variables of interest, the data sources, and the different research methods used to conduct the research for all three objectives of the thesis are explained. The below-given research process has been followed (Figure 4.1):

Figure 4.1

Research Process



Source: Author's elaboration

After the review of the existing literature, gaps were identified, and the objectives of the thesis were formulated, as explained in Chapter 3. For each of the objectives, a separate research framework was designed, given below, and empirical analysis was done based on that.

4.2 Development of Research Framework

Research Objective 1: The first research objective is to investigate the relationship between India's public debt and economic growth. Firstly, trends are observed for India's public debt and economic growth, and an overview of the nexus between these two variables is given

among other BRICS member countries. Secondly, the study employs the Bayer and Hanck (2013) technique to examine the co-integrating relationship between the chosen variables. The Bayer and Hanck cointegration test is a recent, more robust, and reliable technique as it integrates four distinct cointegration methods. Thirdly, the study employs the autoregressive distributed lag (ARDL) bounds test of cointegration and checks the robustness of the results by comparing the results obtained using the Bayer and Hanck method. The ARDL bounds test also facilitates the estimation of long-run and short-run coefficients. The study also examines the effects of the COVID-19 pandemic on India's debt and economic growth. It forecasts the time the Indian economy would take to recover from these health crises using the ARIMA model.

Research Objective 2: The second objective comprises two aspects – examining India's determinants of public debt. In the first aspect of the objective, the study proposes to explore the various determinants of public debt, including economic development, using a framework of exploratory research. The existing literature has not widely discussed the relationship between public debt and economic development. This issue motivated us to address how economic development affects public debt accumulation. Initially, we explain the relationship between debt and various macroeconomic variables. Then, the structural equation modelling (SEM) approach is used to determine the factors that affect public debt accumulation in India. The study also explains how natural resource rent can influence debt accumulation in the case of India using the ARDL bound test methodology. In the second aspect of the objective, the study investigates the debt sustainability of the Indian economy by using different approaches such as the interest-growth differential, debt threshold, and fiscal reaction function. The role of institutional quality in influencing the debt sustainability of India has also been analysed by including it as an interaction term in the model.

Research Objective 3: The third objective is determining the debt threshold, sustainability, and the causes of variation in Indian states' indebtedness. First, an overview of the current liability position of Indian states is given, and then the quantile regression approach is employed to understand how each determinant of debt reacts to the increase in the debt level of the states. Further, a debt sustainability index is constructed to rank each state based on its sustainability or unsustainability.

4.3 Data Sources and Variables

The section provides an objective-wise overview of the data sources, selected variables, techniques, and approaches to fulfil them.

The variables and data sources used to investigate the nexus between public debt and economic growth are as follows: annual time series data for the Indian economy between 1984 and 2019 are used. Data for GDP (constant 04-05), gross final consumption expenditure (GFCE), gross fixed capital formation (GFCF), import-export, and CPI inflation (INF) rate are sourced from the World Development Indicators (WDI). The remaining data, namely foreign exchange reserves (FXR- USD) and debt taken from the Handbook of Indian Statistics released by the Reserve Bank of India Database. For the analysis, trade openness (TRADE) is taken as the proportion of the sum of exports and imports to GDP. Similarly, the public debt ratio is computed by dividing it by GDP.

The data sources and variables to investigate the relationship between debt and crisis is elaborated here. The study uses quarterly data at constant prices (2011-12) for GDP from 2012Q1 to 2020Q4. The external debt (ED) data is available for the period 2000Q4-2020Q4. The data has been sourced from the RBI database and Main Economic Indicators - a complete Organization for Economic Co-operation and Development database. Quarterly information

allows for capturing the effect of the COVID-19 crisis more precisely at multiple points in a year. Internal debt is not included in the study due to the unavailability of the quarterly data.

The study uses eight variables to capture the magnitude of economic development. The human development report suggests that HDI, an aggregate index of three variables, is the primary and most appropriate variable to measure economic development. It should be noted that the study also covered a few more variables to understand the direct effect of these different economic variables on public debt. These variables collectively account for HDI. Table 4.1 presents the significant variables applied in the model and the data sources. Some variables are converted into log form to maintain the normality in the research, such as the human development index, GDP per capita, infant mortality rate, and life expectancy rate. The focus of the study is limited to India, ranging from 1985 to 2018. The period of study is based on the data availability.

Table 4.1

Variables and Data Sources

Variables	Labels	Definitions	Data Sources

For Economic Development (ED)			
Human Development Index	HDI	The composite index evaluates the three basic dimensions of human development - healthy and long life, a modest standard of living, and knowledge accessibility on a scale of 0 to 1.	UNDP
Life expectancy at birth (years)	LE	The expected number of years a newborn baby will live.	WDI
Mortality rate, infant (per 1,000 live births)	IM	Infant mortality rate shows the probability of an infant dying between birth and the age of one year expressed as per thousand births.	WDI
Physicians (per 1,000 people)	PHY	All professionals and medical doctors, medical school graduates, working in any area of expertise (per 1,000 inhabitants).	WDI
GDP per capita (constant LCU)	GDPC	Total gross domestic product of an economy is divided by the total population.	WDI
Government expenditure on education, total (% of GDP)	GEE	Public expenditure on government academic institutions, including subsidies given to all levels of private educational institutions with expenses bearings such as salaries of staff and other benefits, contracted services, teaching materials, books, equipment, repairs, furniture, and telecommunications (as a percentage of GDP).	WDI
Current health expenditure	CHE	Current expenditure from the government budget, social health insurance funds, grants, and external borrowings (as a percentage of GDP).	WDI
Other Variables			

Debt-GDP ratio	DGR	Debt-GDP ratio is the borrowings accumulated by the government as a percentage of GDP.	IMF
Military expenditure	ME	Military expenditure is the expenditure on defense taken as a percentage of GDP.	WDI
Lending interest rate (%)	IR	The lending interest rate is the interest rate paid on the government's borrowings.	WDI
Corruption	CPI	The corruption perceptions index shows the country's score on how corrupt their public sectors are. The score lies between 0 and 10. 0 represents highly corrupt, while 10 means highly clean.	TI
Inflation, consumer prices (annual %)	IN	Inflation is the annual %age change in the cost to the average consumer of obtaining a basket of goods and services.	WDI
Gross fixed capital formation (constant LCU)	GFCF	As per the Reserve Bank of India, gross fixed capital formation is the investment taken as the aggregate of gross additions to the fixed assets during one year.	WDI
Total debt service	DS	Total debt service is the debt service on the borrowings taken as a percentage service of exports of goods services, and primary income.	WDI

Note: UNDP – United Nations Development Programme, WDI – World Development Indicators, IMF – International Monetary Fund, TI – Transparency International

The study uses data from 1990 to 2019 to investigate the interaction between natural resource rents, public debt, and other macroeconomic variables. Public debt is the dependent variable, and total natural resource rent is the primary independent variable. The control variables are economic growth, inflation, trade openness, and unemployment rate. The data are

retrieved from the World Development Indicators (WDI) Database of the World Bank and the World Economic Outlook Database of the International Monetary Fund (IMF) to accomplish the objective. Public debt is taken as the GDP percentage, representing the combined debt liabilities of the centre and state governments. Total natural resource rents as a percentage of GDP constitute coal, mineral, oil, forest, and natural gas rents. GDP per capita (constant) is the proxy of economic growth. Trade openness (percentage of GDP) is the total of export and imports. All the variables are converted in the natural logarithmic form to maintain the normality of the data.

The data sources and variables used to examine the debt sustainability of India are explained in this section. The scope of the study is restricted to India from 1985 to 2020. The study uses GDP annual growth as a proxy of economic growth. Public debt (PD), institutional quality (IQ), gross national expenditure (GNE), gross fixed capital formation (GFCF), and foreign direct investment (FDI) are the independent variables. The study uses primary surplus (PS) data from the Reserve Bank of India (RBI) database to examine fiscal reaction functions. General government debt, taken as a percentage of GDP, is the measure of public debt. The data for the same is collected from International Monetary Fund (IMF). Economic freedom index data from the Freedom House Report is used for institutional quality. The index is computed using four fundamental indicators, i.e., the size of government, the rule of law, efficiency of regulations, and open markets. These indicators are divided into sub-indicators measured on a scale from 0 to 100 (Godil et al., 2021)**.** GDP per capita, trade, gross national expenditure, and gross fixed capital formation data have been extracted from World Development Indicators (WDI). GFCF, GNE, and FDI are taken as a percentage of GDP.

In the study, two methods are used to examine the debt sustainability of India. First, the debt threshold beyond which any further rise in debt could harm the economy is determined by

how far the current debt-GDP ratio is from the debt threshold. Second, debt sustainability is measured by using the fiscal reaction function approach. In addition, the study includes institutional quality in the empirical testing to examine its role in India's debt threshold and sustainability.

The variables and data sources used to examine the debt sustainability of Indian states are elaborated in this section. The sample comprises 252 observations of each variable for 2011-2019. Appendix J shows the list of 28 states included in the analysis, except for Telangana, due to the unavailability of the data. The theoretical framework galvanizes selecting the independent variables presented in section 2. Table 4.2 explains each independent variable and its positive or negative effect on debt per the existing literature and theoretical framework. Reserve Bank of India (RBI) and the Indiastat database are the main data sources used in the study. Actual figures of the selected variables rather than the budgeted values are used in the analysis. Using forecasted values could deliver inaccurate results as these values are always either underestimated or overestimated from the actual values.

Table 4.2

Description of the Variables of Interest

Variable Type	Variable Name	Label	Description/Computation	Expected Relation

Dependent Variable	State Debt	SD	Debt as a percentage of GSDP [(Total Debt)/GSDP]	
Independent Variable				
Fiscal Factors	Gross Capital Expenditure	GCE	Annual state-wise capital expenditure	(+)
	Total Revenue	TR	Tax revenue plus non-tax revenue	(+/-)
	Interest Payments	IP	Interest payments made against debt liabilities	(+)
	Primary Deficit	PD	The primary deficit is the gross fiscal deficit less interest payments	(+)
Socio-economic Factors	Social Sector Expenditure	SSE	Expenditure made on social sectors	(+)
	Gross State Domestic Product	GSDP	Annual gross domestic product of states	(-)
Political Factors	Elections	EL	Dummy variable with value 1 for the years in which elections happened	(+)

Source: Author's own illustration

The measurement unit of variables of interest is not similar. Some are in percentage form, some in absolute values, and one is a dummy variable. Therefore, to maintain the normality in the data, all the variables are transformed into log form except elections because it is a binary variable.

The data sources and the variables of interest for constructing the debt sustainability index for Indian states are explained here. The data has been sourced from the Handbook of Statistics on Indian States (RBI), State Finance Reports (RBI), and Indiastat. The study is a

cross-sectional study using the time frame 2020-21. Overall, 30 states and UTs were selected for the study based on the data availability. These states and UTs are divided into six zones: the northern zone, southern zone, western zone, eastern zone, central zone, and central zone northeastern zone (Table 4.3 and 4.4). Taking insights from the existing literature, four indicators of debt sustainability are selected for the study to construct the debt sustainability index for the Indian states, namely outstanding liabilities (proxy of debt) as per cent of GSDP, the primary deficit as per cent of GSDP, Interest-Growth differential and debt servicing. All these indicators have been explained below:

Outstanding Liability (L)

Outstanding liabilities represent the total internal debt plus loans and advances from the central government, total provident funds, reserve funds, deposits and advances, and contingency funds of the states. The selection of this indicator for the study is based on the findings of studies that suggest that a country is a debt sustainable when its debt-GDP ratio is stable and when the country is able to generate enough primary surplus to contain future debt (Buiter et al., 1985; Ewijk and Lukkezen, 2013; Kaur et al., 2018).

Primary Deficit (D)

As explained in the previous paragraph, primary balance plays an essential role in covering up the debt of an economy. It represents the difference between the expenditure and the revenues of the government. Higher revenues than expenditures lead to a higher surplus which helps in the timely repayment of liabilities and down-turning the accumulation. Contrary to that, higher expenditure than revenues leads to deficits, making an economy more dependent on debt and unsustainable. Considering the importance of the primary balance, the study includes a primary deficit to GSDP as a debt sustainability indicator.

Interest-Growth Differential (G)

This indicator is selected based on Domar's debt sustainability condition. Domar (1994) postulates that a country is a debt sustainable when its GDP growth rate is higher than the interest rates on debt. Interest-Growth differential represents the difference between the interest rate and the annual growth of states' gross domestic product. The interest rate has been calculated by dividing the current year's interest payment by the previous year's outstanding liabilities.

Debt servicing (S)

Debt servicing shows the capacity of the government to repay its debt obligations. Poor debt servicing capacity indicates the risk of default. International Monetary Fund considers an economy as debt sustainable if it is competent to pay back its debt without any quixotic future correction to its revenues and expenditure. It is computed by dividing the interest payments from the revenue receipts.

Table 4.3

States and UTs included in the Study

S. No.	States/UTs	S. No.	States/UTs
1	Andhra Pradesh	16	Manipur
2	Arunachal Pradesh	17	Meghalaya
3	Assam	18	Mizoram
4	Bihar	19	Nagaland
5	Chhattisgarh	20	Odisha
6	Goa	21	Puducherry
7	Gujarat	22	Punjab
8	Haryana	23	Rajasthan

9	Himachal Pradesh	24	Sikkim
10	Jammu & Kashmir	25	Tamil Nadu
11	Jharkhand	26	Telangana
12	Karnataka	27	Tripura
13	Kerala	28	Uttar Pradesh
14	Madhya Pradesh	29	Uttarakhand
15	Maharashtra	30	West Bengal

Source: Author's compilation

Table 4.4

Zone-wise Segregation of States/UTs

S. No.	Zone	States/UTs
1	Northern Zone	Haryana, Himachal Pradesh, Jammu & Kashmir, Punjab, and Rajasthan
2	Southern Zone	Andhra Pradesh, Karnataka, Kerala, Puducherry, Tamil Nadu, Telangana
3	Eastern Zone	Bihar, Jharkhand, Odisha, Sikkim, West Bengal
4	Western Zone	Goa, Gujarat, Maharashtra
5	Central Zone	Chhatisgarh, Madhya Pradesh, Uttarakhand, Uttar Pradesh
6	North-Eastern Zone	Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura

Source: Reserve Bank of India

4.4 Research Methodology and Procedure

4.4.1 Bayer and Hanck and ARDL Bound Test Specifications: Public Debt and Economic Growth

As mentioned earlier, one of the most recent techniques proposed by Bayer and Hanck (2013) examines cointegration among the variables of interest. The Bayer-Hanck approach is more reliable and robust as it integrates four individual cointegration techniques. Taking a cue from Umar et al. (2020), Fisher's equation is formulated in the following manner:

$$EG - JOH = -2[ln(P_{EG}) + ln(P_{JOH})] \quad (1)$$

$$EG - JOH - BO - BDM = -2[ln(P_{EG}) + ln(P_{JOH}) + ln(P_{BO}) + ln(P_{BDM})] \quad (2)$$

where,

EG, JOH, BO, and BDM represent the different tests formulated by Engle and Granger (1987), Johansen (1991), Boswijk (1994), and Banerjee et al. (1998), respectively. *P* stands for the probability value of each test of cointegration.

Further, to check the robustness of results obtained using the Bayer-Hanck method (2013), the study employs the autoregressive distributed lag (ARDL) bounds test (Pesaran et al. 2001), which has two crucial characteristics. First, it can be applied where variables are integrated of equal order or a mixture of both. Second, the estimated coefficients using ARDL are more robust than the Johansen approach when the sample size is small (Pesaran and Shin, 1995). Therefore, using the following equation, the long-run coefficients of public debt, economic growth, and other variables in the model are examined:

$$\ln Y_t = \alpha_0 + \beta_0 \ln Y_{t-1} + \beta_1 \ln DEBT_{t-1} + \beta_2 \ln GFCF_{t-1} + \beta_3 \ln GFCE_{t-1} + \\ + \beta_4 \ln TRADE_{t-1} + \beta_5 ln INF_{t-1} + \beta_6 ln FXR_{t-1} + \omega_t \quad (3)$$

where,

ln refers to the natural log of the variables, Y is the GDP, DEBT is the ratio of public debt to GDP, GFCF is the gross fixed capital formation, GFCE is the government's final consumption expenditure, TRADE is the trade openness, INF is the inflation, and FXR is the foreign exchange reserves. While ω_t in the model represents the error term with constant mean and variance, *t* is the time. As usual, α is the constant term, and β denotes the coefficients of the variables.

Similarly, equation (4) shows the short-run co-integrating relationship with a set of variables, and δ represents the coefficients of the variables. The optimal lagged values of each variable based on Schwarz criteria are explained by a, b, c, d, e, f, and g.

$$\Delta \ln Yt = \alpha_0 + \sum_{j=1}^{a} \delta_j \Delta \ln Y_{t-j} + \sum_{k=0}^{b} \delta_k \Delta \ln \mathrm{DEBT}_{t-k} + \sum_{l=0}^{c} \delta_l \Delta \ln \mathrm{GFCF}_{t-l} + \sum_{m=0}^{d} \delta_m \Delta \ln \mathrm{GFCE}_{t-m} + \sum_{n=0}^{e} \delta_n \Delta \ln \mathrm{TRADE}_{t-n} + \sum_{o=0}^{f} \delta_o \Delta \ln \mathrm{INF}_{t-o} + \sum_{p=0}^{g} \delta_p \Delta \ln \mathrm{FXR}_{t-p} + \varphi ECT_{t-1} \quad (4)$$

The error correction term (ECT) measures the pace of adjustment back of the model towards the equilibrium in the face of any economic shock. Significant negative ECT indicates the long-run causality among variables. Lastly, the direction of the causality between public debt and economic growth is tested by applying the Granger causality test. The null hypothesis of the test assumes that there is no Granger causality. It should be noted that the optimal lag length and the maximum integrated order required for the causality test have been estimated

through the vector autoregression (VAR) approach and Augmented Dickey-Fuller (ADF) and Phillips-Perron tests, respectively.

4.4.2 ARMA and ARIMA Model Specifications: Public Debt, Economic Growth and COVID-19 Pandemic

To predict India's GDP and external debt for the next five years, the auto-regressive integrated moving average (ARIMA) model is used. This model was built under a Box-Jenkins methodology (Box and Jenkins, 1976) and was subjected to an Augmented Dickey-Fuller test to check if the data was stationary. The methodology includes three main steps to estimate and forecast the model, i.e., a) Identification, b) Estimation, and c) Diagnostic and Forecasting.

In the first stage, the stationarity of the series is verified.. If the series is stationary at level, the order of autoregressive (p) and order of the moving average (q) by using a correlogram is identified. If the series is non-stationary at the level, the difference of the series is taken, and stationarity is rechecked. Later, p and q are identified. In the second stage, after placing possible p and q, different models are estimated, and the best model among them is chosen. The model with significant AR and MA values and with the lowest Akaike Information Criterion (AIC), Schwarz Criterion (SC), and Hannan-Quinn Criterion (HQ) values are considered the best model. The third stage includes diagnostic testing and forecasting. Under diagnostic testing, it is checked whether the q statistics of the model are significant or not and whether AR and MR roots are within the critical values. Finally, the study uses the same model to forecast the values for the next five years.

The general equation of the ARMA of orders p and q are as follows:

$$Y_t = c + \alpha_1 Y_{t-1} + \cdots + \alpha_p Y_{t-p} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \cdots - \theta_q \varepsilon_{t-q} \quad (1)$$

Y_t is the time series, p implies autoregressive order, and q represents moving-average order. ε_t explains the past error terms used as independent variables in the model. This model is a combination of both AR and MA models.

If the series is non-stationary at the level, then the ARMA model can be broadened by taking the difference of the series, and the resulting model is known as the ARIMA model. Following is the equation for the ARIMA model:

$$\Delta Y_t = c + \alpha_1 \Delta Y_{t-1} + \cdots + \alpha_p \Delta Y_{t-p} + \varepsilon_t - \theta_1 \varepsilon_{t-1} - \cdots - \theta_q \varepsilon_{t-q} (2)$$

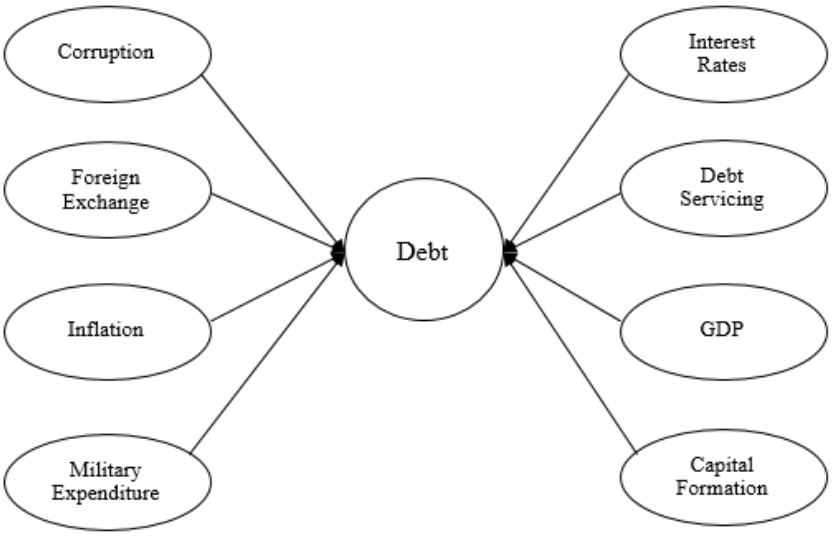
where ΔY_t is the difference between Y_t and Y_{t-1}. The series becomes stationary when differencing is done. ARIMA model includes three parameters, i.e., p, d, and q. d stands for the degree of difference.

4.4.3 Structural Equation Modelling Specifications: Economic Development and Public Debt

As mentioned earlier, the conceptual framework used in the study is based on the existing literature, particularly a study by Forslund et al. (2011). The framework defines the relationship between public debt composition and various macroeconomic factors—Figure 4.2 shows the rough diagram of the relationship, which will be investigated for the analysis.

Figure 4.2

Relationship between Debt and Various Macroeconomic Variables



Source: Author's illustration

Moreover, the study extends the existing conceptual framework by capturing another dimension of the economy, i.e., economic development. The aim is to examine whether economic development is a determinant of public debt accumulation. It is interesting to note that economic development is a broader term and cannot be accounted for by a single factor; hence several other variables have been taken into account to estimate the effect of economic development on public debt.

As mentioned, the study uses the structural equation modelling (SEM) method for data analysis. In general, SEM is used for both factor and regression analysis. SEM evolved from simple linear models to non-parametric models, and now it can be used in complex time-series models (Fan et al., 2016; Hair et al., 2021). SEM is based on a path diagram constructed from theoretical constructs. The primary purpose of using the SEM technique is the model specification, and the current research is partially confirmatory and partially exploratory. Generally, SEM analysis is conducted to test a hypothesis, test a model, modify a model, or test and compare two or more models.

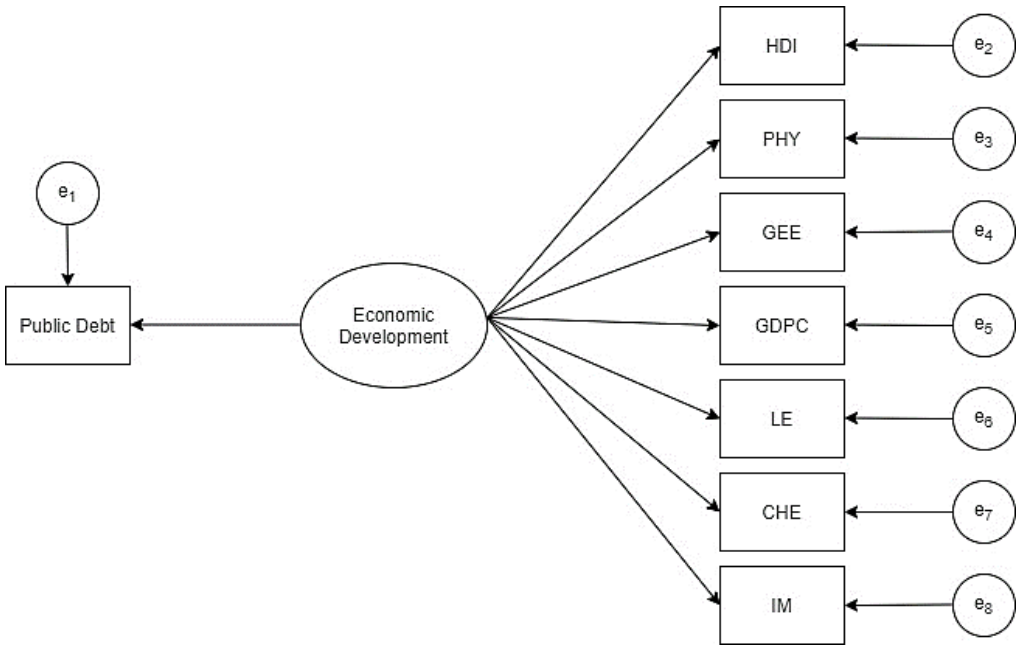
Furthermore, SEM can be used when the theoretical base is poorly developed. The study is exploratory, with less or no shreds of evidence in existing literature in our knowledge (Hair et al., 2021). Moreover, it may be applied to time series studies with a small sample size (Fan et al., 2016).

The underlying assumptions of SEM while computing the multiple regression model are a) the independent or the exogenous variables are correlated to each other and b) the residual term is considered an unobserved latent variable, the value of which is fixed to unit one. Generally, the path diagram consists of two types of variables: latent and observed variables. While the latent variables are not directly observable, the observed variables are considered for the study. It is worth noting that the latent variable data is not readily available. Hence, the latent variables are constructed by the various observed variables.

For the study, two path diagrams have been used. Figure 4.3 shows the first path diagram representing economic development (latent variable) and its observable variables. Latent variables are always drawn within a circle/oval, and observed variables are drawn as squares. Moreover, in the given diagram, economic development acts as an independent variable to compute coefficients of the dependent variable, i.e. public debt. Smaller ovals are the error terms of each observed variable.

Figure 4.3

Path Diagram for Model 1

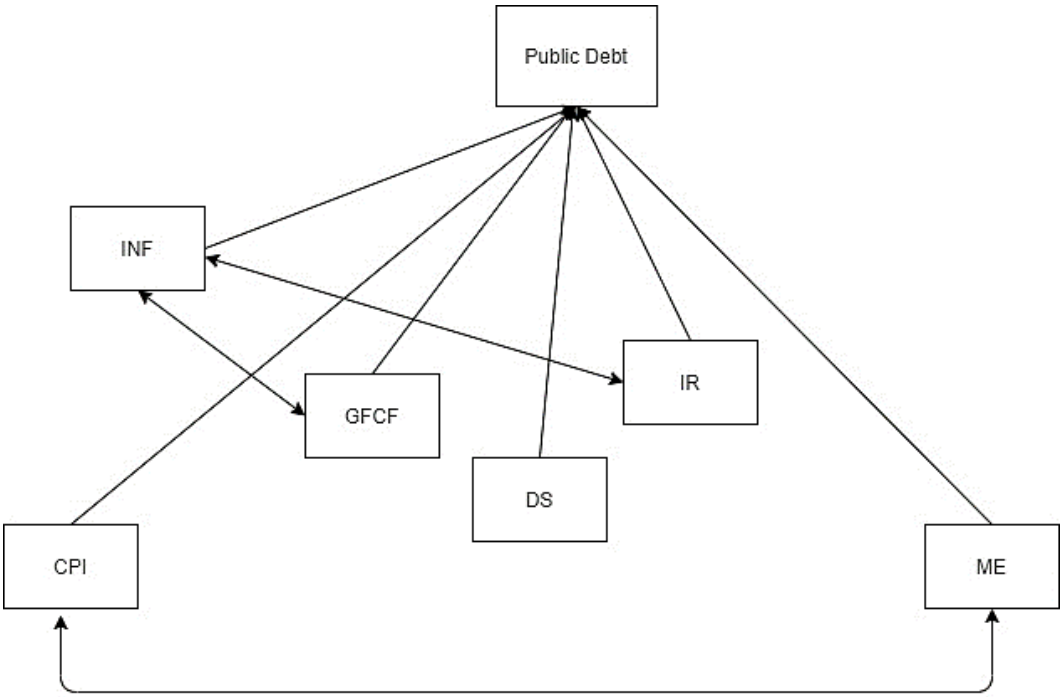


Source: Author's own illustration

Figure 4.4 presents the second path diagram, which illustrates the relationship between public debt and other macroeconomic factors in which some variables correlate. The hypothesis (H_1) of Figure 2 is that economic development influences public debt. Economic development is defined by its observed variables. The hypothesis (H_2) of Figure 3 is that the selected macroeconomic variables influence public debt. The analysis was performed by using AMOS software.

Figure 4.4

Path Diagram for Model 2



Source: Author's own illustration

4.4.4 ARDL Model Specifications and VAR Granger Causality: Public Debt and Natural Resource Rents

The empirical testing is comprehended in six steps. The first step begins with a preliminary analysis, including descriptive statistics and checking the stationarity of the variables by using the Augmented Dickey-Fuller (ADF) unit root test (Dickey and Fuller, 1979; Dickey and Fuller, 1981). The presence of unit root in the series can produce misleading outcomes. Therefore, it is essential to perform the unit root test to know the level of integration at which the series is stationary. The next step comprises the cointegration test for investigating the existence of a long-run relationship between the variables. Third, find out the long-run and short-run coefficients using the ARDL model. Finally, the direction of causality between natural resource rents and India's public debt was detected using the VAR Granger causality test.

Examining the cointegration among the macroeconomic variables, in the long run, is a common practice in the area of research due to the fluttering nature of such variables. Thus, the study investigates the long-run and short-run co-integrating association between public debt and the remaining selected variables by using Auto-regressive Distributed Lag (ARDL) bound test (Pesaran et al., 2001). The reason for choosing the ARDL test over other traditional cointegration methods is its flexibility. The method can be used even when the series are integrated in different orders, i.e., I(0) or I(1). Moreover, the method can produce reliable estimates when the sample size used in the study is small due to data unavailability.

In the long run, supported by existing literature, a positive association between public debt and total natural resource rents is expected. Negative signs are expected between public debt and GDP per capita and public debt and inflation. The literature favours positive and negative associations between public debt, inflation and trade openness; therefore, the study pre-assumes any of the two signs in the outcome. As suggested by the limited studies on unemployment and public debt, negative signs between these two are supposed.

The functional relationship between public debt and selected other variables can be written as follows:

$$\ln Debt = f(\ln TNR, \ln GDPC, \ln INF, \ln TO, \ln UR)$$

where ln is the natural log, debt represents total public debt, TNR is the total natural resource rents, GDPC is the GDP per capita, INF denotes inflation, and TO and UR are trade openness and unemployment rate, respectively.

The ARDL bound test null hypothesis denies the existence of a co-integrating long-run relationship between the study variables, whereas the alternative hypothesis favours the same. Both hypotheses are given below:

$$H_0: \beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0$$

$$H_1: \beta_0 \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$$

Suppose the resulting F-statistic of the model is higher than the critical upper bound. In that case, it is said that the null hypothesis is rejected, and variables are co-integrated in the long run. To find out the long-run coefficients, a long-run ARDL equation for the current study can be established as follows:

$$\ln Debt_t = \alpha_0 + \beta_0 \ln Debt_{t-1} + \beta_1 \ln TNR_{t-1} + \beta_2 \ln GDP_{t-1} + \beta_3 \ln INF_{t-1} +$$

$$+ \beta_4 \ln TO_{t-1} + \beta_5 lnUR_{t-1} + \omega_t$$

where α_0 is the constant term, β's indicates the long-run coefficients of the independent variables, *t* is the time and ω_t is the error term.

The equation formulated for the short-run ARDL estimates is as follows:

$$\Delta \ln Debt_t$$

$$= \alpha_0 + \sum_{j=1}^{a} \delta_j \Delta \ln D_{t-j} + \sum_{j=0}^{b} \delta_k \Delta \ln TNR_{t-j} + \sum_{j=0}^{c} \delta_l \Delta \ln \mathrm{GDP}_{t-j} + \sum_{j=0}^{d} \delta_m \Delta \ln INF_{t-j}$$

$$+ \sum_{j=0}^{e} \delta_n \Delta \ln \mathrm{TO}_{t-j} + \sum_{j=0}^{f} \delta_o \Delta \ln \mathrm{UR}_{t-j}$$

$$+ \varphi ECT_{t-1}$$

where Δ represents the differencing of the series, *a,b,c,d,e,* and *f* imply the lag values for each variable. δ's are the short-run coefficients of the variables. *j* indicates the degrees of freedom. ECT is the error correction term that determines the pace at which the disequilibrium in the model will be corrected. φ is the coefficient of ECT.

4.4.5 Standard Quadratic Equation Specification: Public Debt Threshold and Sustainability

The study uses a standard quadratic equation approach to see the effect of debt and institutional quality on economic growth and compute the debt threshold. It applies Autoregressive Distributed Lag (ARDL) methodology proposed by (Pesaran et al., 2001). The main advantage of using this methodology over any other co-integration technique is that ARDL can be applied to series integrated of any order. It does not require series' to be integrated of the same orders. The method helps get the short-run coefficients and the error correction term, showing the speed at which the divergence will return to its original equilibrium. Additionally, it also takes care of the problem of endogeneity. The study formulates the following basic equation for understanding the relationship.

$$Y_t = \alpha + \beta_1 PD_t + \beta_2 PD^2{}_t + \beta_3 \text{IQ} + \beta_4 X_t + \varepsilon_t \qquad (1)$$

Where Yt denotes the GDP per capita in percentage, α and β's represent the intercept and coefficients. PD represents the Public debt-GDP ratio, and PD2 is the term squared term of public debt. X is the vector of some control variables. The control variables used in the current study are GFCF and FDI. Subscript *t i*mplies the time. εt indicates the error term. IQ has been taken in log form to maintain the normality of the data.

The primary focus of the study is to ascertain the relevance and magnitude of β's of public debt in the equation (1). The linkage between public debt and economic growth is expected to be either U-shaped or inverted U-shaped. The shape of the relationship depends on the signs of the βs. Say, if both the β's, i.e., $\beta 1$ and $\beta 2$ are positive, the relationship is linear. However, if $\beta 1$ is positive and the sign of $\beta 2$ is negative, the linkage turns out to be non-linear

and inverted U-shaped. In contrast, if $\beta 1$ is negative and $\beta 2$ is positive, the relationship is non-linear but U-shaped. The following formula is applied (Sanusi et al., 2019) to obtain the public debt threshold:

$$\overline{PD^{*}} = -\beta_1/2\beta_2 \qquad (2)$$

Then equation (1) is converted into ARDL long run and short run equations, respectively, to get the estimates by taking the tinge from Sharma et al. (2021):

$$\mathrm{Y}_t = \beta + \beta_0 + \beta_1 Y_{t-1} + \beta_2 \mathrm{PD}_{t-1} + \beta_3 (PD_{t-1})^2 + \beta_4 \mathrm{GFCF}_{t-1} + \beta_5 \mathrm{GNE}_{t-1} + \\ + \beta_6 FDI_{t-1} + \beta_7 \mathrm{IQ}_{t-1} + \omega_t \qquad (3)$$

$$\Delta \mathrm{Y}_t = \alpha + \alpha_0 + \sum_{p=1}^{a} \delta_p \Delta Y_{t-1} + \sum_{q=0}^{b} \delta_q \Delta \mathrm{PD}_{t-1} + \sum_{r=0}^{c} \delta_r \Delta (PD_{t-1})^2 + \sum_{s=0}^{d} \delta_s \Delta \mathrm{GFCF}_{t-1} \\ + \sum_{t=0}^{e} \delta_t \Delta \mathrm{GNE}_{t-1} + \sum_{u=0}^{f} \delta_u \Delta \mathrm{FDI}_{t-1} + \sum_{v=0}^{g} \delta_v \Delta \mathrm{IQ}_{t-1} \\ + \varphi ECT_{t-1} \qquad (4)$$

In equation (3), β and β_0 stand for intercept and trend, respectively; the rest of the β's represent long-run coefficients; ω_t is the error term. In equation (4), α is intercept and α_0 is the trend; δ's are the short-run coefficients; φ indicates the pace at which disequilibrium is corrected within a year. a,b,c,d,e and f explain the selected variables' optimal lag length. The null hypothesis of equation (3) is H0: = 0, which means there is no long-run co-integration, while the alternate hypothesis is H0: ≠ 0 implying the presence of long-run co-integration. The

null hypothesis is rejected when the f-statistics is higher than the critical values of the lower and upper bound.

Fiscal Reaction Function Approach: Debt Sustainability

The second approach is the fiscal reaction function approach. Under this approach, the response of primary surplus (PS) to the change in public debt and other variables, such as output gap (OG) and institutional quality (IQ), is measured. The study considers the effect of structural breaks in primary surplus by including a dummy variable for the breaks. The study also tries to check the indirect impact of institutional quality via public debt. Hence, an interaction term of debt and institutional quality is included. Equation (5) shows the formulation of the fundamental fiscal reaction function. Equation (6) shows the inclusion of interaction terms to measure the indirect effect of IQ on primary surplus.

$$PSt = a_0 + \eta_0 PS_{t-1} + \eta_1 PD_{t-1} + \eta_2 IQ_{t-1} + \eta_3 OG_{t-1} + \eta_4 DV + \mu_t \quad (5)$$

$$PSt = a_0 + \eta_0 PS_{t-1} + \eta_1 PD_{t-1} + \eta_2 IQ_{t-1} + \eta_3 (PD_t * IQ_t) + \eta_4 OG_{t-1} + \eta_5 DV + \mu_t \quad (6)$$

4.4.6 OLS Regression and Quantile Regression Specifications: Indian States Indebtedness

Consistent with the discussion, the model has three groups of explanatory variables, i.e., socio-economic, fiscal/financial, and political. The dependent variable for the model is state debt (SD), taken as a percentage of gross state domestic product (GSDP). For the analysis, initially, the OLS regression model is employed as follows:

$$SD_i = \beta_0 + \beta_1 \mathrm{GCE}_i + \beta_2 \mathrm{PD}_i + \beta_3 \mathrm{TR}_i + \beta_4 \mathrm{IP}_i + \beta_5 \mathrm{GSDP}_i + \beta_6 \mathrm{SSE}_i + \beta_7 \mathrm{EL}_i + \varepsilon_i$$

……(1)

Equation (1) explains the fundamental relationship between the dependent and independent variables. As described in Table 4.2, SD is the dependent variable on the left side of the equation, and all others are the independent variables on the right side. Except for β_0, the constant term, and the rest of the $\beta's$ are the coefficients of the independent variables. i represents distinct states such as 1, 2, 3…….n and ε_i denotes the error term.

Indian states vary in many notable ways, such as the size of the government and geographical, social, and financial factors. Hence, the problem of heteroskedasticity and autocorrelation might be possible in the data used in the present study. Heteroskedasticity is an assumption of OLS regression that might not hold in data with high variations. Hence, it is necessary to estimate equation (1) after correcting for both heteroskedasticity and autocorrelation.

Quantile Regression

India is tremendously heterogeneous across states; therefore, the relationship between state debt and the explanatory variables of interest is likely to differ at different quantiles. The OLS regression model is based on conditional expectation only and does not describe the full conditional distribution. Quantile regression alleviates this difficulty. It explains the effect of each independent variable at multiple quantiles such as 10, 20, 30….90. In addition, compared to OLS regression, quantile regression produces more robust coefficient estimates by

addressing the problems of heteroskedasticity and outliers. Thus, the study uses the quantile regression approach to thoroughly examine the relationship between state debt and the selected independent variables by using the following equation:

$$min_{\beta \in R^p} \sum_{i \in \{i: y_i \geq x'\}} r|y_i - x'\beta| \sum_{i \in \{i: y_i < x'\beta\}} (1 - r)|y_i - x'\beta|$$

……(2)

where y_i is the dependent variable given as in equation (1) for the state i, x is the vector of all the explanatory variables. p is the no. of explanatory variables, and r represents the vector consisting of each quantile. β indicates the coefficient value, which will change with the change in the quantile of the dependent variable.

4.4.7 Index Construction Specifications: Debt Sustainability Index of Indian States

1. Data Normalisation

After identifying the variables affecting India's debt sustainability, the research proceeds further with the construction of the index. To maintain uniformity, each indicator is transformed on a scale of 0 and 1 by using the given formula:

The normalized value for positive components = $\frac{Observed\ value - Minimum\ Value}{Maximum\ Value - Minimum\ Value}$

The normalized value for negative components = $\frac{Maximum\ value - Observed\ Value}{Maximum\ Value - Minimum\ Value}$

2. Weight Assignment and Index Construction

Then, PCA is applied to get the factor loadings. The best components having an eigenvalue equal to one or higher than one for assigning the weights to each indicator are chosen. A component with an eigenvalue equal to one or higher than one implies that that component explains the highest variance. Weights have been computed using the factor loading values (absolute) and the proportion of variance construed by the component in which the particular variable falls. The following formula is employed for the construction of the weighted debt sustainability index:

$$DSI = \frac{W^L(Liability) + W^D(Deficit) + W^G(Growth) + W^S(Servicing)}{W^L + W^D + W^G + W^S}$$

Here, DSI represents the debt sustainability index, and W indicates the weights that are assigned to each indicator. Weights are computed by multiplying the factor loading value of the variable with the variance proportion explained by the component in which that variable falls. The DSI value ranges from 0 to 1, where 0 represents high sustainability, and 1 represents high unsustainability. This is because the selected variables negatively affect debt sustainability, as suggested by the existing studies.

Following these steps, finally, ranks are given to the states/UTs based on their DSI score from 0 to 1. Further, all the states/UTs are classified into four categories using the DSI score.

The four categories are – highly sustainable states (HS) in the 25th percentile and below, sustainable states (S) in the 25th percentile and 50th percentile, unsustainable states (U) in the 50th percentile and 75th percentile, and highly unsustainable (HU) in the 75th percentile and above. Further, the same steps have been followed to check the debt sustainability status of the different regions of India, such as the eastern, western, northern, southern, central, and northeastern regions.

CHAPTER 5

Analysis of Empirical Results

5.1 Introduction

The chapter presents the empirical results of the objectives of the thesis and gives a detailed discussion. Each objective was empirically tested following the research framework by applying the appropriate methodologies/approaches. The current chapter is divided into three parts. Part I captures the results of objective one, Part II consists of the results of objective two, and Part III is a compilation of the empirical results of objective three.

5.2 Section-I: Public Debt, Economic Growth, and Crisis

Section I has been divided into two parts. The first part shows the results of the nexus between public debt and economic growth. In the beginning, a preliminary analysis which includes descriptive statistics to analyze the data and a unit root test to check the stationarity of the data, is done. Then, the study proceeds to check the existence of the long-run co-integration between the dependent and the independent variable by employing the Bayer and Hanck co-integration test and the bound test of co-integration. After checking for the co-integration, we run the equation of ARDL to get the long- and short-run estimates. Further, the Granger causality test is applied to check the causality's direction. The detailed analysis is given below:

5.2.1 Revisiting the Debt-Growth Nexus: Evidence from India

I. Descriptive Statistics

Table 5.1, which presents the descriptive statistics of the variables under study, shows that the distribution of each variable is nearly symmetrical over the chosen period. Interestingly, the mean and median estimates for most of the variables are very close to each other. The skewness estimates indicate that all the variables are positively skewed except TRADE, INF, and FXR.

The findings of the Jarque-Bera test point to the non-rejection of the null hypothesis even at a 10% significance level, and confirm that all the variables are normally distributed.

Table 5.1

Descriptive Statistics of the Variables

	lnGDP	lnDEBT	lnGFCF	lnGFCE	lnTRADE	lnINF	lnFXR
Mean	31.520	4.248	30.148	29.293	-1.323	1.941	28.412
Median	31.464	4.244	30.119	29.267	-1.342	2.003	28.759
Maximum	32.612	4.422	31.429	30.436	-0.578	2.630	31.215
Minimum	30.515	4.024	28.858	28.266	-2.120	0.913	24.859
Std. Dev.	0.641	0.081	0.829	0.613	0.542	0.421	2.133
Skewness	0.118	0.101	0.062	0.145	-0.158	-0.399	-0.409
Kurtosis	1.788	4.006	1.607	1.869	1.512	2.361	1.780
Jarque- Bera	2.288	1.580	2.933	2.044	3.472	1.569	3.236
Probability	0.318	0.454	0.231	0.360	0.176	0.456	0.198

Source: Author's own

II. Unit Root Test

The purpose of the unit root is to examine the stationarity of the series and order of integration of each variable, i.e., GDP, DEBT, GFCF, GFCE, TRADE, FXR, and INF. Two different unit root tests are conducted for the analysis: ADF and PP tests. The test's null hypothesis assumes the presence of the unit root against the alternative hypothesis that the time series is stationary. The Akaike criterion estimates the optimal lag length for all the macroeconomic variables. The results obtained from the ADF and PP tests indicate that the null hypothesis is not rejected at

the level for any of the series. However, each series becomes stationary after taking the first difference (Table 5.2).

Table 5.2

Results of the Unit Root Test

Variable	Level Data		First Difference		Inference
	ADF	PP	ADF	PP	
lnGDP	-2.172	-1.837	-4.406***	-8.591***	I[1]
lnDEBT	-2.657	-2.751	-3.250*	-3.892**	I[1]
lnGFCF	-2.101	-2.042	-7.333***	-7.317***	I[1]
lnGFCE	0.747	-1.664	-5.392***	-3.479**	I[1]
lnTRADE	-0.045	-0.528	-4.699***	-4.718***	I[1]
lnFXR	-1.044	-1.306	-3.565**	-3.888**	I[1]
lnINF	-3.089	-2.858	-4.699***	-6.836***	I[1]

*Note: I[1] shows the integration order of one. ***, **, * Significant at 1, 5 and 10 per cent, respectively.*

Source: Author's own

III. Bayer and Hanck Cointegration Test

The Bayer-Hanck cointegration approach provides a combined test decision of multiple cointegration methodologies. The basic assumption of the method is that the null hypothesis of no cointegration is rejected if the F-statistic exceeds the critical values. Table 5.3 shows that the F-statistic is higher than the critical value in both cases. Therefore, the null hypothesis is rejected. The results suggest the existence of cointegration among the selected variables in the long run.

Table 5.3

Bayer-Hanck Cointegration Test

Model	F-Statistic		Decision
	EG-J	EG-J-Ba-Bo	
lnGDP = f(lnDEBT, lnGFCF, lnGFCE, lnTRADE, lnINF, lnFXR)	55.876***	55.931***	Cointegration
Critical Values at a 5% level of significance	10.352	19.761	

*Note: ***, **, * Significant at 1, 5 and 10 %, respectively.*
Source: Author's own

ARDL Bounds Test for Cointegration

Following the Bayer-Hanck cointegration test, the ARDL bounds test proposed by Pesaran et al. (2001) is conducted to test the long-run relationship between debt and growth. The suitability of this model is validated by conducting normality (Table 5.1), autocorrelation (Appendix B), and heteroscedasticity tests (Appendix A). The model clears all the standard diagnostic tests. The null hypothesis of the bounds test assumes that there is no level of relationship among the variables. It is evident from Table 5.4 that the null hypothesis is rejected at a 1% level of significance, as the F-statistic is higher than the lower and upper bounds.

Table 5.4

Bound Test for Cointegration

F-statistic	Level of significance	Lower critical value	Upper critical value
5.296121	10%	2.53	3.59
	5%	2.87	4.00
	2.50%	3.19	4.38
	1%	3.6	4.9

Source: Author's own

IV (a) Long-run and Short-run Estimates

Table 5.5 reports the results of long-run estimates of the ARDL model. The negative coefficient of the debt-to-GDP ratio implies that an increase of 1 per cent in debt causes a decrease of 0.23 per cent in economic growth in the long run. The findings are consistent with extant literature (Sen et al., 2007; Drine & Nabi, 2009; Kumar and Woo, 2010; Ogunmuyiwa, 2011). However, capital formation has a significant positive effect on economic growth in the long run, and expenditure affects economic growth negatively, as demonstrated by Adhikary 2011; Aigheyisi 2013; and Reddy 2019. As expected, trade openness and inflation negatively impact economic growth in the long run (Hodge, 2006; Were, 2015).

The country's holding of foreign exchange reserves significantly adversely affects growth. A change of 1 per cent of foreign exchange reserves leads to a change by a negative 0.03 per cent in GDP growth. The findings align with some of the previous empirical investigations (Ben-Bassat & Gottlieb, 1992; Aizenman & Marion, 2003; Nathaniel & Oladiran, 2018). The foreign exchange reserves of India have continuously been rising, and literature suggests that a consistent massive rise in foreign exchange reserves of a developing country can devise many problems, such as soaring inflation and fiscal costs, high-interest rates, and imports promotion, which could affect growth negatively (Mohanty & Turner 2006; Prasad et al. 2007; Park & Estrada 2009)

Table 5.5

Long-run Estimates of the ARDL Model

Variables	Coeff.	Std. Err.	t-stat.	Prob.
lnDEBT(-1)	-0.234	0.040	-5.863	0.000
lnGFCF(-1)	0.205	0.045	4.592	0.000
lnGFCE(-1)	-0.044	0.051	-0.863	0.397
lnTRADE(-1)	-0.048	0.024	-2.014	0.056
lnINF(-1)	-0.040	0.008	-5.157	0.000
lnFXR(-1)	-0.031	0.010	-3.152	0.005

Source: Author's own

Similarly, Table 5.6, which presents the short-run estimates of the ARDL model, shows that debt affects growth negatively in the short run as well. In addition, trade openness, inflation, and foreign exchange reserves also significantly adversely affect growth. The financial markets of emerging economies are not well established, and their absorptive capacity is limited for foreign exchange reserves (Gould, 2003; Polterovich & Popov, 2003). Hence, the enlargement of FXR affects economic growth through inflation and high imports (Prasad et al. 2007). However, expenditure and capital formation positively respond to growth in the short run at 10% and 1% levels of significance, respectively.

The error correction term confirms the existence of a long-run relationship (Banerjee et al., 1998). The ECT measures the speed of adjustment and should be negative within a range between 0 and 1. The findings suggest that the coefficient of ECT is negative and significant, implying that the dependent variable adjusts to changes in the independent variables at a speed of almost 88% to converge towards long-run equilibrium within a year.

Table 5.6

Short-run Estimates of the ARDL Model

Variables	Coeff.	Std. Err.	t-Stat.	Prob.
C	24.315	4.343	5.599	0.000
TREND	0.049	0.009	5.47	0.000
D(lnDEBT)	-0.426	0.074	-5.749	0.000
D(lnGFCE)	0.100	0.055	1.809	0.084
D(lnGFCF)	0.119	0.04	2.957	0.007
D(lnTRADE)	-0.042	0.024	-1.778	0.089
D(lnFXR)	-0.028	0.009	-3.141	0.005
D(lnINF)	-0.024	0.006	-4.045	0.001
ECT(-1)	-0.882	0.128	-6.869	0.000

Source: Author's own

IV (b) Stability Test

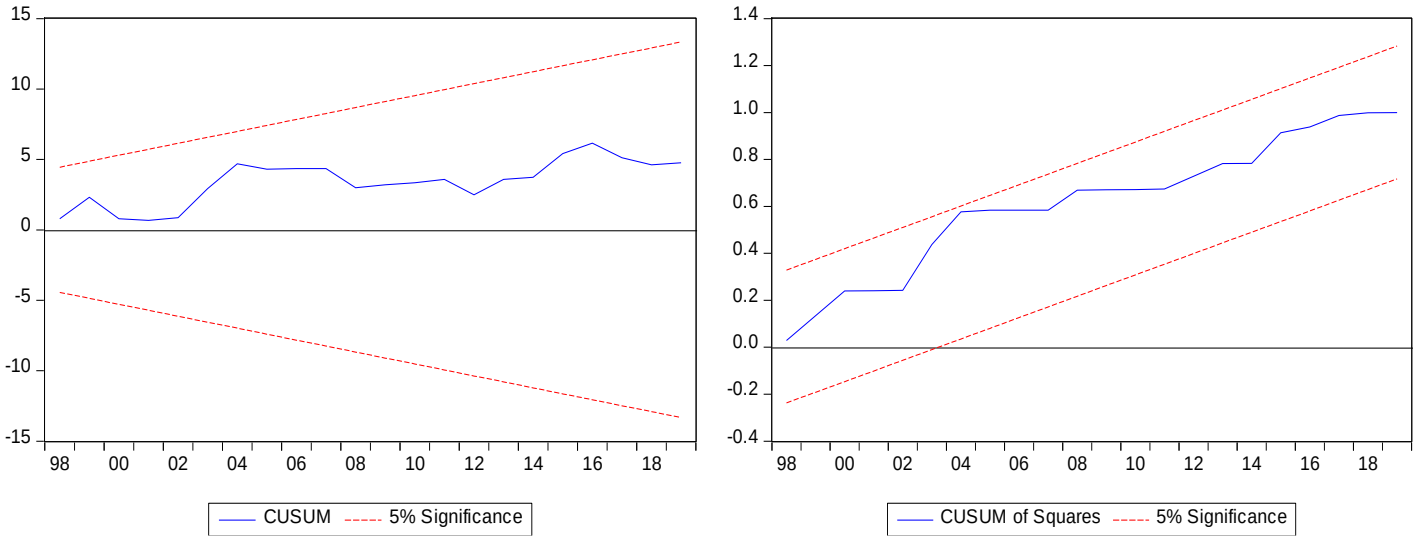
As explained by Brown et al. (1975), the cumulative sum of recursive residuals (CUSUM) and the CUSUM of the square (CUSUMQ) tests are used to check the robustness and the stability of a model. Interestingly, the cumulative sum of the estimated parameters should not move beyond the critical area at a 5% significance level. Figure 5.1 and Figure 5.2, which present the regression coefficients' fall within the boundaries of critical values at a 5% significance level, indicate that the model is stable.

Figure 5.1

CUSUM Test

Figure 5.2

CUSUM Square Test



Source: Author's own

IV. Granger Causality Test Results

The cointegration tests do not shed light on the direction of causality. Therefore, in the study, the direction of the causality is confirmed using the Granger causality test. The empirical results presented in Table 5.7 show that the first null hypothesis, which states that debt does not cause GDP, can be rejected as its p-value is significant at a 5% level. However, the second null hypothesis of GDP Granger causes debt cannot be dismissed due to an insignificant p-value. Hence, the results confirm that unidirectional causality runs from debt to economic growth in the short and long run. The rest of the results of the Granger causality test of all variables with GDP are given in Appendix C. The study finds a unidirectional causality moving from GDP to GFCF, GDP to GFCE, TO to GDP, and FXR to GDP. Similar to the findings of Riyath and Ismail (2018), the study's results also suggest bidirectional causality between INF and GDP.

Table 5.7

Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.

lnDEBT does not Granger Cause lnGDP	16.164	0.059
lnGDP does not Granger Cause lnDEBT	6.373	0.143

Source: Author's own

5.2.2 The Effect of the COVID-19 Pandemic on Economic Growth and Public Debt: An Analysis of India and The Global Economy

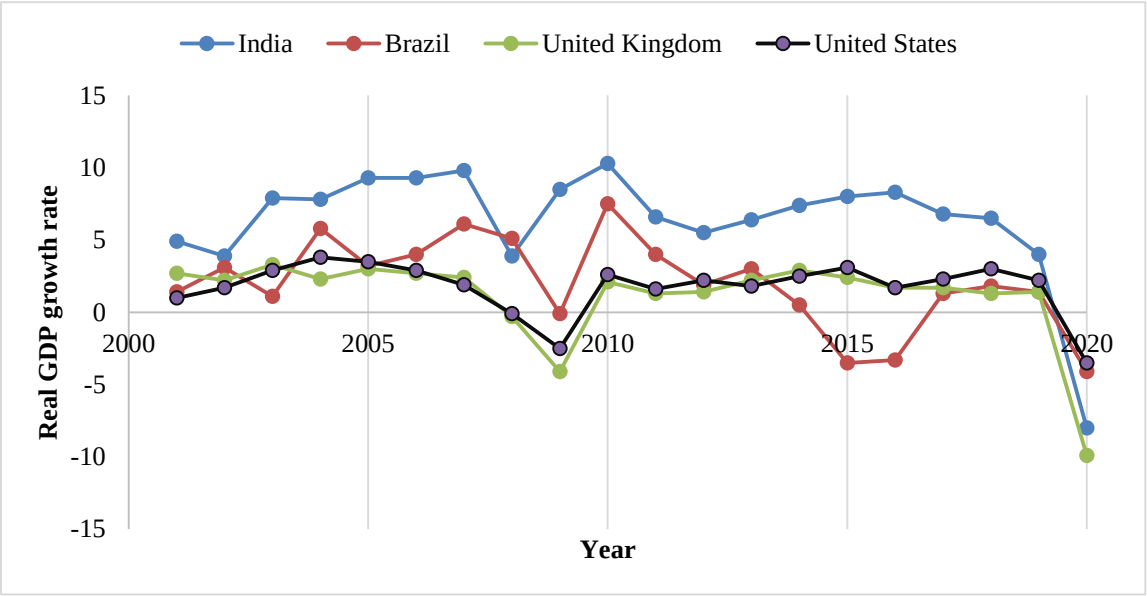
Part II shows the study's empirical results relating to the COVID-19 pandemic's effect on external debt and the economic growth of India and the global economy. Starting with the graphical representation of the current scenario of the public debt and economic growth of India, Brazil, the UK, and the USA, the stationarity of the data is checked. Finally, various ARIMA models are tried to select the best forecasting method. Later, India's GDP and external debt are forecasted for the next five years.

I. High Debt-Low Growth Trap in the Post-Pandemic Economy

Gross domestic product is the most used economic indicator to assess the overall economic measure. In practice, it takes into account the market value of all final goods and services produced in the economy. It is increasingly being recognized that any untoward macroeconomic events, such as the global financial crisis and the outbreak of the COVID-19 pandemic, have significant implications on the GDP of global economies, as shown in Figure 5.3. For example, in the aftermath of the ongoing COVID-19 pandemic, several countries have deviated from following fiscal prudence, leading to GDP contraction and public debt expansion.

Figure 5.3

Real GDP Growth Rate of the UK, the US, India, and Brazil, 2001-2020



Source: Author's illustration from World Economic Outlook data, IMF

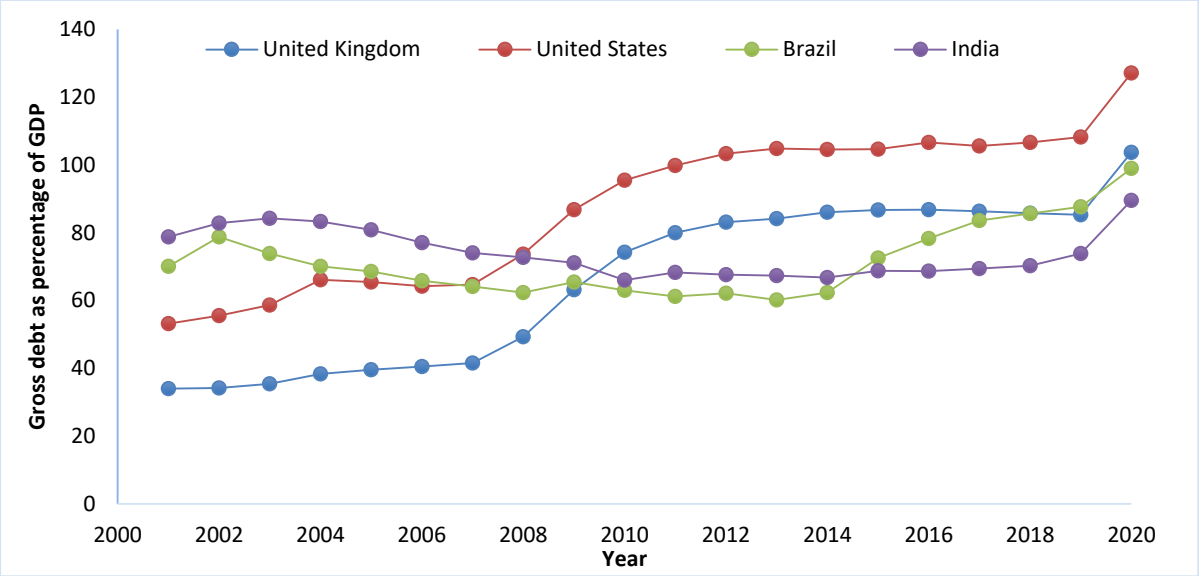
As mentioned earlier, macroeconomic instabilities, mainly resulting from the unprecedented crisis, have significant implications for public debt. Unlike the previous crisis, COVID-19 has impacted the economy severely, particularly the heavily indebted economies, and is expected to have a prolonged negative effect on public debt. An example of the four most severely affected countries by the COVID-19 pandemic: the United Kingdom, the United States, Brazil, and India.

As shown in Figure 5.4, which presents the gross debt as a percentage of GDP for four countries, namely, the United Kingdom, the United States, Brazil, and India, there has been a sharp upturn in the public debt since the onset of COVID-19 pandemic in 2020. Considering the developed economies, public debt as a percentage of GDP for the United Kingdom has more than doubled since the beginning of the global financial crisis. For the United States, it increased, though not doubled, from 73 per cent in 2008 to almost 127 per cent in 2020. The pattern is similar to that observed for the United Kingdom and the US, although India's and

Brazil's debt-GDP ratio was relatively stable until 2014. The public debt ratio for India increased by 23 percentage points between 2014 and 2020. Brazil's public debt rose from 49 per cent in 2008 to 104 per cent in 2020. In short, the public debt has recorded an 'unprecedented increase' since the pandemic outbreak. Crossing the desired level of public debt for many emerging economies is a significant cause for concern.

Figure 5.4

Gross Debt of the UK, the US, India, and Brazil as a percentage of GDP, 2001-2020



Source: Author's illustration from World Economic Outlook data, IMF

Likewise, the current health crisis has resulted in an unimaginable rise in overall expenditure. Moreover, in India, where more than half of the health expenditure is borne by the general citizens themselves (termed as out-of-pocket spending), the situation has worsened because of the declining incomes of the individuals due to the simultaneous economic crisis. The IMF World Economic Outlook 2020 report has listed the Indian economy as one of the economies that might get hit hard due to the high out-of-pocket expenditure on health and significant economic contractions. The report also underlines that in 2018, India, on average, utilized 43% of its external aid for health expenditure (International Monetary Fund, 2020).

II. ARIMA Estimations

When checked using Augmented Dickey-Fuller (ADF) unit root test, it is found that the data is non-stationary at a level for both the series,' i.e., GDP and external debt (Table 5.8). Therefore, the study ran the Partial Autocorrelation Plot Function (PACF) and Autocorrelation Plot Function (ACF) to identify the stationarity. The ACF shows a pattern where ACF crosses the standard error bound at all the lags. The same pattern can be seen for PACF in some of the lags. The results confirm stationarity by taking the series's first difference (Table 5.8). As expected, the null hypothesis of the presence of unit root at a 1% significance level is rejected. Then, again ACF and PACF are run to identify the possible models by determining three parameters, i.e. 'p', the number of time lags, 'd' the degree of differencing, and 'q', the moving average order. The study adopts ARIMA (1,1,1), ARIMA (1,1,2), ARIMA (2,1,1), and ARIMA (2,1,2) for GDP as well as for external debt to choose the best out of the four models.

Table 5.8

Augmented Dickey-Fuller Unit Root Test - GDP and External Debt India

Variable	Level	1st Difference
	t-stat	t-stat
GDP Growth	-1.47188	-6.36848***
External Debt	-2.42105	-3.95897*

*Note: *,**,*** represent significance at 10%, 5% and 1% levels.*
Source: Author's own

Table 5.9 shows the results of all the models. While comparing the results, it has been found that coefficients of AR and MA are significant in models ARIMA (1,1,2) and ARIMA (2,1,1) only. However, AIC, SC, and HQ values are lower for ARIMA (2,1,1) than ARIMA

(1,1,2). Hence, ARIMA is the best model for forecasting the GDP and external debt for the next five years (2,1,1).

Table 5.9

ARIMA Models – GDP and External Debt - India

		Coefficients		Criteria		
Variables	ARIMA (p,d,q)	AR	MA	AIC	SC	HQ
GDP	1,1,1	0.26772	-1.00000	27.53561	27.71337	27.71337
	1,1,2	-0.82893***	-0.74845***	27.80612	27.98388	27.86748
	2,1,1	-0.17458	-0.70912	27.57923	27.75699	27.64059
	2,1,2	-0.98259	0.90103	27.59737	27.77512	27.65873
External Debt	1,1,1	0.84478	-0.6559	24.92949	25.04859	24.97724
	1,1,2	0.15919***	0.28009***	24.90889	25.02799	24.95664
	2,1,1	0.36188	0.15894	24.88409	25.00319	24.93184
	2,1,2	0.62364	-0.31300	24.89989	25.01899	24.94764

Source: Author's own

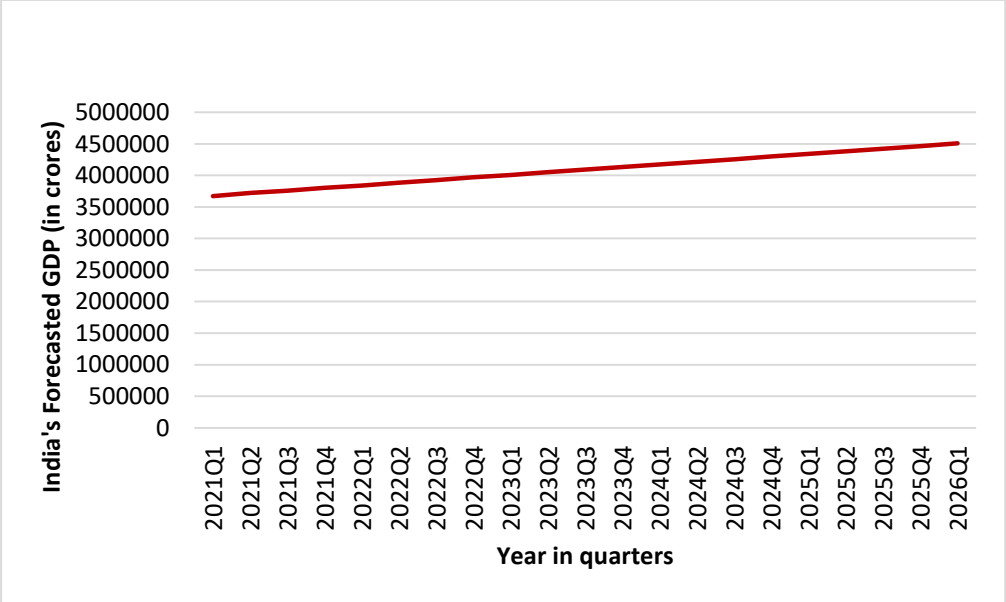
Appendix D and E show the diagnostic test results. The correlogram demonstrates that the lag values of ACF and PACF are within the 95% confidence bound. Moreover, all the p values are greater than equal to 0.05, indicating the absence of autocorrelation. Therefore, the residual terms are independent of each other, and the mean and variance are also constant over time for the model chosen as the best model. The model's inverse AR and MA roots (appendix F and G) are also within the circle, signifying the model's stability.

III. Forecasting

Using the same model, the study then tries to forecast the GDP for the next five years quarterly from 2021Q2 to 2026Q1. Appendix H shows the combined graph of earlier data and predicted GDP values. It shows how GDP started falling in the first quarter of 2020 and slowly achieved the values of 2019Q4, i.e., before the COVID-19 crisis. The forecasting results suggest that by the end of 2021Q1, the economy will show a sign of recovery (refer to Figure 5.5).

Figure 5.5

India's Forecasted GDP

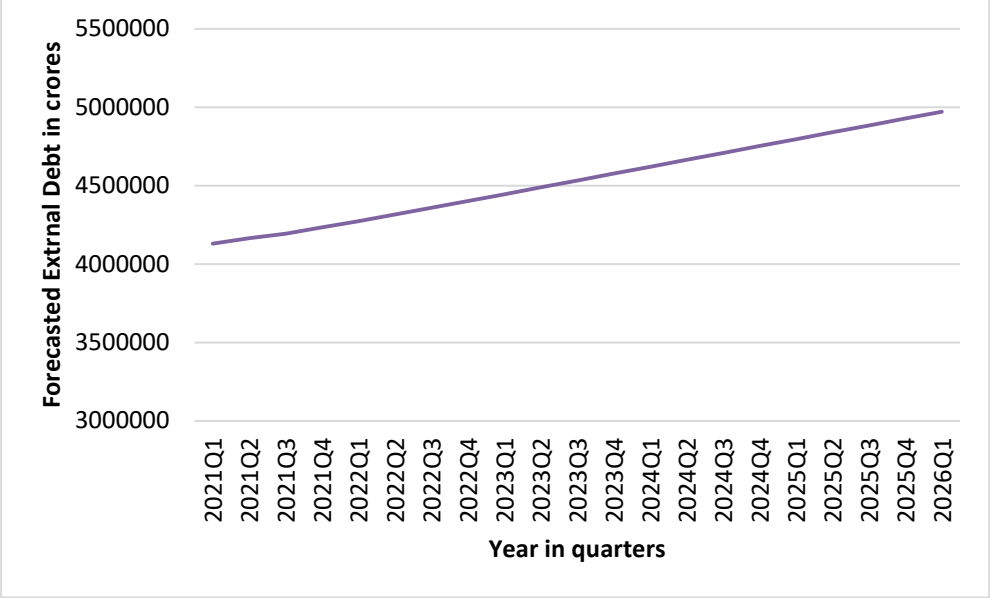


Source: Author's own

In the final step, external debt is forecasted for the period from 2021Q1 till 2026Q1. Appendix I shows the combined graph of earlier data and the predicted values of external debt. The projected values of external debt, as shown in Figure 5.6, suggest a continuous rise in external debt amidst the COVID-19 crisis at a high pace.

Figure 5.6

India's Forecasted External Debt



Source: Author's own

5.3 Section II: Debt Determinants, Threshold, and Sustainability

Section II is related to the second objective of the thesis and has been divided into two parts. Part I of Section II examines various determinants of public debt accumulation in India. The section is further bifurcated into two subsets. The first subset focuses on economic development as a determinant of debt, in which we apply the structural equation modelling (SEM) approach. The second subset reveals the role of natural resource rents in accumulating public debt. ARDL bound test is used to check the relationship between the selected variables.

Part II shows the study results, which examine debt sustainability via debt threshold estimation exceeding which debt can impair India's economic growth and may impede the future surge. Further, the study checks the fiscal response of primary surplus to rising public debt. The study also investigates the role of institutional quality in stimulating economic growth and reducing the negative effect of public debt on primary surplus. In the beginning, a preliminary analysis is done, which includes descriptive statistics to analyze the data and a unit root test to check the stationarity of the data. The focus of the study is limited to India only for

the period 1985-2020. Quadratic ARDL Bound, test, and fiscal reaction function approaches have been used for the estimations.

5.3.1 Does Economic Development Affect Public Debt Accumulation? Empirical Evidence from India

I. Empirical Results

After constructing the path diagram per the theoretical model, the next thing is to compute the standard estimates of the parameters. Following this, it is vital to calculate non-standard estimates, standard deviations, and t-statistics to determine the significance of each variable. Based on these estimates, it is possible to decipher the type of relationship between these variables with economic development and public debt. Lastly, different measures to check the model's goodness of fit are analyzed.

Estimates of model 1, as shown in Table 5.10, suggest that GDP per capita, no. of physicians, life expectancy, and infant mortality rate are the observed variables that define economic development. Here, economic development has been considered both an independent and latent variable. On the other hand, the findings indicate that economic development has a negative relationship with public debt. With the rise in economic development, there will be a decrease in public debt accumulation with a coefficient of 23.23. The standardized results show that a 1 unit change in almost half of the observed variables (HDI, GDPC, LE, IM) has an approximate 1 unit change in economic development. The hypothesis (H_1) is accepted for almost all the variables in Model 1 except for GEE and CHE.

Table 5.10

Estimates of the Model 1

Parameters	Unstandardized Estimates	S.E.	C.R.	Standardized Estimates
ED	-23.23	11.031	-2.106**	-0.434
GEE	1.547	1.224	1.263	0.497
GDPC	3.354	0.108	31.068***	1
CHE	0.158	1.514	0.104	0.226
HDI	1	0.344	2.631***	0.975
PHY	1.105	0.42	2.631***	0.41
LE	0.427	0.013	33.008***	0.992
IM	-2.813	0.115	24.548***	-0.998

*Note: ***, **,* signifies level of significance at 1%, 5% and 10% respectively*

Source: Author's own

Table 5.11 presents the estimates of Model 2. The results suggest that debt servicing, inflation and military expenditure are the critical factors of debt accumulation in India. While debt servicing and inflation have a negative impact on the accumulation of debt, elevation in military expenditure gives a boost to the public debt requirements. The standardised results show that military expenditure has the highest coefficient, i.e. 0.877, and has a positive relationship with public debt at a 1% significance level.

Table 5.11

Estimates of the Model 2

Parameters	Unstandardized Estimates	S.E.	C.R.	Standardized Estimates
IR	-0.771	0.616	-1.253	-0.278

DS	-3.073	1.816	-1.693*	-0.665
ME	1.156	0.223	5.183***	0.877
CPI	1			0.535
INF	-0.355	0.205	-1.738*	-0.291
GFCF	-0.534	0.489	-1.091	-0.229

*Note: ***, **,* signifies level of significance at 1%, 5% and 10% respectively*

Source: Author's own

The negative coefficient of inflation implies that any change in inflation beyond a threshold level is likely to create uncertainties in the economy, adversely affecting the public debt. Also, the negative debt servicing coefficient explains that any increase in the country's ability to repay (debt servicing ratio) will drag down the public debt accumulation or vice-versa. The remaining two variables, gross fixed capital formation and interest rate, do not significantly impact the dependent variable. The regression coefficient of corruption has been set to 1 here due to the pre-requirement of performing structural equation modelling. It is interesting to note that corruption has an impact of 0.535 units on public debt for a 1 unit change in corruption. The hypothesis (H_2) is accepted for all the macroeconomic variables in model 2 except IR and GFCF.

II. Goodness of Fit

There are various measures to assess the model fit. Almost all the goodness of fit methods are based on the chi-square function or the degrees of freedom. Time-series data focus on the measures that produce a good fit model index irrespective of the sample size or distribution.

Tables 5.12 and 5.13 present the goodness of fit model statistics with different criteria. Most of the criteria require the value of goodness of fit should satisfy the standard values. However, in some cases, the data and the variables selected for the study affect the goodness

of fit indices. Indices' value does not necessarily equal to or near the standard values as the model is always incomplete and can be improved with more modifications. It should be noted that a few variables in the model are important for the study and cannot be eliminated to improve the model's fitness. Thus, to maintain the study's essence, a few criteria are considered.

Table 5.12

Model Fit Summary - Model 1

Fitness Criteria	Current Value	Standard Value
χ^2	1.797	<3
GFI	0.823	≥0.9
RMSEA	0.155	<1
CFI	0.768	≥0.9

Source: Author's own

Table 5.13

Model Fit Summary - Model 2

Fitness Criteria	Current Value	Standard Value
χ^2	2.224	<3
GFI	0.73	≥0.9
RMSEA	0.193	<1

CFI	0.362	≥0.9

Source: Author's own

From Table 5.12, it is evident that model 1 satisfies the first three categories of the goodness of fit measure:

1. Based on the chi-square values of the model, which is less than the standard value depicting that model is fit.
2. The Goodness of Fit (GFI) standard values indicate an excellent fit if the indices of a model are equal to or higher than 0.90. Here, in the present case, the value is 0.823, significantly closer to 0.90, indicating a good fit. The same is the case with Comparative Fitness Index (CFI), the standard value is 0.90, but the current value is slightly below, i.e., 0.768, yet can be considered a good fit.
3. Root Mean Square Error of Approximation (RMSEA) value for the current study is below the standard value of <1, implying an excellent model fit.

Table 5.13 shows the results of the goodness of fit measures of model 2. The results indicate that out of the four, the model has a good fit in the first three criteria. The value of CFI is much lower than the standard value implying a lousy fit. Overall, it can be concluded that both models align with the data specifications.

5.3.2 Impression of Total Natural Resource Rents on India's Public Debt: An Empirical Analysis

I. Empirical Results

I (a) Preliminary Analysis

Table 5.14 shows the descriptive statistics for the variables of the research study. The kurtosis values near two and skewness values near zero signal that the data series used for the analysis

are normally distributed. Examining the other statistics, the mean, median and maximum values of DEBT, GDPC, and UR are almost similar, implying a consistent rise over the period. TNR was highest in 2008, with an actual value of 7.101 per cent of GDP and 1.960 in natural logarithm. However, after a sharp decline for a few years, it has started rising again. Inflation has fluctuated from high to low to moderate for the study period. Trade openness is seeing a slight decline each year from the previous years.

Table 5.14

Descriptive Statistics

	LNDEBT	LTNR	LNGDPC	LNINF	LNTO	LNUR
Mean	4.287	1.020	10.856	1.892	3.492	1.725
Median	4.279	0.918	10.820	1.873	3.649	1.732
Maximum	4.436	1.960	11.577	2.630	4.022	1.754
Minimum	4.189	0.548	10.258	1.202	2.741	1.662
Std. Dev.	0.071	0.355	0.418	0.455	0.398	0.026
Skewness	0.582	0.729	0.192	0.036	-0.304	-0.855
Kurtosis	2.284	2.941	1.797	1.555	1.715	2.627
Jarque-Bera	2.332	2.661	1.993	2.618	2.526	3.828
Probability	0.312	0.264	0.369	0.270	0.283	0.147
Sum	128.622	30.603	325.686	56.753	104.749	51.751
Sum Sq. Dev.	0.148	3.661	5.059	6.013	4.601	0.020
Observations	30	30	30	30	30	30

Source: Author's own

Results presented in Table 5.15 suggest that DEBT and INF are stationary at a level while TNR, GDPC, TO, and UR become stationary after taking the first difference. All the series are stationary at a 5% or 10% significance level. As the variables are integrated of mixed orders, the most suitable methodology to estimate the cointegration is ARDL bound test.

Table 5.15

Unit Root Test

Variable	Level	First Difference	Inference
LNDEBT	-3.208**	-3.079**	I[0]
LNTNR	-1.835	-5.786***	I[1]
LNGDP	-2.165	-5.015***	I[1]
LNINF	-3.254**	-6.704***	I[0]
LNTO	-2.169	-4.458***	I[1]
LNUR	-1.349	-3.428**	I[1]

Source: Author's own

I (b) Cointegration Test, Long-run and Short-run Findings.

The null hypothesis of the ARDL bound test for cointegration is "no level cointegration." However, the results presented in Table 5.16 show that F-statistics is higher than the critical upper bound at I(1), which implies the rejection of the null hypothesis. Thus, it can be concluded that public debt and other variables are co-integrated at a 1% significance level in the long run.

Table 5.16

ARDL Bound Test for Cointegration

F-statistics	Significance	I(0)	I(1)
12.548	10%	2.75	3.79
	5%	3.12	4.25
	2.50%	3.49	4.67
	1%	3.93	5.23

Source: Author's own

Tables 5.17 and 5.18 demonstrate the long-run estimates of the ARDL test, respectively. A significant positive association between TNR and DEBT is identified at a 5% significance level in the long run. One per cent change in total natural resource rents will have a 0.308 per cent positive change in public debt. In the short run, TNR has an insignificant negative effect on DEBT. Considering economic growth, a significant adverse linkage between GDPC and DEBT in the long and short run can be witnessed. However, the negative effect is higher (2.387) in the long run than in the short run (0.824). The coefficient of GDPC is the highest among the other selected variables, which validates that the GDPC of resource-rich economies plays a vital role in repressing public debt.

Table 5.17

Long-run Results of ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTNR(-1)	0.308	0.135	2.284	0.034
LNGDPC(-1)	-2.387	0.784	-3.045	0.007
LNINF(-1)	-0.170	0.047	-3.592	0.002
LNTO(-1)	-0.764	0.300	-2.547	0.020
LNUR(-1)	-0.311	0.921	-0.338	0.739

Source: Author's own

The coefficients of INF in the long and short run are negative and significant at the 1% level. A 1 per cent rise in inflation will result in a 0.170 per cent decline in public debt in the long run, while the effect is minute in the short run. The study reveals an inverse relationship between TO and DEBT in the long and short run. The results suggest that a 1% upsurge in trade openness will reduce public debt by 0.17%. This implies that an increase in trade activities significantly reduces the public debt in the long run. However, in the short run, the effect is minute.

Table 5.18

Short-run Results of ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNTNR	-0.004	0.039	-0.091	0.929
LNGDPC	-0.824	0.235	-3.502	0.002
LNINF	-0.059	0.016	-3.703	0.001
LNTO	-0.004	0.105	-0.042	0.967
LNUR	-0.107	0.327	-0.328	0.746
ECT	-0.345	0.035	-9.752	0.000

Source: Author's own

Finally, the study could not find a significant association between UR and DEBT in India's long run or the short run, unlike Haber and Neck (2006) and Joy and Panda (2020). The ECT is negative and significant, with a coefficient of 0.345, proving that 34% of disequilibrium in the model will be correct within a year.

I (c) Causality Test

Subsequently, the direction of causality is identified by employing the VAR Granger causality test. The findings represented in Table 5.19 affirm the rejection of the null hypothesis of no granger causality. The p-values are significant at a 1% level in both cases, therefore, suggesting bidirectional causality. This implies that the total natural resources and public debt Granger cause each other.

Table 5.19

VAR Granger Causality/Block Exogeneity Wald Tests

Dependent variable: LNDEBT

Excluded	Chi-sq	df	Prob.
LNTNR	8.9116	2	0.0116

Dependent variable: LNTNR			
Excluded	Chi-sq	df	Prob.
LNDEBT	9.2987	2	0.0096

Source: Author's own

5.3.3 Debt Threshold, Primary Surplus, and Institutional Quality: An Empirical Testing of the Debt Sustainability of India

I. Empirical Results

I (a) Descriptive Statistics

Table 5.20 shows the descriptive statistics of the selected data for the variables. The mean and median values of GDP, GFCF, GNE, FDI, IQ, and PS are almost equal, denoting symmetrical distribution contrary to the rest of the variables, i.e., PD and PD^2 with high variation in their mean and median. The statistics suggest that the variables are positively skewed. The probability values of the Jarque-Bera test indicate the normal distribution of data at a 5 per cent significance level.

Table 5.20

Descriptive Statistics

	GDP	PD	PD^2	GFCF	GNE	FDI	IQ	PS
Mean	4.48	71.68	5167.53	28.17	103.86	1.05	4.29	1.49
Median	4.61	69.65	4851.66	28.07	102.84	0.86	4.34	1.24
Maximum	7.30	84.24	7096.89	35.81	107.55	3.62	4.34	3.90
Minimum	-0.98	62.89	3955.66	21.80	99.78	0.03	4.03	-0.91

Std. Dev.	2.01	5.57	823.36	3.95	2.38	0.88	0.10	0.98
Skewness	-0.54	0.79	0.90	0.35	0.17	0.77	-1.82	0.15
Kurtosis	2.68	2.65	2.84	1.93	1.58	3.19	4.75	3.20
Jarque-Bera	1.87	3.77	4.77	2.38	3.09	3.53	23.67	0.19
Probability	0.39	0.15	0.09	0.30	0.21	0.17	0.07	0.91
Sum	156.77	2508.64	180863.60	985.99	3634.99	36.72	455.01	52.04
Sum Sq. Dev.	137.47	1055.55	23049358.00	529.80	192.93	26.64	287.95	32.76
Observations	35	35	35	35	35	35	35	35

Source: Author's own

I (b) Unit Root Test

Zivot and Andrews's (1992) unit root test is used in the present study. The reason for using Zivot and Andrew (ZA) unit root test over commonly used ADF and PP tests is that these tests do not give information about the structural breaks in sample size. At the same time, ZA helps to identify the structural breaks. Ignoring structural breaks can produce false results and lead to rejecting the null hypothesis, suggesting the presence of a unit root. The ZA test internally searches when the trend is broken to identify the most critical structural break spot. The test supports the structural break identification in intercept and slope (Cai and Menegaki, 2019; Matsuki and Pan, 2021). The date at which the t-stat is lowest is considered the structural break date.

The ZA test's null hypothesis (H0) is that the series has a unit root without a structural break. The alternative hypothesis (H1) is that the series is stationary with a structural break. Table 5.21 shows that all the variables are integrated of either I(0) or I(1). The series are

stationary with structural breaks at 5 per cent and 10 per cent significance levels. Also, 2004 and 2008 seem to be the prominent years of the break for most variables.

Table 5.21

Zivot Unit Root Test

	at level		at first diff		Stationarity
Variables	t-stat	break year	t-stat	break year	I(0)/I(1)
GDP	-4.85	2011	-12.94***	2012	I(1)
PD	-4.99**	2000	-4.41**	2009	I(0)
GFCF	-3.98***	2004	-8.15***	2008	I(0)
GNE	-3.70**	2004	-9.33***	2013	I(0)
FDI	-5.45***	2006	-7.98***	2009	I(0)
IQ	-5.18***	1996	-13.99***	2004	I(0)
PS	-4.27**	2013	-8.06***	2008	I(0)

*Note: *, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively.*

Source: Author's own

I (c) ARDL Bound Test Results

After checking the data's normality and the series' stationarity, ARDL bound test is used to examine the long-run co-integration among the selected variables. The F-statistics (10.14347) presented in Table 5.22 is higher than the upper bound value at a 1per cent significance level. Hence, the results confirm that the variables are co-integrated in the long run, rejecting the null hypothesis.

Table 5.22

ARDL Bound Test Results

Significance Level	Lower Bound	Upper Bound

F-statistic	10%	2.387	3.671
10.14347	5%	2.864	4.324
	1%	4.016	5.797

Source: Author's own

Table 5.23 represents the long-run estimates of the analysis. The results reveal that public debt boosts GDP growth before attaining a certain threshold. Beyond that threshold, it starts counteracting. The opposite signs of the coefficients and significance of PD and PD^2 at the 5 per cent level confirm the inverted U-shaped association between GDP growth and public debt. The findings align with Drine and Nabi (2010) and Reinhart and Rogoff (2010). Besides, using equation (2), a debt threshold value of 74.07 per cent of GDP is obtained, suggesting that the accumulation of debt over the threshold limit is likely to affect economic activities adversely (Shastri and Sahrawat, 2015; Misra et al., 2021).

The results further reveal that GFCF has a positive but insignificant effect on GDP growth. Consistent with Salman et al. (2019) and Sani et al. (2019), the study reveals that institutional quality also positively and significantly impacts GDP. One unit of change in IQ brings a 10 unit of change in GDP at a 1 per cent significance level. The effect of GFCF is insignificant, while GNE adversely affects the economy's GDP. On the other hand, FDI has a negative but insignificant effect on GDP in the long run.

Table 5.23

ARDL Long run Estimates

Variables	Coefficient	Standard Error	t-Statistic
PD	1.037	0.439	2.362**
PD^2	-0.007	0.003	-2.454**
IQ	10.442	1.060	9.847***

GFCF	0.053	0.045	1.179
GNE	-0.319	0.047	-6.817***
FDI	-0.109	0.146	-0.752

*Note: *, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively.*

Source: Author's own

Table 5.24 provides the short-run estimates of the analysis. Similar to the long-run outcomes, the public debt coefficients are positive and negative. In the short run, the association between economic growth and public debt follows a non-linear trend. Likewise, GFCF does not significantly impact GDP in the short run. However, GNE and FDI have significant negative coefficients indicating a negative effect on GDP, whereas institutional quality positively contributes to the GDP in the short run.

As expected, the error correction term is negative and significant, suggesting the pace of the adjustment in the equilibrium. The results show that roughly 87 per cent of the disequilibrium is corrected during a period of one year.

Table 5.24

ARDL Short-run Estimates

Variables	Coefficient	Standard Error	t-Statistic
PD	3.129	1.349	2.319**
PD2	-0.026	0.009	-2.833*

IQ	21.967	2.675	8.212***
GFCF	0.161	0.133	1.216
GNE	-0.420	0.159	-2.646**
FDI	-1.111	0.532	-2.088**
ECT	-0.873	0.120	-6.492***

*Note: *, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively.*

Source: Author's own

I (d) Fiscal Reaction Function Results

Table 5.25 presents the results of equation (5). The results reveal the direct impact of institutional quality and public debt on India's economic growth. Moreover, lagged values of primary surplus and other variables are included to evaluate the effects of previous values on the current value of primary surplus. Interestingly, the coefficient of the lagged dependent variable is significant at a 5 per cent significance level. The results further reveal that the Debt-GDP ratio negatively affects the PS at a 1% significance level. One unit change in DGR leads to a 1.65 unit change in primary surplus. This implies that the primary surplus negatively reacts to the mounting public debt. The ineffective utilization of the public debt results in the rise of expenditure over revenues which eventually affects the primary balance of the economy.

The coefficient of IQ is positive at a 1 per cent level of significance, which specifies that good institutional qualities positively contribute to the primary surplus performance. Table 5.25 shows that a 1 per cent change in institutional quality has a positive 0.89 per cent change in primary surplus. Moving to the output gap, the results show OG has an insignificant negative effect on PS. Furthermore, the dummy variable included in the model for the structural breaks in the PS negatively affects the primary surplus at a 1 per cent significance level.

Table 5.25

Response of Primary Surplus – Direct Impact of Institutional Quality and Public Debt

Variables	Coefficient	Standard Error	t-Statistic
LPS(-1)	0.321	0.160	2.003**
LDGR(-1)	-1.650	0.611	-2.701***
LIQ(-1)	0.896	0.429	2.089**
LOG	-0.009	0.029	-0.316
DV	-0.663	0.180	-3.679***
C	4.377	3.153	1.388

*Note: *, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively.*

Source: Author's own

Table 5.26

Response of Primary Surplus – Indirect Impact of Institutional Quality and Public Debt

Variables	Coefficient	Standard Error	t-Statistic
LPS(-1)	0.301	0.162	1.859*
LDGR(-1)	-1.076	0.856	-1.257*
LIQ(-1)	1.696	0.937	1.809*
LDGR*LIQ	-0.185	0.192	-0.961

LOG	-0.005	0.029	-0.169
DV	-0.754	0.203	-3.702***
C	1.851	4.109	0.450

*Note: *, ** and *** denote significance at 10%, 5% and 1% significance levels, respectively.*

Source: Author's own

Table 5.26 shows equation (6) estimates containing an interaction term that focuses on institutional quality in the association between debt and primary surplus. The empirical results suggest that the negative sign and significance of the debt-GDP ratio is maintained in both the models, i.e., equation (5) and (6). However, the coefficient size of the debt-GDP ratio reduces in the indirect model compared to the direct model after including the interaction term. This advocates that up-gradation in institutional quality has considerable influence in compressing the negative effect of public debt on primary surplus. Hence, enhancing institutional quality reduces the adverse effects of public debt but also helps to improve economic performance (Daud & Podivinsky, 2014; Presbitero, 2008). The signs of the output gap and dummy variable confirm that these variables negatively affect the primary surplus. However, the effect of the output gap is insignificant as per the results.

5.4 Section III: State Debt Determinants and Sustainability

Section III has two Parts, I and II. Part I emphasizes the factors influencing debt sustainability among the Indian states and how the magnitude and relationship between these factors and the debt changes with the change in debt level. After the preliminary analysis, quantile regression is employed to examine the effect of each factor varying with the state-specific level of debt. Part II shows the results of the debt sustainability index of the Indian states. The aim was to

analyse each state and region's relative position and find out the reason behind the difference in the sustainability condition of a particular state. Further, each state and region has been ranked based on the debt sustainability score.

5.4.1 What Aggravates State Indebtedness? A Panel Study of Indian States

I. Empirical Results

I (a) Descriptive Statistics

Table 5.27 shows the data description of all variables. The skewness coefficients are not equivalent to zero, implying that the data is asymmetrical. The positive values of kurtosis denote that distributions of the variables have fatter tails. The high volatility can be seen in the states' primary deficit, tax revenues, and gross state domestic products.

Table 5.27

Descriptive Statistics

Variables	Mean	Median	Max	Min	Std. dev.	Skewness	Kurtosis	Obs.
SD	3.329	3.256	2.352	4.151	0.316	0.261	3.381	252
GDC	9.141	9.227	6.571	11.668	1.258	-0.265	1.945	252
TR	9.566	10.121	5.849	12.335	1.701	-0.579	2.074	252

IP	8.191	8.447	5.252	10.474	1.461	-0.355	1.874	252
PD	5.472	8.461	-9.804	11.534	6.432	-1.327	3.056	252
SSE	9.816	17.008	7.238	12.114	1.542	-0.350	1.916	252
GSDP	16.601	17.008	13.495	19.188	16.601	-0.455	1.904	252
EL	0.218	0.000	0.000	1.000	0.414	1.364	2.861	252

Source: Author's own

I (b) OLS Regression Results

OLS regression results are reported in Table 5.28. Out of four fiscal factors, three factors significantly affect state debt accumulation. While GCE and IP positively contribute to the state debt, TR has a negative impact on the same. One unit change in TR leads to a negative 0.25 change in state debt. PD does not play a significant role in determining the state's indebtedness. Among socio-economic factors, only GSDP has a negative effect on the debt at a 1% level of significance. The years in which elections are held also do not significantly contribute to aggravating the debt. As per the r-squared statistics, the selected explanatory variables explain 63% variation in the dependent variable, i.e., state debt.

Table 5.28

Determinants of State Debt - OLS Regression Results

Independent Variables	**Dependent Variable: Debt-GDP Ratio**		
		Coefficient	t-stat
Fiscal Factors	GCE	0.0735	1.670*
	TR	-0.2534	-5.332***

	IP	0.5332	14.436***
	PD	-0.0029	-1.3250
Socio-Economic Factors	SSE	-0.0673	-1.3000
	GSDP	-0.3071	-5.149***
Political Factors	EL	0.0050	0.1690
R-squared	0.6396		
Adjusted R-squared	0.6293		
No. of observations	252		

Source: Author's own

I (c) Quantile Regression Results

Almost all the results presented in Table 5.28 authenticate those posit in Table 5.29. However, these are the average results, which can differ at the upper and lower tails. Results represented in Table 5.29 for quantile OLS regression are more subtle than those in Table 5.28 for OLS regression. Amongst the fiscal covariates, TR and IP were significant at a 1 per cent level for all the quartiles. Further, TR and IP's negative and positive effects on debt are similar throughout the low to high quartile range. GCE positively contributes to debt if a state's debt level is within the quartile range of 30 to 50. The effect of PD remains significantly negative for the lower tail; later, the effect becomes insignificant and positive at higher tails. This implies that PD has a negative effect on the debt of states with low debt levels.

Table 5.29

Determinants of State Debt - Quantile Regression Results

Independent Variables	Dependent Variable: Debt-GDP Ratio									
		0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Fiscal Factors	GCE	0.093	0.057	0.093*	0.0945**	0.0999**	0.067	0.105	0.127	0.127
	TR	-0.271***	-0.287***	-0.301***	-0.264***	-0.252***	-0.257***	-0.231***	-0.251***	-0.333***
	IP	0.485***	0.488***	0.492***	0.529***	0.527***	0.543***	0.537***	0.471***	0.573***
	PD	-0.006**	-0.004	-0.003	-0.003	-0.003	0.001	0.000	-0.002	0.002
Socio-Economic Factors	SSE	-0.031	-0.019	-0.097*	-0.117**	-0.111*	-0.123	-0.141	-0.105	-0.094
	GSDP	-0.258**	-0.240***	-0.208***	-0.262***	-0.279***	-0.269***	-0.305***	-0.269***	-0.301***
Political Factors	EL	-0.006	-0.008	0.045	0.024	-0.002	0.011	0.039	0.011	-0.017

Source: Author's own

Amid socio-economic factors, the significance for SSE holds only for three quantiles, i.e., 30, 40, and 50, while the effect of GSDP is significant throughout all the quantile ranges. The SSE negatively affects states' debt with a debt level within the quantile of 30 to 50. GSDP has an adverse effect at all debt levels, either low or high. Political factor: the election does not significantly contribute to the state's indebtedness at any debt level.

5.4.2 Relative Position of Indian States and Regions on Debt Sustainability Index

Empirical Results

I (a) PCA Results

At first, PCA is applied to four indicators of debt sustainability. Table 5.30 and 5.31 represents the results, comprising eigenvalues, factor loadings, and the cumulative variance of correlated indicators. The first three components represent 94% of the total variance. The first and second principal components elucidate 50% and 74% of the total variance, respectively. The components are associated with liability, deficit, servicing, and growth indicators (Table 5.31). The first component (Comp1) is significantly associated with the liability (0.379), the deficit (0.652), the debt servicing (-0.514), and (-0.409). The positive signs of liability and deficit imply that these indicators contribute to the states' unsustainability conditions.

Table 5.30

Eigenvalues of Relative Components

Components	Eigenvalue	Proportion	Cumulative
Comp1	1.999	0.500	0.500
Comp2	0.949	0.237	0.737
Comp3	0.799	0.200	0.937
Comp4	0.254	0.064	1.000

Source: Author's own

Table 5.31

Factor Loadings of Relative Components

Variables	Comp1	Comp2	Comp3	Comp4
Liability	0.379	0.827	0.19	-0.368
Deficit	0.652	0.054	-0.077	0.753
Servicing	-0.514	0.307	0.636	0.488
Growth	-0.409	0.468	-0.744	0.244

Source: Author's own

I (b) DSI Score and Ranking of States.

Table 5.32 shows the DSI score, rank, category, and the region under which each state falls. The score for states ranges between 0.377 and 0.711. Based on minimum to maximum scores, states have been ranked. While Puducherry scores the lowest, Jammu and Kashmir score the highest. The lowest score represents high debt sustainability, and the highest score represents low debt sustainability, meaning debt is unsustainable. The results suggest Puducherry, Odisha, Jharkhand, Maharashtra, and Karnataka are the top five highly debt-sustainable states.

In contrast, Jammu and Kashmir, Punjab, Nagaland, Arunachal Pradesh, and Rajasthan are the top five highly unsustainable states. The sample was segregated into six regions to check the region-wise sustainability of the states and UTs. The analysis discloses that most northern, southern, and northeastern states are either unsustainable or highly unsustainable.

Table 5.32

Debt Sustainability of Indian States Index Ranking

States/UTs	DSI score	Rank	Category	Region
Andhra Pradesh	0.529	22	HU	Southern
Arunachal Pradesh	0.630	27	HU	North-eastern
Assam	0.470	18	U	North-eastern
Bihar	0.441	14	S	Eastern
Chhattisgarh	0.425	12	S	Central
Goa	0.406	10	S	Western
Gujarat	0.388	9	S	Western
Haryana	0.502	19	U	Northern
Himachal Pradesh	0.455	17	U	Northern
Jammu & Kashmir	0.744	30	HU	Northern
Jharkhand	0.323	3	HS	Eastern
Karnataka	0.348	5	HS	Southern
Kerala	0.552	25	HU	Southern
Madhya Pradesh	0.412	11	S	Central
Maharashtra	0.334	4	HS	Western
Manipur	0.534	23	U	North-eastern
Meghalaya	0.368	6	HS	North-eastern
Mizoram	0.505	20	U	North-eastern
Nagaland	0.641	28	HU	North-eastern
Odisha	0.298	2	HS	Eastern
Puducherry	0.283	1	HS	Southern
Punjab	0.662	29	HU	Northern
Rajasthan	0.556	26	HU	Northern
Sikkim	0.375	7	HS	Eastern

Tamil Nadu	0.516	21	U	Southern
Telangana	0.384	8	HS	Southern
Tripura	0.452	16	U	North-eastern
Uttar Pradesh	0.436	14	S	Central
Uttarakhand	0.435	13	S	Central
West Bengal	0.540	24	HU	Eastern

Source: Author's own

The fiscal condition of northern states is at an alarming stage as all the northern states fall under the highly unsustainable category. Among the southern states, Karnataka, Puducherry, and Telangana are still performing well on the fiscal ground. Only Meghalaya is highly sustainable among the northeastern states, and the rest are unsustainable. Furthermore, while computing weights for each component, it was found that fiscal deficit has the highest weightage in the debt sustainability index. This signifies that fiscal deficit plays a significant role in determining a state's debt sustainability or unsustainability. The data also suggests that the states with low fiscal deficits are sustainable.

I (c) DSI Score and Ranking of Regions in India.

To check the robustness of the results, the empirical analysis is extended to test the sustainability of each region separately. The results are shown in Table 5.33 and Appendix K and L. The results match the previous results. The northern and southern regions are highly unsustainable, the central and western regions are highly sustainable, the eastern region is sustainable, and the northeastern region is unsustainable. When ranked, the western region is at the top of the debt sustainability index, followed by the central region at second rank, then the eastern and northeastern regions at the third and fourth rank, respectively—southern and northern secure the last two ranks.

Table 5.33

Debt Sustainability of Regions in India Index Ranking

Region	DSI score	Rank	Category
Northern Region	0.707	6	HU
Southern Region	0.689	5	HU
Western Region	0.010	1	HS
Eastern Region	0.304	3	S
Central Region	0.277	2	HS
North-eastern Region	0.594	4	U

Source: Author's own

The western and central regions have the lowest outstanding liability to GSDP ratio compared to the other areas. In contrast, northern and southern states have a high outstanding liability to GSDP ratio but are lesser than the northeastern states, as per the data. This could be the reason for the unsustainable conditions of northern and southern regions. Further, the debt servicing ratio and the difference between the interest rate and GSDP growth rate is high, too, depicting that possibly most of the funds procured by way of debt are utilized to repay the existing liabilities, including the principal amount and the interest.

5.5 Summary

This chapter discusses the empirical results of the objectives obtained by employing different methods. Beginning with the investigation of the debt-growth nexus in the case of India, it was found that there is a long-run relationship between economic growth and India's public debt. While examining the determinants of public debt in India, the research suggested that macroeconomic variables and various developmental play significant roles in determining public debt accumulation in India. Next, the debt sustainability of India by using various approaches was investigated, and it was concluded that India is debt unsustainable. Lastly, the

study determined whether the Indian states are debt sustainable by constructing a debt sustainability index. The findings suggested that most Indian states are debt unsustainable due to low revenue generation and improper utilisation of borrowed funds.

CHAPTER 6

Conclusion and Policy Implications

6.1 Introduction

The present chapter compiles the conclusions and policy implications of each thesis objective. Specific conclusions drawn based on the findings of the objectives are presented. Then novelty of the research is provided, followed by policy recommendations. At last, the chapter will cover the limitations of the study and the future scope of research.

6.2 Conclusion and Discussion

6.2.1 Nexus Between Public Debt and Economic Growth in India

In the first objective, the study examines how debt and other key macroeconomic variables, such as public expenditure, capital formation, inflation, trade openness, and foreign exchange reserves, affect economic growth by using the Bayer-Hanck cointegration test. In order to check the robustness of the model, the results of Bayer-Hanck cointegration are compared with the ARDL bounds test results. The results of both analyses suggest that the variables are co-integrated in the long run. Considering the impact of explanatory variables on economic growth, the study found that debt and inflation have a negative effect on economic growth. This is mainly due to the unproductive utilisation of funds raised through debt and delayed repayment of the debt liability resulting from high-interest payments. As expected, trade openness, expenditure, and foreign exchange reserves significantly adversely affect the growth of the Indian economy.

Taking a cue from Aigheyisi (2013), irrational spending and unproductive utilisation can be one of the reasons for the negative effect of public expenditure on growth. Presumably, the rise in imports is a primary reason for the negative impact of trade openness on economic growth in the long run. Not surprisingly, capital formation has a significant positive effect on growth. As explained by Gould (2003) and Prasad et al. (2007), the low absorption capacity of

financial markets of emerging economies leads to a rise in inflation, fiscal cost, and imports with the enlargement of FXR and later affects economic growth negatively. Moreover, India's foreign exchange reserve has continuously been rising over the past decade, pushing it to the 4th rank in the list of highest foreign exchange reserve holding countries.

The Granger causality test's empirical results indicate unidirectional causality running from debt to economic growth in the long run. The study highlights the need for considering a threshold level of public debt beyond which the economy cannot acquire funds on credit. It is acknowledged that the increased debt after a certain limit could negatively impact economic growth.

6.2.2 Impact of COVID-19 Pandemic on Economic Growth and Public Debt in India

In examining the impact of the Covid-19 pandemic on economic growth and public debt with special reference to India, it is found that the economy witnessed a contraction in the first quarter of the year 2020 due to the suspension of economic activities. Although the Indian economy shows signs of revival of economic activities, it requires vigorous resuscitation through fiscal stimulation. The ARIMA model forecasting results revealed that external debt would continue to grow to meet the increasing health expenditure, and GDP would also bounce back slowly after the end of 2021.

It is worth noting that the Indian government has taken several policy measures to stimulate economic activities. Consequently, the Indian government has taken more extensive measures to stimulate the contracted economy (Patra et al., 2021). One of the striking measures is the Aatma Nirbhar Bharat Abhiyan (ANBA) scheme, which aims to facilitate the debt of INR 20 lakh crore. The revival package accounts for about 10 per cent of the Indian GDP. To make the country more self-reliant, reviving the Micro, Small, and Medium Enterprises

(MSMEs) is recommended. The scheme was launched to revive the economic aftermath of the pandemic and economic crisis.

The various segments of the ANBA zeros in on the composition and size of the stimulus along with consumption, liquidity, and investment. The benefits of ARBA are expected to accrue through investment channels in the coming years primarily. Having said that, the recurrent occurrence of new and even more dangerous mutants of COVID-19 is likely to strike the economy in unprecedented ways. A steady deceleration in output, income, and employment in the future may lead to mounting public debt and the risk of default, further aggravating the debt distress level.

6.2.3 Determinants of Public Debt in India

Regarding the second objective, Evidence drawn from the analysis suggests that economic development, inflation, military expenditure, debt servicing, and corruption are the main factors influencing the debt GDP. Improved economic development, such as the healthcare system, education, and standard of living, enhances labour productivity, employment opportunities, and overall capital efficiency. It increases income and investment, which later help economic growth and makes the country less dependent on other financial institutions. This could be the possible reason for the adverse effect of economic development on public debt.

Presumably, the positive relationship between CPI ranking and public debt is because, with improved corruption ranking, the credibility of an economy increases, thus providing easy access to borrowings. High credibility makes borrowing easy. On the other hand, a rise in the debt servicing ratio also depicts that the economy is doing well and can repay its debts timely, which helps reduce debt. Also, excessive expenditure on the military or defence as a GDP ratio should be taken care of because a significant part of new debts goes for defence. Moreover,

inflation is a negative factor in determining the public debt accumulation of the country. High inflation may increase uncertainty in the market and might also increase the cost of issuing domestic debt. The findings are consistent with the existing literature (Ghosh et al., 2013; Omrane Belguith and Omrane, 2017; Cooray et al., 2017; Kaur et al., 2018; Lakshmanan, 2019).

Further, in examining the role of natural resource rents in driving the public debt in India, the findings exhibit that total natural resource rents positively contribute to the public debt in the long run. In contrast, the effect is negative in the short run but insignificant. The positive relationship between natural resource rents and public debt is supported by the facts stated in existing studies. Any exploration or mining of natural resources makes the governments believe in future windfalls, which over the period, give rise to heavy borrowings to support major future projects for stimulation of development and growth (Ampofo et al., 2021)—eventually pushing the economy towards the debt trap and debt overhang phenomenon.

6.2.4 Debt Threshold and Debt Sustainability in India

In investigating the debt sustainability of India by measuring the debt threshold and the fiscal responsibility of the primary surplus to the change in the public debt ratio, the study highlights the role of institutional quality in spurring economic growth performance and minimizing the negative impact of public debt on primary surplus. As per the World Economic Outlook database on debt, the public debt-GDP ratio of India was 89.61 per cent in 2020, and the empirical results show that the debt threshold of public debt in India is 74.07 per cent. This indicates that the Indian economy has already crossed its debt threshold due to the continuous accumulation of public debt in the recent period. The findings confirm any further rise in the debt ratio beyond that point will harm economic growth. However, the current health crisis due

to COVID-19 has made the economy so vulnerable that it had to borrow more funds to develop health infrastructure, support research for medication to fight against COVID-19, vaccinate the citizens, etc.

The response of primary surplus to the change in the debt-GDP ratio is also negative as per the estimation results, which indicates that rising debt adversely affects the government's revenues because most of the revenues go into repaying the debt and interest liabilities. The debt position of India fails on both the parameters of debt sustainability and comes out to be unsustainable. Furthermore, institutional quality also plays a prominent role in stimulating growth and reducing the negative effect of public debt on primary surplus.

6.2.5 Debt Sustainability and Variation in Debt Position of Indian States

For the third research objective, the quantile regression model is applied to investigate the debt sustainability of Indian states. The study revealed that the current health crises have severely affected the Indian economy. It has increased public spending at all levels of government to provide health facilities in order to contain COVID-19. However, the debt sustainability position of states differs as their debt drivers differ. Some states face high deficits, such as West Bengal, Uttar Pradesh, Uttarakhand, Tamil Nadu, Rajasthan, Punjab, Madhya Pradesh, Kerala, Karnataka, Jammu Kashmir, Haryana, Bihar, and Andhra Pradesh. Further, their social sector expenditure and capital expenditure are also high compared to other states, as per the data. The degree of diversity is much high among the states.

Against this consideration, the current research attempted to examine socio-economic, financial, and political variables as the drivers of state government debt by focusing on each driver's heterogeneous effect when the debt level changes. The study analyzes 28 states by employing quantile regression from 2011-2019. The results reveal that the impact of each driver changes with the change in the level of debt. In other words, the magnitude of the effect

varies depending on the quantile in which the debt percentage of a state falls. In some cases, the effects were positive and significant for some parts of the distribution; the effects were insignificant for others. Moreover, in some cases, the effects were opposite for the upper and lower tails of the distribution.

After examining the impact of drivers of debt at different quantiles, the research is extended to find out the debt sustainability position of each state after the COVID-19 pandemic. The research aimed to compare the states and examine which variables are most influential in the state's fiscal health. To achieve this objective, the debt sustainability index is constructed for 2020-2021. The results revealed that almost half of India comes under the unsustainable debt category. Mostly, the states falling under the northern and southern regions are severely affected by the COVID-19 pandemic. The crises lead to a high rise in debt and a reduction in revenue generation.

The study suggests that Pondicherry is a highly debt-sustainable state, while Jammu and Kashmir fall under the highly unsustainable state. The reason for such variation in the debt sustainability of states is mainly the fiscal deficit, i.e., high differences in the revenue generation and expenditures of the states. The results suggest that the states with a low fiscal deficit are sustainable.

6.3 Novelty of the Research Work

- The thesis revisits the nexus between public debt and India's economic growth by employing recent novel techniques for more robust findings.
- The study also analyzes the effects of the COVID-19 pandemic on public debt and the economic growth of India, which is a novel addition to previous literature.

- The thesis contributes to the existing literature by investigating the role of economic development and natural resource rents in driving public debt in India.
- The thesis also contributes to the literature by examining the role of institutional quality in influencing the impact of public debt on India's economic growth.
- A thorough examination of the debt sustainability of India by using different approaches such as debt threshold, fiscal reaction function, and growth-interest rate differential is also a novel contribution to the existing literature.
- To the best of our knowledge, this is the first time a state-level analysis of debt sustainability has been conducted by investigating the change in impact of various variables on the change in the level of debt.
- The thesis adds to the existing literature by constructing a debt sustainability index for analyzing the differences in debt sustainability of the states.

6.4 Policy Implications

- The findings of the study have significant policy implications for the Indian economy, particularly in the context of the COVID-19 pandemic, which has resulted in a steep decline in economic growth and a subsequent rise in public debt. Policymakers can take a more cautious approach to halting the rising debt and keeping to the sustainable growth path. Although the risk for India is not extremely severe, the unprecedented increase in public debt is a major cause for concern and poses a severe threat to achieving sustainable growth. It is believed that the timely implementation of policies to improve fiscal sustainability could help increase the country's liquidity position. In addition, favouring the productive utilisation of public debt is essential to impact economic growth positively. The government should focus on increasing its primary

surplus so that debt servicing can be improved and timely debt repayments can be made to avoid the burden of increased interest liabilities.

- The government must maintain public investment in human resources, skill development, healthcare, and environmental preservation while dealing with debt-deficit unevenness. It is suggested that the world economy must continue the stimulus package, which is likely to speed up the recovery process. With the infusion of additional financial resources, the economy responds positively by creating effective demand.
- From a policy perspective, transparency should be maintained to improve the CPI score and reduce corruption and debt requirements. Taking care of the excessive expenditure on the military or defence is urgent because a significant part of new debts goes to defence (Gupta and Bedarkar, 2016). Economic development should be paramount so the country would be more self-reliant, generate more employment, and improve labour productivity.
- The corrupt environment, feeble regulations, and ineffective government nature create an opportunity to embezzle borrowed funds, inflating the negative impact of debt. Therefore, extensive improvement in institutional quality is required for the proper utilization of borrowed funds and sustainable growth.
- The study suggests that prudent institutional behaviour and economic policies are necessary for regulating and administrating the debt sustainability of resource-abundant economies. The economies must limit their borrowings during windfalls to avert adverse conditions. Moreover, the resource revenues should be diverted towards the real sectors rather than collateral for borrowings. Commitment to rational borrowings, transparency in the system, and effective and efficient utilization of the revenues

generated through natural resources will indeed downturn the public debt in the long run.

- Since inflation and trade openness have a negative linkage with public debt, the study proposes boosting the export of commodities and curtailing imports of luxury items. Also, liberal trade policies will augment foreign direct investments and reduce resource-abundant economies' dependency on public debt.
- It is suggested that policymakers should bear in mind each variable's varying effect on the debt level. While enforcing strict policies on the level of debt can have an unwanted effect on the controllable variables, such as investments and social sector expenditure of the states, the liberal policies for debt accumulation can also throw the states into a debt trap. Therefore, every aspect of all the controllable and uncontrollable variables should be addressed while setting a debt limit. The states must channel expenditure to sectors that crowd private investments and optimize multiplier effects and inter-temporal and intersectoral linkages that boost output, employment, and productivity.

6.5 Limitations and Future Scope

- Though, in recent years, the Indian economy has become highly dependent on domestic debt, the present study is more focused on the general government debt, i.e., the public debt of both central and state governments. It is important to theoretically explain why a higher debt level denominated in domestic currency exerts negative pressure on GDP growth after the threshold. The study investigating the individual effect of domestic debt on economic growth can be focused upon in future research.
- Further, the study only discusses the changes and effects on debt and economic growth due to COVID-19. The effect of the ongoing health crisis on the primary balance,

spending, and revenues of the government can also be explored for a better understanding of the rise in debt and slowdown in economic growth.

- The study only focuses on the fiscal, social and political characteristics of the Indian states in determining debt sustainability. While demographic and geographical characteristics are equally important. As per some recent studies in the context of other developing nations, geographical characteristics play an important role in the debt positions of the sub-national governments. Similarly, human capital also determines the efficient utilization of borrowed funds. While states with more young human capital are expected to be more efficient in paying back the debt, the states with older generations might have to pay more social security, increasing the debt burden and making the state less efficient. Similarly, the level of pollution (carbon emissions or PM10) would reflect a better picture of the quality of life and growth instead of a simple set of social factors. These aspects required to be studied separately.
- The scope of the present study is limited to India. The study can be extended to a specific group to analyse the group behaviour of the economies. The role of institutional quality in influencing the impact of debt on economic growth can be analysed for a group of countries. Likewise, the role of natural resource rents as a factor of public debt can also be analysed for a group of countries to understand the differences and similarities. Further, bureaucraticsalary bills may reflect a better picture of unproductive expenses. Hence, it can be considered in the future scope of research.

REFERENCES

Abbas, S. M. A., & Christensen, J. E. (2010). The role of domestic debt markets in economic growth: An empirical investigation for low-income countries and emerging markets. In *IMF Staff Papers*, 57(1). Palgrave Macmillan. https://doi.org/10.1057/imfsp.2009.24

Abbott, A., Cabral, R., Jones, P., & Palacios, R. (2015). Political pressure and procyclical expenditure: An analysis of the expenditures of state governments in Mexico. *European Journal of Political Economy, 37*, 195–206.

https://doi.org/10.1016/j.ejpoleco.2014.12.001

Abdullahi, M. M., Bakar, N. A. B. A., & Hassan, S. B. (2015). Determinig the macroeconomic factors of external debt accumulation in Nigeria: An ARDL bound test approach. *Procedia - Social and Behavioral Sciences*, *211*, 745–752. https://doi.org/10.1016/j.sbspro.2015.11.098

Abiad, A., & Ostry, J. D. (2005). Primary Surpluses and Sustainable Debt Levels in Emerging Market Countries (Discussion Paper No. PDP/05/6). *International Monetary Fund.* http://www.imf.org/external/pubs/cat/longres.aspx?sk=18554

Acemoglu, D., Johnson, S., & Robinson, J. (2001). An African Success Story: Botswana. *SSRN Electronic Journal*, 1–53.

Adhikary, B. K. (2011). FDI, Trade Openness, Capital Formation, and Economic Growth in Bangladesh: A Linkage Analysis. *International Journal of Business and Management*, *6*(1), 16–28. https://doi.org/10.5539/ijbm.v6n1p16

Afonso, A., & Tovar, J. (2013). Growth and productivity : The role of government debt. *International Review of Economics and Finance*, *25*, 384–407. https://doi.org/10.1016/j.iref.2012.07.004

Ahluwalia, M. S. (2002). Economic reforms in India since 1991: Has gradualism worked? *Journal of Economic Perspectives*, *16*(3), 67–88. https://doi.org/10.1257/089533002760278721

Aigheyisi, O. (2013). The Relative Impacts of Federal Capital and Recurrent Expenditures on Nigeria's Economy (1980-2011). *American Journal of Economics*, *3*, 210–221.

Aizenman, J., & Marion, N. (2003). The high demand for international reserves in the Far East: What is going on? *Journal of the Japanese and International Economies*, *17*(3), 370–400. https://doi.org/10.1016/S0889-1583(03)00008-X

Aizenman, J., & Marion, N. (2011). Using inflation to erode the US public debt. *Journal of Macroeconomics*, *33*(4), 524–541. https://doi.org/10.1016/j.jmacro.2011.09.001

Akram, V., & Rath, B. N. (2020a). Optimum government size and economic growth in case of Indian states: Evidence from panel threshold model. *Economic Modelling*, *88*, 151–162. https://doi.org/10.1016/j.econmod.2019.09.015

Akram, V., & Rath, B. N. (2020b). What do we know about fiscal sustainability across Indian states? *Economic Modelling*, *87*, 307–321. https://doi.org/10.1016/j.econmod.2019.08.005

Al-Fawwaz, T. M. (2016). Determinants of external debt in Jordan: an empirical study (1990–2014). *International Business Research*, *9*(7), 116–123. https://doi.org/10.5539/ibr.v9n7p116

Alper, C. E., & Forni, L. (2011). Public Debt in Advanced Economies and its Spillover Effects on Long-term Yields. In *International Monetary Fund*.

Alt, J. E., & Lassen, D. D. (2006). Fiscal transparency, political parties, and debt in OECD countries. *European Economic Review*, *50*(6), 1403–1439. https://doi.org/10.1016/j.euroecorev.2005.04.001

Ampofo, G.M.K., Jinhua, C., Bosah, P.C., Ayimadu, E.T., & Senadzo, P. (2021). Nexus between total natural resource rents and public debt in resource-rich countries: a panel data analysis. *Resources Policy*, *74*, 1–9. https://doi.org/10.1016/j.resourpol.2021.102276

Agnello, L., & Sousa, R. M. (2015). Can re-regulation of the financial sector strike back public debt? *Economic Modelling*, *51*, 159–171.

Anyanwu, J. C., & Erhijakpor, A. E. O. (2004). Domestic Debt and Economic Growth : The Nigerian Case. *West African Financial and Econonomic Review*, *1*, 98–128.

Arezki, R., & Brückner, M. (2012). Commodity windfalls, democracy and external debt. *Economic Journal*, *122*(561), 848–866. https://doi.org/10.1111/j.1468-0297.2012.02508.x

Ashworth, J., Geys, B., & Heyndels, B. (2005). Government Weakness and Local Public Debt Development in Flemish Municipalities. *International Tax and Public Finance*, *12*(4), 395–422. https://doi.org/10.1007/s10797-005-2317-3

Atique, R., & Malik, K. (2012). Impact of Domestic and External Debt on the Economic Growth of Pakistan. *World Applied Sciences Journal*, *20*(1), 120–129. https://doi.org/10.5829/idosi.wasj.2012.20.01.1621

Auty, R., & Warhurst, A. (1993). Sustainable development in mineral exporting economies. *Resources Policy*, *19*(1), 14–29. https://doi.org/10.1016/0301-4207(93)90049-S

Awan, R., Anjum, A., & Rahim, S. (2015). An econometric analysis of determinants of external debt in Pakistan. *British Journal of Economics, Management & Trade*, *5*(4), 382–391. https://doi.org/10.9734/bjemt/2015/8837

Azizi, K., Canry, N., Chatelain, J.-B., & Tinel, B. (2012). Are no-ponzi game and transversality conditions relevant for public debt? a keynesian appraisal. In *Political Economy Research Institute, Worling Paper, 296*. https://doi.org/10.4324/9781315143842

Baber, W. R., & Gore, A. K. (2008). Consequences of GAAP Disclosure Regulation: Evidence from Municipal Debt Issues. *The Accounting Review*, *83*(3), 565–591. https://doi.org/10.2308/accr.2008.83.3.565

Bal, D. P., & Rath, B. N. (2014). Public debt and economic growth in India: A reassessment. *Economic Analysis and Policy*, *44*(3), 292–300. https://doi.org/10.1016/j.eap.2014.05.007

Balaguer-Coll, M. T., Prior, D., & Tortosa-Ausina, E. (2013). Output complexity, environmental conditions, and the efficiency of municipalities. *Journal of Productivity Analysis*, *39*(3), 303–324. https://doi.org/10.1007/s11123-012-0307-x

Balaguer-Coll, M. T., Prior, D., & Tortosa-Ausina, E. (2016). On the Determinants of Local Government Debt: Does One Size Fit All? *International Public Management Journal*, *19*(4), 513–542. https://doi.org/10.1080/10967494.2015.1104403

Banerjee, A., Dolado, J. J., & Mestre, R. (1998). Error-correction mechanism tests for cointegration in a single-equation framework. *Journal of Time Series Analysis*, *19*(3), 267–283. https://doi.org/10.1111/1467-9892.00091

Barro, R. J. (2002). On the Determination of the Public Debt. *Journal of Political Economy*, *87*(5, Part 1), 940–971. https://doi.org/10.1086/260807

Bayer, C., & Hanck, C. (2013). Combining non-cointegration tests. *Journal of Time Series Analysis*, *34*(1), 83–95. https://doi.org/10.1111/j.1467-9892.2012.00814.x

Ben-Bassat, A., & Gottlieb, D. (1992). On the Effect of Opportunity Cost on International Reserve Holdings. *The Review of Economics and Statistics*, *74*(2), 329–332.

Benfratello, L., Monte, A. Del, & Pennacchio, L. (2018). Corruption and public debt: a cross-country analysis. *Applied Economics Letters*, *25*(5), 340–344. https://doi.org/10.1080/13504851.2017.1321831

Benito, B., & Bastida, F. (2004). The Determinants of the Municipal Debt Policy in Spain. *Journal of Public Budgeting, Accounting & Financial Management*, *16*(4), 495–525.

Benito, B., Bastida, F., & Guillamón, M. D. (2010). Urban sprawl and the cost of public services: An evaluation of Spanish local governments. *Journal of Local Self-Government*, *8*(3), 245–264. https://doi.org/10.4335/8.3.245-264(2010)

Berkmen, S. P., Gelos, G., Rennhack, R., & Walsh, J. P. (2012). The global financial crisis: Explaining cross-country differences in the output impact. *Journal of International Money and Finance*, *31*(1), 42–59. https://doi.org/10.1016/j.jimonfin.2011.11.002

Bilan, I., & Ihnatov, I. (2016). Public debt and economic growth : A two-sided story. *International Journal of Economic Sciences*, *IV*(2), 24–39. https://doi.org/10.20472/ES.2015.4.2.003

Bittencourt, M. (2015). Determinants of government and external debt: Evidence from the young democracies of South America. *Emerging Markets Finance and Trade*, *51*(3), 463-472. http://dx.doi.org/10.1080/1540496X.2015.1025667

Bohn, H. (2007). Are stationarity and cointegration restrictions really necessary for the intertemporal budget constraint? *Journal of Monetary Economics*, *54*(7), 1837–1847. https://doi.org/10.1016/j.jmoneco.2006.12.012

Boswijk, H. P. (1994). Testing for an unstable root in conditional and structural error correction models. *Journal of Econometrics*, *63*, 37–60. http://www.sciencedirect.com/science/article/pii/0304407693015609

Box, G. E., & Jenkins, G. M. (1976). *Time series analysis: Forecasting and control. San Francisco*. Holden-Day.

Brown, R. L., Durbin, J., & Evans, J. M. (1975). Techniques for Testing the Constancy of Regression Relationships over Time. *Journal of the Royal Statistical Society, Series B (Methodological)*, *37*(2), 149–192.

Buchanan, J. M., & Buchanan, J. M. (1958). Public principles of public debt: a defense and restatement. In *Homewood, IL: RD Irwin*. https://doi.org/10.2307/2228016

Buiter, W. H., Persson, T., & Minford, P. (1985). A Guide to Public Sector Debt and Deficits. *Economic Policy*, *1*(1), 13–79. https://doi.org/10.2307/1344612

Bulow, B. J., & Rogoff, K. (1989). Sovereign Debt : Is to Forgive to Forget ? *The American Economic Review*, *79*(1), 43–50.

Burger, J. D., & Warnock, F. E. (2006). Local Currency Bond Markets. *IMF Staff Papers*, *53(Special Issue)*, 133–146. https://www.jstor.org/stable/30036026

Butkiewicz, J. L., & Yanikkaya, H. (2006). Institutional quality and economic growth: Maintenance of the rule of law or democratic institutions, or both? *Economic Modelling*, *23*(4), 648–661. https://doi.org/10.1016/j.econmod.2006.03.004

Cai, Y., & Menegaki, A. N. (2019). Fourier quantile unit root test for the integrational properties of clean energy consumption in emerging economies. *Energy Economics*, *78*, 324–334. https://doi.org/10.1016/j.eneco.2018.11.012

Calvo G. et al. (2013). Optimal Holdings of International Reserves: Self-insurance against Sudden Stops. *Monetaria, Centro de Estudios Monetarios Latinoamericanos*, *1*, 1–35.

Calvo, G. A., Izquierdo, A., & Talvi, E. (2003). Sudden stops, the real exchange rate, and fiscal sustainability: Argentina's lessons. *NBER Working Paper 9828*. National Bureau of Economic Research, Cambridge, MA. https://doi.org/10.1093/0199271402.003.0010

Cecchetti, S., Mohanty, M., & Zampolli, F. (2011). The Real Effects of Debt. In *BIS Working Papers No. 352*. Switzerland.

Checherita-westphal, C., & Rother, P. (2012). The impact of high government debt on economic growth and its channels : An empirical investigation for the euro area. *European Economic Review*, *56*(7), 1392–1405. https://doi.org/10.1016/j.euroecorev.2012.06.007

Cherif, R., & Hasanov, F. (2012). *Public Debt Dynamics: The Effects of Austerity, Inflation, and Growth Shocks* (Working Paper No. 12/230). International Monetary Fund. https://www.imf.org/external/pubs/ft/wp/2012/wp12230.pdf

Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2018). Rising Public Debt to GDP Can Harm Economic Growth. *Economic Letter*, *13*(3), 1–4.

Chudik, A., Mohaddes, K., Pesaran, M. H., & Raissi, M. (2017). Is There a Debt-Threshold Effect on Output Growth? *The Review of Economics and Statistics*, *99*(1), 135–150. https://doi.org/10.2139/ssrn.2627286

Ciocchini, F., Durbin, E., & Ng, D. T. C. (2003). Does corruption increase emerging market

bond spreads? *Journal of Economics and Business*, *55*(5–6), 503–528. https://doi.org/10.1016/S0148-6195(03)00052-3

Claessens, S., Klingebiel, D., & Schmukler, S. L. (2007). Government Bonds in Domestic and Foreign Currency: The Role of Institutional and Macroeconomic Factors. *Review of International Economics*, *15*(2), 370–413. https://doi.org/10.1111/j.1467-9396.2007.00682.x

Cochrane, J. H. (2011). Understanding policy in the great recession: Some unpleasant fiscal arithmetic. *European Economic Review*, *55*(1), 2–30. https://doi.org/10.1016/j.euroecorev.2010.11.002

Cooray, A., Dzhumashev, R., & Schneider, F. (2017). How Does Corruption Affect Public Debt? An Empirical Analysis. *World Development*, *90*, 115–127. https://doi.org/10.1016/j.worlddev.2016.08.020

Corsetti, G., Kuester, K., Meier, A., & Müller, G. J. (2014). Sovereign risk and belief-driven fluctuations in the euro area. *Journal of Monetary Economics*, *61*, 53–73. https://doi.org/10.1016/j.jmoneco.2013.11.001

Cropf, R. A., & Wendel, G. D. (1998). The determinants of municipal debt policy: A pooled time-series analysis. *Environment and Planning C: Government and Policy*, *16*(2), 211–224. https://doi.org/10.1068/c160211

Cunningham, B. M. (2003). The Distributional Heterogeneity of Growth Effects: Some Evidence. *Manchester School*, *71*(4), 417–447. https://doi.org/10.1111/1467-9957.00354

Da Veiga, J. A. L., Ferreira-Lopes, A., & Sequeira, T. N. (2016). Public Debt, Economic Growth and Inflation in African Economies. *South African Journal of Economics*, *84*(2), 294–322. https://doi.org/10.1111/saje.12104

Dash, A. K., & Rath, S. S. (2016). Fiscal performance of North Eastern states of India. *Arthshastra Indian Journal of Economics & Research*, *5*(6), 31-41. https://doi.org/10.17010/aijer/2016/v5i6/107521

Daud, S. N. M., & Podivinsky, J. (2014). Government debt and economic growth in Malaysia: the role of institutional quality. *Applied Economics Letters*, *21*(17), 1179–1183. https://doi.org/10.1080/13504851.2014.916378

Dholakia, R. H., Mohan, T. T. R., & Karan, N. (2004). *Fiscal Sustainability of Debt of States*.

Report submitted to Twelfth Finance Commission, New Delhi, Indian Institute of Management, Ahmedabad, May.

Diamond, P. A. (1965b). National Debt in a Neoclassical Growth Model. *The American Economic Review*, *55*(5), 1126–1150.

Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, *74*(366), 427–431. https://doi.org/10.2307/2286348

Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, *49*(4), 1057–1072.

Domar, E. D. (1944). The " Burden of the Debt " and the National Income. *The American Economic Review*, *34*(4), 798–827.

Drine, I., & Nabi, M. S. (2009). External Debt, Informal Economy and Growth. *Economic Bulletin*, *29*(3), 1695–1707.

Drine, I., & Nabi, M. S. (2010). Public external debt, informality and production efficiency in developing countries. *Economic Modelling*, *27*(2), 487–495. https://doi.org/10.1016/j.econmod.2009.10.014

Dumitrescu, B. A. (2014). The public debt in Romania – factors of influence, scenarios for the future and a sustainability analysis considering both a finite and infinite time horizon. *Procedia Economics and Finance*, *8*, 283–292. https://doi.org/10.1016/s2212-5671(14)00092-6

Egert, B. (2015). Public debt, economic growth and nonlinear effects: Myth or reality? *Journal of Macroeconomics*, *43*, 226–238. https://doi.org/10.1016/j.jmacro.2014.11.006

Ehigiamusoe, K. U., & Lean, H. H. (2020). The role of deficit and debt in financing growth in West Africa. *Journal of Policy Modeling*, *42*(1), 216–234. https://doi.org/10.1016/j.jpolmod.2019.08.001

Elmendorf, D. W., & Mankiw, N. G. (1999). Government Debt. In *Handbook of Macroeconomics, (1)*, 1615–1669. https://doi.org/10.1111/j.2041-9066.2010.00045.x

Engle, R. F., & Granger, C. W. J. (1987). Co-Integration and error correction : representation , estimation, and Testing, *Econometrica*, *55*(2), 251–276.

https://www.jstor.org/stable/1913236

Ewijk, C. van, & Lukkezen, J. (2013). Early-warning indicators for debt sustainability. In *CPB Policy Brief, 8*.

Fan, S. (2009). Public Expenditures, Growth, and Poverty: Lessons from Developing Countries. *ASEAN Economic Bulletin*, *26*(2), 235–237. https://doi.org/10.1355/ae26-2k

Feldkircher, M. (2014). The Determinants of Vulnerability to the Global Financial Crisis 2008 to 2009: Credit Growth and Other Sources of Risk. *Journal of International Money and Finance*, 43, 19-49. https://doi.org/10.1016/j.jimonfin.2013.12.003

Folorunso, A., & Falade, O. E. (2013). Relationship between Fiscal Deficit and Public Debt in Nigeria: an Error Correction Approach. *Journal of Economics and Behavioral Studies*, *5*(6), 346–355. http://doi.org/10.22610/jebs.v5i6.410

Forslund, K., Lima, L., & Panizza, U. (2011). The determinants of the composition of public debt in developing and emerging market countries. *Review of Development Finance*, *1*(4), 207–222. https://doi.org/10.1016/j.rdf.2011.09.004

Friedman, E., Johnson, S., & Kaufmann, D. (2000). Dodging the grabbing hand: the determinants of unofficial activity in 69 countries. *Journal of Public Economics*, *76*(3), 459–493. https://doi.org/10.1016/S0047-2727(99)00093-6

Galiński, P. (2015). Determinants of Debt Limits in Local Governments: Case of Poland. *Procedia - Social and Behavioral Sciences*, *213*, 376–382. https://doi.org/10.1016/j.sbspro.2015.11.554

Gelb, A. H. (1988). *Oil windfalls: Blessing or curse?* Oxford University Press. https://scholar.google.com/scholar?q=Windfallgains:blessingorCurse

Ghosh, A. R., Kim, J. I., Mendoza, E. G., Ostry, J. D., & Qureshi, M. S. (2013). Fiscal Fatigue, Fiscal Space and Debt Sustainability in Advanced Economies. *The Economic Journal*, *123*(566), 4–30. https://doi.org/10.1111/ecoj.12010

Giménez, J. V., Arzoz, P. P., & Cabasés, F. H. (2003). Endeudamiento municipal y efectividad de las restricciones institucionales de disciplina crediticia (1988-2000). *Hacienda Pública Española*, 9–47.

Globan, T., & Matošec, M. (2016). Public debt-to-GDP ratio in new EU member states: Cut

the numerator or increase the denominator? *Romanian Journal of Economic Forecasting*, *19*(3), 57-72. https://ipe.ro/rjef/rjef3_16/rjef3_2016p57-72.pdf

Godil, D. I., Sharif, A., Ali, M. I., Ozturk, I., & Usman, R. (2021). The role of financial development, R&D expenditure, globalization and institutional quality in energy consumption in India: New evidence from the QARDL approach. *Journal of Environmental Management*, *285*, 112208. https://doi.org/10.1016/j.jenvman.2021.112208

Gould, E. R. (2003). Money Talks : Supplementary Financiers and International Monetary Fund Conditionality. *International Organization*, *57*(3), 551–586. https://doi.org/10.1017/S0020818303573039

Grosu, A. C., Pintilescu, C., & Zugravu, B. (2022). Trends in public debt sustainability in Central and Eastern EU countries. *Post-Communist Economies*, *34*(2), 173–195. https://doi.org/10.1080/14631377.2020.1867431

Gupta, D., Bedarkar, M. (2016). Fiscal Consolidation in India: the way forward. *Indian Journal of Finance, 10(12).* https://doi.org/10.17010/ijf/2016/v10i12/106882

Gupta, S., Mello, L. De, & Sharan, R. (2001). Corruption and Military Spending. *European Journal of Political Economy*, *17*, 749–777. https://doi.org/10.1016/S0176-2680(01)00054-4

Gurinovich, A. G., & Smirnikova, J. L. (2021). Debt policy of the Russian regions: Economic and legal research. *Indian Journal of Finance*, *15*(1), 23-35. https://doi.org/10.17010/IJF/2021/V15I1/157012

Haber, G., & Neck, R. (2006). Sustainability of Austrian public debt: A political economy perspective. Empirica, 33(2), 141–154.

Hall, G. J., & Sargent, T. J. (2011). Interest rate risk and other determinants of post WWII U.S. government debt/GDP dynamics. *American Economic Journal: Macroeconomics*, *3*(3), 192–214. https://www.aeaweb.org/articles?id=10.1257/mac.3.3.192

Hanson, J. A. (2007). The Growth in Government Domestic Debt : Changing Burdens and Risks. In *The World Bank*.

Finance & Development. (2020). What is Debt Sustainability?. In International Monetary Fund. https://www.imf.org/en/Publications/fandd/issues/2020/09/what-is-debt-

sustainability-basics

Hayati, N., & Rahman, A. (2012). How Federal Government ' s Debt Affect the Level of Economic Growth ? *International Journal of Trade, Economics and Finance*, *3*(4), 323–326.

Hernandez, A. M. L., Gomez, J. L. Z., & Rodriguez, D. O. (2012). Effects of the crisis in Spanish municipalities' financial condition: an empirical evidence (2005-2008). *International Journal of Critical Accounting*, *4*(5), 631–645. https://doi.org/10.1504/ijca.2012.051457

Hilscher, J., Raviv, A., & Reis, R. (2022). Inflating away the Public Debt? An Empirical Assessments. *The Review of Financial Studies*, 35(3), 1553–1595. https://doi.org/10.1093/rfs/hhab018

Hodge, D. (2006). Inflation and growth in South Africa. *Cambridge Journal of Economics*, *30*(2), 163–180. https://doi.org/10.1093/cje/bei051

Hortas-Rico, M., & Solé-Ollé, A. (2010). Does urban sprawl increase the costs of providing local public services? Evidence from spanish municipalities. *Urban Studies*, *47*(7), 1513–1540. https://doi.org/10.1177/0042098009353620

International Monetary Fund. (2020a). *Fiscal Monitor: Policies for the Recovery*. Washington, DC, October. https://www.imf.org/en/Publications/FM/Issues/2020/09/30/october-2020-fiscal-monitor

International Monetary Fund. (2020b). *World Economic Outlook: A Long and Difficult Ascent*. Washington, DC, October. https://www.imf.org/en/Publications/WEO/Issues/2020/09/30/world-economic-outlook-october-2020

International Monetary Fund. (2021). World Economy Outlook: Managing Divergent Recoveries. In *International Monetary Fund*. https://www.imf.org/en/Publications/WEO/Issues/2021/03/23/world-economic-outlook-april-2021

Jalles, J. T. (2011). The Impact of Democracy and Corruption on the Debt-Growth Relationship in Developing Countries. *Journal of Economic Development*, *36*(4), 41–72. https://doi.org/10.35866/caujed.2011.36.4.003

Jha, R., & Sharma, A. (2004). Structural breaks, unit roots, and cointegration: A further test of the sustainability of the Indian fiscal deficit. *Public Finance Review*, *32*(2), 196–219. https://doi.org/10.1177/1091142103260858

Johansen, S. (1991). Estimation and hypothesis testing of cointegration vectors in Gaussian Vector Autoregressive Models. *Econometrica*, *59*(6), 1551–1580.

Jomo, K. S., & Chowdhury, A. (2020). COVID-19 Pandemic Recession and Recovery. *Development*, *63*, 226–237. https://doi.org/10.1057/s41301-020-00262-0

Joy, J., & Panda, P. K. (2021). An empirical analysis of sustainability of public debt among BRICS nations. *Journal of Public Affairs*, *21*(2), e2170. https://doi.org/10.1002/pa.2170

Kannan, R., & Singh, B. (2007). Debt-deficit dynamics in India and macroeconomic effects: A structural approach. *MPRA Paper 16480, University Library of Munich, Germany*, 1–22. Retrieved from http://mpra.ub.uni-muenchen.de/16480/

Kar, S., & Naidu, S. (2020). Past fiscal profligacy should not stop deficit monetisation now. In *BloombergQuint*. Bloomberg. https://www.bloombergquint.com/opinion/past-fiscal-profligacy-should-not-stop-deficit-monetisation-now

Kassouri, Y., Altıntaş, H., Alancioğlu, E., & Kacou, K. Y. T. (2021). New insights on the debt-growth nexus: A combination of the interactive fixed effects and panel threshold approach. *International Economics*, *168*(August), 40–55. https://doi.org/10.1016/j.inteco.2021.08.001

Kaur, B., & Mukherjee, A. (2012). Threshold Level of Debt and Public Debt Sustainability: The Indian Experience. *Reserve Bank of India Occasional Papers*, *33*(1), 1–37.

Kaur, B., Mukherjee, A., & Ekka, A. P. (2018). Debt sustainability of states in India: An assessment. *Indian Economic Review 53*(1), 93-129. https://doi.org/10.1007/s41775-018-0018-y

Kim, E., Ha, Y., & Kim, S. (2017). Public Debt, Corruption and Sustainable Economic Growth. *Sustainability*, *9*(3), 1–30. https://doi.org/10.3390/su9030433

Kim, H. J., Chen, M. H., & Jang, S. C. S. (2006). Tourism expansion and economic development: The case of Taiwan. *Tourism Management*, *27*(5), 925–933. https://doi.org/10.1016/j.tourman.2005.05.011

Kiptoo, K. C. (2012). *The determinants of Kenya's external debt sustainability*. (School of Business, University of Nairobi), Kenya. http://erepository.uonbi.ac.ke/handle/11295/96960

Klein, L., & Salvatore, D. (2013). Shift in the world economic center of gravity from G7 to G20. *Journal of Policy Modeling*, *35*(3), 416–424. https://doi.org/10.1016/j.jpolmod.2013.03.004

Kourtellos, A., Stengos, T., & Tan, C. M. (2013). The effect of public debt on growth in multiple regimes. *Journal of Macroeconomics*, *38*(1), 35–43. https://doi.org/10.1016/j.jmacro.2013.08.023

Kretzmann, S., & Nooruddin, I. (2005). Drilling into debt. *Oil Change International*.

Krugman, P. (1988). Financing vs. forgiving a debt overhang. *Journal of Development Economics*, *29*(3), 253–268. https://doi.org/10.1016/0304-3878(88)90044-2

Kumar, M. S., & Woo, J. (2010). Public debt and growth. In *International Monetary Fund Working Paper/10/174*.

Lahiri, A., & Kannan, R. (2000). National Institute of Public Finance and Policy , New Delhi. *National Institute of Public Finance and Policy*, (May).

Lakshmanan, T. L. (2019). Revisiting the Sustainability of Kerala State Finances. *Arthshastra Indian Journal of Economics & Research*, *8*(1), 7-22. https://doi.org/10.17010/aijer/2019/v8i1/142711

Lavigne, R. (2011). The political and institutional determinants of fiscal adjustment: Entering and exiting fiscal distress. *European Journal of Political Economy*, *27*(1), 17–35. https://doi.org/10.1016/j.ejpoleco.2010.04.001

Law, S. H., & Habibullah, M. S. (2006). Financial Development, Institutional Quality and Economic Performance in East Asian Economies. *Review of Applied Economics*, *2*(2), 1–16.

Law, S. H., Azman-Saini, W. N. W., & Ibrahim, M. H. (2013). Institutional quality thresholds and the finance - Growth nexus. *Journal of Banking and Finance*, *37*(12), 5373–5381. https://doi.org/10.1016/j.jbankfin.2013.03.011

Law, S. H., Ng, C. H., Kutan, A. M., & Law, Z. K. (2021). Public debt and economic growth in developing countries: Nonlinearity and threshold analysis. *Economic Modelling, 98,*

26–40. https://doi.org/10.1016/j.econmod.2021.02.004

Lederman, D., & Maloney, W. F. (2006). Natural resources, neither curse nor destiny. In *Natural Resources, Neither Curse nor Destiny*. World Bank Publications.

Llaudes, R., Salman, F., & Chivakul, M. (2010). The Impact of the Great Recession on Emerging Markets. *IMF Working Paper*, *10/237*.

Mabugu, R., Robichaud, V., Maisonnave, H., & Chitiga, M. (2013). Impact of fiscal policy in an intertemporal CGE model for South Africa. *Economic Modelling*, *31*(1), 775–782. https://doi.org/10.1016/j.econmod.2013.01.019

Mahdavi, S. (2014). Bohn's test of fiscal sustainability of the American state governments.

Southern Economic Journal, *80*(4), 1028–1054.

Mahmood, T., & Rauf, S. (2008). The Profile of Debt Structure: Monetary and Fiscal Policies: A Case of Pakistan (1971-2007). *Pakistan Economic and Social Review*, *46*(2), 201–234. https://www.jstor.org/stable/25825335

Mahmood, T., Arby, M. F., & Sherazi, H. (2014). Debt sustainability: A comparative analysis of SAARC countries. *Pakistan Economic and Social Review*, *52*(1), 15–34.

Makhoba, B. P., Kaseeram, I., & Greyling, L. (2022). Asymmetric effects of public debt on economic growth: Evidence from emerging and frontier SADC economies. *Cogent Economics and Finance*, *10*(1). https://doi.org/10.1080/23322039.2022.2046323

Makin, T., & Arora, R. (2012). Fiscal Sustainability in India at State Level. *Public Finance and Management*, *12*(4), 350–367.

Manzano, O., & Rigobon, R. (2001). Resource Curse or Debt Overhang? *National Bureau of Economic Research.* http://www.nber.org/papers/w8390

Matsuki, T., & Pan, L. (2021). Per capita carbon emissions convergence in developing Asia: A century of evidence from covariate unit root test with endogenous structural breaks. *Energy Economics*, *99*, 105326. https://doi.org/10.1016/j.eneco.2021.105326

Mauro, P., Romeu, R., Binder, A., & Zaman, A. (2013). A modern history of fiscal prudence and profligacy. *International Monetary Fund*. https://doi.org/10.1016/j.jmoneco.2015.07.003

Meade, J. E. (1958). Is the national debt a burden? *Oxford Economic Papers*, *10*(2), 163–183.

https://doi.org/10.1093/oxfordjournals.oep.a040800

Meissner, C., Sarr, M., Bulte, E., & Swanson, T. (2010). *Resource curse and sovereign debt*. In *Robert W. Kolb (Ed.) "Sovereign Debt: From Safety to Default."* Wiley. https://doi.org/10.1002/9781118267073.ch6

Melina, G., Yang, S. C. S., & Zanna, L. F. (2016). Debt sustainability, public investment, and natural resources in developing countries: The DIGNAR model. *Economic Modelling*, *52*, 630–649. https://doi.org/10.1016/j.econmod.2015.10.007

Mendoza, E. G., & Ostry, J. D. (2008). International evidence on fiscal solvency: Is fiscal policy "responsible"? *Journal of Monetary Economics*, *55*, 1081–1093. https://doi.org/10.1016/j.jmoneco.2008.06.003

Mhlab, N., & Phiri, A. (2019). Is public debt harmful towards economic growth? New Evidence from South Africa. *General and Applied Economics*, *7*(1), 1–15. https://doi.org/10.1080/23322039.2019.1603653

Ministry of Finance. (2022). *Status Paper on Government Debt of India 2020-21* (Issue April).

Misra, S., Gupta, K., & Trivedi, P. (2021). Sub-national government debt sustainability in India: an empirical analysis. *Macroeconomics and Finance in Emerging Market Economies*. https://doi.org/10.1080/17520843.2021.1948171

Modigliani, F. (1961). Long-run implications of alternative fiscal policies and the burden of the national debt. *The Economic Journal*, *71*(284), 730–755.

Mohanty, M. S., & Turner, P. (2006). Foreign exchange reserve accumulation in emerging markets: what are the domestic implications? *BIS Quarterly Review, September*, 39–51. https://bit.ly/367gcIT

Mohsin, M., Ullah, H., Iqbal, N., Iqbal, W., & Taghizadeh-Hesary, F. (2021). How external debt led to economic growth in South Asia: A policy perspective analysis from quantile regression. *Economic Analysis and Policy*, *72*, 423–437. https://doi.org/10.1016/j.eap.2021.09.012

Moorthy, V., Singh, B., & Dhal, S. C. (2000). Bond financing and debt stability: theoretical issues and empirical analysis for India. *RBI Development Research Group, Study No.*(10 June 2000), 1–79. Retrieved from http://mpra.ub.uni-muenchen.de/12148/

Nathaniel, O. O., & Oladiran, A. T. (2018). Foreign Exchange Reserve Accumulation and Economic Growth in Nigeria. *American Journal of Social Sciences*, *6*(2), 15–24.

Neck, R., & Getzner, M. (2001). Politico-economic determinants of public debt growth: A case study for Austria. *Public Choice*, *109*(3), 243–268. https://doi.org/10.1023/A:1013012802378

Noga, M., Postula, M., & Klepacki, J. (2018). The Impact of the European Public Debt Criterion on the Real Socio-Economic Development. *Transformations in Business and Economics*, *17*(3 (45)), 38–54.

Ogunmuyiwa, M. (2011). Does External Debt Promote Economic Growth in Nigeria ? *Journal of Economic Theory*, *3*, 29–35.

Omrane Belguith, S., & Omrane, H. (2017). Macroeconomic determinants of public debt growth: A case study for Tunisia. *Theoretical and Applied Economics*, *24*(4), 161–168.

Pablo, A., & Alex, P. (2015). *What Really Drives Public Debt : A Holistic Approach* (WP/15/137). International Monetary Fund. https://www.imf.org/external/pubs/ft/wp/2015/wp15137.pdf

Panizza, U. (2008). Domestic and External Public Debt. *United Nations Conference on Trade and Development (UNCTAD)*, *3*, 1–19.

Panizza, U., & Presbitero, A. F. (2013). Public debt and economic growth in advanced economies: A survey. *Swiss Journal of Economics and Statistics*, *149*(2), 175–204. https://doi.org/10.1007/BF03399388

Panizza, U., & Presbitero, A. F. (2014). Public debt and economic growth: Is there a causal effect? *Journal of Macroeconomics*, *41*, 21–41. https://doi.org/10.1016/j.jmacro.2014.03.009

Papava, V., & Charaia, V. (2021). The problem of the growth of Georgia's public debt during the economic crisis under the COVID-19 pandemic (January 26, 2021). https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3773635

Park, D., & Estrada, G. B. (2009). Are Developing Asia ' s Foreign Exchange Reserves Excessive ? An Empirical Examination. *Electronic Journal*, *August*, 1–18. https://doi.org/10.2139/ssrn.1616950

Patra, M. D. (2020). Reserve Bank of India Bulletin. In *Reserve Bank of India: Vol. LXXIV* (Issue 12). https://bulletin.rbi.org.in

Pattillo, C. A., Poirson, H., & Ricci, L. (2004). *What Are the Channels Through Which External Debt Affects Growth?* (IMF Working Paper WP/04/15). https://doi.org/10.5089/9781451843293.001

Pattillo, C., Poirson, H., & Ricci, L. (2011). External Debt and Growth. *Review of Economics and Institutions*, *2*(3), 1–30. https://doi.org/10.5089/9781451849073.001

Pattnaik, R. K., Prakash, A., & Misra, B. S. (2003). Sustainability of Public Debt in India: An Assessment in the Context of Fiscal Rules. *Other Political Economy: Budget*.

Pegkas, P. (2018). The Effect of Government Debt and Other Determinants on Economic Growth: The Greek Experience. *Economies*, *6*(1), 10. https://doi.org/10.3390/economies6010010

Pesaran, M. H., & Shin, Y. (1995). An autoregressive distributed lag modelling approach to cointegration analysis. *Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium*, 371–413. https://doi.org/10.1017/ccol0521633230.011

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds Testing Approaches to the analysis of Level Relationships. *Journal of Applied Econometrics*, *16*, 289–326. https://doi.org/10.1002/jae.616

Pettersson-Lidbom, P. (2001). An empirical investigation of the strategic use of debt. *Journal of Political Economy*, *109*(3), 570–583. https://doi.org/10.1086/321021

Pigou, A. C. (1928). An Analysis of Supply. *The Economic Journal*, *38*(150), 238–257.

Plekhanov, A., & Singh, R. (2006). How Should Subnational Government Borrowing Be Regulated ? Some Cross-Country Empirical Evidence. *IMF Staff Papers*, *53*(3), 426–452.

Polterovich, V., & Popov, V. (2003). Accumulation of Foreign Exchange Reserves and Long Term Growth. *Electronic Journal*, *January*. https://doi.org/10.2139/ssrn.1751866

Pradhan, K. (2016). Ricardian Approach to Fiscal Sustainability in India. *Margin*, *10*(4), 499–529. https://doi.org/10.1177/0973801016659799

Pradhan, K. (2019). Analytical Framework for Fiscal Sustainability: A Review. *Review of Development and Change*, *24*(1), 100–122. https://doi.org/10.1177/0972266119845951

Prasad, E. S., Rajan, R. G., & Subramaniam, A. (2007). Foreign Capital and Economic Growth. *Brookings Papers on Economic Activity*, *1*, 153–229.

Presbitero, A. F. (2008). The Debt-Growth Nexus in Poor Countries: A Reassessment. *Economics*, *2*(1), 0–29. https://doi.org/10.5018/economics-ejournal.ja.2008-30

Presbitero, A. F. (2010). Total Public Debt and Growth in Developing Countries. *European Journal Of Development Research*, *24*(4), 606–626.

Rajaraman, I., & Pattnaik, R. K. (2005). *A Study of Debt Sustainability at State Level in India*.

Ramu, M. R. A. (2021). Public debt sustainability in sub-national level: a case of Karnataka. *Indian Economic Review*, *56*(2), 463–485. https://doi.org/10.1007/s41775-021-00114-9

Rangarajan, C., & Srivastava, D. K. (2005). Fiscal deficits and government debt in India: Implications for growth and stabilisation. *Economic and Political Weekly*, *40*(27), 4–53.

Rao, M. G. (2017). The Effect of Intergovernmental transfers on Public Services in India. In *NIPFP Working Paper Series No. 218* (218). https://doi.org/10.1080/13547860.2019.1675352

Reddy, P. S. (2019). Exploring the Causal and Co integration relationship between Savings , Capital Formation and Economic Growth in India – An Empirical Analysis. *Journal of Xi'an University of Architecture & Technology*, *XI*(XII), 1844–1852.

Reinhart, C. M., & Rogoff, K. S. (2010). Growth in a Time of Debt. *American Economic Review*, *100*(2), 573–578.

Renjith, P. S., & Shanmugam, K. R. (2018). Sustainable Debt Policies of Indian State Governments. *Margin*, *12*(2), 224–243. https://doi.org/10.1177/0973801017753283

Renjith, P. S., & Shanmugam, K. R. (2020). Dynamics of public debt sustainability in major Indian states. *Journal of the Asia Pacific Economy*, *25*(3), 501–518. https://doi.org/10.1080/13547860.2019.1668138

Reserve Bank of India. (2020). *State Finances: A Study of Budgets 2020-21*. https://www.rbi.org.in/Scripts/AnnualPublications.aspx?head=State%20Finances%20:%20A%20Study%20of%20Budgets

Reserve Bank of India. (2021). *State Finances: A Study of Budget 2021-22*. https://www.rbi.org.in/Scripts/AnnualPublications.aspx?head=State%20Finances%20:%

20A%20Study%20of%20Budgets

Reserve Bank of India (2022). *Public Debt Statistics* https://www.rbi.org.in/scripts/FS_PDS.aspx

Reserve Bank of India (2022). *Handbook of Statistics on Indian Economy.* https://www.rbi.org.in/Scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20Economy

Reserve Bank of India (2022). *Handbook of Statistics on Indian States.* https://www.rbi.org.in/Scripts/AnnualPublications.aspx?head=Handbook%20of%20Statistics%20on%20Indian%20States

Riyath, M., & Ismail, M. (2018). The Causal Relationship between Inflation and Economic Growth: An Empirical Study in Sri Lanka. *Asian Journal of Research in Business Economics and Management*, *8*(1), 21–29. https://doi.org/10.5958/2249-7307.2018.00003.8

Sachs, J. D. ., & Warner, A. M. . (1997). Sources of Slow Growth in African Economies. *Journal of African Economies*, *6*(3), 335–376. https://doi.org/https://doi.org/10.1093/oxfordjournals.jae.a020932

Sadik-zada, Richard, E., & Gatto, A. (2019). *Determinants of the public debt and the role of the natural resources: A cross-country analysis.* https://doi.org/10.1007/978-3-030-61258-0_5

Salman, M., Long, X., Dauda, L., & Mensah, C. N. (2019). The impact of institutional quality on economic growth and carbon emissions: Evidence from Indonesia, South Korea and Thailand. *Journal of Cleaner Production*, *241*, 118331. https://doi.org/10.1016/j.jclepro.2019.118331

Salvatore, D. (2020). Growth and trade in the United States and the world economy: Overview. *Journal of Policy Modeling*, *42*(4), 750–759. https://doi.org/10.1016/j.jpolmod.2020.03.001

Sani, A., Said, R., Ismail, N. W., & Mazlan, N. S. (2019). Public Debt, Institutional Quality and Economic Growth in Sub-Saharan Africa. *Institutions and Economies*, *11*(3), 39–64.

Sanusi, K. A., Hassan, A. S., & Meyer, D. F. (2019). Non-linear Effects of Public Debt on Economic Growth in Southern Africa Development Community (SADC)

Countries. *International Journal of Economics & Management*, *13*(1).

Schclarek, A. (2005). *Debt and Economic Growth in Developing and Industrial Countries* (No. 2005:34) Working Paper.

Sen, S., Kasibhatla, K. M., & Stewart, D. B. (2007). Debt overhang and economic growth – the Asian and the Latin American experiences. *Economic Systems*, *31*, 3–11. https://doi.org/10.1016/j.ecosys.2006.12.002

Sharaf, M. F. (2022). The asymmetric and threshold impact of external debt on economic growth: new evidence from Egypt. *Journal of Business and Socio-Economic Development*, *2*(1), 1–18. https://doi.org/10.1108/jbsed-06-2021-0084

Sharma, M., Mohapatra, G., & Giri, A. K. (2021). Is tourism pro-poor in India? An empirical investigation using ARDL approach. *Journal of Economic and Administrative Sciences*. https://doi.org/10.1108/jeas-02-2021-0031

Shastri, S., & Sahrawat, M. (2015). Fiscal Policy Sustainability in India : An Empirical Assessment. *Journal of Economic Policy and Research*, *10*(1), 99–112.

Siba, E. G. (2007). Determinants of Institutional Quality in Sub- Saharan African Countries. *International Conference on African Development*. Western Michigan University: ScholarWorks at WMU Center.

Singh, C. (1999). Domestic Debt and Economic Growth in India. *Economic and Political Weekly*, *34*(23), 1445–1453. http://www.jstor.org/stable/4408051

Sinha, P., Arora, V., Bansal, V. (2011), Determinants of Public Debt for middle income and high income group countries using Panel Data regression, MPRA Paper No. 32079, https://mpra.ub.uni-muenchen.de/32079/

Skilling, D., & Zeckhauser, R. J. (2002). Political competition and debt trajectories in Japan and the OECD. *Japan and the World Economy*, *14*(2), 121–135. https://doi.org/10.1016/S0922-1425(01)00077-9

Swamy, V. (2015a). Government debt and economic growth in India: Estimating the debt threshold and debt intolerance (April 16, 2015). *Available at SSRN 2595112* https://doi.org/http://dx.doi.org/10.2139/ssrn.2595112

Swamy, V. (2015b). Government debt and its macroeconomic determinants – an empirical

investigation (May 2, 2015). *Available at SSRN 2601875*. https://doi.org/10.2139/ssrn.2601875

Tamborini, R., & Tomaselli, M. (2020). *When does public debt impair economic growth? A literature review in search of a theory* (DEM Working Papers No. 2020/7).

Tarek, B. A., & Ahmed, Z. (2017). Governance and public debt accumulation: Quantitative analysis in MENA countries. *Economic Analysis and Policy*, *56*, 1–13. https://doi.org/10.1016/j.eap.2017.06.004

Teles, V. K., & Cesar Mussolini, C. (2014). Public debt and the limits of fiscal policy to increase economic growth. *European Economic Review*, *66*, 1–15. https://doi.org/10.1016/j.euroecorev.2013.11.003

The World Bank (2022). *World Development Indicators database.* https://databank.worldbank.org/source/world-development-indicators

Tiruneh, M. W. (2004). An empirical investigation into the determinants of external indebtedness. *Prague Economic Papers*, *13*(3), 261–277. https://doi.org/10.18267/j.pep.242

Tiwari, A.K. 2012. Debt sustainability in India: Empirical evidence estimating time-varying parameters. *Economics Bulletin* 32(2), 1133–41.

Tronzano, M. (2013). The sustainability of Indian fiscal policy: A reassessment of the empirical evidence. *Emerging Markets Finance and Trade*, *49*(1), 63–76. https://doi.org/10.2753/REE1540-496X4901S105

Umar, M., Ji, X., Kirikkaleli, D., Shahbaz, M., & Zhou, X. (2020). Environmental cost of natural resources utilization and economic growth: Can China shift some burden through globalization for sustainable development? *Sustainable Development*, *28*(6), 1678–1688.

Vakhtang, C., & Vladimer, P. (2021). Public Debt Increase Challenge Under COVID-19 Pandemic Economic Crisis in the Caucasian Countries. *Journal of Contemporary Issues in Business and Government*, *27*(03), 18-27. https://doi.org/10.47750/cibg.2021.27.03.003

Veiga, L. G., & Veiga, F. J. (2014). *Determinants of Portuguese Local Governments' Indebtedness*. NIPE WP 16/2014. http://repositorium.sdum.uminho.pt/handle/1822/30612

Were, M. (2015). Differential effects of trade on economic growth and investment : A cross-country empirical investigation. *Journal of African Trade*, *2*(1–2), 71–85. https://doi.org/10.1016/j.joat.2015.08.002

Woo, J., & Kumar, M. S. (2015). Public Debt and Growth. *Economica*, *82*(328), 705–739. https://doi.org/10.1111/ecca.12138

Zivot, E., & Andrews, D. W. K. (1992). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of Business and Economic Statistics*, *10*(3), 251–270. https://doi.org/10.1080/07350015.1992.10509904

APPENDICES

Appendix A

Heteroskedasticity Test

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
F-statistic	0.499764	Prob. F(12,22)	0.8928
Obs*R-squared	7.497216	Prob. Chi-Square(12)	0.8231
Scaled explained SS	1.598005	Prob. Chi-Square(12)	0.9998

Appendix B

Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	2.121603	Prob. F(1,21)	0.16

Obs*R-squared	3.211547	Prob. Chi-Square(1)	0.0731

Appendix C

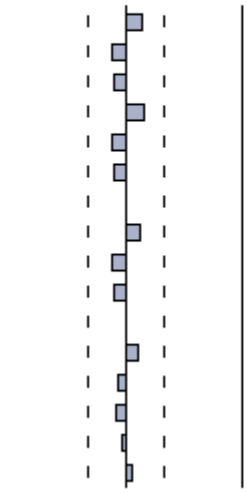
Granger Causality Test

Null Hypothesis:	F-Statistic	Prob.
LNGFCF does not Granger Cause LNGDP	1.01081	0.4038
LNGDP does not Granger Cause LNGFCF	2.79738	0.0600
LNGFCE does not Granger Cause LNGDP	0.41547	0.6639
LNGDP does not Granger Cause LNGFCE	8.63400	0.0011
LNFER does not Granger Cause LNGDP	4.38345	0.0217
LNGDP does not Granger Cause LNFER	0.68322	0.5129
LNINF does not Granger Cause LNGDP	9.27089	0.0097
LNGDP does not Granger Cause LNINF	4.98649	0.0826
LNTO does not Granger Cause LNGDP	3.15244	0.0321
LNGDP does not Granger Cause LNTO	0.53593	0.7937

Appendix D

Correlogram of best model ARIMA (2,1,1) – GDP India

Sample: 2012Q1 2020Q4
Included observations: 35
Q-statistic probabilities adjusted for 2 ARMA terms



		AC	PAC	Q-Stat	Prob
1		0.145	0.145	0.7996	
2		-0.121	-0.145	1.3737	
3		-0.109	-0.071	1.8560	0.173
4		0.169	0.189	3.0522	0.217
5		-0.133	-0.231	3.8119	0.283
6		-0.109	-0.013	4.3412	0.362
7		0.004	0.034	4.3418	0.501
8		0.123	0.023	5.0646	0.536
9		-0.134	-0.124	5.9647	0.544
10		-0.104	-0.040	6.5292	0.588
11		-0.006	-0.017	6.5314	0.686
12		0.112	0.043	7.2326	0.703
13		-0.077	-0.059	7.5835	0.750
14		-0.085	-0.063	8.0299	0.783
15		-0.045	-0.057	8.1609	0.833
16		0.052	-0.002	8.3431	0.871

Appendix E

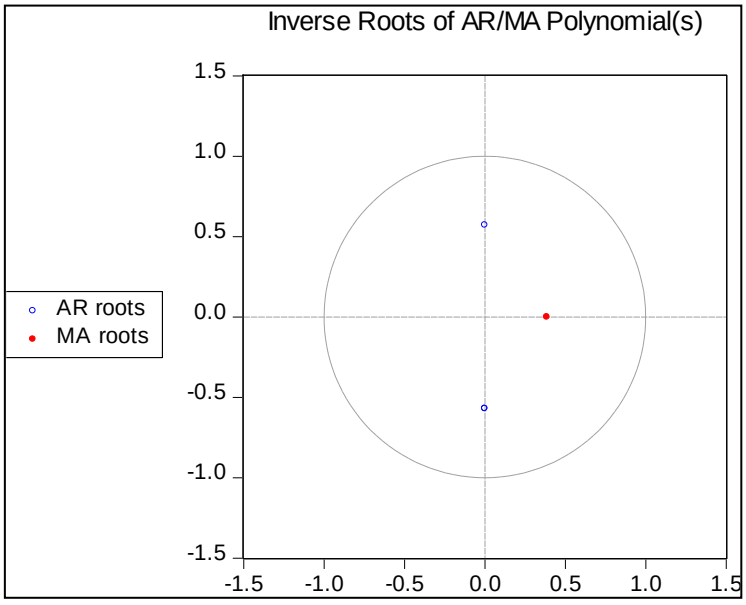
Correlogram of best model ARIMA (2,1,1) – External Debt India

Sample: 2000Q4 2026Q1
Included observations: 80
Q-statistic probabilities adjusted for 2 ARMA terms

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.006	-0.006	0.0030	
		2	-0.023	-0.023	0.0487	
		3	0.040	0.040	0.1874	0.665
		4	0.044	0.044	0.3521	0.839
		5	-0.098	-0.096	1.1885	0.756
		6	0.024	0.024	1.2389	0.872
		7	0.109	0.103	2.3121	0.804
		8	0.183	0.194	5.3467	0.500
		9	-0.112	-0.104	6.5133	0.481
		10	-0.073	-0.098	7.0180	0.535
		11	0.117	0.102	8.3271	0.502
		12	-0.067	-0.051	8.7628	0.555
		13	-0.094	-0.056	9.6340	0.564
		14	-0.024	-0.080	9.6933	0.643
		15	0.158	0.123	12.206	0.511
		16	0.027	0.062	12.279	0.584
		17	-0.035	0.002	12.409	0.648
		18	0.037	0.010	12.551	0.705
		19	0.127	0.083	14.290	0.647
		20	-0.074	0.014	14.895	0.669

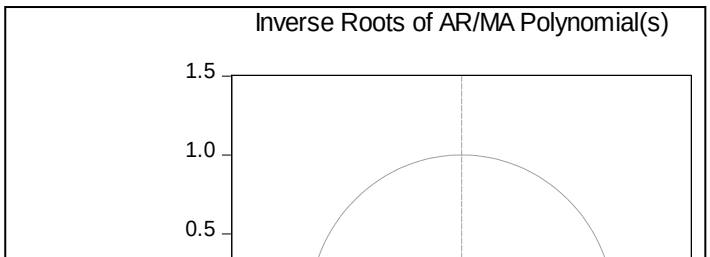
Appendix F

AR and MA roots - GDP India



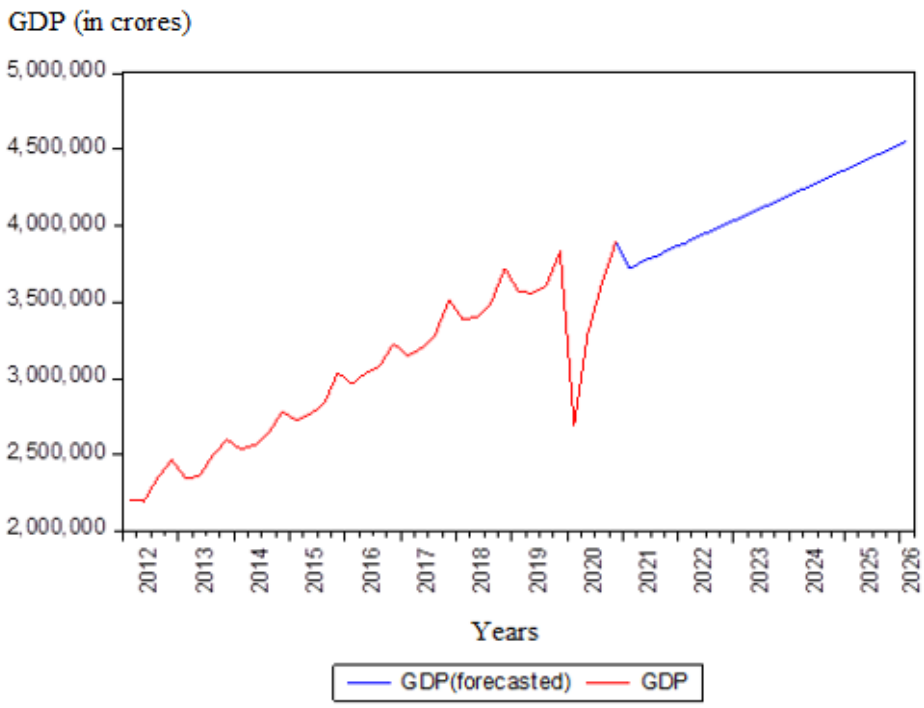
Appendix G

AR and MA roots – External Debt India



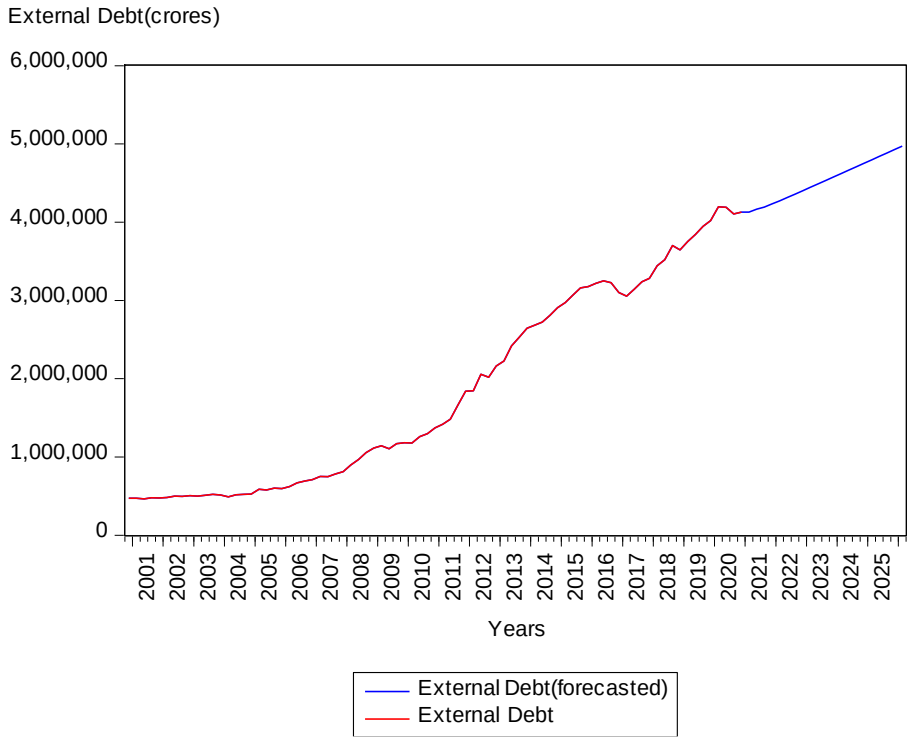
Appendix H

GDP graph after forecasting from 2012Q1 to 2026Q1



Appendix I

External Debt graph after forecasting from 2000Q4 to 2026Q1



Appendix J

List of States

Andhra Pradesh	Maharashtra
Arunachal Pradesh	Manipur
Assam	Meghalaya
Bihar	Mizoram
Chhattisgarh	Nagaland
Goa	Odisha
Gujarat	Punjab
Haryana	Rajasthan
Himachal Pradesh	Sikkim
Jammu and Kashmir	Tamil Nadu
Jharkhand	Tripura

Karnataka	Uttar Pradesh
Kerala	Uttarakhand
Madhya Pradesh	West Bengal

Appendix K

Eigenvalues of Relative Components

Components	Eigenvalue	Proportion	Cumulative
Comp1	2.154	0.538	0.538
Comp2	1.761	0.440	0.979
Comp3	0.072	0.018	0.997
Comp4	0.014	0.004	1.000

Source: Author's own

Appendix L

Factor Loadings of Relative Components

Variables	Comp1	Comp2	Comp3	Comp4
Debt-GSDP	0.553	0.428	0.4595	-0.5479
PB	0.402	0.603	-0.3116	0.6147
DS	0.467	-0.5373	0.5115	0.4812
IG	0.561	-0.4061	-0.6558	-0.3006

Source: Author's own

List of Publications and Working Papers

Papers Published

- Pratibha Saini, & Krishna Muniyoor, (2021). "Revisiting the debt-growth nexus: Evidence from India." *Economic Annals, 66*(231), 151-171 [indexed in Scopus (University of Belgrade, Serbia), H-index =12, Q4 (0.15)] DOI: https://doi.org/10.2298/EKA2131151S.
- Pratibha S. & Krishna M., (2022). "The Effect of COVID-19 Pandemic on Economic Growth and Public Debt? An analysis of India and the Global Economy". *Journal of Economic and Administrative Sciences,* [(Emerald Publishing) indexed in ABDC (C), Web of Science Emerging Sources Citation Index (ESCI)] (online print published) https://doi.org/10.1108/JEAS-01-2022-0018
- Pratibha S. & Krishna M., (2022). "Does economic development affect public debt accumulation? Empirical evidence from India" *Indian Journal of Finance* [(Associated Management Consultants Private Limited) indexed in ABDC (C), Scopus H-index=9, Q4 (0.22)]
  http://www.indianjournaloffinance.co.in/index.php/IJF/article/view/169174

Under-review/Working Papers

- Pratibha S. & Krishna M., (2022). "What drives public debt in SAARC countries: A panel analysis." *South Asian Journal of Macroeconomics and Public Finance*. [(Sage Publications Ltd) indexed in Scopus, H-index=5, Q4(0.14)] (revision submitted)
- Pratibha S. & Krishna M., (2022). "Debt Threshold, Primary Surplus, and Institutional Quality: An Empirical Testing of the Debt Sustainability of India." *Business Perspectives and Research.* [(Sage Publications Ltd) indexed in ABDC (C), Scopus, H-index=9, Q3 (0.26)] (revision submitted)

- Pratibha S. & Krishna M., (2022). “Impression of total natural resource rents on India’s public debt: An empirical analysis.” *Journal of the Asia Pacific Economy.* [(Taylor and Francis) H-index=30, Q2] (under-review)
- Pratibha S. & Krishna M., (2022). “What aggravates the state government indebtedness? A panel study” *Millenial Asia*. [(Sage Publications Ltd), Scopus, Q3](under-review)

List of Conferences and Workshops

Papers Presented in Conferences

- Attended 56th Annual Conference of TIES organized by Madurai Kamraj University, Madurai, during 7-9 January 2020 and presented a paper titled "An empirical analysis of the impact of public debt and other macroeconomic determinants on the economic growth of India."
- Presented paper titled "Economic development and other determinants of public debt accumulation: Structural equation modelling approach" in SRC'21, a multidisciplinary research conference organized by IIT Kanpur during 27-28 March 2021.

List of Workshops

- Two days workshop on Research Methodology organized by BITS Pilani- Pilani campus from 23-24 February 2019.
- Seven days workshop on academic writing organized by BITS Pilani- Pilani campus during 4-11 April 2019.
- Two days Faculty Development Program on "How to publish in Scopus & High Impact Journals?" organized by International Management Institute, New Delhi, during 6-7 June 2019.
- Six days GIAN course on Econometric Techniques for Research in Management and Social Sciences organized by NIT Allahabad during 25-30 November 2019.
- One day virtual workshop on scientific writing organized by ACS Publications in collaboration with BITS Pilani, Hyderabad campus on 4th October 2021.

Brief Biography of Supervisor

Krishna M is currently an Associate Professor in the Department of Economics and Finance, Birla Institute of Technology and Science, Pilani Campus. He received his PhD from Tata Institute of Social Sciences, Mumbai. His research revolves around growth and development, energy economics, and economic growth and development. He was a visiting researcher at the London School of Economics and Political Science during 2010-11. Currently, he teaches courses including Fundamentals of Finance and Accounting, Principles of Economics, Economic Analysis of Public Policy, and Managerial Economics for both undergraduate and master's levels. He has published dozens of papers in both international and national journals of repute such as Journal of Cleaner Production, Economic Annals, Journal of the Knowledge Economy, Journal of International Women's Studies, and World Economics.

Brief Biography of Candidate

Pratibha Saini is a Senior Research Scholar (UGC) at the Department of Economics and Finance, Birla Institute of Technology and Science, Pilani - Pilani Campus. She has published research papers in peer-reviewed journals during her Ph.D. and participated in conferences. She also acted as a teaching assistant for subjects such as Principals of Economics, Fundamentals of Financial Accounting, and Financial Management. Her research focuses on public finance and macroeconomics. Her research interests lie in development economics and financial economics.