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Internship Report

on

'Impact of Fiscal Deficit on Private

Investment: Evidence from India'

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2020

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Certificate

This internship report titled *"Impact of Fiscal Deficit on Private Investment: Evidence from India"* is a report on the study taken up at the Fiscal Policy Institute (FPI) in 2020-21.

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All opinion and conclusions expressed in the internship report are of the Intern and usual disclaimer applies.

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ACKNOWLEDGEMENTS

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Abstract

Fiscal deficit is one of the major macroeconomic problems of the Indian economy. Keeping a check on the fiscal deficit becomes important in order to maintain the fiscal health of an economy. The main reason behind capping the fiscal deficit is its adverse impact on the macro economy. Crowding out of private investment is one such adverse impact with high fiscal deficits. This paper tries to assess the relevance of the crowding-out effect in the Indian context. The period of analysis is from 1980-81 to 2017-18. The paper uses standard unit root tests to test for the stationarity of the variables and Fully Modified OLS methodology to measure the relationship between fiscal deficit and private investment. It was observed that fiscal deficit adversely affects the private investment and hence the crowding out hypothesis stands relevant for India.

Keywords: Fiscal deficit, Crowding-out effect, FMOLS

Impact of Fiscal Deficit on Private Investment: An Evidence from India

1. Introduction

Fiscal deficit is the difference between the total expenditure of the government and revenue receipts and non-debt capital receipts. The relationship between fiscal deficit, interest rate and private investment is a most widely discussed, debated and unresolved issue. This adds to policy relevance given the mixed evidence in the existing empirical literature. It is argued that increase in fiscal deficit (increase in government expenditure over revenue) leads to an increase in interest rate, and high-interest rates will result in a decrease in investment, and hence crowd-out private investment.

Theoretically and empirically, there are different views and evidences on this issue. This motivates us to revisit the debate and check whether the crowding-out hypothesis holds for India.

2. Literature Review

A brief review of relevant and important studies on the crowding-out hypothesis in the international and Indian context is presented below.

Argimon, Gonzalez-Paramo and Roldan (1997) attempted to find the relationship between government spending and private investment using the unbalanced panel data set for 14 OECD countries for the time period 1979 to 1988. It was observed that there exists a significant crowding-in effect on private investment with increased public expenditure. In addition, the positive impact of governments' infrastructure spending on private investment was observed. The main implication of their model was that if the public services are complementary to private consumption, the impact of public consumption is larger in size than that associated with public investment and vice versa when public goods are a substitute for private consumption.

Hermes and Lensink (2001) observed that there exists a non-linear relationship between fiscal policy variable and private investment. They focused on the different variables that influence fiscal policy and private investment such as government expenditure and revenue categories.

The analysis was based on the macroeconomics performance of a sample of 33 less developed countries. They performed panel estimates of a set of less developed countries and averaged over three consecutive time periods: 1970-1979, 1980-1989, 1990-1998.

Arin (2004) found that both government expenditure and income taxes have a distortionary effect on private investment. Panel data set for G-7 countries from 1996 to 2000 was used for the analysis. The result from regression suggests that only tax on household income and government expenditure have a negative effect on per capita income growth. This study also provided evidence that when the government wage bill is included in government expenditure, the spending side has a distortionary effect on private investment and growth, and the spending side has larger effects compared to the revenue side, in both magnitude as well as significance level. The cyclically adjusted values for different types of taxes are obtained from the OECD Economic Outlook database. A comparative analysis of cyclically adjusted variables and 5-year averages revealed that Japan has the lowest share of indirect and income taxes while Italy has the lowest share of corporate taxes and Canada has the lowest share of social security taxes.

Rangarajan and Srivastava (2005) examined the long-term profile of fiscal deficit and debt relative to GDP in India, and measured the debt-deficit sustainability considering relevant determinants of fiscal policy in the medium and short-term. The impact of combined fiscal deficit and debt of the Centre and state governments on savings, investment, and growth was measured in the paper. It was observed that the fiscal deficit adversely affects private investment. This result depends on the sensitiveness of private investment on the interest rate. This paper also summarises various literature on debt accumulation in India.

Chakraborty (2006) evaluated the real and financial crowding out in India during 1970-71 to 2002-03 using asymmetric vector autoregressive model. It was observed that there is no evidence of direct crowding out between public investment and private investment. She tried to analyse the impact of non-homogeneity of public capital formation on private capital formation through public infrastructure and non-infrastructure investment. Also the real and financial crowding out in India over the last four decades. The data on capital formation in public and private sector is taken from the new series of National Account Statistics published by the Central Statistical Organisation and data for other variables (that is the rate of interest, rate of inflation, availability of credit to the private sector, GDP, gross fiscal deficit, exchange rate and money supply) is drawn from the Handbook of Statistics on Indian Economy, published by RBI.

Using the high-frequency macro data, Chakraborty (2012) found that the increase in fiscal deficit does not cause the rise in interest rate which is quite contrary to the popular belief. The asymmetric vector auto regression model is being used in this study that established that the rate of interest is affected by the reserve money change, expected inflation and volatility in the capital flows but not the fiscal deficit. The analytical framework for this study is derived from the extended version of Sargent's (1969) paper 'Commodity Price Expectations and the Interest Rate'. The data for macro variables are drawn from the data bank of RBI, and the period of analysis was FY2006-07[04] to FY2011 [04]. It was found that the long term and short term interest rates are determining the financial crowding out, but fiscal deficit does not appear to be causing crowding out both in the short and the long run.

Chhibber & Kalloor (2016) analysed the determinants of aggregate private investment and its components like corporate and non-corporate private investment for the period 1980-81 to 2013-14. The variables identified as potential determinants of private investment are the size of the public sector, capital stock, the real effective exchange rate, output gap and availability of credit to the private sector. The regression analysis revealed that the private investment is determined by three key variables: public investment, the real exchange rate and the availability of credit to the private sector. Also, the output plays a determinate role as it holds back private investment. They suggested that India should achieve 8% plus GDP growth on a sustainable basis to keep private investment between 25-30% of GDP and public investment to around 14-15% of GDP.

Mohanty (2019) assessed the impact of fiscal deficit and its financing pattern on private corporate sector investment in India, using Autoregressive Distributed Lag Models (ARDL). The data set used in this study is annual time series data from 1970-1971 to 2012-2013. He finds in his paper that there is a linear relationship between fiscal deficit and its mode of financing and private investment, but there is some possibility that these variables are nonlinearly related. Further, it was observed that both in the short and long run, fiscal deficit crowds out private investment. The result also shows that internal financing of fiscal deficit has a negative impact on private investment, but external financing of fiscal deficit has an insignificant effect. The Dataset was obtained from the Database of Indian Economy of the Reserve Bank of India and the National Accounts Statistics of the Central Statistics Office (CSO).

Recently, Mohanty & Bhanumurthy (2020) examined the role of fiscal policy in affecting the interest rate in emerging economies like India through the SVAR Model. This paper has used various Quarterly time series data from 1996 to 2018. The data for domestic variables such as interest rate, fiscal deficit, bank credit to commercial sector and inflation are obtained from the "Handbook of Statistics on the Indian Economy", Reserve Bank of India. Using structural VAR methodology, it was found that the foreign interest rate and inflation tends to increase the interest rate in India. In the paper, the direction of causality among the variables is analysed for both 2008's pre-crisis and post-crisis.

Research gap

There are many studies measuring the relationship between fiscal deficit and private investment. However, there are no recent studies conducted using long term time series data on testing the relevance of the crowding out hypothesis in the Indian context. This paper makes an attempt to fill the existing gap. Given this background, the paper has the following objectives:

Objectives

1. To analyse the trends in fiscal deficit, interest rate and private investment
2. To empirically examine the relevance of the crowding out hypothesis in India.

3. Theoretical Background

A situation when deficit financing by the government leads to increased interest rate and a reduction in private investment is called the crowding effect. In other words, we say that crowding out is a term used to describe a situation when an expansionary fiscal policy leads to a decrease or 'crowd out' private investment.

Expansionary fiscal policy means an increase in the budget deficit that is the government is spending more money than its income. A large budget deficit will increase the demand capital, given the supply of money. The supply of funds in the financial market is the sum of private savings, government savings and net investment by foreign players in domestic markets. If private savings and net foreign investment remain the same, then less financial capital is available for private investment in physical capital. And when government borrowing soaks up the available financial capital and leaves less for the private investment in physical capital (that is increased
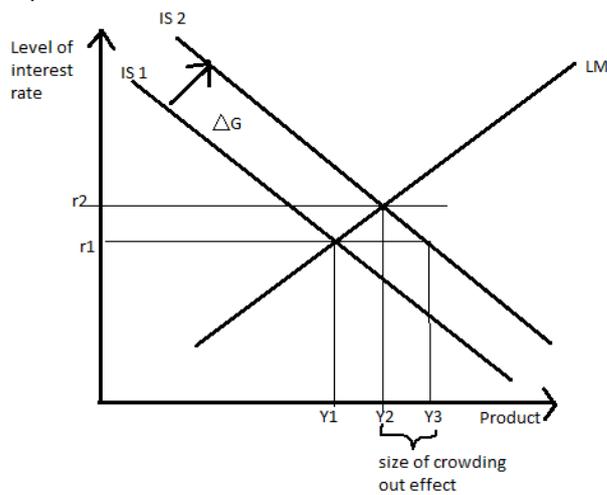
budget deficit means a reduction in government savings), the result is said to be crowding out. It is a cyclical process which can be shown as:

Increase in government expenditure (Expansionary fiscal policy) →increase in income → increase in demand for money →increase in rate of interest →**Decrease in investment**

There exist three different views in the literature that provides theoretical analysis to explain linkages between budget deficits and private investment, i.e. Neo-classical, Keynesian and Ricardian. The Neo-classical view states that a rise in the budget deficit leads to an increase in the interest rate which results in a decrease in private investment. The Keynesian model argues that an increase in the budget deficit raises the interest rate; such an increase in interest rate also stimulates the domestic economic activity and crowds in private investment. The Ricardian Equivalence Theorem (RET) argues that a deficit merely postpones taxes for future tax liability and therefore tax-financing and debt-financing of deficit have an equal impact on the economy (Mohanty and Bhanumurty, 2020).

Crowding out can be divided into two main categories (i) Direct crowding out where the economic activities interact directly with private consumption and investment. (ii) Indirect crowding out, which is much more complex than the first one. In this case, we talk about the transactional crowding out (Balcerzak & Rogalska, 2014). The transactional crowding out is defined as the phenomenon of a decrease in private investment and private consumption due to an increase in the interest rates, which is the consequence of fiscal stimulus. Let us assume that the demand for money is a growing function of the product and that leads to an increase in the transactional demand for real resources of money due to fiscal expansion (increase in aggregate demand in the product market). If we keep the supply of money constant, the increase in the transactional demand for money leads to an increase in the interest rate, which is necessary to maintain equilibrium in the money market. At the same time, increased interest rate leads to a decline in both private investment and private consumption as they are a negative function of the interest rate. We can see it in the figure below:

Figure 1: IS-LM

The change in the size of government expenditure increases aggregate demand and shifts the curve from IS 1 to IS 2, which means the equilibrium level shift from Y1 to Y3. The money market, after the fiscal stimulus for the size of product Y3 and interest rate r1, the money market is in a state of disequilibrium. To attain equilibrium again requires a transition to Y2 product size and a higher interest rate r2. Thus, in this model, the size of the effects of transaction crowding out is the difference between Y2 and Y3.

Given this theoretical background, where there are distinct views on deficits impact on private investment, this paper empirically examines the relevance of crowding out hypothesis in India.

4. Data, Variables and Methodology

Figure 1: Trends in Fiscal Deficit, Interest Rate and Private Investment in India, 1980-81 to 2017-18
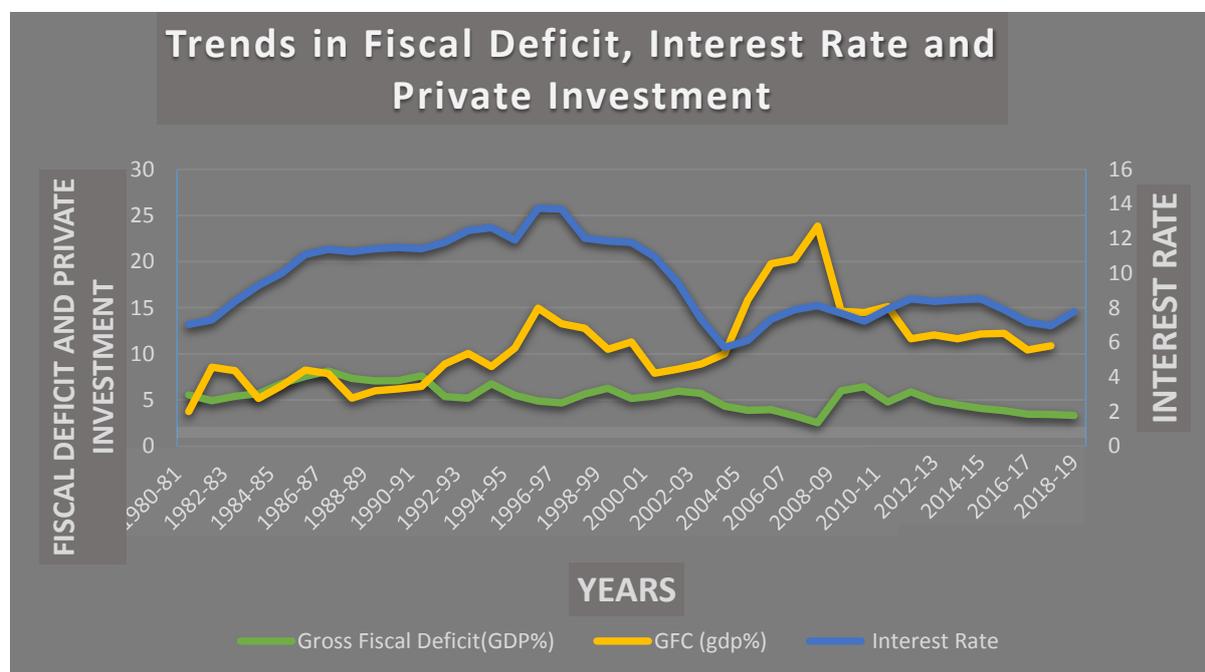
Source: Reserve Bank of India

Trends in fiscal deficit, interest rate and private investment have been analysed in three different phases: (1) Era of Pre-liberalisation, (2) post-liberalisation and pre-FRBM Act (1990-91 to 2002-03) and (3) post-FRBM Act. Fiscal profligacy is seen to have caused a balance of payments crisis in 1991 and a reduction in the fiscal deficit was therefore an urgent priority at the start of the reforms. The combined fiscal deficit of the Central and state governments was successfully reduced from 8.13% to GDP in 1986-87 and stood at 7.61% of the GDP in 1990-91. The downward trend of gross fiscal deficit continued up to 1996-97. Since 1997-98, fiscal deficit had again started increasing. In 2001-02, a large rise in public debt involving large interest payments year over year led to the diversion of resources from investment to debt servicing. With the enactment of the Fiscal Responsibility and Budget. Management (FRBM) Act in 2003, the gross fiscal deficit got reduced from 5.72% of GDP (2002-03) to 3.94 % of GDP (2006-07). Again, the global crisis of 2008-09 placed the laid- down roadmap for achieving FRBMA targets and consequently, gross fiscal deficit rose to 8.3 per cent of the GDP in 2008-09. A downward trend is observed in fiscal deficit since 2011-12.

As can be seen from Figure 1, there is a substantial variation in private investment rates. For example, in recent times, private capital formation has seen high jump post-2000 but after 2007, it has witnessed a drastic decline. The rate of private investment fluctuated in the 4 and 24 per cent range and averaged 14-15 per cent between 1980-2018. The trend of interest rate suggests that the level of real interest rate is lower in the post-2002 period compared to pre-liberalisation. It fluctuated between 4 and 7.50 per cent between 1980-2018.

The data related to gross fiscal deficit, interest rate and private capital formation is extracted from the Reserve Bank of India Database.

Variables

Fiscal Deficit: It is basically defined as the difference between revenue receipts, non-debt capital receipts and total expenditure.

Private Investment: Gross fixed capital formation by private financial and non-financial sector is considered as private investment.

Real Interest Rate: Weighted average of Central Government Securities rate is considered as interest rate in this paper.

Descriptive Statistics

It is a brief description of the coefficients that summarise a data set. It can be a representation of the entire population or a sample of the population. Descriptive statistics can be divided into measures of central tendency and measures of variability. Mean, median and mode are some of the measures of central tendency of a data set, whereas standard deviation, variance, skewness and kurtosis measure the degree of variability.

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Private Capital Formation	38	5522.658	6433.238	63.85465	20677.71
Gross Fiscal Deficit	39	34048.7	21096.28	8299	88937
Gross Fiscal Deficit (% of GDP)	39	5.353292	1.352477	2.54	8.13

Interest rate	39	9.517692	2.233133	5.71	13.75
Private Capital Formation (% of GDP)	38	10.88022	4.333616	3.745792	23.84491

Source: Author's calculation

The above table 1 provides the summary of all the variables used in the analysis by reporting the mean, standard deviation, minimum and maximum. The total number of observations is 39. Private investment % to GDP has a mean of 10.88022 with standard deviation of 4.333617. The maximum and minimum value of Private investment % to GDP are respectively 23.84491and 3.745792. Fiscal Deficit % to GDP has a mean of 5.353292 with standard deviation of 1.352477. The maximum and minimum value of Fiscal Deficit % to GDP are respectively 8.13 and 2.54. Interest rate has a mean of 9.517692 with standard deviation of 2.233133. The maximum and minimum value of Interest rate are respectively 13.75 and 5.71.

Methodology

Time series methodology is used in this paper for the analysis. Checking for stationarity is the first step in the time series analysis. ADF test[1] is used to check for stationarity.

Augmented Dickey-Fuller test

An augmented Dickey-Fuller test is a test specialised for statistics and econometrics. It tests the null hypothesis whether a unit root is present in the time series sample. This test is used for large and complicated time series models. The augmented Dickey-Fuller statistic is a negative number. More negative the number, the stronger the rejection of the hypothesis. The intuition behind the test is that if the series is characterised by a unit root process, then the lagged level of the series will provide no relevant information in predicting the change besides the one obtained in the lagged changes. In this case, the null hypothesis is not rejected. In contrast, when the process has no unit root, it is stationary and hence exhibits reversion to the mean - so the lagged level will provide relevant information in predicting the change of the series and the null of a unit root will be rejected.

Augmented Dickey-Fuller Test: The test is performed on all the variables. When the absolute value of the test statistic is less than the absolute critical value at 5% level of significance, then

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[1]ADF test is given by Dickey and Fuller (1979).

we do not reject the null hypothesis, implying that the given time series variable is not stationary.

Johansen cointegration[2] is used to check the cointegration. Fully Modified OLS is used for the estimation of the long run relationship. The FMOLS[3] method generates reliable estimates for a small sample size and gives the robustness check for the results by overcoming issues like endogeneity problems, serial correlation and by allowing heterogeneity in the long-run parameters (Kalim and Shahbaz (2009); Agbola (2013); Bashier and Siam (2014); Fereidouni, Al-Mulali and Mohammed (2017)). FMOLS has advantage over the Engler Granger Method as FMOLS can give the appropriate and valid estimates for long-run relationship (Amarawickrama and Hunt (2008)). Further to check the cointegration, Hansen Test, Engle-Granger test, Phillips-Ouliaris test and Park Added Variables test are used.

Methodological details along with the results obtained are given in next session.

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[2]Johansen (1991) and Johansen (1995) provide the Johansen cointegration test to analyse the long run relationship
[3]FMOLS method is given by Philips and Hansen (1990) for analysing the relationship between the series of I(1).

RESULT

Table 2: ADF test for Stationarity

	At level *T stat* *(Critical values)* *[P value]*	*First difference* *T stat* *(Critical values)* *[P value]*
Private Capital Formation (% of GDP)	-0.414505 (-1.950117) [0.5271]	-6.454101 (-1.950394) [0.0000]
Gross Fiscal Deficit (% of GDP)	-0.732429 (-1.950394) [0.3922]	-6.299661 (-1.950394) [0.0000]
Real Interest Rate	-0.646578 (-1.949856) [0.4305]	-8.472636 (-1.949856) [0.0000]

* Lags are taken based on AIC values

Table 2 shows that all the non-stationary variables are stationary with 1st difference ADF test. For fiscal deficit lag 6 is for first difference and for capital formation lag is zero for first difference. When the absolute value of test statistic is greater than the critical value, then the time series variable is stationary. The variables in the above table have their test statistic value more than critical value at 5% level of significance, therefore cointegration can be tested.

After performing the stationary test, these are their likely outcomes:

- Series are integrated of order 0. That is, stationary in level (this require no differencing).

- Series are integrated of order 1. That is stationary after first difference.

- Series are integrated with different orders. That is, having a combination of *I(0)*

and $I(1)$ series.

In our case, all the non-stationary variables are stationary with 1st difference ADF test and time lag of one. So, in this case, we will perform a cointegration test to establish a long-run relationship.

Cointegration test

Cointegration test is used to establish if there is a correlation between the time series in the long term. The concept was first introduced by Noble laureates Robert Engel and Clive Granger in 1987. Cointegration tests identify scenarios where two or more non-stationary time series are integrated in a way that they cannot deviate from equilibrium in the long term. There are three most popular tests used to identify the long-term relationship between two or more sets of variables:

- Engel-Granger

- Phillips-Ouliaris

- Johansen test

Two prominent cointegration tests for $I(1)$ series in the literature are the Engel-Granger and Johansen cointegration tests. Here we will test for cointegration through **Johansen cointegration test.** The hypothesis is stated as:

H_0: no cointegration among variables

H_1: Ho is not true (that is there are cointegrated variables)

Decision Criteria: Rejection at the 5% level. That is, we reject the null hypothesis if the Trace and Max statistics > 5% critical value; otherwise, we fail to reject the null hypothesis.

Table 3: Lag selection for Johansen Cointegration Test

lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-218.24				90.07	13.01	13.06	13.15
1	-183.67	69.13*	9	0	20.08*	11.51*	11.69*	12.05*
2	-179.88	7.60	9	0.57	27.67	11.82	12.14	12.76
3	-172.44	14.87	9	0.09	31.45	11.91	12.37	13.25
4	-167.73	9.41	9	0.4	43.37	12.16	12.76	13.91

AIC value suggests that Lag one is appropriate for Johansen Cointegration test.

Table 4: Johansen Cointegration test

Maximum Rank	Parms	LL	Eigenvalue	Trace Statistics	5% Critical Values
0	3	-215.23	.	33.2214	29.68
1	8	-204.25	0.44739	11.2765*	15.41
2	11	-200.49	0.18398	3.7536	3.76
3	12	-198.61	0.09647		

In this model, given trace statistic and max statistic, we accept the null hypothesis of cointegration among variables in this model. Hence, Johansen cointegration test suggests that there is one cointegration equation. There is a long-run relationship. Also, the series are related and can be combined linearly. Which means if there are shocks in the short run which may affect movement in the individual series, they would converge with time (in the long run). Hence, we estimate both short-run and long-run models.

Fully Modified OLS

In econometrics, Ordinary Least Squares (OLS) method is widely used to estimate the parameter of a linear regression model. OLS estimators minimise the sum of the squared errors

(a difference between observed values and predicted values). Fully modified least squares (FM-OLS) regression was originally designed in work by Phillips and Hansen (1990) to provide optimal estimates of cointegrating regressions. The method modifies least squares to account for serial correlation effects and for the endogeneity in the regressors that result from the existence of a cointegrating relationship.

The fiscal deficit and interest rates are taken as independent variables to assess its individual impact on private investment. It is true that the fiscal deficit puts upward pressure on the interest rate and in turn crowds out private investment. However, this mechanism has been variously viewed by Neo classical, Keynesian and Ricardian approaches. In addition, there are many other mechanisms through which fiscal deficits impact private investment. One such mechanism may be the rating given by the rating agencies. Higher fiscal deficits reduce the credentials of the economy and crowd out investments. Investments in secondary markets are sensitive to the level of fiscal deficit. Hence, two variables are modelled independently.

Table 5: Results of Fully Modified OLS

Variables		Coefficients
Gross Fiscal Deficit (% of GDP)		-1.967**
		(-3.445)
		(0.00)
Real Interest Rate		-0.637*
		(-1.998)
		(0.05)
Constant		25.718***
		(3.236)s
		(0.00)
R-squared		0.54
Adjusted R-squared		0.52
S.E. of regression		2.94
Long-run variance		19.69
Hansen Test		Lc Statistics
		0.628
		(0.02)

Engle-Granger tau-statistic		-3.416 (0.14)
Engle-Granger z-statistic		-15.535 (0.21)
Phillips-Ouliaris tau-statistic		-3.495 (0.13)
Phillips-Ouliaris z-statistic		-16.153 (0.19)
Park Added Variables Chi-square		Linear: 0.416 (0.52) Quadratic: 4.451 (0.11) Cubic: 4.440 (0.22) Quartic: 112.931 (0.00)

Source: Author's Calculations

The results measuring the crowding out effect re provided in Table 5. It was found that the gross fiscal deficit (% of GDP) and real interest rate do have a statistically significant impact on the private capital formation (% of GDP). A 1% increase in fiscal deficit reduces private investment by more than 1%. Similarly, an increase in interest rate by 1% reduces private investment 0.6%. It was observed that there exists a significant crowding-in effect on private investment with increased public expenditure (Argimon et al., 1997). Both have a negative impact on private capital formation. The adverse effect on private investment occurs if fiscal deficit puts pressure on interest rates and the sensitiveness of private investment on the interest rate (Rangarajan and Srivastava, 2005). Park Added Variables test suggests that in model one, except Quartic trend, there is a cointegration.

The results show that fiscal deficit and interest rate adversely affect private capital formation. Gross fiscal deficit (% of GDP) and real interest rate do have a statistically significant impact on private capital formation (% of GDP). The results obtained here are in line with the findings of Mohanty (2019).

There are many lessons to be drawn from the above results. It is very important to cap fiscal deficit to limit the crowding out of private investments. The study can be extended to sub national level to examine the relation between fiscal deficit and private investments. The fiscal deficit level is different for various states. For instance, some states may have higher fiscal deficits and for states like Karnataka, fiscal deficits are well within the prescribed limit under the fiscal responsibility act and fiscal deficit in its entirety is being spent towards capital formation. In this context, it is an empirical question to examine how this hypothesis holds in this situation.

Limitations of the Study: The present report has several limitations. The model used is narrow and has potential to improve with the introduction of other determining factors of interest rate like world interest rate, inflation etc. In India, Reserve Bank of India plays a vital role in determining the interest rate. The Monetary Policy Committee of the Reserve Bank of India does take policy decisions on changes in the interest rate based on several important factors like inflation, economic growth and also the level of fiscal deficits. The study can also be extended by tracking the transmission channels through which fiscal deficit passes through and impacts the interest rate.

5. Conclusion

This paper measures the relevance of the 'Crowding out hypothesis' in the Indian context. The period of the analysis is from 1980-81 to 2017-18. The data related to gross fiscal deficit, interest rate and private capital formation is collected from the Reserve Bank of India Database. The paper uses standard unit root tests to test for the stationarity of the variables and Fully Modified OLS methodology to measure the relationship between fiscal deficit and private investment. It was observed that fiscal deficit adversely affects the private investment and hence the crowding out hypothesis stands relevant for India. Both fiscal deficit and interest rates are found to be having a negative relationship with private investment in India. This paper highlights the importance of capping the fiscal deficit.

The results in this paper have policy relevance and can be further extended. The analysis can be conducted at sub-national level, given the data on private investments. Since the model does not discuss the impact of the macroeconomic risk on private capital formation explicitly, further investigation can be done by including the risk factors. In addition, the transmission channels can be identified using a suitable econometric method.

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