Does Government Deficit Crowd Out Private Investment? An Empirical Analysis for National and Sub-National Governments

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Expansionary fiscal policy can stimulate or retard growth in an economy depending on whether it crowds in or crowds out private investment. Amidst mixed results in the literature, the present study makes a comprehensive attempt to examine crowding out evidence by exploring the link between Gross Fiscal Deficit (GFD) on the one hand, and real interest rates and private investment, on the other, in a time series framework for the central government and panel framework for 23 state governments. The Autoregressive Distributed Lag (ARDL) cointegration results confirm the existence of a long-run equilibrium relationship between GFD, adjusted for cycles, and real rate of interest for central government for the period 1980-81 to 2017-18, thus supporting financial crowding out. While support for real crowding out is weak for central government, for the state governments, support has been found for real crowding out, with the strength of the coefficient rising when GFD is financed by gross market borrowings. This reinforces the need for both tiers of government—national and sub-national—to continue efforts towards fiscal consolidation, improving the quality of expenditure and to try financing their deficits less via market borrowings and more through own revenues.

Introduction

The debt-deficit dynamics of the fisc and its interplay with monetary management are important in deciding the macroeconomic consequences of fiscal slippages on real rate of interest and private investment. In recent years, in the context of macroeconomic management in India, there has been greater emphasis on fiscal deficit reduction as high fiscal deficit affects capital formation in the economy via two channels—increasing interest rates resulting

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in reduction in private investment and also reducing government sector's own investment due to higher revenue or consumption expenditures, usually called the 'crowding out'. Crowding out, thus, refers to the reduction in private investment that results when the fisc adopts an expansionary policy. Crowding out can be real or financial. Real crowding out generally takes place in a neoclassical full employment scenario when an increase in public spending displaces private capital formation, without regard to the manner in which the fiscal deficit is financed. Financial crowding out, on the other hand, refers to the negative impact on private investment caused by an increase in interest rates arising from a pre-emption of real and financial resources by the government through bond financing of fiscal deficit. This is more likely to occur when the economy is in the boom phase as the yields on government bonds tend to move up, with the government facing more competition from other private sector investments.

Theoretically, the explanation comes from the Keynesian IS-LM framework whereby at any point below full employment, increase in government expenditure leads to a rightward shift of IS curve inturn resulting in rise in interest rates.[1] Analytically, any tax cut and increase in government expenditure lead to higher fiscal deficit and higher aggregate demand and consumption, inturn reducing national savings. Real rate of interest comes into act to play the balancing factor between national savings and demand for investment. Furthermore, the nature of financing of fiscal deficit is also important as financing through higher market borrowings is likely to push up interest rates and crowd out private investment, at the margin. While the Ricardian Equivalence hypothesis supported no impact of deficits on interest rates in an intertemporal budget constraint framework whereby any government spending is financed by taxes today or tomorrow (Barro, 1989), the loanable funds approach supported fiscal deficit's influence on interest rates from supply side advocating that higher deficits increase supply of government securities, lower their price, inturn resulting in higher interest (Burney and Yasmeen, 1986).

Post-independence till about the 1980s, India had focused on a completely state-led growth story where government capital expenditure was playing an important role. With fiscal deficits of the government ballooning to unsustainable levels, large-scale automatic monetization, as was happening then, became one of the indisputable cause of the Balance of Payments (BoP) crisis in 1991. Learning from the past, especially from the distortionary impact of high fiscal deficit, India's fiscal history has seen significant improvement whereby deficit financing of the pre-1990 era has been given up in favor of market/debt-based financing since early 1990s which has culminated with adoption of fiscal rules in 2004-05. While the initial few years after Fiscal Responsibility and Budget Management (FRBM) witnessed overall macroeconomic stability by fiscal consolidation, a dramatic fiscal expansion post the crisis was associated with overall macroeconomic instability, leading to the 'taper tantrum' in 2013. With fiscal consolidation resuming from 2012-13 under the amended FRBM Act, 2003, reductions in fiscal deficits by the central government were brought about generally

[1] This theory also supports the complementary effect of expansionary fiscal policy that if interest rate sensitivity is low, government spending could crowd in private investment due to the positive effect on investor expectations.

by cutting down capital and planned revenue expenditures. This raises the issue of whether such cut backs aid or hurt private investment. Besides, the periodic shifts in the FRBM goalposts coupled with higher market borrowings have kept the G-sec yields and State Development Loans (SDL) spreads high.

Along with center, state governments' fiscal position has also been a matter of concern, particularly in the post-UDAY (Ujjwal DISCOM Assurance Yojana) period. States' role is becoming important considering that their expenditure is almost one and a half times that of the center and is growing. The share of states in the general government deficit has also been rising and they have increasingly resorted to market borrowings to finance their deficits. Large issuances of state development loans, thus, have been exerting upward pressure on yields which in turn has led to the debt repayment costs forming a major proportion of the committed expenditure of the state governments. Consequently, the rating agencies and international institutions have in the recent past reiterated the crowding out risks.

Against this backdrop, the present paper tries to explore evidence towards crowding out—financial and real—in a cointegrated framework. It is an addition to the existing strand of literature as it uses the fiscal deficit after adjusting it for cyclical fluctuations which is a more relevant variable to capture the crowding out impact. Also, apart from using latest available data till 2017-18, the uniqueness of this study lies in the analysis of both financial and real crowding out in a similar setup for the central, state and general government finances. The paper is structured as follows: a brief overview of the cross-country and Indian literature is presented, followed by explanation of the data along with some stylized facts and trends in the key variables, particularly the fiscal deficit and its nature, quality and performance in the post-FRBM period, real interest rates and private investment. Subsequently, the rationale as well as the methodology of the Autoregressive Distributed Lag (ARDL) cointegration model and the system Generalized Method of Moments (GMM) for center and states, are explained respectively. Then, the empirical results are discussed, and finally, the conclusion and policy implications are offered.

Literature Review

Cross-Country

The empirical investigation of the relationship between fiscal deficit and the interest rate during the 1980s and the 1990s was generally confined to the advanced economies. Earliest work by Tanzi (1985), in the context of the US economy for the period 1960 to 1984, observed that sensitivity of interest rate to government spending has got diluted over the years. The probable explanation of these findings was given in terms of increasing flow of global capital. Evans (1985) using a really long data period from 1858 to 1950 shows a similar result that deficit does not impact interest rates. Cebula (1990) in an IS-LM framework and Cebula (1997a) in a loanable funds framework for US during the 1970s to 1990s and Correia-Nunes and Stemitsiotis (1995) for the period 1970-1993 for 10 major industrialized countries showed a positive association between interest rate and fiscal deficit. Gale and Orszag (2002) using a cross-country study of 60 countries brought out this contradiction very clearly

pointing out that around one-half found a predominantly positive significant effect of fiscal deficit on interest rates.

While studies have shown that budget deficits or surpluses have no connection with long-term interest rates (Reynolds, 2002), employing instead of actual, expected budget deficit as the regressors, some others prove significant effects of fiscal policy on long-term interest rates (Reinhart and Sack, 2000; and Laubach, 2009). Studies show that a one percentage point increase in projected budget deficit to Gross Domestic Product (GDP) ratio increases interest rates by 9-10 basis points in OECD countries (Reinhart and Sack 2000; and Ardagna *et al.*, 2007). While most studies have used budget deficit measures inclusive of interest payments, some studies have also chosen an alternative variable, primary budget deficit as the dependent variable (Cebula and Rhodd, 1993) highlighting model mis-specification issues, as interest rates may turn out to be endogenously linked to budget deficit via its influence on GDP growth through investment, tax revenues, etc. Studies have shown that effects of public debt on interest rates are quantitatively smaller than the effect of public deficits (Laubach, 2009).

The 2000s saw extension of this literature on budget deficits and interest rates into Emerging Market Economies (EMEs) in a big way with many of them gaining experience of market determined interest rates (Zoli, 2005; and Aisen and Hauner, 2008). Another very important aspect that many recent studies have tried to capture is the nonlinearity in the impact of budget deficits on interest rates/inflation, i.e., conditions under which fiscal deficit can have significant influence on these monetary variables, viz., the effect of budget deficit is noteworthy incase of relatively high deficits, domestically financed deficits or in cases of low financial openness and/or low financial depth with financial markets not so well-developed, etc. (Zoli, 2005; Ardagna *et al.*, 2007; Aisen and Hauner, 2008; and Ishaq and Mohsin, 2015). Given these factors, the effect is expected to be larger for EMEs.

Studies have also attempted fiscal policy impact on interest rates after taking out the impact of cyclical factors from the fiscal deficit. Reason being during recessions, deficits may be negatively associated with interest rates because of adverse impact of automatic stabilizers on fiscal deficit coupled with monetary easing adopted by central bank to tackle recession. Cohen and Garnier (1991) address this problem by using estimates of fiscal deficits after adjusting them for the impact of business cycles, usually called Cyclically Adjusted Fiscal Deficit (CAFD). By doing so, they find the impact of deficit to GDP ratio on interest rates to be significant and also much higher than earlier studies, to the tune of 40-55 basis points for a one percentage point increase in deficit to GDP ratio. For the same reason, others have also tried to see this relationship after eliminating cycle impacts by using structural deficit (Cebula, 1997b). Some have tried to address this problem by focusing on long horizon forecasts of both fiscal variables and interest rates (Laubach, 2009) assuming that in the long run, business cycle impact on these macro variables is limited.

India

Literature on crowding out for India has generally provided evidence in favor of public investment crowding out private investment (RBI, 2002; Mitra, 2006; and Bahal *et al.*,

2015). Within public investment, infra investment and social sector investment has generally been found to be complementary to private investment by raising marginal productivity of private capital. Given that interest rates were administered in India for a long time, getting direct evidence of crowding out by linking fiscal deficit and real interest rates was rather limited in India which was popular in advanced economies during the 1980s and 1990s.

One of the early studies that examined the relationship between fiscal deficit and interest rates for India was by Dua and Pandit (2002) whose aim was essentially to examine what determines interest rates in India. While ignoring other aspects (not directly relevant to this study), the only point that can be taken for our analysis is that real government expenditure was found to be an important determinant of domestic interest rates in India along with other factors. Chakraborty (2002) directly addressed this issue using a two-variable VAR model (1994-2000) to find that market borrowings when used as a proxy for fiscal deficit alter the influence with real rate impacting fiscal deficit. Two years later, by incorporating a third variable, reserve money in the VAR framework for almost the same period (1996-2001), Goyal (2004) shows that there does exist a two-way causality between fiscal deficit and interest rates. Chakraborty (2012) using high frequency data for the period 2006-2011 and adding capital flows as a variable showed that interest rates are impacted by a host of factors, i.e., changes in reserve money, capital flows, expected inflation but not fiscal deficit.[2]

Subsequent studies have found evidence the other way to Chakraborty (2012), albeit there are slight variations in variables chosen as well as time period. Based on Zoli (2005), RBI (2013) estimated that a one percentage point increase in fiscal deficit leads to direct increase in call rate, used as a proxy for monetary policy rate, of about 0.72 percentage points with a one period lag in a linear framework, after controlling for output and inflation gap.[3] Rani and Kumar (2017) in a recent study analyze and further confirm the positive relationship between fiscal deficit and interest rates in an ARDL framework for the period 1980-81 to 2013-14 with money supply and inflation as additional variables.

Sub-National Government

There have been very few studies that have analyzed crowding out at the sub-national level. Martinez-Lopez (2006) finds that productive public investment (i.e., roads, hydraulic infrastructure, ports, etc.) and social public investment (i.e., education and health) raise the rate of return of private investment by pushing up productivity in Spanish regions and thus crowding in private investment. On the other hand, public consumption and interest rates are found to have a negative effect on private investment. Tuladhar and Bruckner (2010) test crowding out effects of local government expenditure on private investment at the prefecture (district) level in Japan for the period 1990-2000 finding strong crowding out effects of local government expenditure on private investment: a 10% increase in government expenditure decreased private investment by more than 5.2% on an average. Huang *et al.* (2017) examine local public debt issuance in China and report that public debt (local) is

[2] Vinod *et al*. (2014) provide further support to this using a different methodology of maximum entropy bootstrap.

[3] This study was for the period 1988-89 to 2011-12 assuming that call rates were deregulated in 1989.

negatively associated with investment of the domestic manufacturing firms at the city level. An enormous increase in local debt produced by massive debt issuance (as part of the post-2008 fiscal stimulus) curtailed investment of private manufacturing firms by tightening their funding constraints.

In the Indian scenario, the literature is quite scant due to lack of sufficient data. Mallick (2013) carries out a panel data analysis involving 15 major states over 12 years and finds evidence supporting crowding out of private investment by public expenditure. Wahi and Kapur (2018) carry out a panel analysis for Indian states for the period 2007-08 to 2015-16 to find that higher fiscal deficits have a negative impact on overall GDP thus, indirectly providing evidence in favor of crowding out.

Against this backdrop, this study tries to re-examine the relationship between fiscal deficit and interest rates using more relevant variables and latest data.

Data and Methodology

Any empirical analysis necessitates recapitulation of the data sources along with the trend and behavior of the key variables for the period of study.

Gross Fiscal Deficit Trends, Fiscal Responsibility and Budget Management Performance

During the 1980s, the Gross Fiscal Deficit (GFD) for the central government remained, on an average around 6.5%, reaching a peak of 9.4% in 1989-90. The structural reforms including that of fiscal reforms that followed the BoP crisis of 1990-91 resulted in a general decline in fiscal imbalances during first half of the 1990s. The second half of 1990s saw a deterioration in fiscal position, which again led by slack in tax revenues due to growth slowdown coupled with rising committed expenditures like wages, salaries and interest payments. Enactment of the FRBM Act on August 26, 2003 and its subsequent implementation in 2004-05 by center and subsequently through state-specific legislations by all states, unleashed a regime of fiscal rules to restrain discretionary fiscal policies with inherent deficit bias. The fiscal consolidation that followed, particularly during the 2005-08 period was marked by reduction in revenue deficit as well, thus, reflecting the improvement in true fiscal position. The period 2008-09 to 2011-12 was generally associated with large-scale fiscal stimulus. The consolidation that was observed post 2012-13, primarily for central government has been largely brought about by cuts in capital expenditures/plan revenue expenditure (Figure 1), thus, deteriorating the quality of expenditure.[4] The states have also seen a rising trend in revenue to fiscal deficit ratio raising concerns about lowering of public sector's own investment, inturn contributing to crowding out and higher debt. Infact, combined center plus states (usually called general government) GFD and debt for India remains high vis-à-vis other EMEs and fiscal consolidation is generally advocated to reduce this high debt (IMF, 2018) (Table 1).

[4] It may be noted that higher revenue expenditure, if not good for private investment, does support overall economic growth through higher government final consumption expenditure. However, the impact is generally in the short run and the multiplier for revenue expenditure is generally estimated to be much lower than capital expenditure (RBI, 2019).

Figure 1: Gross Fiscal Deficit Trends

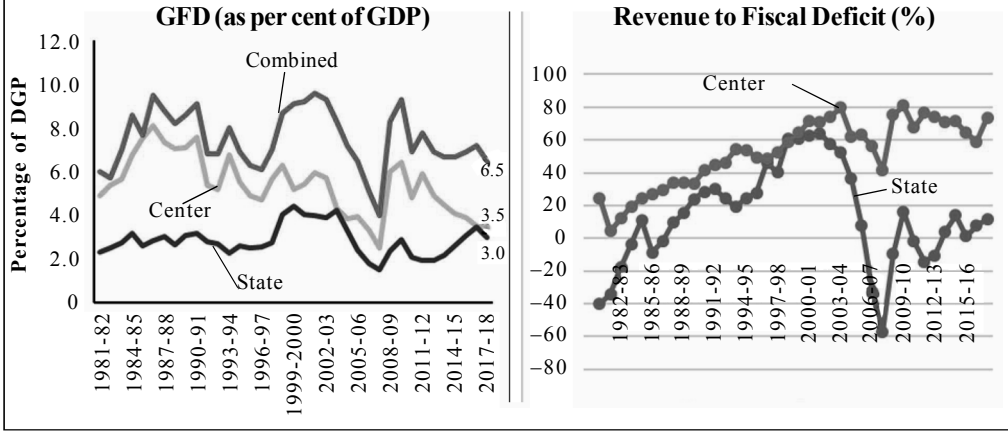


Table 1: Cross-Country GFD and Gross Debt for 2018 (as % to GDP)

	GFD	Gross Debt
Argentina	5.2	86.3
Brazil	6.8	87.9
Chile	1.5	25.6
China	4.8	50.5
Colombia	2.2	50.5
Egypt	9.5	92.6
Hungary	2.3	69.4
India	5.8*	68.3*
Indonesia	1.8	29.2
Malaysia	3.6	56.2
Mexico	2.3	53.6
Philippines	1	39.6
Poland	0.6	48.4
Romania	2.9	36.6
Russia	–2.8	14
Saudi Arabia	4.6	19.1

Table 1 (Cont.)

	GFD	Gross Debt
South Africa	4.4	56.7
Sri Lanka	5.3	84.1
Thailand	0.3	42.1
Turkey	3.6	29.1
Uruguay	2.7	70
Note: * for 2018-19 Budget Estimates (BE).		
Source: IMF Fiscal Monitor, April 2019 except India for which source is Reserve Bank of India		

The nature of government deficit financing influences the interest rates in the economy in turn deciding on the true crowding out impact. Prior to fiscal reforms, the government securities market was marked by scheduled commercial banks as the sole captive investors in these securities driven by statutory requirements. The market determined rate of interest started when the auction-based mechanism for selling government securities in the primary market was put in place in the early 1990s, followed by a series of steps to develop the government securities market, viz., setting up of a system of primary dealers, institutionalization of liquidity adjustment facility in 2000, and Reserve Bank of India (RBI) withdrawing from the primary market for government securities with effect from April 2006. Along with these institutional developments, the share of market borrowing in combined (center plus states) GFD financing has gone up from on an average about 25% in the 1980s to about 40% in the 1990s to more than 60% starting from the early 2000s (Figure 2) which through its impact on yield has kept real rate of interest high for private sector, weakening the transmission of lower policy rates to other segments and thereby limiting the expansionary effect of increased revenue expenditure to certain extent. In the post-inflation targeting framework, with RBI operating with a clear mandate to tame inflation, any increase in fiscal deficit if financed by higher market borrowing is reflecting itself more quickly in a sharper increase in G-sec yields with higher scope for crowding out. This is true not only for the G-secs but also for the state development loans whose average yield spreads have been witnessing an increasing trend particularly in the current decade, viz., more than 20 bps rise in the SDL primary yield spread over the last five years (Table 2 and Figure 3). Furthermore, increased market borrowings has also imposed large redemption pressures on the state governments, consequently inflating their debts.

The FRBM Act in 2004-05 proposed that the central and state GFD would each be progressively reduced to reach 3% of GDP. The FRBM was, however, put on hold during 2008-09 to 2012-13 due to the global financial crisis. While the FRBM Act was revived from the fiscal year 2013-14, the goal post for achieving the GFD-GDP target of 3.0% was periodically shifted from 2016-17 to 2017-18 and subsequently to 2018-19. The Union Budget 2018-19 proposed a revision in the FRBM Act, 2003, whereby the GFD and debt

Figure 2: Rising Combined (Net) Market Borrowing

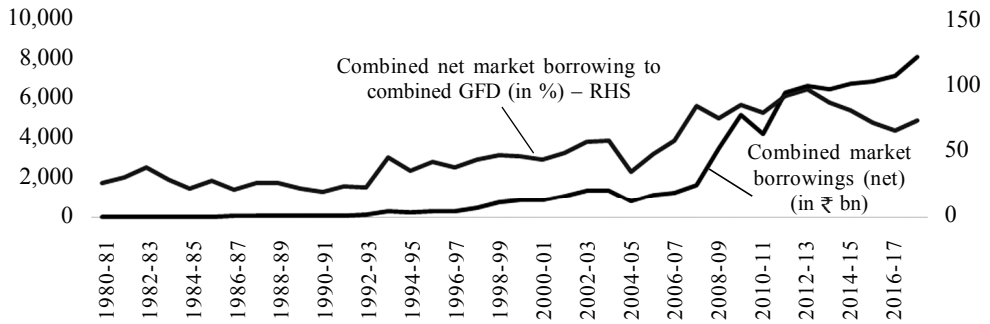
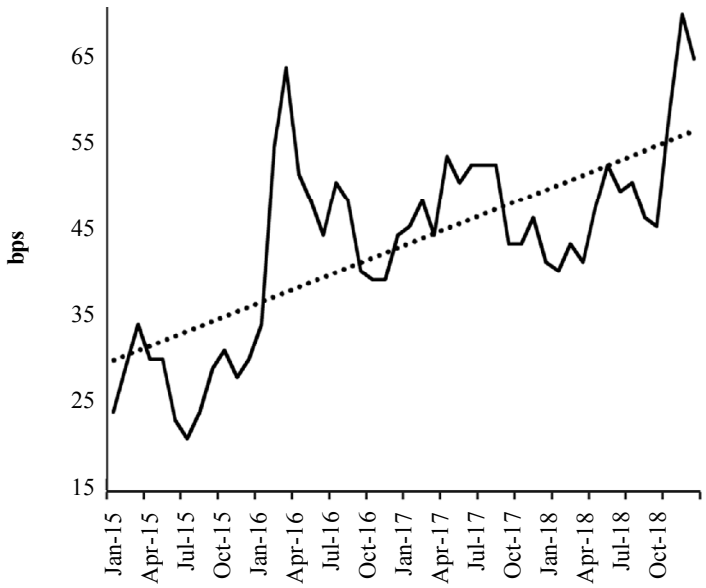


Table 2: Share of Market Borrowings in States' GFD and Primary SDL Yield Spread

	2014-15	2015-16	2016-17	2017- 18 (RE)	2018-19 (BE)
Share of Market Borrowings in State GFD (in %)	63.09	61.42	65.82	74.92	90.59
Primary Yield Spread (bps)	38	50	60	59	–

Source: State Budget Documents and Reserve Bank of India.

Figure 3: Average Spread in SDL Yields



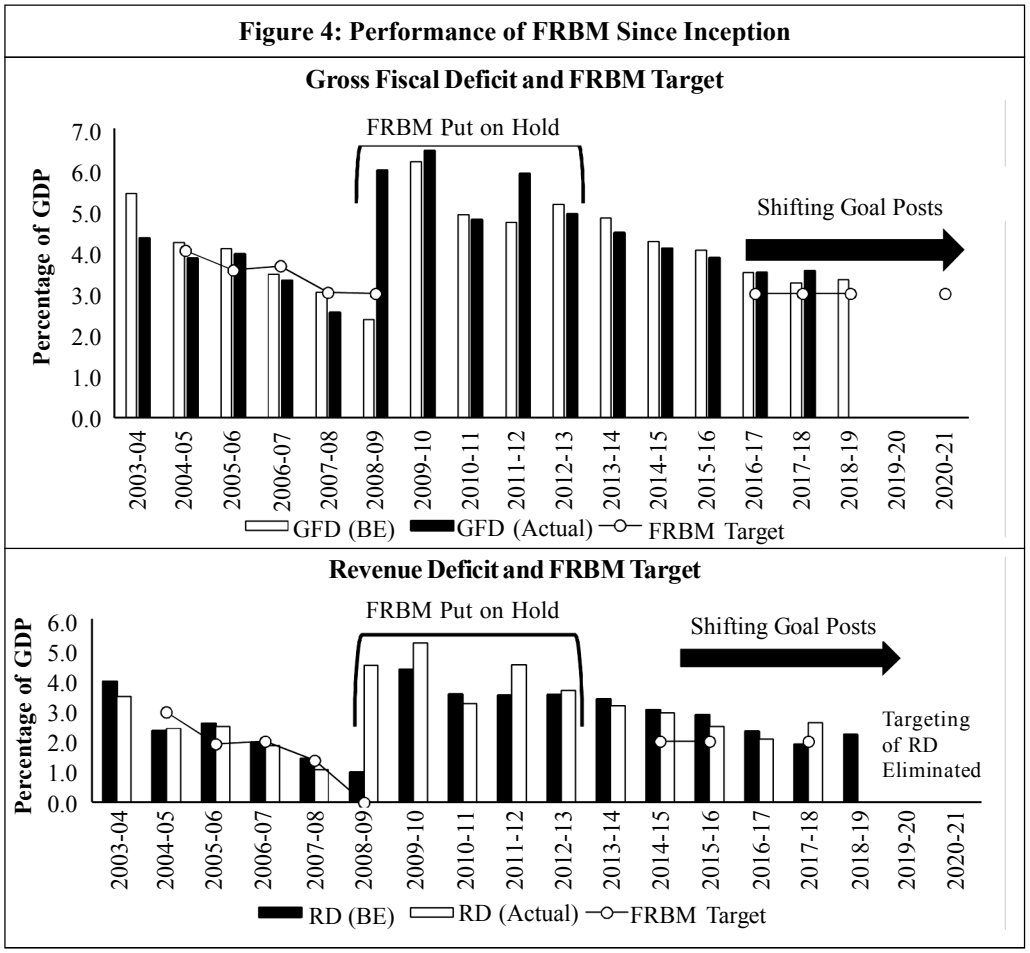
Source: CCIL

became the operational targets; revenue deficit targeting was dispensed with while escape and buoyancy clauses were introduced (Government of India, 2018). The GFD target of 3% of GDP was deferred to 2020-21, while aiming to attain the central debt to GDP ratio of 40% and the general government debt to GDP ratio of 60% by 2024-25. On balance, the GFD target could be met during the pre-crisis FRBM period only[5] and it has not been met at all in the decade after the crisis with 3% goalpost getting periodically shifted forward once it came closer (Figure 4). Thus, even after a decade and a half since FRBM was instituted for India, the fiscal performance with respect to fiscal deficit to GDP targets has been weak and thus, puts a case for re-examining its impact on the rest of the economy.

Key Variables

Crowding out involves exploring the relationship between (1) fiscal deficit and rate of interest (financial crowding out); and (2) fiscal deficit and private investment (real crowding out) in a long-term time framework. The choice of the key variables is, thus, crucial.

Figure 4: Performance of FRBM Since Inception



[5] If off-budget items such as bonds issued to oil marketing companies, fertilizer companies and Food Corporation of India, in lieu of subsidies, are added back to total expenditure for these years, then the GFD target was met only in 2004-05.

Fiscal Deficit – Cyclically Adjusted

Two different variants of fiscal deficit have been used—the Cyclically Adjusted Fiscal Deficit (CAFD) and Cyclically Adjusted Primary Deficit (CAPD).[6] Use of cyclically adjusted deficit could be more relevant from macro perspective, particularly when it is known from theory that the fiscal-monetary relationship gets more complicated closer to zero output gap or full employment levels. Thus, this measure by construction has economic stabilization properties and is more relevant from macro perspective and is in line with international papers (Cohen and Garnier, 1991; Cebula, 1997a; and Laubach, 2009). Also, the gap between the two has become significant post crisis for India (Misra and Trivedi, 2016) because of which the focus on this has come to the fore front in terms of an escape or buoyancy clause in the revised FRBM. Use of CAPD may further rule out the possibility of changes in interest rates directly or indirectly impacting the deficit through changes in real GDP growth through capital formation alterations.

Real Interest Rates

Real rate of interest is not an observed variable and constructing it, particularly for a longer time period for research purpose remains a challenge. For any exercise of this kind, it is the secondary market yield for the 10-year benchmark G-sec which is considered the most representative of market conditions (in line with Goyal, 2004). However, considering that this data is available since 1996, the series was extended backwards using the SBI prime lending rate, adjusted for the average gap between the two for the second half of 1990s.[7] To compute real rate as per standard Fisher equation, Consumer Price Index (CPI) inflation needs to be subtracted from the nominal rate. In the absence of back series of CPI (combined), inflation rate based on CPI-Industrial Workers (IW)[8] is netted out from the nominal rate to arrive at the real rate series. It may be noted that most research so far in this area have used Wholesale Price Index (WPI) to net out.

Private Investment

Center and General Government

For examining private investment, the private component of the Gross Fixed Capital Formation (GFCF) of the CSO data has been used. While the latest data on this pertains to 2011-12 base year, the data for the previous years has been arrived by splicing the series suitably. It may be noted here that the break-up of GFCF into public and private components since 1970-71 is available only at current prices and not at constant prices, for which the break up

[6] Cyclical adjustment of fiscal deficit has been done on the basis of Ghosh and Misra (2016) and Misra and Trivedi (2016).

[7] Prime lending rate is generally used as an indicator of nominal rate of interest for the 1980s as it is an important determining factor of private investment behavior (Rangarajan and Mohanty, 1998; Chakraborty, 2012; and Rani and Kumar, 2017).

[8] Infact, CPI-IW which reflects CPI inflation for the industrial workers may be more relevant for any analysis on private investment and crowding out.

is available only from 2011-12. Accordingly, private investment to GDP, all at current market prices has been chosen as the variable of interest.

State Governments

While state-wise SDL yields show limited variability ruling out financial crowding out analysis for states, no readily available data on state-wise private investment remains the key hindrance to undertake real crowding out.[9] An attempt has been made here to undertake real crowding out analysis for states in a panel framework by computing the state-wise private investment data from available data sources.

At the national level, CSO publishes data on GFCF by type of institution, that is, public, private or household sector. The data on GFCF by type of institution at the state level is not readily available. This paper calculates private sector GFCF for each state using a methodology similar to the one outlined in Mallick (2008). National level data on public and private GFCF is published by the CSO. State-wise data on total GFCF is published by the RBI in its *Handbook of Statistics on Indian States*. The national level public GFCF is allocated to each state on the basis of the share of each states' capital expenditure in the total capital expenditure of all states. This figure is then subtracted from the total GFCF of each state to arrive at estimates of private GFCF. It may be noted that the national level data on GFCF by type of institution (public, private and household) is available only at current prices and not at constant prices, for which the data is available from 2011-12. Thus, the analysis has been done using GFCF at current prices. The variable of interest for our analysis is private investment as a percentage of GSDP, both of which have been taken at current prices.

The Relationship Between Key Variables

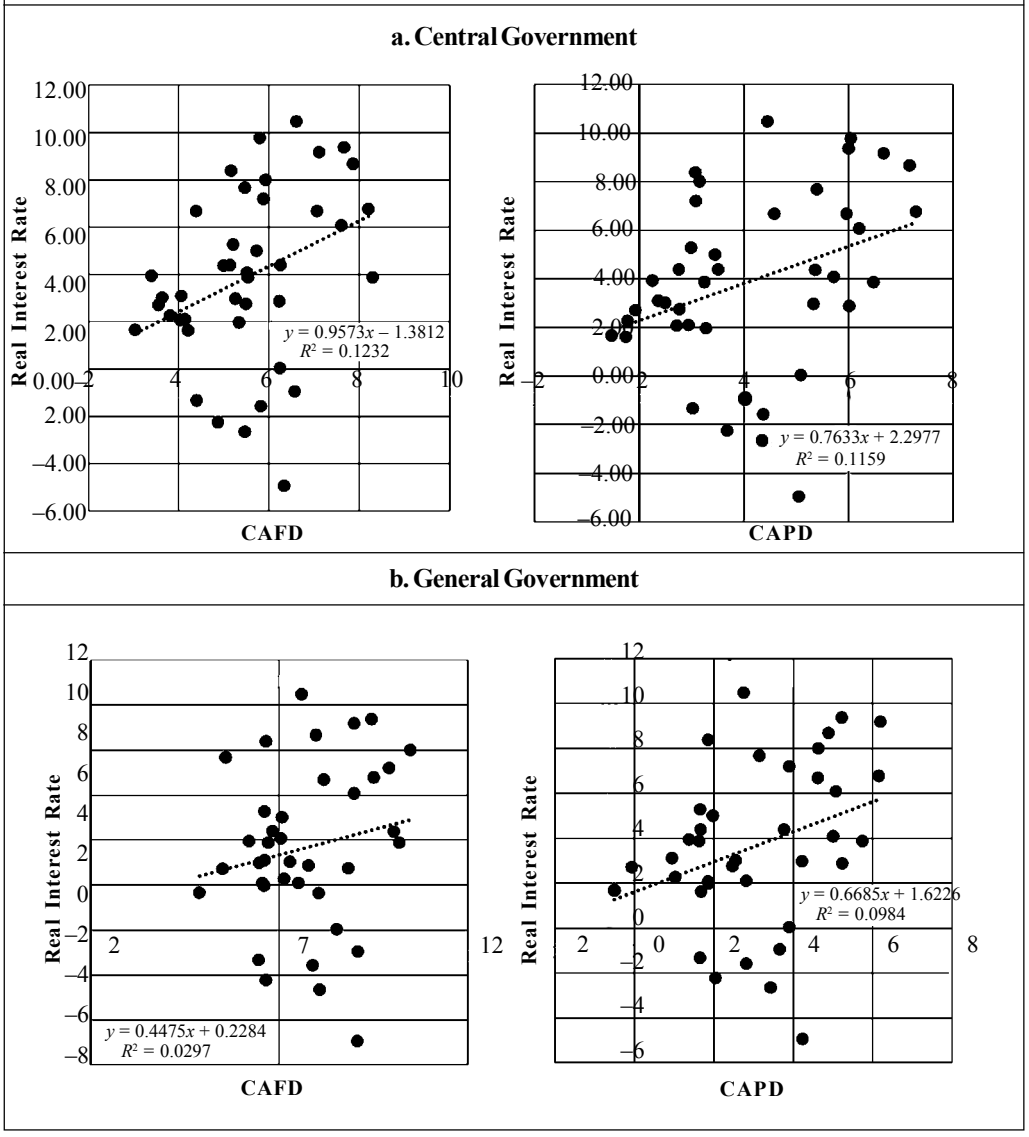
A simple scatter (*xy*) plotting of CAFD and CAPD vis-à-vis the real rate of interest as shown in Figure 5 shows a positive relationship between the two during the period 1980-81 to 2017-18 necessitating the need to probe the relationship in a multivariate long-run framework. Two additional variables have been considered as factors which might influence the relationship between fiscal deficit and rate of interest: (a) Broad money supply as indicator of the general liquidity conditions (in line with Khundrakpam and Pattanaik, 2010); and (b) net capital flows which have started influencing the rate of interest since late 1990s (in line with Chakraborty, 2012).

Similar graphs for CAFD and CAPD vis-à-vis the private investment to GDP ratio for the period 1980-81 till 2017-18 shows a clear negative relationship between the two (Figure 6).[10] Recognizing the important role that bank credit has played in influencing private

[9] Furthermore, data on GFCF of the private sector which is taken as a measure of private investment is not readily available at the level of the states. The Directorate of Economics and Statistics (DES) of each state publishes data on GFCF by type of institution. The state-wise estimates of GFCF by the DES, however, are very limited. Only few states have data on the level of public and private capital formation and the data is available only for some years.

[10] The negative correlation becomes stronger and more significant for more recent years.

Figure 5: Cyclically Adjusted Deficits and Real Interest Rates – Scatter Plot

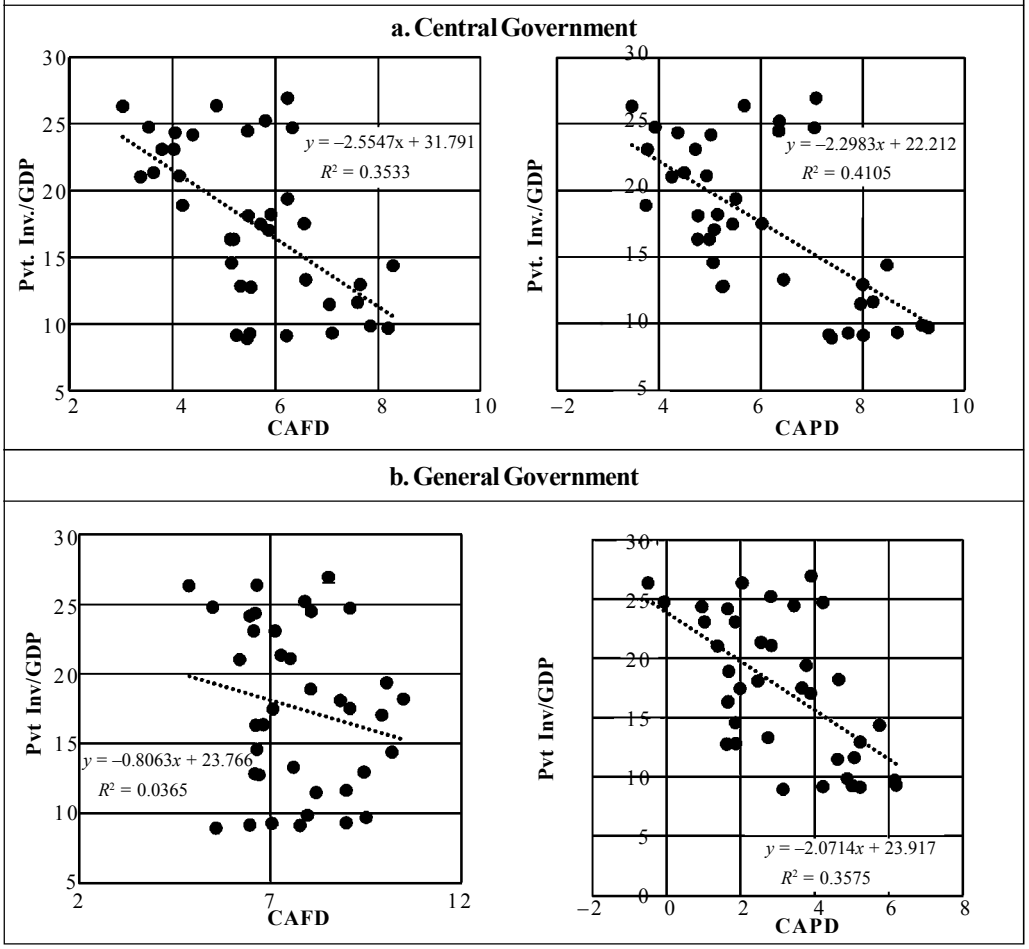


investment, non-food bank credit growth has been added as an additional variable while examining real crowding out.

Data Sources

The necessary data on center and general government's GFD, GDP at market prices, 10-year benchmark G-sec yield, SBI prime lending rate, CPI-IW, gross domestic capital formation, broad money supply, net capital flows, and non-food bank credit were collected from the online database of the *Handbook of Statistics on Indian Economy*, RBI. The period of the study is from 1980-81 to 2017-18.

Figure 6: Cyclically Adjusted Deficits and Private Investment to GDP – Scatter Plot



The data for Gross State Domestic Product (GSDP), GFD, gross revenue deficit and gross market borrowing of the states has been collected from the *Handbook of Statistics on Indian States,* RBI. For the purpose of this study, an index for infrastructure has also been created using roads and electricity as indicators for infrastructure development of states. Length of state highways (in km) and state-wise per capita electricity consumption (in kWh) has been taken as the indicator for road and electricity development, respectively. These figures were normalized and the average of the normalized figures was taken to create an index for infrastructure development of each state.[11]

[11] An index for infrastructure was created using a methodology similar to that used by Mundle *et al*. (2016) Two indicators of infrastructure, i.e., roads and electricity have been used. For roads, length of state highways (in km) and for electricity state-wise per capita consumption of electricity (in kWh) have been used. The two indicators are measured in different units and a process of normalization has been carried out to make them comparable. Normalization has been carried out as follows: X_{ij} = {Y_{ij} – Minimum (Y_j)}/ {Maximum (Y_j) – Minimum (Y_j)}, where Y_{ij} is the value of the j^{th} indicator for the i^{th} state. This process of normalization rescales the indicators in the range [0, 1].

An index for infrastructure has been computed by taking the average of the normalized figures obtained.

Research Methods

Central and General Government

Unit Root Tests

The first step before testing for a long-run relationship between time series is to check if the variables used in the model are stationary and to identify the order of integration of the time series used in the model. Checking for stationarity is important because the impact of shocks to a stationary series dissipates in the long run. On the other hand, identification of the order of integration of a time series helps avoid estimating spurious regressions. The unit root test examines the null hypothesis that the series Y_t contains a unit root.

The results of the unit root test, as shown in Table 3, indicate that the null hypothesis of presence of unit root is not rejected for four series—cyclically adjusted fiscal and primary deficit to GDP (both center and general government), private investment to GDP and net capital flows. All these variables exhibit stationarity in first difference, making them I(1) variables. The *t*-statistics for the Augmented Dickey-Fuller (ADF) test for the real rate of interest, broad money supply and non-food credit growth variables, is above the critical value of at least 5% level of significance, thus, rejecting H_0 and making them I(0) variables. On balance, the unit root test clearly shows that the model has a mix of I(0) and I(1) variables, thus, necessitating the use of ARDL model.

Table 3: Unit Root Tests (ADF) Results for the Data Series Used in the Study

Series	Test-Statistics	Critical Value of Test Statistics at			Result (H_0: *Presence of Unit Root in the Series*)	I(0) or I(1) Series
		1% Level	5% Level	10% Level		
Cyclically Adjusted Center's Fiscal Deficit to GDP	–2.1	–3.6	–2.9	–2.6	Don't Reject H_0	I(1)
Cyclically Adjusted Center's Primary Deficit to GDP	–1.8	–3.6	–2.9	–2.6	Don't Reject H_0	I(1)
Cyclically Adjusted General Government's Fiscal Deficit to GDP	–2.9	–3.6	–2.9	–2.6	Don't Reject H_0	I(1)
Cyclically Adjusted General Government's Primary Deficit to GDP	–2.4	–3.6	–2.9	–2.6	Don't Reject H_0	I(1)
Real Rate of Interest	–3.2**	–3.6	–2.9	–2.6	Reject H_0	I(0)
Private Investment to GDP	–1.3	–3.6	–2.9	–2.6	Don't Reject H_0	I(1)
Broad Money Supply Growth	–3.3**	–3.6	–2.9	–2.6	Reject H_0	I(0)
Net Capital Flows	1.96	–3.6	–2.9	–2.6	Don't Reject H_0	I(1)
Non-Food Credit Growth	–3.7***	–3.6	–2.9	–2.6	Reject H_0	I(0)

Note: *** and ** indicate that the null hypothesis of non-stationarity is rejected at 1%, 5% and 10% levels of significance respectively. Automatic selection of lags through Schwarz Information Criteria (SIC).

Cointegration and ARDL Method

Following the stationarity tests, the present study attempts to examine the possibility of a long-run relationship between (1) real interest rates and cyclically adjusted deficits; and (2) private investment and cyclically adjusted deficits through the two-stage cointegration test proposed by Pesaran and Shin (1999) and extended by Pesaran *et al.* (2001), called the bounds test. ARDL has a major advantage in that it can be applied irrespective of whether the underlying variables are I(0), I(1) or fractionally integrated as is the case here. So the order of integration does not matter. Moreover, there is simultaneous estimation of the short-run and long-run parameters of the model, thus, making it simpler than other cointegration techniques and also accommodative to small sample properties. The objective of the study is to examine whether a long-run relationship exists between real long-term interest rates and government deficit with money supply and net capital flows as control variables.[12] This study has followed the ARDL approach, in particular, for central government so as to explore any long-run cointegration while maintaining the order of integration of variables as well as allowing for short-run interactions.

The following three ARDL models are specified in the first stage to determine the long-run relationship between the selected macroeconomic variables:

$$\Delta \ln D_t = \alpha_0 + \Sigma\beta_1 \Delta \ln D_{t-i} + \Sigma\beta_2 \Delta \ln R_{t-i} + \Sigma\beta_3 \Delta \ln X_{t-i} + \gamma_1 \ln R_{t-1} + \gamma_2 \ln D_{t-1} + \gamma_3 \ln X_{t-1} + \varepsilon_{1t} \quad ...(1)$$

$$\Delta \ln X_t = \alpha_0 + \Sigma\beta_1 \Delta \ln X_{t-i} + \Sigma\beta_2 \Delta \ln D_{t-i} + \Sigma\beta_3 \Delta \ln R_{t-i} + \gamma_1 \ln X_{t-1} + \gamma_2 \ln D_{t-1} + \gamma_3 \ln R_{t-1} + \varepsilon_{2t} \quad ...(2)$$

$$\Delta \ln R_t = \alpha_0 + \Sigma\beta_1 \Delta \ln R_{t-i} + \Sigma\beta_2 \Delta \ln D_{t-i} + \Sigma\beta_3 \Delta \ln X_{t-i} + \gamma_1 \ln R_{t-1} + \gamma_2 \ln D_{t-1} + \gamma_3 \ln X_{t-1} + \varepsilon_{3t} \quad ...(3)$$

where Δ stands for the first difference operator, D stands for cyclically adjusted deficit, R stands for real interest rates, and X for additional control variables like money supply, capital flows.

In Equation (1), 'D' is the dependent variable and 'R' and 'X' are the long-run regressors. The null hypothesis of no cointegration is defined by H_0: $\gamma_1 = \gamma_2 = \gamma_3 = 0$ and is tested against the alternative hypothesis of H_1: $\gamma_1 \neq 0$ *or* $\gamma_2 \neq 0$ *or* $\gamma_3 \neq 0$, by means of an F-test. In this regard, two bounds of critical values are generated. For I(0) variables, the critical values of the lower bound serve as a benchmark, while for I(1) variables, the critical values of the upper bound serve as a benchmark. According to the bounds test, cointegration exists if the compound F-statistic exceeds the upper critical value.[13]

[12] Standard approach has been either to examine it in a VAR framework allowing for all interactions by taking differenced variables to unify the order of integration or to examine the same in a long-term cointegrated framework notwithstanding short-term interactions among variables. The results for the long-run model obtained using this approach are unbiased irrespective of the fact that few regressors might be endogenous. The problem of endogeneity is, thus, taken care of (Harris and Soli, 2003).

[13] The test becomes inconclusive if the F-statistic falls within the two bounds of critical values. If the F-statistic is below the lower critical value, it implies no cointegration.

The second stage entails the estimation of the long- and short-run coefficients of the cointegrated equation. Once the long-run ARDL model suggests the existence of a long-run relationship between the real interest rates, fiscal deficit and other variables, the conditional long-run equilibrium relationship is estimated by the following reduced form of ARDL equation:

$$R_t = \alpha_0 + \Sigma\beta_1 R_{t-i} + \Sigma\beta_2 D_{t-i} + \Sigma\beta_3 X_{t-I} + \varepsilon_{4t} \quad \ldots(4)$$

Following Equation (4), the short-run elasticities are estimated as in Equation (5):

$$\Delta R_t = \alpha_0 + \Sigma\gamma_1 \Delta R_{t-i} + \Sigma\gamma_2 \Delta D_{t-i} + \Sigma\gamma_3 \Delta X_{t-I} + EC_{t-I} + \varepsilon_{4t} \quad \ldots(5)$$

where Δ stands for the difference operator, *EC* represents the error correction term derived from the long-run equilibrium cointegrating relation using the ARDL model (given by Equation 4) as specified above.

Sub-National Government

Unlike the time series analysis for central and general government, the state government's availability of state-wise data allows us to assess the effect of rising deficits and market borrowings of the state governments on the level of private investment in each state (as computed in earlier). To analyze crowding out at the level of Indian states, the two models used are specified as below:

Model 1:

$$PI_{it} = \alpha + \beta_1 PI_{it-1} + \beta_2 GFD_{it} + \beta_3 X_{it} + u_{it} \quad \ldots(6)$$

Model 2:

$$PI_{it} = \alpha + \beta_1 PI_{it-1} + \beta_2 GMB_{it} + \beta_3 X_{it} + u_{it} \quad \ldots(7)$$

where PI_{it} is private investment of each state as a percentage of GSDP, PI_{it-1} is the first lag of private investment as a percentage of GSDP, GFD_{it} is the gross fiscal deficit of each state as a percent of GSDP, GMB_{it} is the gross market borrowings of each state as a percentage of GSDP, and X_{it} is the vector of control variables, namely, gross state domestic product ($GSDP_{it}$), real rate of interest (*RIR*) and infrastructure (I_{it}).

A dynamic panel data analysis of 23 Indian states for the period 2001-02 to 2016-17 has been carried out to analyze the dynamic aspects of private investment. The State of Telangana was formed in 2014 and for the purpose of this analysis, it has been clubbed with the State of Andhra Pradesh. Dynamic panel data estimators suggested by Arellano-Bover/Blundell-Bond (Arellano and Bover 1995; and Blundell and Bond 1998), i.e., System GMM has been used for the analysis as it has greater efficiency than the Arellano-Bond estimators, i.e., Difference GMM. The Arellano-Bond estimation (Difference GMM) uses the generalized method of moments and transforms the regressors through differencing. It makes the assumption that the instruments used are internal and are based on the lagged values of the regressors. Inclusion of external instruments is also allowed for. On the other hand, the Arellano-Bover/Blundell-Bond estimation (System GMM) augments this by assuming no

correlation between the fixed effects and the first difference of the instrument variables. This increases the number of instruments that can be used and also increases efficiency. Both these estimators are meant to be used for panels with fewer time periods and many individuals, i.e., 'small T, large N' panels.[14]

Results and Discussion

Central and General Government Finances

Financial Crowding Out

Bounds Test for Cointegration

The existence of long-run equilibrium relationship between real rate of interest and cyclically adjusted deficits along with other important determinants of real interest rate like money supply and net capital flows is confirmed if the bounds *F*-test of joint significance of lagged levels of the variables included in the model rejects the null of no cointegration. From Table 4, it is observed that the estimated *F*-value is higher than the upper bound critical value, thus confirming the existence of long-run cointegration for both central and general government.

Table 4: Bounds Test for Cointegration for Financial Crowding Out: ARDL *F*-Statistics

Central Government	Real Rate/CAFD, M3, Net Capital		Real Rate/CAPD, M3, Net Capital	
	5.99***		6.12***	
F-Critical Values	5% I(0)	5% I(1)	5% I(0)	5% I(1)
	2.8	3.7	3.1	4.1
General Government	Real Rate/CAFD, M3, Net Capital		Real Rate/CAPD, M3, Net Capital	
	4.30**		4.23**	
F-Critical Values	5% I(0)	5% I(1)	5% I(0)	5% I(1)
	3.6	4.2	3.6	4.2

Note: H_0: *No Cointegration*, H_1: *There is long-run cointegration relationship*.*** and ** indicate the rejection of the null hypothesis of non-stationarity at 1% and 5% levels of significance respectively. Sample size is 40. Critical values of the *F*-statistics are extracted from Narayan (2005).

Long-Run and Short-Run Estimates

Since the real rate of interest, cyclically adjusted fiscal and primary deficits, all as percentage to GDP, money supply growth and net capital flows are found to have long-run equilibrium relationship for the central government, the long-run elasticities are estimated using ARDL

[14] This piece of research uses dynamic panel system GMM analysis for its econometric estimation of states' crowding out which has been implemented using the xtabond2 user written command in Stata (Roodman, 2009). In the given model specification, thus, gross state domestic product has been taken as an endogenous variable while all other explanatory variables have been taken as exogenous. The collapse option has been used to limit the number of instruments and avoid instrument proliferation.

model (Equation 4). The long-run estimates are reported in Table 5 for the different variants of GFD considered here for both central and general government.

Table 5: Long-Run ARDL Estimation Coefficients with Real Interest Rate as Dependent Variable

	Central Government		General Government	
	CAFD:ARDL (1, 2, 4, 1)	CAPD:ARDL (1, 3, 4, 2)	CAFD:ARDL (1, 2, 4, 1)	CAPD: ARDL (1, 3, 4, 2)
Constant	16.7*** (3.03)	19.8*** (3.84)	7.97 (1.67)	5.69 (1.63)
Government Deficit	1.03** (2.13)	0.82*** (2.51)	0.18 (–0.47)	0.09 (0.27)
M3 Growth	–1.01*** (–3.43)	–0.94*** (–3.22)	–0.22 (–1.31)	–0.19 (–1.13)
Net Capital Flows	–0.01*** (–3.69)	–0.002*** (–4.44)	–0.00* (–1.88)	–0.00 (–1.56)
LM Test for Serial Correlation	0.90 (0.35)	1.26 (0.32)	2.39 (0.08)	2.28 (0.09)
Heteroskedasticity Test	0.24 (0.62)	0.98 (0.49)	3.06 (0.04)	2.95 (0.04)
Jarque-Bera Normality Test	0.55 (0.75)	1.17 (0.55)	1.06 (0.59)	0.66 (0.72)

Note: ***, ** and * indicate that the null hypothesis of non-stationarity is rejected at 1%, 5% and 10% levels of significance respectively; figures in parentheses are *t*-statistic values; for diagnostics checks, however, figures in parentheses are probabilities. The ARDL models are chosen based on automatic selection by AIC; model selection graphs are given in Appendix.

It can be observed that for central government, both the models using different variants of fiscal deficit provide more or less similar evidence on the long-run correlation. Consistently, both estimates suggest that the effect or influence of cyclically adjusted deficits is strongly positive on real rate thus, providing evidence for financial crowding out. The long-run impact of money supply on real rate is strongly negative indicating higher money supply leads to lower inflation and lower real rate. Net capital flows negatively impact real rate but the strength of the impact is weak. Financial crowding out for general government, however, remains weak with coefficients being insignificant.

Table 6 reports the results of short-run error correction estimates using ARDL model (Equation 5) for the central government.[15] It becomes evident that the error correction term is found to be negative and significant. This reveals that there is a fairly effective feedback

[15] As general government did not show a significant long-run coefficient, the short-run ECM has not been estimated for the same.

Table 6: Short-Run Error Correction Estimates of ARDL for Central Government (Dependent Variable: Real Interest Rates)		
	CAFD	**CAPD**
Error Correction	–0.95***	–0.97***
Δ*Govt Deficit*	–1.14*	–0.8*
Δ*Govt Deficit* (–1)	1.23***	1.25***
Δ*Govt Deficit* (–2)		0.51
Δ*Money Supply*	0.05	0.10
Δ*Money Supply* (–1)	–0.77***	–0.76***
Δ*Money Supply* (–2)	–0.70***	–0.70***
Δ*Money Supply* (–3)	–0.45***	–0.46***
Δ*Net Capital Flows*	0.001	1.05*e*–05
Δ*Net Capital Flows* (–1)		0.001
Note: *** and * indicate that the null hypothesis of non-stationarity is rejected at 1% and 10% levels of significance respectively.		

leading to financial crowding out for central government in India with more than 90% of the previous period error getting corrected in the current period. As long as the estimated short-run elasticities are concerned, the changes in government deficit seems to have relatively a stronger and quicker degree of influence on real rate than money supply whose effect comes even for three-period lagged changes.

Robustness Checks

An alternate way used in literature to confirm the long-run relationship between variables, particularly to explore the variability of the residual process of a cointegrating equation is the cumulative sum (CUSUM) and CUSUM of squares (CUSUMSQ) of recursive residuals test by Brown *et al*. (1975). The residuals of a cointegrating regression equation should be stable with long-run movements within the critical bounds, if the given series are cointegrated.

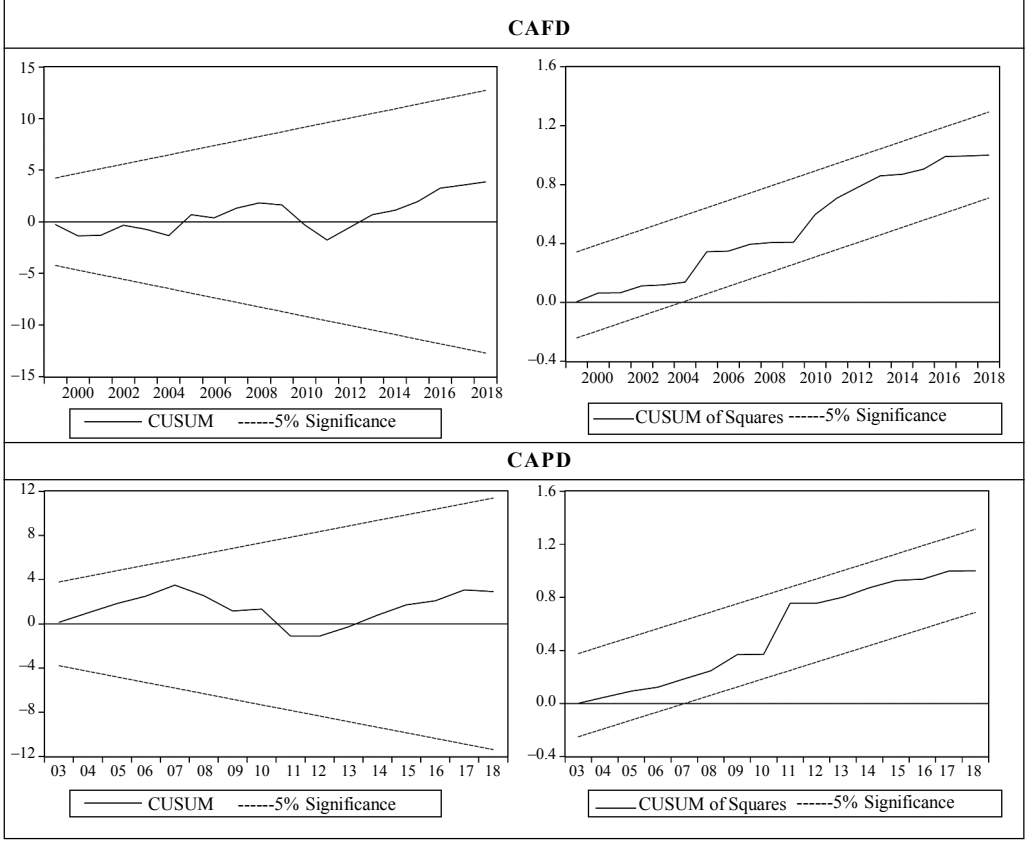
Figure 7 shows the graph of CUSUM and CUSUMSQ that remains within the 5% upper and lower critical bounds indicating the stability of the residuals further confirming the long-run cointegrating relationship, thus supporting financial crowding out for central government. Furthermore, when checked by incorporating structural breaks for net capital flows, the results hold.

Real Crowding Out

Bounds Test for Cointegration

As before, the long-run equilibrium relationship between private investment to GDP and different fiscal deficit variables along with another important determinant of real rate, the

Figure 7: CUSUM and CUSUMSQ Test Results for Financial Crowding Out for Central Government



non-food credit growth exists as shown by the Bounds *F*-test of joint significance of lagged levels of the variables. The null of no cointegration is rejected for both central and general government (Table 7).

Long-Run and Short-Run Estimates

Checking for the long-run estimates, however, one observes variation across central and general government across models as shown in Table 8. While the long-run coefficients have the expected negative sign, the significance level is nil/low for central government, but high for general government. This indicates that it is the higher combined government deficit, adjusted for business cycles, that have contributed towards lowering public investment in turn crowding out private investment. Diagnostic checks, however, are weakly satisfied for general government necessitating further probing. Along with GFD, non-food bank credit growth also remains an important determinant for private investment.

The results of short-run error correction estimates of ARDL model are reported in Table 9. It is evident that the error correction term is found to be negative and significant, albeit with a

Table 7: Bounds Test for Cointegration for Real Crowding Out: ARDL *F*-Statistics				
Central Government	Pvt. Inv./CAFD, Net Food Credit Growth		Pvt. Inv./CAPD, Net Food Credit Growth	
	5.35**		5.90***	
F- Critical Values	5% I(0)	5% I(1)	5% I(0)	5% I(1)
	3.1	3.9	3.4	4.3
General Government	Pvt. Inv./CAFD, Net Food Credit Growth		Pvt. Inv./CAPD, Net Food Credit Growth	
	4.24**		5.69**	
F-Critical Values	5% I(0)	5% I(1)	5% I(0)	5% I(1)
	3.62	4.16	4.94	5.58

Note: H_0: *No Cointegration* and H_1: *There is long-run cointegrated relationship*. *** and ** indicate the rejection of the null hypothesis of non-stationarity at 1% and 5% levels of significance respectively. Sample Size is 37. Critical values of the *F*-statistics are extracted from Narayan (2005).

Table 8: Long-Run ARDL Estimation Coefficients with Private Investment to GDP as Dependent Variable				
	Central Government		**General Government**	
	CAFD: ARDL (2, 4, 1)	CAPD: ARDL (2, 4, 0)	CAFD: ARDL (2, 4, 1)	CAPD: ARDL (2, 4, 0)
Constant	–9.0 (–0.23)	11.9* (1.91)	2.58 (0.99)	3.05 (0.10)
Government Deficit	–0.21 (–0.15)	–2.5* (–2.04)	–0.63** (–2.79)	–0.66** (–3.33)
Non-Food Credit Growth	1.96* (1.98)	0.85* (1.96)	0.13*** (3.84)	0.12*** (3.63)
LM Test for Serial Correlation	0.35 (0.90)	1.07 (0.36)	2.03 (0.08)	2.28 (0.06)
Heteroskedasticity Test	0.32 (0.96)	0.27 (0.96)	0.89 (0.48)	0.80 (0.54)
Jarque-Bera Normality Test	0.43 (0.80)	1.79 (0.40)	0.009 (0.99)	0.57 (0.75)

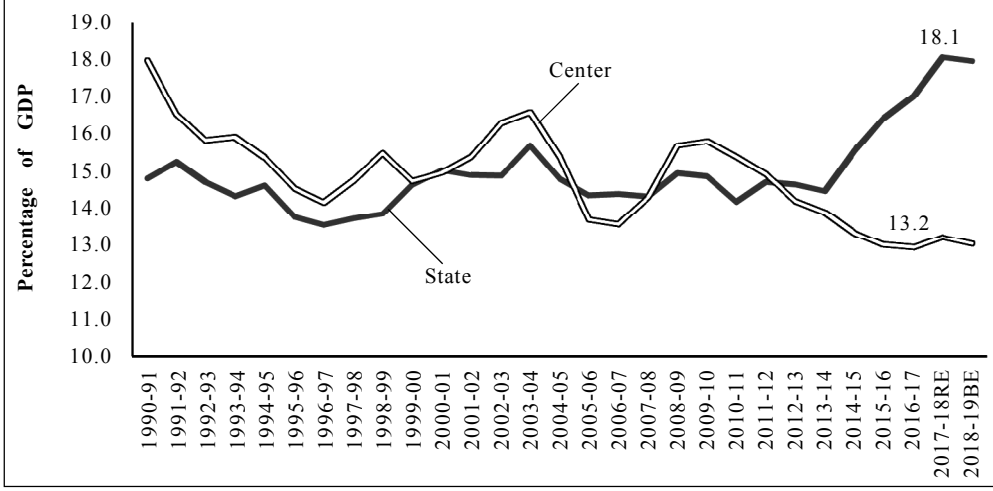
Note: ***, ** and * indicate that the null hypothesis of non-stationarity is rejected at 1%, 5% and 10% levels of significance respectively; figures in parentheses are *t*-statistic values; for diagnostics checks, however, figures in parentheses are probabilities. The ARDL models are chosen based on automatic selection by AIC; model selection graphs are given in the Appendix.

Table 9: Short-Run Error Correction Estimates of ARDL for General Government (Dependent Variable: Private Investment to GDP)		
	CAFD	**CAPD**
Error Correction	–0.10***	–0.17***
Δ*Investment* (–1)	–0.30*	–0.30**
Δ*Govt Deficit*	–0.08	–0.11
Δ*Govt Deficit* (–1)	0.03	0.15
Δ*Govt Deficit* (–2)	0.14	0.23
Δ*Govt Deficit* (–3)	0.63***	0.66***
Δ*Non-Food Credit*	0.13***	0.12***
Note: ***, ** and * indicate that the null hypothesis of non-stationarity is rejected at 1%, 5% and 10% levels of significance respectively.		

small value meaning that only a small proportion of previous period error is corrected in the current period.

Thus, the time series analysis undertaken so far provides evidence in favor of financial crowding out for central government and weak evidence of real crowding out for general government. This may be logical considering that G-sec yields are more directly linked to central government's fiscal position rather than general government. Likewise, private investment may be influenced by general government's expenditure and fiscal position than only central government. This is more likely in recent decade when state expenditures have far exceeded that of center (Figure 8). This result motivated us to explore the real crowding out behavior explicitly for states in a panel framework to exploit the dataset.

Figure 8: Government Expenditures as Percentage of GDP



Sub-National Government

Panel data estimation (using System GMM) results show evidence of real crowding out at the level of the Indian states. GFD has a negative impact on the private investment of the states. It is pertinent to note that the crowding out impact of gross market borrowings of the state governments is stronger with a coefficient of –0.48, almost double that of GFD (Table 10). Growth rate of GSDP has a positive and significant effect and real interest rates have a negative and significant impact on private investment for both the models, as expected. Infrastructure has a positive but less significant impact on private investment for Model 1, albeit the significance increases in case of market borrowing model. The diagnostic tests for both specifications are satisfied. The Hansen test which checks for over-identifying restrictions and the AR(2) test with a null hypothesis of no second-order correlation are not rejected at the conventional significance levels.

Table 10: Dynamic Panel Data Estimation Using Two-Step System GMM (Dependent Variable: Private Investment)

Explanatory Variable	Model 1: Fiscal Deficit	Model 2: Market Borrowings
Constant	0.85 (0.209)	1.49* (0.071)
Lag of Private Investment	0.16 (0.352)	0.11 (0.374)
Gross State Fiscal Deficit	–0.20*** (0.009)	
Gross State Market Borrowings		–0.48*** (0.003)
Gross State Domestic Product	0.12*** (0.009)	0.08* (0.089)
Infrastructure	4.62* (0.068)	4.28** (0.017)
Real Interest Rate	–0.09* (0.051)	–0.14*** (0.004)
No. of Observations	344	344
No. of Instruments	34	34
AR (1) test (*p*-value)	0.015	0.016
AR (2) test (*p*-value)	0.07	0.203
Hansen Test (*p*-value)	0.874	0.949

Note: Figures in parentheses are *p*-values; and ***, ** and * imply significant at <1%, <5% and <10% levels, respectively.

Conclusion

This paper provides evidence supporting crowding out of private investment by higher government deficits. Both the real and financial crowding out channels have been examined for central and general governments in an ARDL cointegrated framework using suitable variables. Evidence for the financial crowding is found to be stronger for the central government with higher cyclically adjusted deficits positively cointegrated with real interest rates in the long run as witnessed from the ARDL bounds test and long run coefficients. Error correction term was found to be negative with the speed of adjustment to equilibrium following a shock being quite high. With rising role of market borrowings in financing central government deficits over the years, the financial crowding out channel through higher G-sec yields seems to have become stronger and quicker.

Evidence supporting the real crowding out channel was mixed for central government. While financial crowding out could not be checked for state governments, evidence supporting real crowding out has been established in the study for the state government in a panel data framework.

The apparent policy implication of this study is that government should continue its commitment towards fiscal discipline as any deterioration in public finances risks crowding out private financing via higher real rates (as observed for central government) and lower private investment (as observed for state governments), besides adding to market volatility through uncertainty about sovereign ratings/credibility and complicating monetary policy. In any such analysis, it is important to look at the fiscal and primary deficits, after adjusting it for cyclical fluctuations to see the true impact on real rates and private investment. A step in this direction has already been announced with the escape and buoyancy clauses being added to the revised FRBM framework as announced in the Union Budget 2018-19. Furthermore, financing of deficit through market borrowings by state governments lowers the pool of resources available for the private sector to borrow from. It is, therefore, imperative that the state governments continue their efforts towards fiscal consolidation, trying to finance their deficit less via market borrowings and more through their own revenues. ❖

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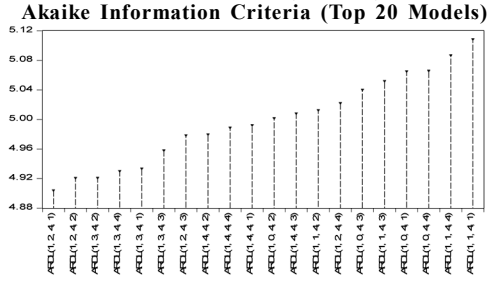
Appendix

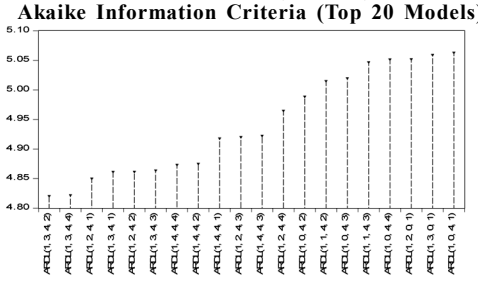
ARDL Model Selection Criteria Graph

I. Financial Crowding Out: Center

CAFD: ARDL (1, 2, 4, 1)
Akaike Information Criteria (Top 20 Models)

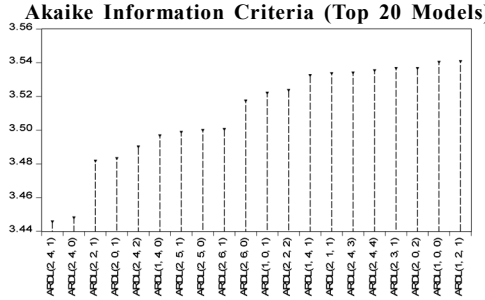


CAPD: ARDL (1, 3, 4, 2)
Akaike Information Criteria (Top 20 Models)

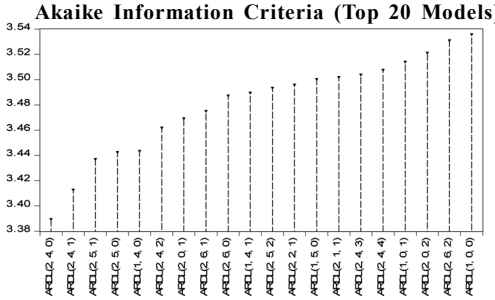


II. Real Crowding Out: Center

CAFD: ARDL (2, 4, 1)
Akaike Information Criteria (Top 20 Models)

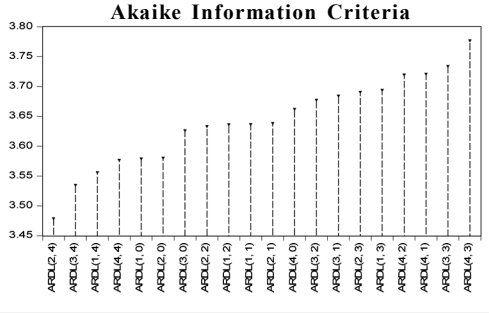


CAPD: ARDL (2, 4, 0)
Akaike Information Criteria (Top 20 Models)

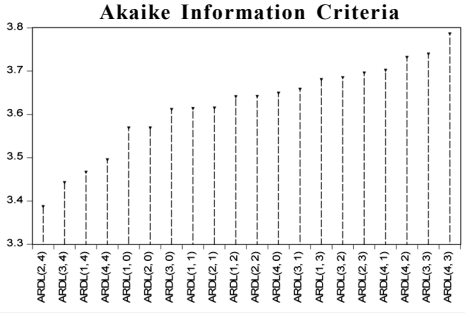


III. Real Crowding Out: General Government

CAFD: ARDL (2, 4, 1)
Akaike Information Criteria



CAPD: ARDL (3, 4, 2)
Akaike Information Criteria



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