Original Research Article

Fiscal deficit and its long run impact on capital formation in India

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Abstract

Background: Fiscal policy has long been considered as a vital instrument for economic growth and stability; yet, the increasing fiscal burden arising from deficit financing raise serious concerns, especially in developing nations like India. The significance of deficit financing as a policy measure to enhance investment has been examined using the proxies of fiscal deficit and capital formation.

Materials and Methods: The study utilized time series data for analysis, employing techniques such as Unit Root Tests, Johansen Cointegration, Granger Causality, Variance Decomposition, and Impulse Response Function to derive valuable insights.

Results: Fiscal deficit of state and general government increased significantly during the study period. However, econometric tests show no long-term or casual association between fiscal deficits and capital formation. Variance decomposition indicates that both variables explain their own variations.

Conclusions: The optimum level of fiscal spending must be determined to prevent excessive burden on the economy.

Keywords: Fiscal deficit, Capital formation, Crowding out, Investment, Deficit financing

1. Introduction

The much-celebrated Keynesian economics provides a clear justification for fiscal policy as a means to enhance output and employment. The development of the neoclassical model gives a theoretical construct suitable to examine its growth effects (Easterly & Rebelo, 1993).[9] Despite the level of economic growth, a nation has achieved, a well-managed fiscal policy is a prerequisite for growth and stability. (Hur, Mallick, & Park, 2010).[17] stresses the contribution of fiscal stimulus programmes to Asia's faster and stronger-than-expected recovery from the global financial crisis. Even during the time of recent covid turmoil governments have resorted to different forms of deficit spending. Historical data suggests that regulated deficit financing can effectively mobilise physical resources for economic development (Hasan, 2019).[16] However, deficit financing results in mounting of fiscal deficit which raises a series of issues especially in emerging economies.

2. Literature Review

(Feldstein, 1982) indicated that changes in government spending, transfers and taxes can have substantial effects on aggregate demand. (Akber, Gupta, & Paltasingh, 2020)1 examined the issues of the crowding in and crowding out effect of public investment on private investment. Taking data from 1970 to 2016, the study found that public investment crowds in private investment both in the long run as well as in the short run. (Karun, Vinod, & Chakraborty, 2020)[20] and (Basar, Polat, & Oltulular, 2011) confirm crowding in effect of private investment. (Majumder, 2007)[22] examined the effect of public borrowing on private investment in Bangladesh's economy and the study results provided evidence for crowding in effect. (Bahal, Raissi, & Tulin, 2015)[2] conducted a study in the context of the Indian economy. During the period since 1980, the economy witnessed crowding in effect which can most likely be attributed to the policy reforms that started during the early 1980s and gained momentum after the 1991 crisis.

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However, an in-depth study brings out mixed predictions and conclusions. The uncontrolled expansion of fiscal activities prompted researchers and policymakers to study the bleak side of the issue. There are scholarly works which give warnings about the dangers of reckless indulgence in deficit financing (Hasan, 2019)[16] and (Brumm, Feng, Kotlikoff, & Kubler, 2022)[6]. Particularly in an economy like India, a sharp deterioration in fiscal health at the state level has been a major cause of concern (Rao, 2002).[25] Higher inflation, interest rates and financial strains are challenges before responsible governments. Strong evidence supports the premise that fiscal deficits lead to external account deficits, resulting in a depreciation of the real exchange rate (Easterly and Hebbel, 1993).[8] Concurrently, the Ricardian Equivalence theory focuses on neutrality regarding real effects (Mawejje & Odhiambo, 2020).[23]

The ultimate impact of fiscal deficit on macroeconomic variables depends on the intensity of crowding in and crowding out effects. However, the possibility of Ricardian Equivalence makes the system more sophisticated. The finding (Raju & Mukherjee, 2010)[24] supports neither a crowding out nor a crowding in hypothesis between government spending and private investment. Accordingly, it does not matter whether a government finances its spending with debt or a tax increase, the effect on the total level of demand in an economy will be the same. Despite the large number of studies in favour of crowding in and Ricardian Equivalence, the traditional theory supported by empirical findings hovers around crowding out of the private investment. The historical data for Britain do confirm a lagged crowding out effect (Black & Gilmore, 1990)5[5] In China, government involvement in private goods, industry, and commerce, primarily through state-owned firms, dramatically reduces private investment (Xu & Yan, 2014). A time series extending from 1950 to 2012 proved the effect of crowding out in the Indian economy (Bahal, Raissi, & Tulin, 2015).[2] Since we have several contradictory studies with empirical support, there is a need for more theoretical work and empirical research concerning these factors (Balcerzak & Rogalska, 2014).[3] Hence the present study examines the significance of deficit financing as a policy measure to enhance investment in India. It will be a value addition to existing literature and useful for policymakers. The objective has been formulated as " to analyse the long-run relationship between the fiscal deficit and capital formation in India". The paper has been structured as follows. The first two sections include an introduction and a literature review. Section three outlines the materials and methods applied for analysis. Sections four, five, and six present the results, discussions, and conclusions, respectively.

3. Materials and Methods

The impact of deficit financing is studied by using fiscal deficit and capital formation as proxies. The data regarding fiscal deficit was taken from the Handbook of Statistics on the Indian Economy and the Economic Survey. The website data worldbank.org provided data on capital formation. The major tools used in the study are Unit Root Test, Granger Causality, Johansen Cointegration, Variance Decomposition and Impulse Response Function. Whenever required the time series data has been converted into its log form.
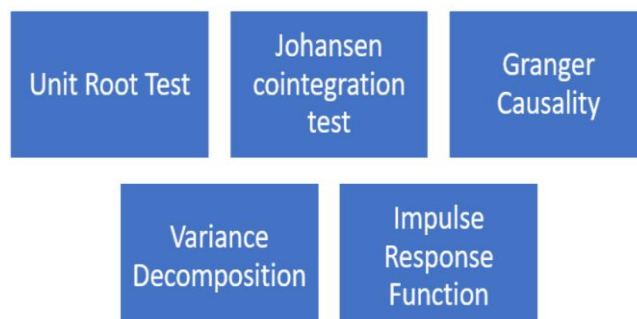

Figure 1: Mapping of data analysis

3.1 Unit root test-(Augmented Dickey Fuller-ADF)

One serious issue related to time series data is the phenomenon of nonstationarity. In the case of non-stationarity, regression analysis may lead to spurious results. Hence it is a common practice to test the stationarity of time series variables in advance. Unit root test is used to test stationarity and Dickey-Fuller Test (Dickey & Fuller, 1979)[7] is the most widely used among them the form of the test is

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \sum_{i=1}^{m} \propto_i \ \Delta Y_{t-i} + \epsilon_t$$

ϵ_t is the white noise error term and the test statistic is based on δ from the above equation.

3.2 Cointegration

Given the non-stationary time series, there is a need to determine the cointegration between variables, which shows long-run equilibrium relation. Johansen cointegration test (Johansen, 1991)[18] and (Johansen, 1995)[19] is the most popular test for determining the existence of cointegration among a set of nonstationary I(1) variables. Its basic equation can be written as

$$Y_t = AY_{t-1} + - - - - + A_n Y_{t-n} + Bx_t + \epsilon_t$$

Y_t is the vector for the I(1) independent and dependent variables, x_t is the vector of the non-random variable and ϵ_t is the error correction term.

Johansen suggests two test statistics namely λ_{max} statistics and λ_{trace} statistics to determine the cointegration.

$$\lambda_{trace} \ (r) = -T\sum_{i=r+1}^{k} ln(1 - \lambda_i$$

$$\lambda_{max}(r, r + 1) = -T \ ln(1 - \lambda_{r+1})$$

Here r shows the number of separate series and T number of usable observations. Estimated eigenvalues are represented by λ

3.3 Granger causality

Granger Causality is used for determining whether one-time series is useful in forecasting another (Granger, 1969)[14] and ((Granger, 1988).[15] The relevant Vector Autoregressive (VAR) model is X_1 and Y_1 with p lags, which can be written as

$$Y_t = \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{i=1}^{p} \beta_i X_{t-i} + \epsilon_{1t}$$
and
$$X_t = \sum_{i=1}^{p} \lambda_i X_{t-i} + \sum_{i=1}^{p} \delta_i Y_{t-i} + \epsilon_{2t}$$

3.4 Variance decomposition

To infer more about the nature and strength of the relationship between variables, we analyse error variance decomposition and impulse response function. The forecast error variance decomposition is used to show the proportion of the movements in a sequence due to its own shocks (Sheng & Tu, 2000).[26]

3.5 Impulse response function

The Impulse Response Function (Koop, Pesaran, & Potter, 1996)[21] gives an idea about the impulse responses of the variable in the VAR system to the time path of its own shocks to another variable. The function can be written as

$IR(m,h,Z_{t-1}) = E(Y_{t+m}/e_t = h, Z_{t-1}) - E(Y_{t+m}/Z_{t-1})$ where m and h represent the time and size of shocks respectively. Z_{t-1} denotes information from the past to t-1 time.

The core econometric analysis in this study was conducted using EViews software. EViews was utilized to conduct unit root tests, Granger causality tests, Johansen cointegration tests, variance decomposition and impulse response function analysis. Excel served as a supplementary tool for data cleansing, initial computations, and data visualisation.

4. Results

4.1 Fiscal deficit in India (Time series analysis)

4.1.1 Gross fiscal deficit (GFD) as a percentage of GDP

Before analysing the ways and intensity of fiscal deficit's impact on capital formation, it is meaningful to examine fiscal deficit closely. State government's Gross Fiscal Deficit as a percentage of GDP is shown in **Figure 2** and that of the General Government (Combined-Centre and States) in **Figure 3**. Both depict an almost similar trend. During the period between 2013-14 and 2020-21, while the state government's GFD as a percentage of GDP increased from 2.2 to 4.1, the GFD of the General government increased from 6.7 per cent to 13.1 per cent. The fiscal deficit has almost doubled during the reference period.
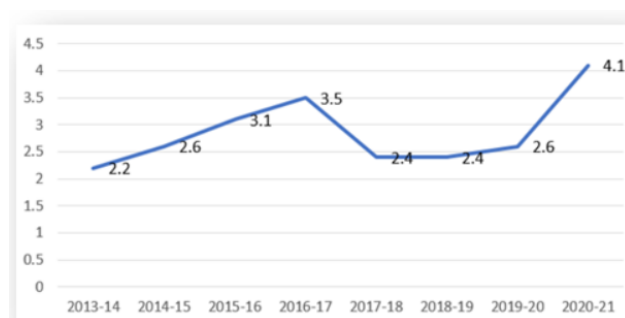

Figure 2: GFd as percentage of GDP (states)
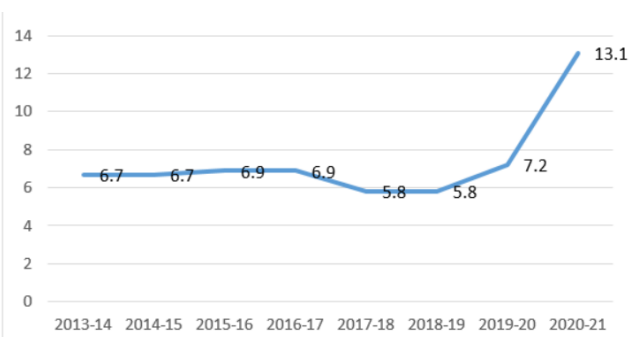Source: Economic Survey 2022-23

Figure 3: GFDas percentage of GDP (Combined)
Source: Economic survey 2022-23

4.1.2 Growth of fiscal deficit (Combined)

A time series data of fiscal deficit for the period from 1980-81 to 2020-21 is given in Appendix I. In 2008-09 fiscal deficit increased by 135 per cent on account of the government's extra spending to cover farm subsidies. Besides, the government took various measures to speed up the process of recovery from the financial crisis. In 2020-21, the fiscal deficit increased by 82 per cent due to increased spending during the covid phase. Through Atmanirbhar Bharat Abhiyan, the government injected Rupees 20 lakh crore into the economy.

4.1.3 Composition and growth of GFD (Centre and States separately)

The composition and growth of GFD for the Centre and States shows that, over the years the dependence on external finance has reduced. Both at the Centre and State levels, financing through market borrowings has increased. The dependence of states on market borrowings has reached the level of 78 per cent in 2020-21.

4.2 Descriptive statistics

The summary statistics for fiscal deficit and capital formation are given in **Table 1**. All returns are calculated as the first difference of the log of fiscal deficit and capital formation. The mean of fiscal deficit and capital formation are 0.14 and 0.07 respectively. The standard deviation shows the deviation of all the observations from the average which are 0.19 and

0.15 for fiscal deficit and capital formation. Skewness and kurtosis are two measures of normality. Here fiscal deficit is positively skewed while capital formation is negatively skewed. Convexity of the curve which is measured by Kurtosis portrays fiscal deficit as leptokurtic and capital formation as platykurtic. The null hypothesis of Jarque Bera is that the distribution is normal. In the case of capital formation, the hypothesis is accepted while for fiscal deficit, the hypothesis is rejected.

Table 1: Descriptive statistics

	Fiscal Deficit	**Capital Formation**
Mean	0.137473	0.074928
Median	0.105422	0.078955
Maximum	0.852761	0.330744
Minimum	-0.155801	-0.256295
Standard Deviation	0.192806	0.152110
Skewness	1.496503	-0.316291
Kurtosis	6.420005	2.327634
Jarque-Bera	34.42419	1.420394
Probability	0.000000	0.491547
Sum	5.498919	2.997122
Sum Sq. Dev	1.449786	0.902355
Observations	40	40
Source: Own Calculation		

4.3 Unit root test results

The unit root test using Augmented Dickey-Fuller Method gives the following results. **Table 2**.

Table 2: ADF test for unit root

Variable	**Level**	**P Value**	**I difference**	**P Value**
Log Capital Formation	-0.138954	0.9380	-7.752282	0.0000
Log Fiscal Deficit	-0.070609	0.9458	-5.580843	0.0000
Source: Own Calculation				

The null hypotheses H_0 are 1) capital formation has a unit root and 2) fiscal deficit has a unit root. At level, both hypotheses are accepted while at first difference both are rejected. It is evident that capital formation and fiscal deficit are non-stationary at level but stationary at first difference ie I(1)

4.4 Cointegration result

Johansen cointegration test is used here for analysing the long-run relationship between variables. Both λ_{max} statistics and λ_{trace} statistics accept the null hypothesis that there is no cointegration between capital formation and fiscal deficit. Detailed cointegration results are given in **Table 3**.

Table 3: Johansen cointegration test result

Included Observations: 39 after adjustments				
Trend Assumption: Linear deterministic trend(restricted)				
Series: Capital Formation and Fiscal Deficit				
Lag Interval(in first differences): 1 to 1				
Unrestricted Cointegration Rank Test (Trace)				
Hypothesis	**Eigenvalue**	**Trace Statistic**	**0.05 Critical Value**	**Prob****
None	0.313021	17.80090	25.87211	0.3574
At most 1	0.077790	3.158296	12.51798	0.8572
The trace test indicates no cointegration at the 0.05 level				
**MacKinnon-Haug-Michelis(1999) p-Values				
Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesis	**Eigenvalue**	**Max-Eigen Statistic**	**0.05 Critical Value**	**Prob****
None	0.313021	14.64260	19.38704	0.2138
At most 1	0.077790	3.158296	12.51798	0.8572
The max-eigenvalue test indicates no cointegration at the 0.05 level				
**MacKinnon-Haug-Michelis(1999) p-Values				
Source: Own Calculation				

4,4 Granger causality test result

The cointegration study does not establish a long-run relationship between capital formation and fiscal deficit. As a next step short-run relationship is being tested using the Granger Causality test. The results (refer to **Table 4**) accept the null hypothesis that Δlog fiscal deficit does not granger cause Δlog capital formation and Δlog capital formation does not granger cause Δlog fiscal deficit.

Table 4: *Pairwise granger causality tests*

Sample: 1981-2021			
Lags: 2			
Null Hypothesis	**Observations**	**F-Statistic**	**Probability**
Fiscal Deficit doesn't granger cause Capital Formation	38	2.20024	0.1268
Capital Formation doesn't granger cause Fiscal Deficit	-	2.48472	0.0988
Source: Own Calculation			

4.5 Variance decomposition using cholesky

The variance decomposition results are presented in **Table 5**. In the short run, 100 per cent forecast error variances are explained by capital formation itself. But in the long run (10 years) it comes down to 86.9 percent. In the case of fiscal deficit 99.9 per cent forecast error variances are explained by the fiscal deficit itself. It comes down to 89.01 per cent in the long run.

Table 5: Variance decomposition using cholesky (d.f adjusted) factors variance decomposition of capital formation

Period	S.E	Capital Formation	Fiscal Deficit
1	0.145775	100	0.000000
2	0.157673	89.34720	10.65280
3	0.162064	86.94795	13.05205
4	0.162123	86.95733	13.04267
5	0.162350	86.97209	13.02791
6	0.162429	86.94072	13.05928
7	0.162463	86.91468	13.08532
8	0.162463	86.91464	13.08536
9	0.162464	86.91424	13.08576
10	0.162465	86.91420	13.08580
Variance Decomposition of Fiscal Deficit			
Period	S.E	Capital Formation	Fiscal Deficit
1	0.183537	0.098460	99.90154
2	0.195711	12.12219	87.87781
3	0.207363	10.96844	89.03156
4	0.207789	11.01492	88.98508
5	0.208552	10.93986	89.06014
6	0.208656	10.98830	89.01170
7	0.208747	10.98559	89.01441
8	0.208760	10.98525	89.01475
9	0.208766	10.98497	89.01503
10	0.208768	10.98510	89.01490
Cholesky One S.D (d.f adjusted)			
Cholesky ordering: Capital Formation Fiscal Deficit			
Source: Own Calculation			

4.6 Impulse response function

Variance decomposition examines the proportion of variance in one variable that is explained by the other variable. However, it doesn't give any idea about the specific effect and therefore we use the impulse response function. The result of the Impulse Response Function is shown in **Figure 4** below.
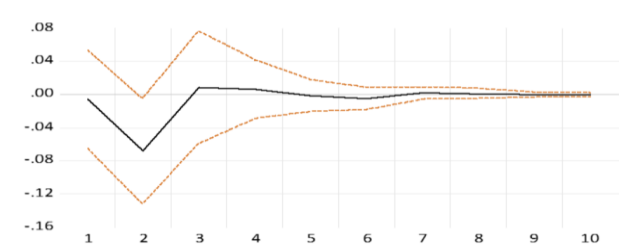

Figure 5: Response of FD1 to CF cholesky oneS.D. (d.f. adjusted) innovatiom ± 2 analytic asymptotic S.E.s
Source: Based on own Calculation

Here dotted lines refer to a 95 per cent confidence interval and the middle line represents the impulse response function on fiscal deficit. It shows that any shock in the dependent variable (capital formation) will result in a first decrease and then an increase in the response of the independent variable (fiscal deficit). The response is weakening up to the second period. However, it increases since then. Ultimately the response seems to be almost stable.

5. Discussion

The results underscore notable trends in India's fiscal dynamics and its impacts. During the reference period, both the combined and state level fiscal deficits increased substantially. Nevertheless, empirical investigation employing Johansen cointegration tests failed to establish a long-term association between fiscal deficit and capital formation. This indicates that fiscal deficits in India may not have consistently resulted in enhanced capital formation over the long run and hence points to the efficacy of fiscal policies in promoting investment.

Moreover, Granger causality tests indicated no causal relationship between fiscal deficits and capital formation. This implies that changes in fiscal deficits do not lead to changes in capital formation, and conversely, in the short term as well. The results of variance decomposition underscored this absence.

This absence of connection demands a reassessment of fiscal policies to ensure that deficit spending results in tangible enhancements in infrastructure and productive assets, rather than being directed towards recurring expenses. Fiscal deficits, frequently justified as instrument for fostering economic development and investment, may not inherently lead to capital formation without a deliberate strategy and targeted approach. In this context, the articles (Emana, 2021)10, (Tung, 2018)27 (Fayou & Daali, 2024)11 demand attention in particular.

The results indicate the necessity for more focussed fiscal methods to close this gap. Future fiscal policies should concentrate on particular sectors where public spending might stimulate private investment, thus creating a multiplier effect on investment. However, the present study is constrained by specific constraints. Key elements, including the saving rate, economic growth, interest rate, inflation, and attitudes, which are known to substantially affect capital formation, were excluded from the analysis. While this ensures the study remains focussed on fiscal deficits, it highlights a limitation that future research can address by integrating these dimensions.

6. Conclusions

The significance of deficit financing as a policy measure to enhance investment has been examined using the proxies of fiscal deficit and capital formation. Since there are theoretical and empirical studies which support crowding out, crowding in and Ricardian equivalence, fiscal policies are analysed under conditions of uncertainty. In the present work, the researcher has initiated an attempt to do a time series analysis considering a fairly long period of data. Even after the introduction of the Fiscal Responsibility and Budget Management Act, 2003 we are not in a position to keep the fiscal deficit under the stipulated levels. Huge financial spending during an economic slowdown put the burden on the public exchequer and ultimately on taxpayers. It has an inflationary effect too. Increasing market borrowings pass on the responsibilities to future generations also. The present study didn't establish a relationship between fiscal deficit and capital formation in the long run or the short run. This should be analysed in the context of, the burden fiscal deficit exerts on taxpayers, exchequer and monetary variables.

In order to ensure that resources are utilized in a manner that is both efficient and effective, it is necessary to determine the optimal level of fiscal spending. This is essential for facilitating the exercise of financial discipline by policymakers and practitioners, thus avoiding the pitfalls of uncontrolled spending. Inflationary pressures and unsustainable debt burdens can result from excessive fiscal outlays, which may compromise long-term economic stability. However, it is impractical to completely forgo deficit financing in a developing economy like India, where poverty alleviation, human development, and infrastructure are critical concerns. In order to determine the optimum level, it is necessary to conduct a thorough assessment of economic requirements, resource availability, and anticipated results. This ensures that fiscal policies enhance sustainable development and equitable growth without burdening future generations.

7. Source of Funding

8. Conflict of Interest

None.

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