Impact of Public Debt on Economic Growth in Case of India:
A Co-Integration Based Study

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ABSTRACT

The present study has investigated the impact of public debt on economic growth from the period of 1990 to 2017. We applied data on public debt (internal & external) and per capita income as a proxy for economic growth. ARDL co-integration test has been used in this study to check long-run relationship between the variables. The co-integration test verified long-run relationship between public debt and economic growth. Public debt has significant impact on economic growth in long-run as well as short-run. The study also used Granger causality test which unravelled unidirectional causality. Only debt caused economic growth.

Keywords: Public debt; Economic growth; ARDL bound test.

INTRODUCTION:

Government of a country goes for debt (Domestic and External) to bridge the gap between revenues and expenditures. Most of the country prefers domestic debt as it bears less burden as compare to external debt. External sources of debt are used if domestic markets for borrowing are not well developed.

A continuous increase in fiscal deficit and rate on borrowings have raised question about debt sustainability and solvency of state to attain macroeconomic stability. Recently, concern about debt sustainability emerged due to high public debt, high fiscal deficit and lower economic growth. More attention over debt sustainability were raised by 12th finance commission in 2004 (Government of India 2004) as rate of debt was faster than GDP (Gross Domestic Product) from 1996 to 2003.

Public debt sustainability to India came into concern by the late 1980s with high fiscal deterioration both centre as well as states levels. For sustainable economic growth with macroeconomic stability, reducing public debt is an important component. Government borrowing to meet its expenditures can reduce private investment due to high rate of interest. High rate of interest may also tend to attract foreign capital which leads to appreciation of exchange rate, which reduces export.

Expenditures always more than revenues for India, gap between both (expenditure & revenues) becoming widening year by year. In 1990-91 the gap was 0.22 million USD, till 2014-15 it became 3.41 million USD. Fiscal deficit in last 25 years has got multiplied almost by 15 times.

Lacking of resources problem particularly concern to underdeveloped countries, but developed countries also indulged in deficit financing. In case of developed countries deficit financing used to stimulate the economy. On the other hand, under developed countries raise borrowings for investment which is supposed to increase the productivity leads output in the economy.

The major problem related to debt is that major portion of India’s revenues is incurred on amount of debt and debt servicing cost, very less money are left for developmental purposes after paying debt. So there should be debt control mechanism in India. Still, no direct control of borrowings is being used in India.

In the present study our focus are investigate the impact of public debt on economic growth in case of India.
Same study was done by Charan (1999) in case of India; he investigated the relationship between internal debt and economic growth by using co-integration and causality technique for the period of 1959 to 1995. The motivation of present study is that, it is different from previous study in two ways. First the period of our study if from 1990 to 2017, since then a lot of changes took place. Second research gap is concern to econometric methodology, we used ARDL bound test for co-integration.

This study is organized into five sections. Section 2 deals with reviews of literature; data and methodology of the paper has been discussed in section 3; Section 5 elaborates findings and at the last section 5 concludes the study.

REVIEW OF LITERATURE:

In this paper under the review of previous studies we have taken both empirical & theoretical studies. A numbers of study have investigated the relationship between public debt and economic growth. Some of the study took only domestic debt and some of them taken both domestic as well as external debt.

In some of the studies it has been investigated that debt as a load on future generation, prominent among them are Baro (1978) and Buchanan(1958). Buchanan’s study shows that burden on current domestic debt is born by future generations.

The empirical studies are very few, instead the topic has been discussed across the world. The result of some studies on the impact of debt on economic growth is dichotomy in their findings. Many of the researchers have predicted that domestic debt have negative impact on economic growth. On the other hand other studies have found a positive relationship between debt and economic growth.

(Smith, 1776, Ricardo, 1951, Kemal, 2001, Ismihan & Ozkan, 2012, Anjaet al, 2012) these study showed negative impact of domestic debt on economic growth. In their view governments borrowing with in the country crowd out private investors as high rate of interest in domestic market, reduces economic growth.

The studies which show positive relationship between domestic debt and economic growth are also available; these are (Karazijiene & Sabohniene, 2010; Abbas & Christenen, 2007; and Charan 1999). They had found that domestic debt stimulates the economy, if economy are controlled and monitored effectively.

We have very few studies in the relation of India on public debt and economic growth. Some of them are very old. Rao (1953), Brahmananda (1980), and Minhas (1987) studied about domestic debt and economic growth when India was a under developed county. But today’s India is totally unlike what these researchers had seen. Minhas (1987) examined that debt and growth are not related at all in India and argued that Keynesian pump-priming theory is not applicable for India.

It has been common point in previous studies that domestic debt is not used for investment purpose rather than to meet the current expenditures. Chellia (1991) also advocated that domestic borrowings are being used for financing which increased government expenditure not capital formation. In 1985 RBI argued the same point. Charan Sing (1999) made a study on domestic debt and economic growth by using co-integration and Granger causality tests. He found no causalities between growth and debt.

Trend in debt and GDP:

![Figure 1](image-url)
DATA AND METHODOLOGY:

Data:
The study employs secondary sources of data (Handbook of Indian statistics) for given variables. We have taken data on combined government debt (centre as well as states) as a percentage of GDP and PCI as a factor of economic growth from 1991 to 2017.

Model:
In this study we have taken two variables public debt (external & internal) and PCI. PCI is our dependent variable and public debt is explanatory variable. Mathematically model is written as following.

\[ LPC_{t} = \beta_{0} + \gamma LDG_{t} + u_{t} \text{ eq. (1)} \]

Where t is time, LPCI is log of per capita income; DG is log of public debt as a percentage of GDP and \( u_{t} \) is error term.

Unit root test:
To avoid the problem of spurious regression, at the first in the present study we used unit root tests for checking the stationary of the variables. If the variables are not stationary, co-integration test cannot be applied. As we taken time series data, ADF (augmented decky fuller) test for unit root has been used.

Co-integration test (ARDL bound test):
After doing unit root test, we applied co-integration test to check the long-run relationship among the chosen variables. Traditionally Engle & Granger (1987) and Johansen & Juselius (1990) co-integration test used. These tests for co-integration are not appropriate when variables are integrated at different order. It is ARDL (autoregressive disturbed lag model) bound test which in most appropriate at different order of integration of the given variables. ARDL approach was given by Pesaran et al. (2001). The present paper used ARDL bound test for co-integration analysis. The ARDL model for our variables is as following.

\[ \Delta PCI_{t} = \alpha_{0} + \sum_{i=1}^{n} \beta_{1i} \Delta PCI_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta LD_{t-i} + \theta_{1} LPCI + \theta_{2} LD_{t-1} + u_{t} \text{ eq. (2)} \]

\[ \Delta LPCI_{t} = \alpha_{0} + \sum_{i=1}^{n} \beta_{1i} \Delta PCI_{t-i} + \sum_{i=0}^{n} \beta_{2i} \Delta LD_{t-i} + \gamma E_{t-1} + v_{t} \text{ eq. (3)} \]

In the above equations \( \Delta \) is used for making first difference. In equation (2) parameters of differenced lagged values shows short-run relationship while coefficients of lagged values shows long-run relationship. If long-run relationship is found we go for error correction term which is given in equation (3) by \( \gamma E_{t-1} \), where \( \gamma \) is speed of adjustment? The null hypotheses for co-integration test is, \( H_{0}: (\theta_{1} = \theta_{2} = 0) \) that means no co-integration between PCI and public debt.

Table 1: Descriptive Statistics

|        | LPCI | LDG  |
|--------|------|------|
| Mean   | 4.422| -0.146|  
| Median | 4.385| -0.151|  
| Maximum| 4.979| -0.079|  
| Minimum| 3.795| -0.191|  
| Std.Dev.| 0.368| 0.0321|  
| Skewness| -0.017| 0.766|  
| Kurtosis| 1.829| 2.631|  
| Jarque-Bera| 0.459| 0.247|  

Source: Author’s calculation

DATA ANALYSIS AND RESULT:

Before making co-integration, we checks order of integration for the variables. Our analysis applied ADF and KPSS unit root tests, with trend & intercept. The result of unit root test is revealed in table 2. Logarithms of gross domestic product (LGDP), logarithm of public debt (LDG) both are stationary at first difference at 5% level of significance but LGDP is stationary at level also in case of ADF test. In case of PP test both the variables are stationary at first difference at 5% level of significance.
Table 3: Stationary test result

| Variables | ADF Test | PP Test |
|-----------|----------|---------|
|           | Level    | First difference | Level    | First difference |
| LPCI      | -4.815*** | -4.229**       | -1.577   | -3.901**         |
| LDG       | -2.436   | -4.282**       | -1.713   | -3.421*          |

**Source:** Author’s calculation. Note: ***, **, * denote statistical significant at 1%, 5%, and 10% level respectively.

Hence, we have different order of integration for the given variables. LGDP is stationary at level and LDG is stationary at first different in case of ADF test of unit root. Under mix order of integration ARDL model of co-integration is most appropriate.

Table 4: F values based on ARDL model

| ARDL Function | Optimal Lag Length | F Statistics |
|---------------|--------------------|--------------|
| LGDP/LDG      | (1,1)              | (5.462)      |

| Significance Level | Critical Bound F- Values |
|--------------------|--------------------------|
|                    | Lower | Upper       |
| 1%                 | 6.84  | 7.84        |
| 5%                 | 4.94  | 5.73        |
| 10%                | 4.04  | 4.78        |

| Diagnostics test | |
|------------------|----------------|
| R-squared        | 0.999          |
| Adjusted R-squared | 0.999      |
| F statistic(prob.value) | 24.373(0.000) |
| Breusch-Godfrey LM test | 0.795       |
| Jarque-Bera      | 0.741          |
| White’s hetroscedasticity test | 0.127          |

**Source:** Author’s calculation.

Co-integration relationship has been discussed in table 3. In case of ARDL co-integration test F statistic values should be more than lower bound and upper bound. Table 2 shows that F statistic value (5.462) which is less than upper bound values at 5% levels of significances. The bound test value (5.462) is between lower bound and upper bund at 5% level of significance. So, our result is inconclusive. At 10% level of significance F statistic (5.462) exceeds upper bound value (4.78). Hence, we have long-run relationship between LPCI and DG at 10% level of significance.

Table 4: Long-run coefficients (LPCI dependent variables)

| Variables | |
|-----------|----------------|
|           | LDG_t          |
|           | 0.262*** (0.035) |

| Notes: ***, **, * level of significance at 1%, 5%, 10, respectively and () shows p value. |

Table4 reveals the long-run coefficients. Both public debt and intercept are positively significant impact on economic growth (LPCI).

Table 5: Short-run coefficients (LPCI dependent variables)

| Variables | |
|-----------|----------------|
|           | ΔLDG_t         |
|           | -0.587*** (0.0) |
|           | ECM_t-1        |
|           | -0.0175(0.002) |

| Notes: ***, **, * level of significance at 1%, 5%, 10, respectively and () shows p value. |

On the basis of table5 we can say that in short-run debt has negative impact on economic growth. The value of ECM_t-1(-0.0175) also significant at 1% level of significance, which shows speed of adjustment.
Table 5: Granger Causality test:

| Null hypothesis                        | F-statistic | p-value |
|----------------------------------------|-------------|---------|
| LDG does not granger cause LPCI        | 3.199**     | (0.04)  |
| LPCI does not granger cause LDG        | 0.676       | (0.619) |

Notes: ***, **, * level of significance at 1%, 5%, 10, respectively and () shows p value.

Causality test are discussed in table5, there is unidirectional causality. Only public debt causes economic growth. The economic growth causation to after discussing the result of bound test it important to check the stability of the model. For stability we used CUSUM and CUSUM square test.

Figure 2. Stability test CUSUM and CUSUMQ.

By checking stability of growth model in figure2 we can see that, stability are found only for CUSUM but for CUSUMQ model is not stable as test values are not within the boundaries.
SUMMARY AND CONCLUSION:

This study investigated the impact of public debt on economic growth with time period from 1990 to 2017 in the context of India. First, we checked stationary of the variables and found combination of order of integration. ARDL bound test has been applied to test the long-run relationship between the variables. Bound test did not verify co-integration as F statistic is > than upper bound value at 5% level of significance, it is between lower bound and upper bound so result is inconclusive. At 10% level of significance, variables are co-integration but 10% is not appropriate.

If we see the short-run and long-run coefficients, public debt has negative impact in short-run and positive impact in long-run. Error correction term (ECM) shows that disequilibrium in the model will come to the path of equilibrium in long-run with the speed of 0.0175. Stability of the model is conformed only in the case of CUSUM test not for CUSUMQ.

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