

Bandi Kamaiah · C.S. Shylajan
S. Venkata Sessaiah · M. Aruna
Subhadip Mukherjee *Editors*

Current Issues in Economics and Finance

Current Issues in Economics and Finance

Bandi Kamaiah · C.S. Shylajan
S. Venkata Seshaiiah · M. Aruna
Subhadip Mukherjee
Editors

Current Issues in Economics and Finance

Editors

Bandi Kamaiah
Department of Economics
University of Hyderabad
Hyderabad
India

M. Aruna
Department of Economics
IBS Hyderabad
Hyderabad
India

C.S. Shylajan
IBS Hyderabad
Hyderabad
India

Subhadip Mukherjee
Department of Economics
IBS Hyderabad
Hyderabad
India

S. Venkata Seshiah
IBS Hyderabad
Hyderabad
India

ISBN 978-981-10-5809-7

ISBN 978-981-10-5810-3 (eBook)

DOI 10.1007/978-981-10-5810-3

Library of Congress Control Number: 2017950019

© Springer Nature Singapore Pte Ltd. 2017

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Printed on acid-free paper

This Springer imprint is published by Springer Nature

The registered company is Springer Nature Singapore Pte Ltd.

The registered company address is: 152 Beach Road, #21-01/04 Gateway East, Singapore 189721, Singapore

Preface

This book is a collection of selected papers presented at Fifth International Conference on Applied Econometrics organized by IBS Hyderabad, a constituent of the ICFAI Foundation for Higher Education (IFHE). The conference was held during July 22–23, 2016. It was organized in collaboration with The Indian Econometrics Society (TIES), New Delhi.

This volume consists of 13 research papers selected out of 52 papers presented at the conference. The papers were selected based on their quality in terms of contemporary topic, newness in the methodology, and themes. It covers topics related to current issues in economic growth and development, international trade, macroeconomic and financial stability, monetary policy, intellectual capital and financial performance, productivity performance of Indian banks, corporate social responsibility, and agriculture and food security. All papers have followed an empirical approach to address research issues. Part I covers papers related to fiscal policy, monetary policy, and financial integration. Part II deals with issues related to international trade and economic growth. Part III covers topics related to productivity and firm performance, and finally, Part IV covers issues related to agriculture and food security.

In the opening chapter, Nikita Pahwa analyzes the impact of internal and external debt on economic growth in India by employing Auto Regressive Distributed Lag (ARDL) technique of co-integration. The results of the study indicate that there is a negative effect of both internal and external debts on Indian economy. M.R. Anantha Ramu and K. Gayithri by using vector error correction method (VECM) examine the composition of fiscal deficit and its impact on GDP. The results of the study indicate that fiscal deficit is adversely affecting the growth. Amrendra Pandey and Jagadish Shettigar examine the empirical relationship between monetary policy variables and industrial production since the onset of economic reforms in India. The study becomes important in the backdrop of recent changes in the RBI's monetary policy stance to target inflation. Anoop S. Kumar and B. Kamaiah analyze the co-movements of nine Asian Forex markets which include China, India, Hong Kong, Malaysia, Indonesia, Singapore, Japan, Taiwan, Thailand, and South Korea using bilateral exchange rate against US dollar from January 3, 2006, to September 4, 2015. They employ wavelet-based methodology

to analyze the extent to which the markets are correlated with each other across different timescales.

The second part of the volume consists of two papers on international trade and growth. Laila Memdani examines the link between economic growth and international trade of various countries and examines how it varies across various income groups. Economic integration within regional trading blocs adds the significant value to increase economic growth, trade, investment, etc. Gurpreet Kaur, Vishal Sarin, and Jasdeep Kaur Dhama explore the empirical relationship between export and GDP for BIMSTEC nations by using time series data over 1997–2015 periods.

The third part of the volume contains four papers related to productivity and firm performance. Mohd Anas Raushan and Ahmed Musa Khan empirically investigate the relationship between the value creation efficiency and financial performance measures of selected Indian business process outsourcing (BPO) and knowledge process outsourcing (KPO) firms. The study finds that intellectual capital efficiency has a significant impact on profitability but not on productivity. Value Added Intellectual Coefficient (VAIC™) method is used to measure the value-based intellectual capital performance of the selected companies. Vasiq Nuvaed, Sucheta Sardar, and Sujoy Chakravarty analyze how spending in CSR is related to the ownership pattern and firm performance in India. By using financial data of 176 BSE-listed firms, authors examine how the ownership structure, firm size, and leverage of a firm affect its CSR expenditure over 2010–2015 periods. Jayashree Patil-Dake analyzes the productivity performance of Indian banks in the post-liberalization era with FDI contents. M. Kollapuri examines whether the acquirer banks are more efficient than the target banks in 16 consolidation deals in Indian banking sector during the period 1995–2013.

The last part consists of three papers on agriculture and food security. Madhabendra Sinha and Partha Pratim Sengupta investigate empirically the causal linkage between movements of foreign exchange rate and agricultural performance in India in terms of production and exports in the post-reform period. This chapter explores the underlying long-term co-integrating relationship between foreign exchange rate and agricultural export in India. Bhabani Prasad Mahapatra and Bhagabata Patro examine the nutritional intake using household data on daily food intake which was collected from the villages in Odisha. They discuss the status of nutritional security at household level. Finally, S. Indrakant examines the dynamics of food grain production in Telangana and estimates the contribution of “increase in area under food grains” and “improvement in technology” to the growth of food grain production in Telangana by using simple decomposition technique. Moreover, the chapter also estimates the influence of important determinants on per capita availability of food grains at state and district levels.

Acknowledgements

We are grateful to all the contributors for timely completion of their manuscripts. We would like to take this opportunity to place on record our gratitude to Prof. K.L. Krishna, Former Director and Professor, Delhi School of Economics, who delivered inaugural address and Dr. C. Rangarajan, Former Chairman, Economic Advisory Council to the Prime Minister, and Former Governor of RBI, who delivered a special address at the conference. In addition, we are particularly grateful to Prof. J. Mahender Reddy, Vice-Chancellor, IFHE, for his continuous motivation for the publication of this volume. We thank The Indian Econometrics Society (TIES), New Delhi, for their collaboration in organizing the conference. Finally, this book project would have been impossible without continuous effort by the team from Springer. We thank all team members.

Hyderabad, India

Bandi Kamaiah
C.S. Shylajan
S. Venkata Sessaiah
M. Aruna
Subhadip Mukherjee

Contents

Part I Fiscal Policy, Monetary Policy and Financial Integration

Impact of Debt on Short-Run and Long-Run Growth: Empirical Evidence from India	3
Nikita Pahwa	
Fiscal Deficit and Economic Growth Relationship in India: A Time Series Econometric Analysis	19
M.R. Anantha Ramu and K. Gayithri	
Relationship Between Monetary Policy and Industrial Production in India	37
Amrendra Pandey and Jagadish Shettigar	
Co-movement Among Asian Forex Markets: Evidence from Wavelet Methods	53
Anoop S. Kumar and Bandi Kamaiah	

Part II International Trade and Economic Growth

Nexus Between International Trade and Economic Growth	67
Laila Memdani	
Causality Between Exports and GDP: An Empirical Evidence from BIMSTEC Region	77
Gurpreet Kaur, Vishal Sarin and Jasdeep Kaur Dhami	

Part III Productivity and Firm Performance

Intellectual Capital and Financial Performance: Evidences from Indian Business Process Outsourcing Industry	97
Mohd Anas Raushan and Ahmed Musa Khan	

CSR as Investment: An Analysis of Ownership Structure and Firm Performance	113
Vasiq Nuvaïd, Sucheta Sardar and Sujoy Chakravarty	
Productivity Performance of Indian Banks with FDI Contents	125
Jayashree Patil-Dake	
Is the Acquirer More Efficient Than Target? An Empirical Study from Selected Bank Consolidation in India	153
M. Kollapuri	
 Part IV Agriculture and Food Security	
Foreign Exchange Rate and Agricultural Performances: A Time Series Exercise for India	183
Madhabendra Sinha and Partha Pratim Sengupta	
Assessing Nutritional Intake from a Field Study in Odisha	197
Bhabani Prasad Mahapatra and Bhagabata Patro	
Dynamics of Food Grains Production in Telangana	213
S. Indrakant	

About the Editors

Dr. Bandi Kamaiah is currently Professor and Dean of School of Economics at University of Hyderabad, India, and President of The Indian Econometric Society (TIES). He has held multiple administrative positions as SAP and ASHIS Coordinator, Head of the Department of Economics at University of Hyderabad. He also served as the Head of RBI Endowment Unit, Institute for Social and Economic Change (ISEC), Bangalore. With 140 research papers in international journals of repute, his areas of research interest are monetary and financial economics, applied time series analysis, macroeconomics, and international finance.

Dr. C.S. Shylajan is Professor and Dean Academics at IBS Hyderabad, India. Prior to this, he was a Post-Doctoral Fellow at Indian Institute of Management (IIM) Calcutta. He was also a Visiting Research Fellow at International Centre for Theoretical Physics (ICTP), Trieste, Italy as part of a Research Program sponsored by UNESCO and Beijer Institute, Sweden. His areas of research interest are international economics, macroeconomics, environmental economics, etc. He was the Consulting Editor of *IUP Journal of Public Finance* during 2006–2012. He is currently Associate Editor of *International Journal of Ecology and Development*.

Dr. S. Venkata Seshiah is Professor and Director at ICFAI Business School, Hyderabad, India. He was a Consulting Editor for *ICFAI Journal of Applied Economics* and he has also edited several books in the area of economic development. He is also a scientific adviser for many national and international journals. His areas of interest are financial economics, capital markets, business strategy, and behavioral economics.

Dr. M. Aruna is Associate Professor with the Department of Economics at IBS Hyderabad. She obtained her Ph.D. from Osmania University and has received short term fellowship from ICSSR, New Delhi. Her research has been published in journals like *Economic and Finance Review*, *Theoretical Economic Letters*, *Energy Review Studies*, *Indian Journal of Economics and Business Economics*, *Business Economics and Finance Review*, and *Journal of Educational Planning and Administration*.

Dr. Subhadip Mukherjee is Assistant Professor in the Department of Economics, ICFAI Business School Hyderabad. He completed the Fellow Programme in Management (FPM) in Economics from IIM Bangalore. His research has been published in journals such as *Economic Modelling* and also in edited volumes published by Springer. His areas of research interest include international trade, applied econometrics especially with respect to microlevel analysis of firms and industries, and development economics.

Part I
Fiscal Policy, Monetary Policy
and Financial Integration

Impact of Debt on Short-Run and Long-Run Growth: Empirical Evidence from India

Nikita Pahwa

Abstract This study tries to analyse the impact of internal and external debt on economic growth in India during the period 1980–2014. Employing ARDL technique of co-integration, the study finds the negative impact of both internal as well as external debt on Indian economy in long run, thereby controlling for other variables namely trade openness, investment and population growth. The results of the error correction model (ECM) show that internal debt, external debt, investment, population growth and trade openness affect the economic growth both in short and long run. The relationship between debt (both internal and external) and economic growth turns out to be negative in long run. However, the short-run impact of internal debt is fluctuating; whereas external debt is negatively related to growth.

Keywords Economic growth • Internal debt • External debt • ARDL bound test approach • India

1 Introduction

1.1 Rationale

Debt and its impact on economic growth has been a very controversial topic in economics. There has been no clear consensus among economist about its effect on economic growth. However, it is agreed by all that fiscal deficit and its refinancing through internal and external debt have consequences on economies. Public debt,

N. Pahwa (✉)
Economics, Mysore University, Bangalore, India
e-mail: nikita.pahwa82@gmail.com

which is summation of internal¹ and external debt,² in case of India, has been a matter of concern for Indian economy. The domestic liabilities (of both the Centre and the State) have increased from 38% of GDP in 1980–1981 to 57% in 1990–1991, to 64% in 2000–2001 and currently these liabilities stood as high as 63% in 2014. The post-reform period of Indian economy witnessed an increase in external borrowings from 9% of GDP in 1980–1981 to 11% of GDP in 1990–1991. It further stayed at 9% in 2000–2001 and has seen a decline to 4% of GDP in 2011.

The overall combined debt of both the Centre and the State, inclusive of both internal and external borrowings has increased at alarming rate in post-reform period as compared to pre reform period.³ During, 1980–1981, total public debt accounted for 47% of GDP, which increased to a drastic 68% in 1990–1991, and 73% in 2000–2001. The public debt increased to its highest of 83% during 2003–2004, however after the implementation of Fiscal Responsibility Budget Management Act 2004 (FRBMA), an act which focused on getting fiscal deficit under desired limits, the borrowing levels started to decline. In 2011, the overall borrowing stood at 66% of GDP, lower than the last decade, but still higher than the pre-reform period.

1.2 Objective

Among mainstream economists, debt has been considered as a burden on society, which affects investment and growth. Ricardian perspective considers government debt as equivalent to future taxes, which implies neutrality of debt to growth, whereas the Keynesian paradigm, considers debt as a key policy perspective for growth. While the focus of neo-classical and Ricardian equivalence approach is on the long run, the Keynesian approach emphasizes on short-run effects of debt. It is in this regard that public debt has implications for economic growth, and hence this becomes a key policy question.

Many studies have tried to test the hypothesis of effect of debt on economic growth in international context, but Indian evidence seems to be very limited in this regard.

This study differs from all other studies on India (Kannan and Singh 2007; Rangarajan and Srivastava 2005; Singh 1999) as it adds other macroeconomic variables like investment, population growth and trade openness (indicated by the sum of both exports and imports), while estimating the impact of debt on growth.

¹Internal debt mostly consists of borrowing through market loans, treasury bills, special securities issued to Reserve Bank of India (RBI) special bearer bonds, other bonds and securities issued to international financial institutions.

²External debt component consists of multilateral and bilateral borrowing, which are concessional and non-concessional and government and non-government further, also includes borrowings from IMF, long-term borrowings, short-term and commercial borrowings.

³India adopted reforms of liberalization, globalization and urbanization in 1991.

Second, this study employs advanced time series techniques of autoregressive distributed lag model (ARDL), co-integration approach and post-estimation techniques (CUSUM test, Ramsey RESET test, White test, LM test) to validate the relationship between debt and growth. Third, various recent studies such as by Bal and Rath (2014) have analysed the same relationship between domestic and external debt and economic growth, for latest period, however they have used different control variables as compared to this study.⁴ This study has tested the consistency of the model by using various post-diagnostic checks for autocorrelation, heteroskedasticity, omitted variable biasness, functional form of the model as well as structural break, which was not included in the study by Bal and Rath (2014).

The study is subdivided into these further subsections: Sect. 2 provides a detailed literature review on the subject, Sect. 3 provides the details of research methodology, data sources and model specification. Section 4 discusses results and findings, and finally, Sect. 5 concludes the study.

2 Review of Literature

Classical economists Ricardo, Mill, and Smith viewed public debt as a destructive factor for economic growth. In Ricardian view, government debt is equivalent to future taxes (Ricardo 1951; Smith 1937). Hence, the shifts between taxes and deficits do not lead to any wealth effects. An increase in debt does not increase consumption, as consumers are forward looking and they save for future rise in taxes and hence total savings in the economy are not affected. In Ricardian view, an increased private savings matches government dis-saving. Hence, total savings, investments and interest rates remain unchanged in this case, thereby leaving national income unaffected. Buchanan (1958) suggested that debt today is postponement of taxes to future, which leads to a shift in tax burden for future generations. Barro (1978) argues that a shift of taxes to future is not necessarily a burden due to the phenomenon of operative intergenerational transfers (Barro and Sala-i-Martin 2003).

However, according to Keynesian economist, investment saving liquidity preference money supply (IS-LM) theory suggests that an increase in government debt which is induced by deficit financing, eventually increasing the level of income, thereby increasing transaction demand for money and prices. As per Keynesian theory if private investors consider the impact of government securities to be positive on net wealth, the deficit will amplify the private consumption expenditure,

⁴Other control variables included total factor productivity, exports, labour force, investment, debt service. Model by Bal and Rath (2014) differs from the model in this study as they took both external and internal debt in one equation of growth. However, both these debt variables are expected to have a very strong correlation and hence my model has two separate equations to test the impact of each of these debt factors on growth.

transaction demand, interest rates and prices. Expansionary fiscal policy, in this case, ends up strengthening economic growth. On the other hand, monetarist argues that debt has negative impact on economic growth, by raising the interest rates, which eventually crowds out private investment. In addition, debt overhang theory suggests that if future debt gets larger than the repayment capacity of the economy, the expected debt service cost will discourage domestic and foreign investments, which will harm the economic growth.

Many studies have tested the relationship between debt and economic growth. Empirical analysis differs in its results, from country to country. Sheikh et al. (2010), in their study on Pakistan, observed that domestic debt servicing had negative impact on economic growth, as compared to the positive impact of domestic debt on growth. The study applied ordinary least square (OLS) technique for the period 1972–2009. Another country specific study on Nigeria by Adofu and Abula (2010), tested the impact of domestic debt on growth, and concluded that negative relationship exists between the two variables. The study further recommended the government to reduce its outstanding domestic debt in the economy. In a panel of 59 developing countries, for the period 1970–2002, study pointed out the negative relationship between debt and growth. Similarly, Kumar and Woo (2010) studied 38 advanced and emerging economies, during the periods 1970 and 2007, and have concluded inverse relationship between initial debt and economic growth. Qureshi and Ali (2010) found high level of public debt negatively affected the economic growth in Pakistan, during 1981–2008.

Concerning India, very few studies have tried to test the impact of debt on growth. Among few of them such as Singh (1999) explored the relationship between domestic debt and economic growth, by applying co-integration technique and granger causality test for the period of 1959–1995. The study supports the Ricardian equivalence hypothesis for India. However, this study only undertook public debt as function of economic growth. Another study by Barik (2010) extended this analysis by increasing the number of control variables in the main equation of debt on growth. This study also examines the indirect effect of public debt on investment and how it further affects growth. Using the basics of augmented Solow growth model, this study supports the Ricardian equivalence hypothesis for India, for the period 1980–2010. Hence, very limited, but the evidence has proved the relevance of Ricardian equivalence in Indian context. Kannan and Singh (2007) showed the impact of high debt and fiscal deficit on interest rates, output, inflation and the trade balance. Rangarajan and Srivastava (2005) concluded that large interest rates on debt and fiscal deficit adversely affect economic growth. Further, the study established the negative impact of public debt on economic growth.

It is with this spirit, that this study also seeks to ask the similar question of how debt affects growth in Indian economy. This study focuses on individual effect of internal and external debt on growth, controlling for various factors like population growth, investment and trade openness.

3 Research Methodology

3.1 Data Source

This study is considering gross domestic product at market price (GDPmp) as an indicator of economic growth. The data on debt of variables namely internal (INT) and external debt (EXT) were collected from Handbook of Statistics of Indian Economy, by Reserve Bank of India (RBI) (2015–2016). The same dataset also provides the data for total exports and imports⁵ of India, with gross fixed capital formation, a measure of investment (INV). All the variables were taken in log form, except population growth, for which population growth (POPGR) is considered in terms of percentage. The data for population numbers were collected from Census of India.

3.2 Model Specification

This paper employs autoregressive distributive lag (ARDL) model or bound testing approach (Pesaran et al 2001), in order to check the existence of short- as well as long-run relationship between internal and external debt with economic growth, controlling for population, investment and trade openness. Bound testing approach or ARDL approach has been applied to this model due to two reasons. First, the time series variables are of mixed order of integration $I(0)$ or $I(1)$, but not $I(2)$. Second, this approach is more suitable for the small and finite sample data like ours. The period of study is from 1980 to 2014, which gives 32 observations for this analysis.

In order to achieve the objective of the current study, the following are the two models for its short- and long-run relationship:

$$\begin{aligned} \text{LnGDPmp} = & \beta_0 + \beta_1 \sum_{i=1}^{\rho 1} \text{LnGDPmp}_{t-i} + \beta_2 \sum_{i=0}^{q1} \text{LnINT}_{t-i} \\ & + \beta_3 \sum_{i=0}^{q2} \text{LnINV}_{t-i} + \beta_4 \sum_{i=0}^{q3} \text{Popgr}_{t-i} + \beta_5 \sum_{i=0}^{q4} \text{Lntrade}_{t-i} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{LnGDPmp} = & \gamma_0 + \gamma_1 \sum_{i=1}^{\rho 1} \text{LnGDPmp}_{t-i} + \gamma_2 \sum_{i=0}^{q1} \text{LnEXT}_{t-i} \\ & + \gamma_3 \sum_{i=0}^{q2} \text{LnINV}_{t-i} + \gamma_4 \sum_{i=0}^{q3} \text{Popgr}_{t-i} + \gamma_5 \sum_{i=0}^{q4} \text{Lntrade}_{t-i} \end{aligned} \quad (2)$$

⁵Sum of exports and imports is referred as trade openness variable, signified as trade.

The first equation shows the relationship between internal debt and economic growth, controlling for other variables. On the other hand, Eq. 2 mainly tests the relationship between external debts and economic growth, after controlling for other variables. In the above equation, $\rho, q1, q2, q3, q4$ refers to the lag length of respective variables. The AIC criteria are applied to identify the lag length. ARDL model gives the Wald test (F statistics), which helps in identifying the long-run relationship among all the variables. The null and alternate hypotheses are as follows:

$$H_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = 0 \text{ and } H_a \neq \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq 0$$

The computed values of F test statistics are then compared to the critical tabulated values of Narayan (2005). Pesaran et al. (2001) and Narayan (2005). They assumed lower bound critical values are integrated of order zero, whereas the upper bound critical values assumed that explanatory variables are integrated of order one. Hence, if the F statistics is smaller than the lower bound value, the null stated above would not be rejected and the conclusion can be drawn that no long-run relationship exists between variables. However, if the computed F statistics is greater than the upper bound values, existence of long-run relationship among variables is validated. If computed F statistics remains between lower and upper bound values, then the results remain inconclusive.

Once, long-run relationship or co-integration exist, coefficients of the model need to be estimated, which requires running of error correction model (ECM). ECM model provides coefficient for short run as well as long-term relationships, as well as one component of error correction, which describes the speed of adjustment from disequilibrium to equilibrium. ECM models for both the models are presented in Eqs. 3 and 4 below:

$$\begin{aligned} \Delta \text{LnGDPmp} = & \alpha_0 + \alpha_i \sum_{i=1}^{\rho 1} \Delta \text{LnGDPmp}_{t-i} + \alpha_j \sum_{j=1}^{q1} \Delta \text{LnINT}_{t-j} \\ & + \alpha_k \sum_{k=1}^{q2} \Delta \text{LnINV}_{t-k} + \alpha_l \sum_{l=1}^{q3} \Delta \text{Popgr}_{t-l} \\ & + \alpha_m \sum_{m=1}^{q4} \text{Lnttrade}_{t-m} + \theta \text{ECM}_{t-1} + \varepsilon_t \end{aligned} \quad (3)$$

$$\begin{aligned}
\Delta \text{LnGDPmp} = & \delta_0 + \delta_i \sum_{i=1}^{\rho 1} \Delta \text{LnGDPmp}_{t-i} + \delta_j \sum_{j=1}^{q1} \Delta \text{LnEXT}_{t-j} \\
& + \delta_k \sum_{k=1}^{q2} \Delta \text{LnINV}_{t-k} + \delta_l \sum_{l=1}^{q3} \Delta \text{Popgr}_{t-l} \\
& + \delta_m \sum_{m=1}^{q4} \text{Lntrade}_{t-m} + \mu \text{ECM}_{t-1} + \varepsilon_t
\end{aligned} \tag{4}$$

In the equation above, $\alpha_i, \alpha_j, \alpha_k, \alpha_l, \alpha_m$ and $\delta_i, \delta_j, \delta_k, \delta_l, \delta_m$ are short-run coefficients. Whereas θ and μ , represents long-term coefficient of speed adjustment, which is expected to be negative and significant.

4 Results and Findings

One of the pre-conditions to go ahead with the ARDL or bound test approach is to check the stationarity of the data. If the order of integration of all the series is $I(1)$ or $I(0)$ or both, bound test can be applied. Applying the unit root test with Augmented Dickey Fuller (ADF) approach as well as Phillips Perron (PP) approach, the following are the results presented in Tables 1 and 2 (Phillips and Perron 1988).

The ADF and PPerron test are conducted at intercept level, intercept with trend as well as at first difference. Internal debt (Lnint) turned out to be stationary at level in Tables 1 and 2, at 1%. Except internal debt all other variables are stationary at first difference. Given we have a mix of $I(0)$ and $I(1)$, bound test or ARDL approach is applied further.

Bound test results or ARDL is required to establish if there exist long-term relationship among variables or not and eventually to estimate the coefficients of long-term series. Table 3 reports the results of bound testing of Eq. 1, as specified earlier. As the F statistics of 6.72 is greater than the upper bound value at 1% (4.92), 5% (3.97) a 10% (3.53) level of significance, we fail to accept the null hypothesis of joint significance of all coefficients to be zero. Hence, it can be concluded that there exists a long-term relationship with internal debt and GDP growth. Furthermore, other variables like population growth, investment and trade openness are also co-integrated with economic growth in India. Similar results of long-run co-integration between external debt with economic growth are represented in Table 4, where the F statistic (12.59) is significantly higher than the upper bound values at 1% (4.92), 5% (3.97) and 10% (3.53) level of significance.

Table 1 Augmented Dickey Fuller (ADF)—at levels and first difference

Variable	At level			At first difference		
	Intercept		<i>p</i> value	Intercept		<i>p</i> value
	Coefficient			Coefficient		
LnGDPmp	0.01	0.99		-0.09	0.87	
LnInt	-0.02	0.01*		-0.11	0.81	
LnExt	-0.04	0.35		-0.12	0.79	
Popgr	-0.04	0.79		-0.33	0.33	
LnTrade	0.00	0.99		-0.26	0.22	
LnInv	0.00	0.98		-0.30	0.21	

* Values being significant at 1%

Table 2 Phillips Perron test—at level and first difference

Variable	At level			At first difference		
	Intercept		p value	Intercept and trend		p value
	Coefficient			Coefficient		
LnGDPmp	0.01	1.00		-0.094	0.89	
LnInt	-0.02	0.00*		-0.11	0.85	
LnExt	-0.03	0.43		-0.12	0.81	
Popgr	-0.04	0.81		-0.33	0.33	
LnTrade	0.00	0.99		-0.26	0.21	
LnInv	0.00	0.98		-0.30	0.21	

* Values being significant at 1%

Table 3 Bound test approach results: GDP on internal debt (other control variables: population growth, trade openness, investment)

Level of significance	Critical values		<i>F</i> statistics	Co-integration
	Lower bound I0	Upper bound I1		
GDPmp (%)				
1	3.81	4.92	6.72	Co-integration exist between internal debt and GDP growth in India
5	3.05	3.97		
10	2.68	3.53		

Table 4 Bound test approach results: GDP on internal debt (other control variables: population growth, trade openness, investment)

Level of significance	Critical values		<i>F</i> statistics	Co-integration
	Lower bound I0	Upper bound I1		
GDPmp (%)				
1	3.81	4.92	12.59	Co-integration exist between external debt and GDP growth in India
5	3.05	3.97		
10	2.68	3.53		

In order to obtain the short-run and long-run estimates, the running of error correction mechanism (ECM) is required after the co-integration. The results from ECM Eqs. 3 and 4 are presented in Tables 5 and 6, respectively. The main advantage of ARDL model is that it can estimate both the short-run and long-run coefficients simultaneously. The summary of both the short-run and long-run estimates of effects of internal debt on economic growth are shown in Table 5. The impact of internal debt on growth seems to be fluctuating in short run as immediate short-run debt affects growth negatively; however, the lag variable of debt affects growth positively. This makes sense as while in immediate short-run debt affects markets negatively, it is only after a lag of sometime that the positive impact of the debt seems to be in existence. In addition, the positive impact of borrowing will exist in the case where the debt amount is used for productive purposes of creating assets as well as jobs. However, the long-run implication of higher internal debt is clear and negative. An increase in 1% internal debt decreases the GDP by 0.35% in long run.

Similarly, the impact of population growth is fluctuating, like internal debt. Again the long-run impact is clear, with growth in population affecting GDP positively with coefficient of 0.29%. Investment affects GDP positively in both short and long run, with 1% of increase in investment leading to increase in GDP by 0.17 and 0.20% in growth, in both short and long run, respectively. Trade openness affects growth positively in short-run but long-run implication turns out to be

Table 5 Long-run and short-run estimation (GDP and internal debt)

Regressors	Coefficient	<i>t</i> test	<i>p</i> value
<i>Short-run estimates</i>			
GDP (−1)	0.44	3.16	0.00*
Internal debt	−0.28	−7.31	0.00*
Internal debt (−1)	0.11	2.78	0.01*
Investment	0.17	8.96	0.00*
Investment (−1)	−0.037	−1.19	0.25
Population growth	0.14	2.53	0.02**
Population growth (−1)	−0.14	−2.62	0.01*
Trade openness	−0.03	−1.33	0.19
Trade openness (−1)	0.10	3.94	0.00*
ECM (−1)	−1.55	−7.27	0.00*
Constant	15.45	7.31	0.00*
<i>Long-run estimates</i>			
Internal debt	−0.35	−10.26	0.00*
Investment	0.20	8.09	0.00*
Population growth	0.29	5.97	0.00*
Trade openness	−0.07	−4.89	0.00*

* and ** Values being significant at 1 and 5%, respectively

Table 6 Long-run and short-run estimation (GDP and external debt)

Regressors	Coefficient	<i>t</i> test	<i>p</i> value
<i>Short-run estimates</i>			
GDP (−1)	−0.46	−4.56	0.00*
GDP (−2)	−0.87	−7.08	0.00*
External debt	−0.15	−8.28	0.00*
External debt (−1)	−0.10	−4.91	0.00*
External debt (−2)	−0.09	−5.61	0.00*
Investment	0.11	4.97	0.00*
Investment (−1)	−0.10	−3.7	0.00*
Population growth	0.29	0.048	0.00*
Population growth (−1)	−0.11	−2.39	0.03**
Trade openness	0.12	4.39	0.00*
Trade openness (−1)	0.08	3.45	0.00*
ECM (−1)	−0.86	−10.23	0.00*
Constant	4.97	10.37	0.00*
<i>Long run estimates</i>			
External debt	−0.09	−2.27	0.04**
Investment	0.40	3.38	0.00*
Population growth	0.50	5.37	0.00*
Trade openness	0.11	2.31	0.03**

* and ** Values being significant at 1 and 5%, respectively