Impact of External Debt on Various Macro Economic Variables: Indian Evidence

Khalid Ashraf Chisti[1*] and Tayibah Shabir[1]

[1]*Department of Commerce, University of Kashmir, Srinagar, India.*

Authors' contributions

This work was carried out in collaboration between authors KAC and TS. Author KAC designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author TS managed the analyses of the study and managed the literature searches. Both authors read and approved the final manuscript.

Original Research Article

ABSTRACT

The paper tries to investigate the impact of external debt on time series quarterly data spanning from 2007:02-2017:03, on various macro-economic variables and to study the existence of relationship and causality between them in India. In order to derive the results various econometric tools such as ADF unit root test, Granger Causality test and Regression Analysis have been employed in the study. The null hypothesis for the study were that External debt does not granger cause various macro-economic variables which was accepted at 5% level of significance and External debt does not have statistically significant relationship with various macro-economic variables, which was accepted in case of all variables except Inflation. Thus, it was found that no granger causal relationship was found between external debt and macro-economic variables and vice-versa. There exists no statistically significant relationship between external debt and RGDP, G-Revenue, Export, and G-Spending and they have almost no impact on the external debt. However, in case of Inflation there exists a positive statistically significant relationship that has 10.27% impact on external debt. It was concluded that External debt does not play a significant role in the economic development of India for the period of the study.

_____

Corresponding author: E-mail: Chistikhalid@kashmiruniversity.ac.in;

1. INTRODUCTION

Growth and development are the basic issues that most of the economies face in the present world. Economic growth is the rise or fall in the real output of an economy. It shows changes in the money value of goods and services produced by all sectors in an economy. It is a quantitative measure and can be expressed in terms of GDP (Gross Domestic product) and GNP (Gross National Product). Conversely, economic development is a wider concept. It is the process by which a nation improves the economic, political, and social welfare of its people. It involves rise in the level of production along with the advancement of technology, better infrastructure, improvement in the living standards and so on. It is an upward movement in the real national income. The process of economic development requires an interaction among various factors of production such as natural resources, trained work force, and capital. All the factors of production can be made easily available if the economy has abundance of capital. Thus, capital formation is the core of the whole problem of economic development and growth. The economies must therefore arrange finance in such amounts that is the best for their development and growth.

Economies can either generate finance through internal sources such as savings, surplus of public undertakings, deficit financing, taxation etc. or they can rely upon funds provided by foreigners i.e. external sources. The funds acquired through external sources are known as external debt. According to World Bank, "total external debt may be defined as the debt owed to nonresident's repayable in terms of foreign currency, goods and services". The debt includes money owed to private commercial banks, other governments, or international financial institutions such as IMF, World Bank, etc. According to International Monetary Fund, "gross external debt is the amount, at any given time of disbursed and outstanding contractual liabilities of residents of a country to nonresidents to repay principle amount, with or without interest or to pay interest with or without principal". These loans including interest must be usually paid in the currency in which the loan was acquired.

External debt is generally incurred by that country's which suffer from shortage of domestic savings and where the countries themselves cannot finance the investment in development activities. But if the external debt is not properly utilized in income generating and productive activities, the ability of a debtor nation to repay is generally reduced. Economists have different opinions regarding the role of external debt on growth and development. Some see external debt as an important source of capital for an economy, accordingly it has positive impact on growth. They believe that external debt increases capital inflow which in turn helps in acquiring the best technology, managerial know-how, technical know-how, etc. On the other hand, some economists are of the view that when external debt accumulates beyond certain manageable level, it will contract the economic growth. As per the Debt Overhang hypothesis, if the anticipated external debt of a country is more than its repayment ability then the increased cost of servicing the debt can impede investment [1]. In addition, the Crowding out effect of debt states that if a major part of the external debt is used for interest payments, then only a small amount would be left out for financing investment activities and it could hamper growth [2]. Thus, the economies must be very careful in managing their external debt. A sustainable level of debt must be only acquired. Sustainable level of debt is that level which allows the debtor nation to meet its current and future debt service obligation in full without recourse to further debt relief or rescheduling, avoiding accumulation of arrears, while allowing an acceptable level of economic growth.

Amin Haleeb [3] empirically investigated the link between external debt and economic development of Sudan for period ranging from 1970-2011. The study used variables such as External Debt, GDP Per Capita, Government Consumption, Exchange rate, Inflation, Export, and Import. Time series data was used to conduct the study. Time- Series data was investigated for unit roots using ADF Unit Root Test. Regression analysis helped to analyze the existence of relationship between the variables. It was found that GDP per capita, Government Final Consumption, and Exports shown improvement with increase in external debt but, Gross Domestic Savings and Imports tend to be reduced with increase in external debt. Thus, it was concluded that external debt has both positive and negative impact on economic development of Sudan for the time of the study.

India being a developing economy, mostly hit by poverty, had to rely heavily on external debt to carry on its developmental process. It was exposed to several internal and external shocks, such as the oil price crises, gulf war, etc., that caused an upsurge in its external debt. India experienced a near balance of payment crises in 1991. On the onset of nineties, the foreign exchange had dropped to US$ 1.2 Billion, and could cover only two weeks of imports. So, government had to rely on Extended Fund Facility of IMF to maintain its imports. Owing to the situation India launched its process of economic reforms on 23 July 1991. From 1999-2017, the external debt averaged to US$260284.12 reaching an all-time high of US$ 485800 Million in the second quarter of 2017 and a record low of US$ 96392 Million in third quarter of 2000. India's external debt has shown considerable improvement over time. Prudent debt management strategies pursued during the early nineties has resulted to place India in contented debt position in recent years. Instead of increasing trend of external debt, sustainable improvement in external debt indicators is witnessed over time. The debt- service ratio has declined from peak of 35.3% in 1990-91 to 8.8% in 2015-16, Debt to GDP ratio declined from 38.7% in 1991 to 23.4% in 2015-16.

In this study, an attempt has been made to see whether external debt has an impact on the economic development of India using various macro-economic variables such as RGDP, Government Revenue, Government Spending, Inflation and Exports. Although the external debt ratios of the country have shown significant improvement, its contribution to the economy are examined in the study. The study will be based on quarterly data ranging from Second quarter of 2007 to Third quarter of 2017. The study will use regression analysis on time series data to verify the impact of external debt on macro-economic variables. In addition, Granger Causality Test will be used to verify the causal effect of external debt on the variables.

2. LITERATURE REVIEW

External debt has played significant role in the development process of the economies but at the same time it has caused several problems. The role of external debt in the economies has been a good topic for discussion among economists. While some economists considered it as an agent of growth, others concluded that it hampers growth. Oleksandr (2003) alienated the existing literature on the topic into three groups. The first group of the theories suggested that external debt could lead to growth in developing and under developed economies through capital accumulation and productivity growth [4]. External debt has positive impact on growth to certain threshold levels. The second group of theories stress that accumulated debt stock has negative impact on growth. This is explained by the Debt Overhang Hypothesis of Krugman [1], Sach (1989) and then advocated by Cohen [5]. Third group of theories combined these effects and argued that the impact of debt on growth is non-linear.

Fosu [6] studied the effect of external debt on the growth of 35 countries in Sub-Saharan African Countries using data for the period 1980 to 1990. The study used export augmented production function along with regression analysis and correlation. The variables of the study included GDP growth rate, external debt, exports, labour, capital and investment. The study found existence of negative relationship between external debt and GDP. The paper found that the growth in these countries would have been 50% more in the non-existence of debt burden. Also, negative correlation between external debt and investment were discovered. On an average, it was found that these countries face an annual reduction of 1% of GDP.

Pattillo et al. [4] in their empirical work studied 93 developing countries for period 1969 to 1998. The paper used panel data and derived results through both linear and non-linear regression analysis. In regression they used ordinary least squares, two-stage least squares, fixed effects and system generalized method of moments, and their results were consistent throughout. They found that for a country with average indebtedness, doubling of the debt ratio would reduce annual per capita growth by between a half and a full percentage point. The average impact of debt only becomes negative at debt ratios above 160-170 percent of exports or 35-40 percent of gross domestic product, and that the marginal impact of debt starts becoming negative at about half of these levels. In their study it was concluded that the level of investment is not the main channel through which excessive external debt reduces growth.

Clements et al. [7] used data of 55 LICs for a period ranging from 1970-1999 to study how external debt affect economic growth and public investment. The study uses Standard Growth

Model and included variables such as external debt, total debt service, trade, GDP, gross domestic investment, population growth rate, gross enrollment rate, and fiscal balance. Regression analysis and panel unit root test were deployed in the study. The study found that outside a certain threshold limit, with rise in external debt the growth rates of per capita income decline. The threshold limit was found to be around 50 percent of GDP of external debt, 20-25 percent of GDP for Net Present Value and around 115-120 percent of exports. It was found that substantial reduction in the external debt would directly increase per capita income growth by around one percentage point per annum.

Abu Baker and Hassan [8] focused to analyses the impact of external debt on economic growth in Malaysia. The analysis was conducted both at aggregate and disaggregate level using time series analysis. VAR estimates were used to generate the results. The variables of the study included GDP, external debt, capital accumulation, labour force and human capital. The study found that external debt positively affects the economic growth at both aggregate and disaggregate level and a percentage point increase in external debt dives 1.29 percent point increase in economic growth.

Adegbite et al. [9] examined the impact that Nigeria's huge external debt stock had on its economic growth between 1975 and 2005. They used a Solow-type neoclassical growth model to regress the ratio of external debt to gross domestic product against the annual gross domestic product growth rate. Ordinary least squares and generalized least squares were used in estimating both linear and non-linear relationships and studying the debt overhang theory for Nigeria. Their results found that external debt contributes positively to growth upto a certain point, after which its contribution becomes negative. The "crowding out" effect of debt servicing was analysed by regressing debt service requirements against private investment and it was found that Nigeria's large debt burden did indeed "crowd out" private investment.

Jayaraman and Lau [10] tried to analyze whether external debt leads to economic growth. The study examined six Pacific island countries between 1988 and 2004 and was based on regressing external debt stock, exports and the budget deficit (all as a percentage of gross domestic product) against gross domestic product. Jayaraman and Lau estimates a regression model by the panel group mean fully modified ordinary least squares, and find that a 1 percent increase in the external debt stock leads to a 0.25 percent increase in national output. Tests for causality where carried out by panel-based vector error correction model with a dynamic error correction term, and it was found that whilst there is no Granger causality relationship between real gross domestic product and external debt in the long-run, there is a significant causal relationship running from external debt to gross domestic product in the short-run.

Ali et al. [11] examined the long run and short run impact of external debt on economic growth in Pakistan over a period of 1970-2010. The study used GDP as a function of annual education expenditure (proxy of human capital), capital, labour force and external debt. The study was based on an extended model of production function. ADF test was used to check for existence of unit root. The optimal lag length selection for ADF test and Johansen's Cointegration was done through Schwartz Criterion and Hannan Quim Criterion. Long run equilibrium equation was obtained by applying Johnsen cointegration test while short run results were obtained through Vector Error Correction Model. Number of cointegrating vectors was used on the bases of Trace Statistics and Max Eigenvalue Test. The results show that external debt exert a negative impact on economic growth, discouraging economic growth and verifying the occurrence of Debt Overhang Hypothesis in Pakistan for the period of the study. Capital as a key factor of production positively affects the economic growth and has a lot of potential to accelerate the pace of economic growth. Human capital has positive impact on economic. An educated and highly productive labour force can speed up the growth process. Labour force showed the negative impact on economic growth indicated that more unskilled labour having low productivity is unlikely to increase the level of output in the country. Short run results also confirmed the significance of capital formation and human capital to generate national income. Short run results showed the similar sign of variable entering in the model as in the long run but significant negative association of labour force and economic growth exist only in the long run.

Rahman et al. [12] studied the relationship between external debt and GDP in Bangladesh

for period 1972-2010. They used time series analysis for investigating the relationship between the two variables i.e. External Debt and GPD. They employed the Augumented Dickey Fuller and Philips Perron Stationarity Test for checking the stationarity of the series. The unit root test show that both the variables are integrated of order 1. Ganger causality test showed that bi-directional causality runs through GDP to external debt as well as external debt to GDP. The co-integration analysis suggested that there is a long-run equilibrium relationship between income and external debt. The Eigen value tests based on stochastic matrix indicates existence of the co-integration relationship between GDP and external debt.

Mohsin et al. [13] evaluated the long run and short run dynamics of external debt and economic growth in Pakistan from 1980-2010. They used variables like external debt, GDP, employment, exports, capital stock for their study. ADF test and PP test were used to check the presence of unit root in the series. Various econometric techniques such as granger causality test, regression analysis, Johansen cointegration test and Impulse response functions (IRF) were deployed. Temporal dynamics where captured by granger causality test and IRF. Results show that unidirectional causality runs from capital stock to external debt, export to employment, and output to external debt, and bidirectional between output and capital stock. The results of Johansen Cointegration show the existence of long run relationship between external debt and GDP.

Dereje [14] empirically is investigating the relationship between economic development and economic growth of 8 African HIPCs for period 1991-2010 using debt overhang theory and debt crowding out effect. He used Solow's Growth Model for his study and the variables for his study were Real GDP, Initial per Capita GDP, and growth rate of investment, population growth, trade balance and net total debt service. Using Cross Sectional Regression Model and Random Effect Approach for estimation, he concluded that the effect of external debt on economic growth is statistically insignificant in terms of debt overhang effect. While in case of debt crowding out effect the relationship is statistically significant. In addition, the study also revealed that, the total amount of debt relief received by these countries did not help them in attaining better economic growth.

Ochieng et al. [15] studied the relationship between economic debt and economic growth in five East African Countries. The period of the study was 1970- 2010. The study was based on Debt Augmented Solow Model by Brauninger (2003). Panel fixed effect model was deployed to achieve the results. For regression analysis real per capita GDP was kept as dependent variable and investment, government expenditure, terms of trade and openness were kept as explanatory variable. Levin Lin Chu panel root test was used to check the stationarity of the data. The regression results revealed that economic debt has negative impact on economic growth. A unit increase in external debt leads to 0.01416 unit decrease in economic growth when other independent variables are kept constant.

Unyekwelu et al. [16] investigated the external debt management strategies in Nigeria for 10 years i.e. from 2002-2011 and its implications on key economic indices. The study adopted empirical approach, using simple linear regression technique, correlation and analysis of variance (ANOVA) for analysis of the data. The variables for the study were External Debt, GDP, Exports, Capital Expenditure and External Reserve. Positive correlation was found between external debt and the variables however the outcome of the regression analysis highlighted existence of negative relationship between external debt and all other variables be that capital expenditure, export, external reserve or GDP. The main cause of negative relationship has been attributed to misappropriation and mismanagement of foreign loans and rescheduling of debts rather than their cancellation.

Siddique [17] examined the impact that external debt has on economic growth of 40 HIPC's for a period ranging from 1970-2007 using growth accounting process. Siddique in his paper has evaluated the result of IMF's initiative on these countries and how the external debt initiative affected the growth of these countries. The variables used included GDP per capita, Capital formation per unit GDP, total debt per unit GDP, total trade per unit GDP and population. Time series data and cross-sectional data were used for the study. The stationary of the data was examined using ADF test for country level and LLC Test, IPS Test and PP Test for panel level. The results were obtained by using the panel data estimation of an Auto Regressed Distribution Lag Model (ARDL) model. The results depicted that capital formation had a

positive impact on GDP in the short run as well as in the long run. On the other hand, debt has a negative influence on the GDP in both short and long run. Merchandise exports in the short run have negative effect on GDP but in the long run exports show positive effect on GDP. Population increase has positive effect on GDP. The results suggest reduction in debt stock would certainly increase the growth performance of the indebted nations. These countries should not only be provided with financial aid but with more chances of promoting exports and management of funds.

Suna [18] examined the relationship between economic debt and economic growth of Turkey. In his study he used quarterly data from 2003:01-2014:03. Using Vector Auto regression (VAR) Model, Augmented Dickey Fuller (ADF), Philips Perron Test, and Granger Causality test the relationship was examined between external debt and economic growth. The study using Granger Causality Test found a unidirectional causality between economic borrowing to economic growth. As per the VAR analysis both variables i.e. external debt and Real GDP tend towards equilibrium which means there is a positive relationship between external debt and economic growth.

Younis et al. [19] studied the dynamic relationship between external debt and economic growth of Iraq from 1980-2014 based upon the Economic Growth Model. The study investigated the impact of external debt on external growth both in the long run as well as in the short run using the ARDL method. The variables for the study were external debt, compound interest, exchange rate and GDP. The studies showed that external debt has negative impact on economic growth and that there exists a significant relationship between the two. However, the study also found that external debt has greater negative impact on external growth in the short run as compared to the long run.

Mukesh [20], tried to study the impact of foreign debt on India. Theoretical framework was adopted in the study, and reasons for the growth of foreign debt were augmented for. Ratio Analysis was done to derive the results. The mainly used ratios were: Debt to service ratio, interest payment to current receipts, debt to GDP ratio and concessional debt to total debt ratio. The study found that the reasons of India's indebtness are structural in nature. External debt accumulation is largely associated with chronic current account deficits. The service and

repayment of debt create a burden on the Indian economy. Most of the foreign debt in India is denominated in USA$ and the country does not have enough foreign exchange reserves for repaying then in the same denomination. The country can overcome this problem by opening to Foreign Direct Investment, reduction of Commercial Borrowings and reducing unnecessary public expenditure.

The study tries to study the impact of external debt on various economic variables indicating the development of the economy. In India not much of the work in regard with this topic has been done. The study will be focused on how external debt affects the various macro-economic such as RGDP, Inflation, Export, Government Revenue and Government Spending. Time- series data for 40 quarter has been used to analyze the impact.

2.1 Objectives

1. To scrutinize the existence of causal relationship between external debt and various macro-economic variables.
2. To examine the impact of external debt on various macro-economic variables that indicate economic development.

2.2 Hypothesis

H_{01}: External debt has no causal relationship with various macroeconomic variables.
H_1: External debt has causal relationship with macro-economic variables.
H_{02}: External debt does not have statistically significant relationship with various macro-economic variables.
H_2: External debt has statistically significant relationship with various macro-economic variables.

3. METHODOLOGY

3.1 Data Source

The data for the study has been collected through secondary sources such as publications of various government agencies of India like RBI, Planning and Development Commission, Ministry of Finance, etc. Various economic variables have been used to study the underlying objectives. The variables used include real gross domestic product (RGDP), external debt, inflation, exports, government spending, and government revenue. The data for the variables of the study are collected at macro level which includes the whole

population and are thus not possible to be collected through primary sources by an individual.

3.2 Data Type

Time series quarterly data spanning from second quarter of 2007- third quarter of 2017 have been used in the study.

Time series data: A time series is a sequence of data points typically consisting of successive measurement made over a time interval. Time series analysis helps in studying behavior of the data in the past so that conclusions from the data can be derived. A time series can be classified as stationary or non-stationary.

Stationary time series: A stationary time series is a stochastic process whose joint probability distribution does not change when shifted in time. Consequently, parameters such as mean, and variance do not change over time and do not follow any trend.

Non-Stationary series: Non-stationary time series is a series whose mean and /or variance or both is a function of time. In time series analysis, if the series are non-stationary the results derived are spurious and unauthentic.

Unit root: Unit root is a feature of some stochastic process that can cause problems in statistical inference involving time series model. A stochastic process has a unit root if 1 is root of the process's characteristic equation.

Lag: Lag is essential delay. Lag helps in eliminating the problem of autocorrelation in the time series which shows how much the series is similar to itself. Lag helps in eliminating those series that are similar, so that existence of relationship is not spurious. Suppose t is a time series and has a lag of 1 then, its lagged series will be t-1.

3.3 Variables and Data Sources

Following are the variables used and have been collected through the following sources:

External Debt: External Debt is the money borrowed from non-residents who include public and private commercial banks, other governments, international institutions, commercial borrowings, trade credit, etc. In simple words, it is a debt liability owned to non-residents by the residents of the country. For the study, the data for external debt has been derived from the quarterly publications India's External Debt Report issued by Ministry of finance, Government of India www.finmin.nic.in and Reserve Bank of India www.rbi.org.in. The data is in Rupees Crore.

GDP: Gross domestic product is the monetary measure of the market value of all final goods and services produced in a period. In this study however, GDP real growth rate calculated by expenditure method at constant prices has been used. Real GDP takes price level changes into account. The GDP growth rate measures how fast the economy is growing. It is the rate at which a nation's GDP changes from one quarter to another. The data for the RGPD variable is in percentage form and has been collected from www.fred.stlouisfed.org.

Inflation: Inflation is the rate at which the general level of prices for goods and services is rising and consequently the purchasing power of currency is falling. Inflation measured by Consumer Price Index (CPI) is defined as the change in the prices of baskets of goods and services that are typically purchased by specific groups of households. The data was collected from www.indexmundi.com and is in percentage form.

Exports: Exports are the goods and services produced in one country and purchased by citizens of another country. This is the value of the aggregate goods and services sent from a resident to a non-resident. The export of any nation is a major source of foreign exchange. The data on exports of India are driven from FRED www.fred.stlouisfed.org and are in Rupees Billion.

Government spending: Includes all government consumption, investment and transfer payments. Government spends money towards the supply of goods and services that are not provided by the public sector but are important for the nation's welfare. Government spending goes to the nation's defense, infrastructure, health and welfare benefits. The data for the variable was driven from www.tradingeconomics.com and is in Rupees Billion.

Government revenue: Refers to all receipts the government gets including taxes, custom duties, revenue from state owned enterprises, and capital revenue. The data on revenue has been

collected from www.tradingeconomics.com and is in Rupees crore.

3.4 Tools and Techniques

Following tools and techniques have been applied on time series data to achieve the stated results:

Unit Root Test: A unit root test tests whether a time series variable is non-stationary and possesses a unit root. The null hypothesis is generally defined as the presence of a unit root and the alternative hypothesis is either stationary, trend stationary or explosive root depending on the test used. There are many unit root tests like Augmented Dicky Fuller(ADF) Test, Phillips Perron (PP) test, Kwiatkowski Phillips Schmidt Shin (KPSS) test, Elliott-Rothenberg Stock Test, Zivot Andrews Test, etc. ADF is the most commonly used unit root test.

ADF Unit Root Test: The ADF test developed by Dicky and Fuller (1979, 1981) is most commonly used unit root test. An ADF tests the null hypothesis that is unit root is present in a time series. The alternative hypothesis is different depending on which version of the test is used but is usually stationarity or trend stationarity. The ADF statistics used in the test is a negative number. The more negative it is the stronger the rejection of the hypothesis that there is a unit root at some level of significance. ADF test has been applied to test the stationarity status of the data using E-Views 10 Software.

Consider here variable Y for methodological discussion relating to the study. If the calculated ADF statistics is less than its critical value then Y is said to be stationary or integrated to order zero i.e., I (0). If this is not the case, then the ADF test is performed on the first difference of Y i.e. D(Y,2). If D(Y,2) is found to stationary, then Y is integrated of order one i.e. I (1). If this is not also the case, then ADF test is performed on the second difference of Y i.e. D(Y,3). If D(Y,3) is found to be stationary, then Y is integrated of order second i.e. I (2). The ADF test can be carried out using intercept, trend and intercept or none. The following model has been used to carry out the ADF test.

At Level:

When Intercept is used
When Trend and Intercept are used:
When none is used:

At First Difference:

When Intercept is used:
When Trend and Intercept are used:
When none is used:

At Second Difference:

When Intercept is used:
When Trend and Intercept are used:
When none is used:

Here,
= Difference,
=Variable,
Intercept or Constant,
Coefficient of the variable,
Trend,
Error Term.

3.5 Regression Analysis

Regression analysis is used to model the relationship between a response variable and one or more predictor variable. It is a statistical approach to forecast change in dependent variable based on change in one or more independent variables. Linear regression is used to predict relationship between one dependent variable and one independent variable whereas multiple regression analysis is used to see if there is a statistically significant relationship between dependent variable and two or more independent variables. The study will be using simple linear regression analysis to predict relationship between its dependent and independent variables. E-Views 10 has been used to perform regression. The general regression model is as under:

$$Y = \alpha + \beta X + \varepsilon$$

Where,

Y = Dependent Variable,
α = Intercept,
β = Coefficient of Independent Variable,
X = Independent Variable,
ε = Residual.

In this study, five regression models are used for checking the relationship between external debt and various macro-economic variables. These models are stated below:

$$RGDP = \alpha + \beta EXTDT + \varepsilon$$
$$INF = \alpha + \beta EXTDT + \varepsilon$$

$$SPD = \alpha + \beta EXTDT + \varepsilon$$
$$REV = \alpha + \beta EXTDT + \varepsilon$$
$$EXP = \alpha + \beta EXTDT + \varepsilon$$

Where,

α = Intercept,
β = Coefficient of Independent Variable,
$EXTDT$ = External Debt,
$RGDP$ = Real Gross Domestic Product,
SPD = Government Spending,
REV = Revenue,
INF = Inflation,
EXP = Exports,
ε = Residual.

3.6 Granger Causality Test

Causation indicates that one event is the result of the occurrence of the other event, i.e. there is causal relationship between two events. The Granger (1969) approach specifies that whether X causes Y is to see how much of the current Y can be explained by past values of Y and then to see whether adding lagged values of X can improve the explanation. The idea of granger causality is that a variable X Granger causes variable Y if variable Y can be better predicted using the histories of both X and Y then it can be predicted using the history of Y alone. Granger causality can occur in any of the following form:

1. Unidirectional Causality from X to Y indicates that X causes Y.
2. Unidirectional Causality from Y to X indicates that Y causes X.
3. Bilateral Causality occurs when both X and Y cause each other.
4. Independence is when neither X nor Y cause each other.

For the study, Granger Causality Test is done using E-Views 10 software. The null hypothesis for the test is that lagged X values do not explain the variation in Y. In other words, it assumes X does not Granger Cause Y. Lag is an important factor in Granger Causality test, therefore selection of optimal lag length is necessary. In this study, lag length will be selected based on Akaike Information Criterion (AIC) value. It is assumed that the two residuals are uncorrelated. The model for the study is:

$$X = \beta_1 X_{t-i} + \beta_2 Y_{t-j} + \varepsilon_1$$
$$Y = \beta_3 X_{t-i} + \beta_4 Y_{t-j} + \varepsilon_2$$

Where,

X and Y = Variables of the study,
β = Coefficient of the variables,
$t - i$ = Lag length,
ε = Residual.

4. RESULTS AND DISCUSSION

This study aims to examine the existence of statistically significant relationship between External Debt and various macro-economic variables like RGDP, Government Revenue, Government Spending, Exports and Inflation. Various econometric tools where used in the study to derive the results. The results depicted are presented below:

4.1 Augmented Dickey Fuller Test

The ADF test has been used to examine whether the time series data has a unit root or not. The ADF test has been performed on the variables like External Debt (EXTDT), Real Gross Domestic Product (RGDP), Inflation (INF), G-Spending (SPD), G-Revenue (REV) and Export (EXP), each having 42 quarterly observations over the period of study which ranges from 2007:02 – 2017:03, with the help of E-Views (10) Software. The hypothesis for the test is:

H_o : Variable has a unit root.
H_1 : Variable does not have a unit root.

The objective of ADF test is to check the stationary of time series data so that further tests such as granger causality test and regression analysis can be performed on the data and the results obtained are reliable. ADF Test is determined by graphing the time series data. The lag values were chosen by default by the software using Schwarz Information Criterion (SIC). The time series data was analyzed at level and first difference. To test the hypothesis 5% level of significance is used. The results of the ADF Test are depicted in Table 4.1A.

Table 4.1A presents that for variable RGDP and SPD the ADF test-statistics is greater than critical values at 5% level of significance. Also, the p-value for both the variables is less than 0.05, therefore, null hypothesis is rejected. That means the variables do not have a unit root and the data is stationary in nature. For other variables REV, EXTDT, EXP, and INF, null hypothesis is accepted because the ADF test-statistics is

Table 4.1A. ADF test results at level

Variable	Includes	t-statistics	Critical value	P.value	Result
RGDP	Trend and intercept	-5.059269	-2.294145	0.0001	Stationary
EXTDT	Trend and intercept	-1.300299	-3.523628	0.8739	Non –Stationary
EXP	Trend and intercept	-1.962714	-2.936942	0.6037	Non- Stationary
INF	Trend and intercept	-2.789955	-3.540328	0.2099	Non-Stationary
REV	Trend and intercept	-2.991134	-3.536601	0.1482	Non-Stationary
SPD	Trend and intercept	-4.598125	-3.523623	0.0035	Stationary

Source: RBI, Planning and Development Commission, Ministry of Finance, E-views 10

Table 4.1B. ADF test results at first difference

Variable	Includes	t-statistics	Critical value	p.value	Result
EXTDT	Trend and Intercept	-5.080337	-3.526609	0.0010	Stationary
EXP	Trend and intercept	-8.093067	-2.936942	0.0000	Stationary
INF	None	-3.03127	-1.951000	0.0035	Stationary
REV	Intercept	-3.350476	-2.945842	0.0198	Stationary

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

lesser than the critical value at 5% level of significance and p-value is greater than 0.05. That means these variables have a unit root problem and are non-stationary at level, to deal with the problem of non-stationarity ADF test is performed on first difference for these variables.

From Table 4.1B, it is apparent that all the variables have ADF test-statistics greater than the critical value at 5% level of significance and p-value less than 0.05. Therefore, the null hypothesis is rejected, and all the variables become stationary at first difference discarding the problem of unit root. The stationary series can now be used to perform the test of granger causality and regression analysis.

4.2 Granger Causality Test

In Granger Causality Test the primary step is to select the optimal level of lag. Lag helps in eliminating the problem of autocorrelation in the time series which shows how much the series is similar to itself. Lag helps in eliminating those series that are similar, so that existence of relationship is not spurious. Suppose t is a time series and has a lag of 1 then, its lagged series will be t-1. The lag for the study has been selected using VAR Lag Selection Criterion. Table 4.2 depicts the result of the VAR Lag Selection Criterion.

Akaike Information Criterion (AIC) is used to select the optimal level of lag. Based on the results in Table 4.2, lag with the least value that is, Lag 4 is selected. Granger causality test is used to empirically examine the first objective of the study that is, to examine the existence of

causal relationship between external debt and macro-economic variables. The hypotheses for the granger causality test are:

H_0: EXTDT does not granger cause macro-economic variables,
Macro-economic variables do not granger cause EXTDT,
H_1: EXTDT granger cause macro-economic variables,
Macro-economic variables grangers cause EXTDT.

The null hypothesis is examined on the p-values of the f-statistics of the granger causality test. The results of the Granger Causality test are shown in Table 4.3.

From the Table 4.3 its evident that all the variables have p-value of more than 0.05 for their respective f-statistics inferring that the null hypothesis are not rejected. Thus, external debt has no granger causal relationship with any of the macro-economic variable and macro-economic variables have no granger causal relationship with external debt. In Indian economy context, it was inferred that for the period of the study external debt does not help in predicting the values of macro-economic variables using the historic values of both external debt and macro-variables and vice-versa. All the time-series used in the study are thus independent.

4.3 Regression Analysis

Simple linear regression has been used to examine the impact of external debt on various

macro-economic variables. The test will be based upon the least square method of regression analysis having 42 quarters as sample. The hypotheses for the test are:

H_0: External debt does not have significant impact on various macro-economic variables.

H_1: External debt does have significant impact on various macro-economic variables.

The test uses the general regression model which is shown below:

External debt is the independent variable in the test where as other variables like Real Gross Domestic Product (RGDP), Inflation (INF), G-Spending (SPD), G-Revenue (REV) and Export (EXP) are dependent variables. For variable RGDP and spending the data will be used on level form whereas, for other variables the data

will be used at level form. In this test five regression models have been used. The coefficients of the independent variable for each model describe the relationship between the dependent variable and the independent variable, whereas the sign of the coefficient depicts the existence of positive or negative correlation between the variables. The p-value of the coefficient indicates whether the relationship is statistically significant or not. For the test 5% level of significance has been used. The R^2 of the model indicates the impact that the independent variable has on the dependent variable. The results of regression analysis are depicted below:

4.4 External Debt and RGDP

The impact of external debt on real growth rate of GDP examined using regression analysis with the help of E-views10 Software showed the tabled results.

Table 4.2. VAR lag selection criterion

Lag	Log L	LR	FPE	AIC	SC	HQ
0	-1555.897	NA	1.87e+29	84.68810	84.68810*	84.51897
1	-1502.902	85.93870	7.66e+28	83.50820	85.33681	84.15287
2	-1481.960	27.16699	2.03e+29	84.32219	87.71817	85.51943
3	-1380.334	98.87977*	9.26e+27	80.77481	85.73818	82.52463*
4	-1303.226	50.01630	3.01e+27*	78.55273*	85.08348	80.85513*

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

Table 4.3. Granger causality test result

Null Hypothesis	f-statistics	p-value	Decision	Outcome
DEXP does not granger cause EXTDT	1.52490	0.2220	Do not reject null hypothesis.	Export does not granger cause external debt.
DEXTDT does not granger cause DEXP	0.15798	0.9577	Do not reject null hypothesis.	External debt does not granger cause export.
DINF does not granger cause DEXTDT	0.41584	0.7957	Do not reject null hypothesis.	Inflation does not granger cause external debt.
DEXTDT does not granger cause DINF	0.99043	0.4289	Do not reject null hypothesis.	External debt does not granger cause inflation
RGDP does not granger cause DEXTDT	1.06613	0.3917	Do not reject null hypothesis.	RGDP does not granger cause external debt.
DEXTDT does not granger cause RGDP	1.26469	0.3072	Do not reject null hypothesis.	External debt does not granger cause RGDP.
DREV does not granger cause DEXTDT	0.89743	0.4787	Do not reject null hypothesis.	Revenue does not granger cause external debt.
DEXTDT does not granger cause DREV	2.20408	0.0943	Do not reject null hypothesis.	External debt does not granger cause revenue.
SPD does not granger cause DEXTDT	0.84900	0.5063	Do not reject null hypothesis.	Spending does not granger cause external debt.
DEXTDT does not granger cause SPD	0.80304	0.5336	Do not reject null hypothesis.	External debt does not granger cause spending.

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

Table 4.4A. Regression analysis results

Variable	Coefficient	Standard error	t-statistics	Probability
C	7.060773	0.469487	15.03934	0.0000
DEXTDT	1.37E-06	4.61E-06	0.297217	0.7679
R Squared	0.002260	Mean Dependent Variable		7.1443990
Adjusted R squared	0.023323	S.D Dep Variable		2.379084
SE of regression	2.406668	Akaike Info Criterion		4.461914
Sum Squared Residual	225.8900	Schwarz Criterion		4.725503
Log likelihood	-93.15924	Hannan Quim Criterion		4.672352
f-statistics	0.088338	Durbin Quim Criterion		0.559060
p-value (f stat.)	0.767878			

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

Table 4.4A shows that the p-value of the t-statistics for external debt is 0.76 which exceeds 0.05 meaning that at 5% level of significance, therefore, the null hypothesis for the model will be accepted. Thus, the relationship between external debt and RGDP is not statistically significant. The R squared value of 0.002260 shows that, only 0.22% variation in RGDP is caused by the external debt in India for the period 2007Q2-2017Q3. That means external debt plays a very minimal impact on the RGDP of Indian economy where as the residuals have greater impact on RGDP. The RGDP of India is higher than most of the economies at present in the world. It has gone through many up and down stages during the 42 quarters of the study. Many political and social influences such as financial crises 2008, change of the government, demonetization, roll out of GST and its improper implementation, entry of foreign direct investment have played a great role in its movement. External debt on the other hand has played a minimal role in the RGDP.

4.5 External Debt and Export

Table 4.4B shows the result of the regression analysis for external debt and export.

The coefficient of external debt and export shows a t-statistics of -0.128346 having a corresponding p-value of 0.89. The null hypothesis for the test would be accepted since the p-value exceeds 0.05% meaning that external debt does not have statistically significant relationship with exports. For the period of the study it can be inferred that only 0.42% variation in exports is caused by external debt. India always has suffered trade deficits during these 42 quarters. Although exports had shown an increasing trend throughout the 42 quarters but same has been the case of imports. Having trade deficits, the economy has been focusing more on the maintaining these deficits and debt is used for this purpose.

4.6 External Debt and Inflation

Table 4.4C shows the regression result of external debt and inflation.

The regression results of external debt and inflation show that for t-statistics of 2.11 the p-value is 0.0411 which is lower than 0.05. It means that at 5% level of significance the null hypothesis will be rejected whereas the alternative would be accepted. Thus, external debt and inflation have a statistically significant

Table 4.4B. Regression analysis results

Variable	Coefficient	Standard error	t-statistics	Probability
C	127.6539	82.07633	1.555307	0.1280
EXTDT	-0.00104	0.000807	-0.128346	0.8985
R Squared	0.000422	Mean Dependent Variable		121.3415
Adjusted R squared	-0.025208	S.D Dep Variable		415.5321
SE of regression	420.7369	Akaike Info Criterion		14.96944
Sum Squared Residual	6903761	Schwarz Criterion		15.05303
Log likelihood	-304.8736	Hannan Quim Criterion		14.99988
f-statistics	0.016473	Durbin Quim Criterion		2.513792
p-value (f stat.)	0.898535			

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

Table 4.4C. Regression analysis results

Variable	Coefficient	Standard error	t-statistics	Probability
C	-0429640	0.281165	-1.528072	0.1346
DEXTDT	5.84E-06	2.76E-06	2.112851	0.0411
R Squared	0.102709	Mean Dependent Variable		-0.073659
Adjusted R squared	0.079701	S.D Dep Variable		1.502411
SE of regression	1.441296	Akaike Info Criterion		3.616513
Sum Squared Residual	81.01604	Schwarz Criterion		3.700102
Log likelihood	-72.13852	Hannan Quim Criterion		3.646952
f-statistics	4.464139	Durbin Quim Criterion		1.916854
p-value (f stat.)	0.041067			

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

relationship and this relationship is positive. A unit increase in the external debt causes 5.48 units increase in inflation. The R squared value of 0.1027 means that external debt has 10.27% impact on inflation.

External debt therefore in India plays a role in inflation. When more money is brought in circulation, the rates of inflation are also high. Inflation is mostly caused when money supply grows faster than the rate of economic growth. In the recent quarters India has witnessed deep deceleration in inflation. The Modi lead NDA government with the help of RBI regulations tried to control the money supply in the economy which helped in bringing the inflation down. In addition, the fall in global oil prices played a prominent role in reduction of the inflation levels in India. For financial year 2016-2017 external debt level of India also reduced by 2.7%. That means with fall in external debt the inflation level also shows a falling trend, indicating the existence of direct relationship between external debt and inflation.

4.7 External Debt and Revenue

The impact of external debt on revenue has been shown in Table 4.4D.

For the model including external debt and government revenue the regression analysis test found that the coefficient of the model has a t-statistics of -1.11 and p-value of 0.2717. At 5% level of significance, it is detected that external debt does not have statistically significant relationship with revenue, since the p-value of the model is 0.27. The R^2 value of the model is 0.03 that is only 3% of the variation in revenue is caused by external debt.

India is a developing country that has a low domestic saving rate and low investment levels. The country has for long been dependent on the external debt to finance its developmental projects. These projects are still in incubation stage and do not provide any great revenue to the government. Most of the revenue of the Indian government comes from the taxes paid by the civilians. Thus, external debt does not impact government revenue in India for the time of the study.

4.8 External Debt and Spending

The impact of external debt on spending can be inferred from the Table 4.4E.

The p-value of the t-statistics for the model is 0.73, meaning that external debt and government

Table 4.4D. Regression analysis results

Variable	Coefficient	Standard error	t-statistics	Probability
C	660.3845	833.2827	0.792510	0.4329
DEXTDT	-0.009133	0.008191	-1.114989	0.2717
R Squared	0.030892	Mean Dependent Variable		103.6341
Adjusted R squared	0.006043	S.D Dep Variable		4284.511
SE of regression	4217.545	Akaike Info Criterion		19.60489
Sum Squared Residual	7.12E+08	Schwarz Criterion		19.68848
Log likelihood	399.9002	Hannan Quim Criterion		19.63533
f-statistics	1.243200	Durbin Quim Criterion		2.601798
p-value (f stat.)	0.271679			

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

Table 4.4E. Regression analysis results

Variable	Coefficient	Standard error	t-statistics	Probability
C	2242.534	131.3253	13.90070	0.0000
DEXTDT	-0.000542	0.001586	-0.341586	0.7345
R Squared	0.002983	Mean Dependent Variable		2209.512
Adjusted R squared	-0.022582	S.D Dep Variable		817.7980
SE of regression	826.9800	Akaike Info Criterion		16.32099
Sum Squared Residual	26671943	Schwarz Criterion		16.40458
Log likelihood	-322.5803	Hannan Quim Criterion		16.35143
f-statistics	0.116681	Durbin Quim Criterion		0.300867
p-value (f stat.)	0.734496			

Source: RBI, Planning and Development Commission, Ministry of Finance E-views 10

spending at 5% level of significance does not have a statistically significant relationship. The R^2 value of the model is 0.29% that means only 0.29% variations in the government spending can be explained by the external debt.

External debt has accumulated in larger amounts in India and the government spends a significant portion of its resources towards the repayment of external debt, which would otherwise be used in public welfare programmes. In March 2017, the short term external debt maturing within a year was 18.6% of the total external debt. The debt needed immediate payments, so the government focused more on its repayment rather than using the resources in other developmental projects. The Debt-Service ratio was 8.3% at the end of financial year 2016-17, indicating that 8.3% of the debt is used in paying the interest on the external debt. The government has therefore only a very little proportion of the debt left for investing in public welfare activities.

5. CONCLUSION

The study examines the impact of external debt on various macro-economic variables such as RGDP, Inflation, Government Spending, Government Revenue and Exports. Time series quarterly data ranging from 2007:02-2017:03 were used to derive the results. The study used econometric techniques such as ADF Unit Root Test, Granger Causality Test and Regression Analysis to derive the results. The study concluded that:

1. External debt does not have statistically significant relationship with RGDP. External debt does not granger cause RGDP nor does RGDP granger cause External Debt for the time of the study. External debt has only 0.22% impact on RGDP growth rate in India. The RGDP in India has many influences other than external debt these include financial crises of 2008, change in the government, and make in India initiative, relaxation in policies of commercial borrowings and foreign direct investment, money supply policies, demonetization, roll out of GST and confusion around it.

2. External debt does not have statistically significant relationship with exports. Neither does external debt granger cause export nor does exports granger cause external debt. Only 0.42% variation in external debt is caused by exports. Exports in India shows increasing trend but at the same time imports have also been increasing and they are increasing more than exports. This created trade deficit in the economy moreover, external debt is used to pay off this deficit, which is why external debt does not have statistically significant relationship with exports.

3. External debt and inflation have positive statistically significant relationship. External debt does not granger cause Inflation and Inflation does not granger cause external debt. External debt causes 10.27% variation in Inflation. In the recent quarters India has witnessed deep deceleration in inflation. The Modi lead NDA government with the help of RBI regulations tried to control the money supply in the economy which helped in bringing the inflation down. In addition, the fall in global oil prices played a prominent role in reduction of the inflation levels in India. For financial year 2016-2017 external debt level of India also reduced by 2.7%. This means that with fall in external debt the inflation level also shows a falling trend, indicating the existence of direct relationship between external debt and inflation.

4. External debt has statistically insignificant relationship with government revenue. Both the variables are independent, and does not granger cause each other. Only 3.08% impact on government revenue is explained by external debt. This is because the debt is not being used in productive activities that could generate revenue to the government.

5. External debt and government spending have statistically insignificant relationship. External debt does not granger cause government spending neither does government spending granger cause external debt. External debt has accumulated in larger amounts in India and the government spends a significant portion of its resources towards the repayment of external debt, which would otherwise be used in public welfare programmes. 18.6% of the total debt is short term in nature and must be paid within a year period; in addition 8.3% to the total debt is used to service the debt.

Thus, external debt does not granger cause any of the macro-variable nor do any of the macro-variable granger cause external debt. External debt has statistically significant relationship with inflation only and for the rest of the variables the relationship is statistically insignificant.

The study reveals that external debt does not help in the economic development of the Indian economy since it does not have any significant impact on macro-economic variables like RGDP, G-Spending, G-Revenue, and Export. External Debt does have significant relationship with Inflation over the period of study.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Krugman P. Financing vs debt forgiving: A debt overhang. National Bureau of Economic Research, Working Paper No.2486; 1988.
2. Diaz-Alejandro C. Southern cone stabilization plans, economic stabilization in developing countries. The Brooking Institution Washington DC; 1981.
3. Amin MAH. The impact of external debt on economic development in Sudan (1970-2011): An empirical investigation. International Journal of Economics and Finance. 2015;4(2).
4. Pattillo C, Poirson H, Ricci L. External debt and growth. IMF Working Paper. 2002;2(69).
5. Cohen D, Sach J. Growth and external debt under risk of debt repudiation. Elsevier Science Publishers B.V. ISBN: 0-444-89284-2. 1991;437-472.
6. Fosu AK. The external debt burden and economic growth in the 1980's: Evidence from Sub-African Africa. Canadian Journal of Development Studies. 1999;20(2):79-120.
7. Clements B, Rina B, Nguyen TQ. External debt, public investment and growth in low income countries. IMF Working Paper. 2003;3(249).
8. Abu Bakar, Hassan S. Empirical evaluation on external debt of Malaysia. International Business and Economic Research Journal. 2008;7(2):95-108.
9. Adegbite EO, Ayadi FS, Ayadi OF. The impact of Nigerian external debt on economic development. International Journal of Emerging Market. 2008;3(3):285-301.
10. Jayaraman TK, Evan L. Does external debt lead to economic growth in pacific island countries. Journal of Policy Modeling. 2008;272-288.
11. Ali R, Mustafa U. External debt accumulation and its impact on economic growth in Pakistan. The Pakistan Development Review. 2012;51(4):79-96.
12. Rahman MM, Suman D, Bashar MA. External debt and gross domestic product in Bangladesh: A cointegration analysis. Central and European Eastern Online Library. 2012;4:36.
13. Mohsin N, Maria Q, Naveed WA. Does external debt causes economic growth: A case study of Pakistan. The Romanian Economic Journal. 2012;43.
14. Dereje AE. The impact of external debt on economic growth. Department of Economics Magisteruppasts 30hp, Varterminen; 2013.
15. Ochieng JB, Kiprop S, Aquilars MK, Girove M. External debt and economic growth in the East Africa community. African Journal of Business Management. 2014;8(21):1011-1018.
16. Unyekwelu UL, Okoye E, Ugwuanyi UB. External debts management strategies in developing economies: An impact

assessment on selected economic indices of Nigeria. International Journal of Economics and Finance. 2014;6(8).

17. Siddique A, Selvanathan EA, Selvanathan S. The impact of external debt on economic growth: Empirical evidence from highly indebted poor countries. The University of Western Australia. 2015;15(10).

18. Suna K. The relationship between external debt and economic growth in Turkey. Proceedings of Second European Academic Research Conference on Global Business Economics, Finance and Banking (EAR15 Swiss Conference); 2015.

19. Younis AA, Taher SS, Jamal HSS. The impact of external debt on economic growth: Empirical evidence from Iraq. International Journal of Economics and Finance. 2015;4(8).

20. Mukesh K. Impact of foreign debt on India: An analysis. International Journal of Applied Research. 2015;1(13):575-578.