Fiscal deficit, inflation and debt trap in India: an empirical analysis

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Abstract

Objectives: The study is to examine the relationship between fiscal deficit and inflation in India for the period of 1981 to 2017 with the variables such as fiscal deficit, inflation, GDP, imports, money supply, capital inflow, exchange rate & interest rate and also is to find out the debt trap of the government.

Methods/Statistical analysis: It is important to check the stationarity of the time series variable; otherwise we will get spurious results with non-stationary data. Thus, this study employs ADF test to check stationarity of the variables. It's an advanced technique to avoid the heteroscedasticity. This study is used VAR model to find the relationship between the fiscal deficit& inflation in India and also use Granger-causality & Johansen-co-integration test to find out causal & long term relationship between the variables. A part from that, table &figure is used to show the debt trap of the government.

Findings: The ADF test result has found that inflation is stationary at level and all other macroeconomics variables are stationary at the first difference. That means all variables are not only depend on lag of others variables, but also depend on their own lags. In VAR model, there are positive significant impacts on inflation from all variables at 1 % level of significance except the exchange rate which is significantly reduces inflation by 0.89 % at 1 % level of significance. In case of import, this study has found significant inverse relation with inflation. Granger causality test show that there is bidirectional causal relationship between the variables and Johansen co-integration test show there is long run association of the variables. After the global financial crisis 2008, the fiscal deficit and interest payment are increased as an upward trend alarming to debt trap of the government, where the government borrow for the sake of repayment.

Applications: There need of coordination between the RBI and government to reduction the inflation. This study has also suggested to government to reduce fiscal deficit, so as to stay away from the debt trap.

Keywords: Fiscal Deficit, Inflation, ADF, VAR, Debt Trap, STATA.

1. Introduction

Inflation is a very important macroeconomic variable which always give challenges to policy maker for economy growth and stability. There are different linkages to inflation, fiscal deficit and inflation relationship is one of them. Fiscal deficit means the total expenditure less total receipts expect borrowing & liabilities of the government. Fiscal deficit by the government is influencing the different macro variables like money supply, interest rate, expenditure, exchange rate etc. Government expenditure is increasing the employment opportunities and also income of the people and hence its increase the demand for goods & service. If the increased demand is not full fill by increase output, then this leads to inflation [1]. Inflation is always and everywhere a monetary phenomenon [2]. Budget deficit leads to expansion of money supply, which is creating inflation in the economy [3]. So whatever fiscal deficit by the government, if the central bank is efficient to control money supply, then there is no question of inflation [4].

Fiscal stimulant like the expenditure policy of the government in some cases are not productive, which only create demand rather than an assets and hence, it leads inflation in the economy [5]. Generally, fiscal deficit is increasing the level of income and hence increase the consumption demand leads to inflation in the economy [6]. Debt financing of deficit is crowed out the private investment by raising the interest rate [7]. Inflation is also internationally linkage depend upon fiscal deficit under the flexible exchange rate and PPP system [8]. Ahigh fiscal deficit increased the interest rate differential with rest of the nation, which create problem in capital account convertibility [9].

Indian economy always face a challenge of poverty, inequality, high illiteracy & others social problems. Being a welfare state, Indian government makes high expenditure on rural development, Infrastructure and defence etc to tackle such type of social problems. Thus, it leads to high fiscal deficit. The Combine Gross Fiscal deficit in India is increasing day by day even after adoption of LPG policy. It has taught the threshold limit of approximately 10% of the GDP in 2001-02 [10]. Such increase in fiscal deficit found positive impact on inflation. Therefore the fiscal Responsibility and Budget Management Act in 2003 was established to maintain fiscal deficit and overall management of the govt. funds. This Act was targeted 3% fiscal deficit of the GDP by 2008 in accordance with only central govt. deficit, but never achieve as such. After this Act the direct lending to govt. by RBI has abolished. The government should reduce fiscal deficit to achieve the goal of economic stability, without reducing fiscal deficit to control inflation will be unsuccessful [11],[12].

Another problem of high fiscal deficit is debt trap of the government. It is generally seen in govt. budget that whatever the current year borrowing through heads of fiscal deficit is meant for the payment of interest of earlier borrowing. As we seen fiscal deficit is inducing inflation and this inflation is further creates more deficit to repay the loans [13]. If there gradual decrease in fiscal deficit and increase in interest payment is good. But in case of India, there is increase tendency of both fiscal deficit and interest payments. Thus the govt fall into debt trap.

2. Data and Methodology

This study is based on empirical research methods. This study has used VAR model to show the relationship between the fiscal deficit and inflation. The data has been collected from RBI database on Indian economy. The variable like gross fiscal deficit of Central and State Governments (CGFD), change in consumer price index (CPI) of agricultural labourers as proxy for inflation, GDP at market price, imports, broad money supply (M3), central government bond rate as interest rate& exchange rate. All the variables are in the natural log terms except inflation, exchange rate and interest rate. This study has covered the data period from 19881–82 to 2016–17 of Indian economy. The first golden rule of any time series data is must stationary. Thus to check the stationarity, ADF test has been used. After the stationarity of the data, VAR test is employ to find out the relation between the inflation and other variables. To know the causal relationship between the variables, here Granger-causality test has been used. The Johansen-co-integration test is used to find out, weather the data are related to each other in long run or not. This study has also collects the deficit & interest payment data from the ministry of finance by covering the period of 1997 to 2016 to show the debt trap of the government.

3. Results analysis

3.1. Stationary test

It is necessary that the time series data must be stationary to precise estimate; otherwise it will give insignificant results or wrong understanding & forecasting. Stationary means the constant of mean & variances of data over the period of time and the covariance between the two time periods depend on the lags of two time period rather than the actual time at which covariance is computed [14]. Here this study have used Augmented Dickey-fuller test to estimate the stationarity of the time series data.

$$\text{ADF model} \quad \Delta x_t = \alpha + \beta x_{t-1} + \sum_{i=1}^{k} \lambda_i \Delta x_{t-1} + \varepsilon_t$$

Under the null β will be negatively biased, if the sample size is small. So under the null hypothesis, the variable is non stationary. The computed **t-** statistic and critical value will be negative in general, but we rejected the null hypothesis on basis that all these value are in absolute term. If the test statistic is greater the critical value in absolute term, then we reject null and concluded the variables is stationary.

Table 1 shows the ADF test with only constant and the results of the variables are obtained by running in STATA. In this analysis all the time series variables are stationary at first difference. But the inflation is stationary at level with test statistic 4.309, which is greater than the 1 % level of critical value 3.682.

That means we rejected the null hypothesis of non-stationary and accepted alternative of stationarity. In case of rate of interest (DR), GDP(DlnGDP) and Money supply(DlnMS) are stationary in first difference at 5% LS. In the same way rest are the exchange rate(DEXR), gross fiscal deficit(DlnCGFD), import(DlnIMPORT) are stationary in first difference at 1% LS.

Table 1. ADF test result

Variables Names	Test Statistic	1% Critical Value	5% Critical Value
INF(level)	-4.309	-3.682	-2.972
DR	-3.606	-3.689	-2.975
DEXR	-4.846	-3.689	-2.975
DlnCGFD	-6.023	-3.689	-2.975
DlnGDP	-3.316	-3.689	-2.975
DlnMS	-3.235	-3.689	-2.975
DlnIMPORT	-3.869	-3.689	-2.975

Source: Author's own calculation

3.2. VAR analysis

The coefficient of the simple regression model (OLS) is only show the relationship between the current dependent and independent variables. But in modern macroeconomics variables are not only depend on each other but also on their own lags. That why we used Vector Autoregressive (VAR) model to incorporate the all these things. In econometrics analysis VAR was developed by Chris Sims in 1980. This is extension to the univariate to multivariate time series data. Generally VAR model treat all variable as endogenous variables. The basic form of VAR is:

$$y_t = \alpha_t + \beta_1 y_{t-1} + \beta_2 y_{t-2} + \ldots\ldots + \beta_p y_{t-p} + u_t$$

$$y_t = \alpha_t + \sum_{i=1}^{p} \beta_i y_{t-i} + u_t$$

Where y_t is Vectors of 'K' observed time series variables. α_t Vectors of deterministic term constant. β_i are (K*K) parameter metrics attached to the lagged value of y_t. u_t vector residual and P is the lags value.

According to lags selection criteria, this study has found 4 lags is best from Selection-order criteria, indicating by the parameter such as LL, FPE, AIC, HQIC, SBIC etc. This study has used the variables like inflation(inf), rate of interest(dr), exchange rate(dexr), gross fiscal deficit(dlncgfd), gross domestic product at market price(dlngdp), money supply(dlnms), import(dlnimport) as endogenous variables. Here, first take the logarithm value of GDP, CGFD, MS & Import. Then inflation is use at label and rest variables rate of interest & exchange rate at first difference. Here 7 variables mean 7 equations, but here study is focusing on that equation where inflation is endogenous & rest are exogenous.

H_0: There is no significant impact of variables on inflation
H_a: There is significant impact of variables on inflation

Table 2. VAR analysis results

Variables	Coefficient	Standard Error	P value	Lags value
Constant	-20.85699	8.08484	0.010	
Inflation	0.9318478	0.2472246	0.000	L1
Rate of interest	1.688058	0.666129	0.011	L1
Exchange rate	-0.896604	.3592794	0.013	L1
CGFD	15.39968	4.145534	0.000	L1
GDP	93.99173	29.55631	0.001	L2
Money supply	95.05111	25.01055	0.000	L3
import	-24.97234	8.067099	0.002	L2

Source: Author's own calculation

Table 2 shows the VAR analysis results of the inflation (INF) equation. That means here the inflation is treat as endogenous variable and rest are exogenous with inflation. This inflation equation model has explained the 91.64 % variation in inflation or goodness of fit. We know that all variables are direct relationship with inflation as per theoretical analysis except the exchange rate. As per the results a 1 % positive change in rate of interest will positively change in inflation by the 1.68805 % after 1 year because here lag is 1 with 1 % level of significance, whereas some researcher [6] has not found any link of interest rate to inflation.

Similarly, a 1% positive change in GFD, GDP & MS will bring positive impact on inflation by 15.39968 %, 93.99173% & 95.05111 % after 1, 2 & 3 year respectively. Other researcher [15] also found that the significant impact of fiscal deficit on inflation with result of a 1% increase in fiscal deficit leads to 0.25 % increase in the WPI where as some other [16] were not find such relation fiscal deficit to inflation. As per main focus of the study from fiscal deficit to inflation, the empirical result positively significance. To control inflation, this study is suggested that there must be the interaction between the monetary and government authority.

A decrease in current inflation by 0.896604 % is due to 1 % increase in exchange rate 1 year before with 1 % LS. It is contradictory to the finding of [8] positive relation under the flexible exchange rate system. Here, as per the results there is inverse relation between import and inflation. A 1 % positive increase in import can reduce inflation by 24.97234 % after 2 years with 1% level of significance.

3.3. Granger causality test

Granger has made a procedure in 2004 to investigating the causality between the variables by using lagged and residuals. Let X_t and Y_t are the two series. X_t is said to be granger cause Y_t, if the lagged value of X_t has statistically significant information about the future value of Y_t[17]. The procedure involves in Y_t .

$$y_t = \alpha_t + \sum_{i=1}^{p} \beta_i y_{t-i} + \gamma X_{t-i} + u_t$$

Where y_t is Vectors of 'K' observed time series variables. α_t Vectors of deterministic term constant. β_i are (K*K) parameter metrics attached to the lagged value of y_t. γ_i are (K*K) parameter metrics attached to the lagged value of X_t. u_t vector residual and P is the lags value.

H0: there is no causality between the variables.
Ha: there is causality between the variables.

Table 3. Granger causality test results

Cause variable	Cause by the variables	Chi 2	dfprob> chi2
Inflation	Rate of interest	76.715	0.000
Inflation	Exchange rate	46.936	0.000
Inflation	Fiscal Deficit	95.443	0.000
Inflation	GDP	10.234	0.037
Inflation	Money supply	23.938	0.000
Inflation	Import	17.278	0.002
Inflation	All	243.11	0.000
Rate of interest	Inflation	208.7	0.000
Exchange rate	Inflation	43.922	0.000
CGFD	Inflation	108.18	0.000
GDP	Inflation	12.333	0.015
Money supply	Inflation	75.794	0.000
Import	Inflation	77.34	0.000

Source: Author's own calculation

Table 3 shows the Granger causality test results with 4 lags between the inflation and the rate of interest, exchange rate, combine gross fiscal deficit, gross domestic product, money supply & imports (Same variables as used in VAR). Here study has found there is bidirectional causality between the variables. The Chi2 statistic of rate of interest 76.715 is rejected the null hypothesis at 1% Level of significance and conclude that there is causality running from the rate of interest to inflation.

Fiscal deficit is positively affect inflation as per VAR analysis. In the same way the chi2 statistic of exchange rate, GFD, money supply & import are reject the null hypothesis at 1 % LS and conclude that there is causality running from exchange rate, GFD, money supply & import to inflation respectively. But the GDP is rejected the null hypothesis at 5% LS. By taking together of all variables, the chi2 statistic 243.11 are reject null hypothesis at 1% LS and conclude that there is causality running from all the variables to inflation by taking together. There is also the causality running from the inflation to all variables like GDP, CGFD, MS, R, and Import& Exchange rate with 1 % level of significance.

3.4. Johansen test for co-integration

Trace test: The likelihood ratio statistic is:

$$LK_{tr}\ (m) = -(T - p) \sum_{i=m+1}^{k} ln(1 - \hat{g}_i)$$

Here this study has seven variables such as INF, R, EXR, lnCGFD, lnGDP, lnMS and lnIMPORT from 1981 to 2016. All the variables are non-stationary at level, but when we convert into first difference they must be stationary. As per ADF test INF is stationary at level and all other variables are stationary at first difference. Here the Johansen test for co-integration use trace test to check co-integration with lags value of 4. In Table 4 at rank 0 the trace statistic 4530.7262 is greater than the 5 % level of critical value 124.24. Thus we rejected null hypothesis of no co-integration and accept the alternative hypothesis of there is co-integration among the variables. In other word they have long run association or they are moving together in long run. In this way further the trace statistic 3522.2308, 2568.4200, 1620.9665, 804.4958, 21.2783 and 21.2783 is greater than the 5% critical value 94.15, 68.52, 47.21, 47.21, 47.21 and 3.76 respectively with respective rank 1, 2, 3, 4, 5 & 6. So the study can conclude that the inflation, rate of interest, exchange rate, combine gross fiscal deficit, money supply, gross domestic product and import are move together in long run.

*Table 4. Johansen test for co-integration results*

Maximum Rank	Trace Statistic	5% critical value
0	4530.7262	124.24
1	3522.2308	94.15
2	2568.4200	68.52
3	1620.9665	47.21
4	804.4958	29.68
5	21.2783	15.41
6	8.1273	3.76
7	…………	…………

Source: Author's own calculation

3.5. Debt trap of government

There is always more than 3 % fiscal deficit in the Indian economy [18]. The government is borrowing money in current year, but repay the loans in different subsequent years. So current year borrowing has a high share on paying interest to the previous year borrowing. In others word the loan raise by the government through the fiscal deficit is only for the payment of the interest to the stake holders. Primary deficit is the difference between the fiscal deficit and the interest payment. High primary deficit leads to adverse effect on growth [19, 20]. Thus low & low primary deficit is healthy for the economy. This can be only possible by reducing the fiscal deficit, otherwise the government fall under debt trap. The following diagram show how the Indian government fall into the debt trap.

Figure 1. Debt trap of government
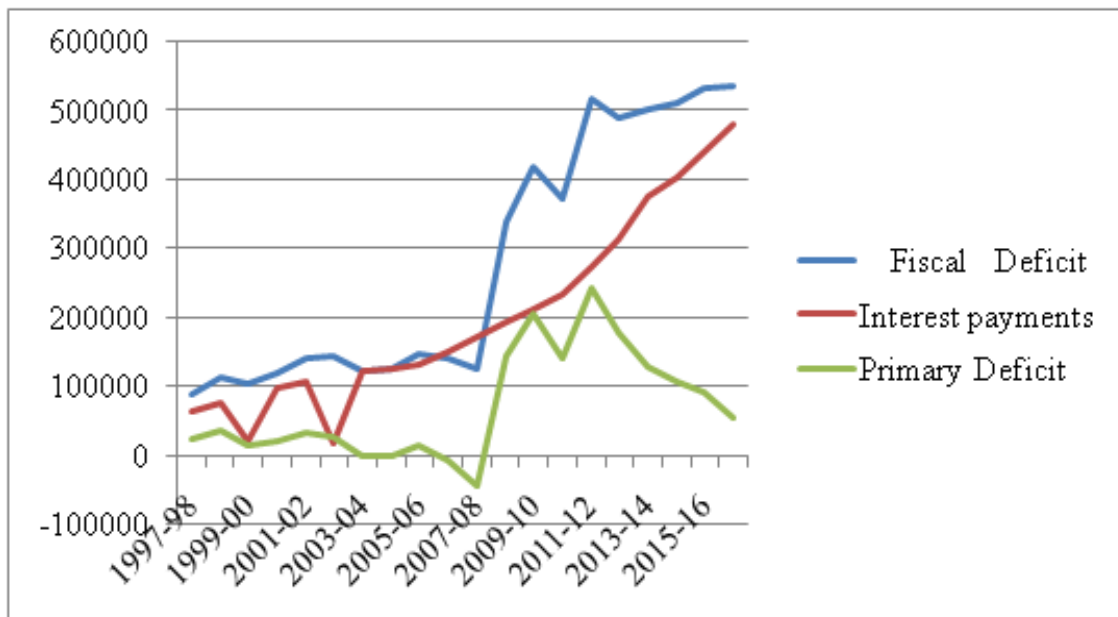
Source: Union Budget, Ministry of Finance, Government of India

Figure 1 shows the debt trap of the Indian economy with the variables like fiscal deficit, interest payment & primary deficit time series data from 1997 to 2016. The unit of measurement are rupees in crore. As per the figure, both FD & primary deficit increase from 1997 to 2002. Initially the fiscal deficit increase at increase rate because of Asian Financial Crisis in 1997. In 2003, there was falling of the both FD & interest payments and at the same time primary deficit was negative. This type of changes is take place due to 8% growth rate of GDP from 4% in 2002. And the % of FD of GDP is falling in the same year from 6% to 4.5%. This type of constant growth of FD was up to 2007.

Due to the Global Economic Crisis in 2008, there has been drastic change in the FD with the increase of 6% in 2008 against 2.7 % in 2007. There was also high primary deficit in same time. After 2008, there was same tendency of high FD & PD up to 2013. Thus the Indian economy fall into the debt trap.

4. Conclusion and Suggestion

This study has analysed the impact of fiscal deficit on inflation in Indian economy by using sample VAR model and has found positive impact of the money supply, GDP, combine GFD & rate of interest to inflation and negative relation of import & exchange rate to inflation in India. Other researchers have also found such fiscal deficit to inflation relation in India. There is bidirectional causality among the variables as per the Granger causality test. There is long run association of fiscal deficit, inflation, Interest rate, GDP, money supply and exchange rate. A change in any macroeconomics variable can change level of income, employment & inflation. This results of co-integration test show that the fiscal deficit and all others variables are move together in the long run. Indian economy founded to be a debt trap economy, where most of borrowing is only for the sake of repayments of previous loans. There is need of high progressive revenue collection with low fiscal deficit to move out from the debt trap.

This study has suggested to the government and RBI on the basis of empirical findings, which will helpful to the governments & policy maker to reduce inflation. Firstly, there must be coordination among the RBI & government to reduce inflation in the Indian economy. Secondly, whenever RBI fixed the rate of interest & exchange rate, inflation should be prior focus. Thirdly, govt. should reduce the fiscal deficit and should raise the progressive revenue to move away from the debt trap.

5. References

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