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Determinants of India's external debt

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Abstract
External debt plays an important role in overall growth and development of a nation. It gives a shape to the economic activities of a country. External debt is more crucial or important for any developing country like India where there is always a saving investment gap. In such a country to finance viable or profitable investment opportunities, the only source is external debt either through ECBs, trade credits, loans from government of another country or other financial institutions. In the present paper, we have tried to come up with the various factors or macroeconomic variables affecting external debt. The period of data covered is 7 years from 2013-14 to 2019-20. The source of data is official website of RBI. For determining the factors affecting external debt of India, we have applied multiple regression model, with the help of which we concluded that different macroeconomic variables like trade balance, exchange rate, foreign exchange reserve etc. affect external debt. Beside all these variables, time is also one of the important factors affecting external debt. From analysis, we concluded that various macroeconomic variables affect the level of external debt. Therefore, given the other independent variables like forex reserve, exchange rate, trade balance and time period, we can predict the value of external debt to GDP ratio. Then paper also deals with testing of efficacy of multiple regression model and we found that model is highly reliable and efficient.

Keywords: external debt, multiple regression, debt to GDP, trade balance to GDP, exchange rate, depreciation of currency

Introduction

External debt refers to that part of country's debt which has borrowed from the foreign lenders through various modes like external commercial borrowings (ECBs), trade credits, from government or various financial institutions. When a nation cannot repay its foreign debt or external debt, it faces a debt crisis. Foreign debt can also be defined as the amount payable by a country to other countries. There are various risk associated with external debt like it affects economic growth, devaluation of domestic currency etc. The International Monetary Fund (IMF) is one of the agencies which keeps track of countries' external debt. When a nation either refuse or unable to repay its external debt, then that nation is to be in sovereign default.

According to Zaman (2014) [11], External debt play an important role in overall development of any economy. It gives shape to the economic activity of any country. Senadza *et al* (2018) [12] stated that economic development and growth is a major goal in most developing nations. Therefore, resources need to Mobilised from various resources including external borrowings in all the feasible or viable profitable project for overall growth and development of a country.

There are various macroeconomic variables or factors that affects the level of external debt. When we are talking about developing growing economy like India, then it would have growing deficit in BOP because it would not have enough saving to fiancé investment and imports. Therefore, it is most likely that external debt would grow in absolute term but debt to GDP ratio depends upon debt as well as GDP. Besides this there are many other variables which also have significant impact on debt and GDP, therefore on debt to GDP ratio as well. Some of these variables are as follows: -

- Time period or Years: Time period or years do play a significant role. Time period shows us a trend in any factor over a period of time. With the help of time factor, we can conclude that whether we have increasing trends or decreasing trends. *A priori* we expect that there should be positive relation between external debt and time variable because with the passage of time the level of debt has risen. So, we should get positive coefficient of regression for time variable.
- Trade Balance**:** Trade balance refers to value of goods that are exported by a country minus the value of goods that are imported by a country during an accounting year. Export of goods effect the inflow of foreign exchange into the country, while import of goods causes outflow of foreign exchange from the country. Therefore, we can write Trade balance = Export – Import If total trade balance is positive and growing, then debt should decline. But if total trade balance is negative and growing then debt should rise. So, we expect that there is a negative relation between trade balance and external debt. We should get negative coefficient of regression for trade balance.
- Exchange Rate: In simple words, "exchange rate is the price of one currency in terms of some other currency". It can be defined as the value of one currency in terms of another country. When "n" unit of domestic currency is expressed in term of one unit of foreign currency (direct quotes), then increase in exchange rate would lead to

depreciation of domestic currency, due to which export would become cheaper whereas import would become costlier. In such a situation, we expect that exports should rise and imports should fall and due to which trade balance would also rise but this will hold good only in the situation, when condition given by "Marshall and Lerner" is satisfied that is:

$$Em + Ex > 1$$

Where Em is the price elasticity of demand for import and
Ex is the price elasticity of demand for export.
If the elasticity of demand is greater than unity, the import bill will contract and export earnings will increase as a sequel to devaluation. So, we expect that trade balance is positively correlated with exchange rate. We also expect that trade balance and external debt are negatively correlated. Therefore, we can say that exchange rate is negatively correlated with external debt. We should get negative coefficient of regression for exchange rate.

- Foreign Exchange Reserve: India's foreign exchange reserve includes foreign currency assets of the Reserve Bank of India (RBI), Gold, Special Drawing Rights (SDRs) and Reserve Tranche Position in the International Monetary Fund (IMF). If forex reserve is utilized for debt servicing, then we may expect that debt should be retired. But if forex reserve is used for development purposes, we may expect the GDP to grow. Therefore, when debt capital increases, it would lead to depletion of forex reserve. So, we should get negative coefficient of regression for forex reserve.

Review of literature

Tiruneh (2004) performed a study for highly indebted poor countries and found that capital flight, debt service payments, import to GDP ratio, per capita income and GDP growth rate are the key determinants of the demand for external borrowings. The study also showed that declining growth rate, high debt service payments, income instability, high import bills are the main reasons for external debt.
Bhatta (2005) [8] studied the relationship between GNP and external debt. He found that external debt has a positive impact on economic growth of Nepal.
Colombo and Longoni (2009) [6] studied the determinants of external debt for developing countries. In their study beside the standard economic variables, they also included socio political factors. The study found that external debt is positively correlated to the degree of openness, level of education and economic development. According to this study exchange rate is one of the important determinants of external debt. Kon (2010) [9] in his study examined the relationship between foreign reserve and other macroeconomic indicators like economic growth and external debt. He concluded that foreign reserve has a positive relationship with economic growth and external debt. Raju and Prasanth (2011) [4] in their paper studied the determinants of India's external debt and found that India's external assistance has a positive relationship with GDP, trade deficit etc. Waheed (2017) [5] in his paper investigated the macroeconomic determinants of external debt in oil and gas exporting and importing countries. He identified that economic growth, foreign exchange reserve, domestic investment, current account deficit, FDI, are main determinants of external debt. He further concluded that policy makers should pay special attention in reducing trade deficit and should find the new sources for revenue.
Gunjikar and Deshpande (2018) [3] in their paper titled factors affecting external debt of India, found that to achieve overall growth and for making country economically healthy, the country should utilise its own natural resources and demographics strength. For economic growth and progress, the country should formulate policies. Focus should be on developing agricultural sector because it would enhance GDP.
Saxena and shanker (2020) [1] in their paper discussed about the factor influencing external debt and found that many factors like net domestic saving, exports, imports, real effective exchange rate, debt service ratio, FDI, GDP, foreign exchange reserves and many other macroeconomic variables affect the level of external debt and according to them they all together can explain 62 percent of the total variability in India's gross external debt.
Azolibe (2020) [2] in his study found that factors such as high rate of corruption, increase in government expenditure, population growth and unemployment rate are important factors which effect the level of external debt in heavily indebted poor countries. According to him external reserve and GDP has a negative effect on external indebtedness. So, he concluded that beside Economic factors, Socio factors also matters a lot when it comes to external indebtedness.
Literature supports that external debt play a vital role in overall growth and development of any nation. Beside this, it is very clear from the review of literature that different macroeconomic factors like exchange rate, GDP, foreign exchange reserve etc. as well as social factors like corruption contribute to the growth of debt.

Objectives of the paper

The paper strives to acquaint the reader with the following concepts:

1. Basic concept of external debt
2. Determinants of external debt
3. Direction and magnitude of relation between external debt and other macroeconomic variables

Data source and Research methodology

After review of available sources, the data on external debt, GDP has been collected from Reserve Bank of India (RBI) and from Handbook of statistics from Indian economy. The Data on other variables like Debt, GDP, trade balance, exchange rate, foreign exchange reserve etc has also been collected from RBI. We have taken the data from 20013-14 to 2019-20. External debt is affected by different macro-economic variables like trade balance, exchange rate, forex reserve, BOP, GDP etc. We cannot ignore the time variable that shows the trends in debt over a period of time. For finding out the direction as well as magnitude of relationship between external debt and different macro-economic variables, we have regressed the external debt with respect to different macro-economic variables. We measured the external debt in

relative terms by deflating it with GDP. We also deflated the different macro-economic variables with GDP. But we have taken some variables in absolute terms, like time period, exchange rate. In the regression model, we have taken the year starting from 2013-14 to 2018-19 i.e., 6 years, on which we have tried to built a model. Using that model, we have predicted the value for 7th year i.e., 2019-20, to check efficacy of regression model We have used the multiple regression equation to find out the relationship of all these factors with external debt. We used all the factors after deflating them by GDP except the exchange rate and years. Therefore, we can write regression equation as follows: -

External debt to GDP = a1 + b1 Years + b2 Trade Balance to GDP + b3 Exchange Rate + b4 Forex Reserve to GDP + μt

Where a1 = intercept term

b1 = change in debt to GDP ratio per annum

b2 = change in debt to GDP ratio due to change in trade balance to GDP ratio b3 = change in debt to GDP ratio due to change in exchange rate b4 = change in debt to GDP ratio due to change in forex reserve to GDP ratio

We have taken the level of significance as 0.05 or 5% and then tested whether all these variables are statically significant or not.

Then we have tested the efficacy of multiple regression equation with the help of within sample, outside sample prediction.

For within the sample testing, we have drawn the actual and predicted debt to GDP ratio on a graph paper, where predicted debt to GDP has been calculated by applying the model in which debt to GDP ratio is regressed with respect to different macro-economic variables. Beside this, we have also calculated the index of prediction for within the sample testing, to see how effective or reliable the model is.

We have calculated the index of prediction as

Index of prediction = predicted debt to GDP / actual debt to GDP x 100

For outside sample prediction we have calculated or predicted the debt to GDP ratio for the year 2019-20.

Data on external debt and other macroeconomic variables (source official website of RBI)

Table 1: External Debt and Different Macro Economic Variables affecting external debt (measured as the ratio of GDP)

Debt to GDP Ratio	year	Trade balance to GDP ratio	Exchange rate	Forex Res to GDP Ratio
0.238768749	2014	-0.072143269	60.0998	0.162761065
0.238334277	2015	-0.067424107	62.5908	0.171450676
0.23363291	2016	-0.056195765	66.3329	0.172724496
0.19849017	2017	-0.047314037	64.8386	0.155811563
0.201299673	2018	-0.061089041	65.0441	0.161469231
0.197924468	2019	-0.067836799	69.1713	0.150537469

Table 2: Summary Output

Regression Statistics				
Multiple R	0.999855			
R Square	0.999711			
Adjusted R Square	0.998554			
Standard Error	0.000789			
Observations	6			
ANOVA				
	df	*SS*	*MS*	*F*
Regression	4	0.002151	0.000538	864.1191
Residual	1	6.22E-07	6.22E-07	
Total	5	0.002152		
	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	22.40959	1.081576	20.71937	0.030702
Year	-0.01119	0.00054	-20.7092	0.030717
trade balance to GDP	-0.61456	0.041205	-14.9147	0.04262
exchange rate	0.003068	0.000266	11.54234	0.055018
forex res to GDP	0.793937	0.061808	12.84529	0.049461

So, the final regression equation with the help of which we can estimate or predict the external debt to GDP ratio is as follows: -

External Debt to GDP ratio^ = 22.40959 – 0.01119 Year – 0.61456 Trade Balance to GDP + 0.003068 Exchange rate + 0.793937 Forex Reserve to GDP

All the macroeconomic variables are significantly related to debt to GDP ratio at 5% level of significance.

Interpretation of Analysis

Table 1 shows the value of different variables after deflating them with GDP and Table 2 shows the result of multiple regression model where we regress the deflated external debt with respect to different variables as mention earlier. From table 2, it is clear that all the variables are significantly related with external debt at 5% level of significance. Thereafter, I discuss each variable one by one in detail and try to find out direction as well as magnitude of relationship between external debt and variable.

1. **Time Period or Years:** We expect that there should be positive relation between external debt and time period if measured in absolute term. But, since we are measuring debt in relative terms, that is, as the ratio of GDP, therefore, we expect that debt to GDP ratio should decline over a period of time, which implies that debt to GDP should be negatively related to time variable. In the regression output we are getting the negative coefficient of regression for time variable, which implies that over a period, the debt to GDP ratio has declined. It is good for the economy because it shows that economy has utilized debt efficiently due to which the GDP has grown very fast as compared to the external debt. So expected relation between debt to GDP ratio and time, get realized and it is good for the economy.
2. **Trade Balance to GDP:** We know that trade balance represents the net capital inflows into the country because trade balance shows the capital inflows into the country due to exports, net of capital outflows from the country due to imports. Therefore, when trade balance is declining debt should rise and vice versa. Although relative level of trade balance is adverse and rising over the period and external debt to GDP is declining. So, both are declining over the period, so we should get positive coefficient of regression. But debt to GDP is falling faster than the trade balance to GDP and moreover absolute level of trade balance is adverse and rising, whereas in absolute term the debt has risen over a period of time. Therefore, we are getting negative coefficient of regression for trade balance to GDP.
3. **Exchange Rate:** We know that when exchange rate increases, it leads to depreciation of domestic currency and appreciation of foreign currency (expressed in direct quotes). When currency gets depreciated, then exports become cheaper and imports become costlier. Therefore, it is expected that devaluation of currency should make trade balance more favourable for the country on the condition that "Marshall and Lerner" condition is met (Ex + Em >1). If trade balance is becoming favourable, then debt should decline and we should get negative coefficient of regression for exchange rate when debt is regressed with respect to exchange rate. Moreover, debt to GDP ratio has declined over a period of time, whereas exchange rate has risen (from table 1). So, we should get negative coefficient of regression. But the actual position of trade balance has become unfavourable even with the devaluation of currency which implies that the "Marshall and Lerner" condition is not hold good. Therefore, with the depreciation of domestic currency debt has risen and we are getting positive coefficient of regression of exchange rate. In addition, we are measuring debt in relative terms while exchange rate in absolute terms. But if we measure both the variables in absolute terms, then, we come to know that both the variables exhibit rising trends, and therefore, when we regress debt with respect to exchange rate, we should get positive coefficient of regression. In table 2, we are getting positive coefficient of regression for exchange rate which is satisfactory.
4. **Forex Reserve to GDP: -** From table 1, it is clear that over a period of time debt to GDP ratio has declined whereas forex reserve to GDP ratio has increased. Therefore, we should get negative coefficient of regression. Moreover, when debt rises, then there will be depletion of foreign exchange reserve because debt has to be repaid from forex reserve which is in the nature of past saving or we can say that when debt rises it leads to dissaving. So, there should be negative relation between the two. But from table 2, it is clear that we are getting positive coefficient of regression. Although debt to GDP ratio has fallen, but absolute level of debt has risen. It implies that GDP has risen faster than the debt. Therefore, debt has been paid out of the current saving and forex reserve has accumulated. Hence, ratio of forex reserve to GDP has risen. We would be getting negative coefficient of regression only when debt rises and that would lead to depletion of forex reserve. But in actual debt as well as forex reserve, both are rising. Therefore, we are getting positive coefficient of regression for fore reserve to GDP. From the above discussion, it is clear that external debt is significantly related with different macro-economic variables.

Testing of efficacy of model

In the previous section, we have formulated the regression model with the help of which we can estimate the debt to GDP ratio given the different variables which affect the external debt. Now, we are going to test the efficacy of model. There are three ways in which we can verify or test the efficiency of model:

1. Within sample prediction
2. Index of prediction
3. Outside sample prediction

Within Sample Prediction

In this method, we have plotted the actual debt to GDP ratio corresponding to the predicted debt to GDP ratio on a graph and tried to observe whether model is "best fitted" or not. From the below drawn graph, we have come to know that the model is best fitted because actual and predicted debt to GDP ratios more or less coincide to each other. This implies that we can estimate or predict the reliable value of debt to GDP with the help of model.

Figure 1- Actual and Predicted Debt to GDP Ratio*

* predicted values are calculated by applying multiple regression model. Where, external debt to GDP ratio is regressed with respect to different macro-economic variables.

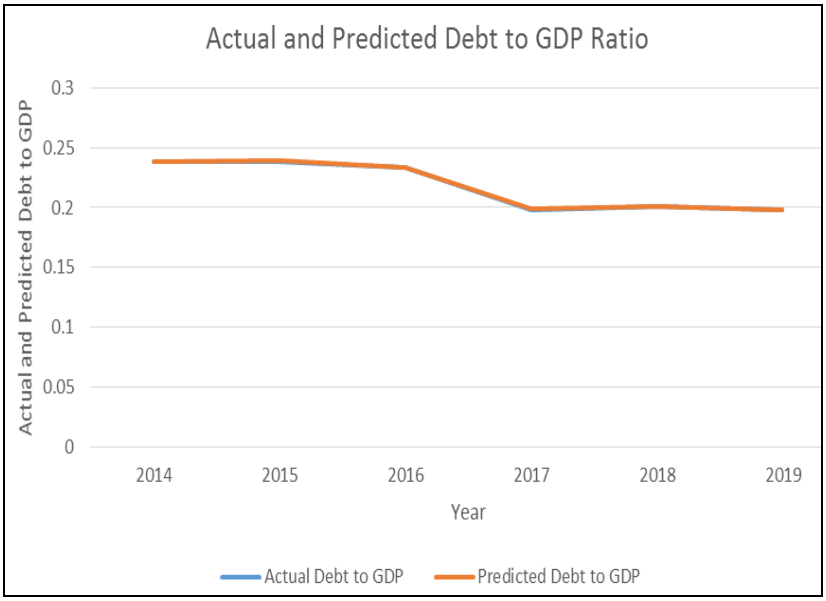

Fig 1

Index of prediction

In this method, we have formed an index, which represents the efficacy of model. For finding out the index we have divided the predicted debt to GDP ratio with actual debt to GDP ratio. If average of index of prediction comes out to be around 95% or more, then it implies that we can estimate the reliable debt to GDP ratio with the help of model.

Table 3: Calculation of Index of Prediction

Financial year	Actual Debt to GDP	Predicted Debt to GDP	Index of Prediction
2014	0.238768749	0.238463461	99.87
2015	0.238334277	0.238918132	100.24
2016	0.23363291	0.233323065	99.87
2017	0.19849017	0.198666303	100.09
2018	0.201299673	0.201067967	99.88
2019	0.197924468	0.19801132	100.04

Average of the index of prediction = total of index of prediction / number of years

Average of the index of prediction = 600/6 = 100

The average of the index of prediction came out to 100%, which implies model is very reliable of efficient.

Outside sample prediction

In this method, on the basis regression equation of debt to GDP ratio, I have predicted the debt to GDP ratio for the year 2019-20.

External Debt to GDP ratio^ = 22.40959 – 0.01119 Year – 0.61456 Trade Balance to GDP + 0.003068 Exchange rate + 0.793937 Forex Reserve to GDP

If we take the value of 2019-20, then predicted value of Debt to GDP ratio will be:-

External Debt to GDP for 2019-20 = 22.40959 – 0.01119(2020) -0.61456(-0.055926177) +0.003068(75.3859) +0.793937(0.177098414)

Predicted debt to GDP = 0.219658698

Actual debt to GDP = 0.206417068

Index of prediction of the year 2019-20= 106.4%

From the above mentioned three methods or ways of testing the efficacy of model; we can say that model is reliable. So, we can estimate the debt to GDP ratio, which depend on different variables.

Conclusion

Over a period of time, debt has risen but debt to GDP ratio has fallen, which shows that there is a negative relationship between debt to GDP ratio and time variable. Therefore, we are getting negative coefficient of regression for time. Trade balance to GDP has negative relation with debt to GDP, which implies that as trade balance become more favourable, the debt should decline. However, the actual trade balance has become more and more unfavourable over a period of time. Therefore, debt has risen correspondingly. Exchange rate has got positive relation with debt to GDP because we are getting positive coefficient of regression for exchange rate in regression analyses. Although we should get negative relation between the two because with appreciation of exchange rate, trade balance becomes more favourable (on the condition that Ex + Em >1), which leads to decline in the external debt. But actually, with depreciation of rupee, trade balance has become unfavourable. Therefore, debt has risen. Forex reserve has got positive relation with debt. But when debt rises that result into a depletion of forex reserve. So, we should get negative relation between two. However, GDP has risen faster than the debt, therefore, we are able to repay the existing debt with the help of current saving and moreover, there is accumulation of fore reserve. That is the reason why debt as well as forex reserve has increased simultaneously. So, from analysis we can say that different macroeconomic variables have significant relationship with debt to GDP ratio. There are many factors which affect the level of external debt in any country.

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