Impact of Fiscal Consolidation on Indian Economy: An Econometric Analysis

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Abstract

This study takes up an econometrics analysis to comprehend the effects of fiscal Consolidation efforts on economic growth in India after gauging theoretical literature on the relationship between deficit-growth from the perspectives of classical, Keynesian, and Neoclassical economics. The findings demonstrate that in Indian context, the fiscal deficit has a negative impact on the GDP for overall period and support the neoclassical theory of deficit spending. Whereas insignificant negative impact among the same in pre NEP and significant positive impact for post NEP periods. The findings of the paired granger causality test, establishes a unidirectional causal relationship that runs from the real GDP to fiscal deficit in both periods such as pre NEP, post NEP and over the period.

Key Words: Fiscal Deficit, Economic Growth, Inflation, Investment.

JEL Classification: H6, E2, C1

Introduction

Fiscal consolidation is the process of lowering the deficit and debt of the government by actions like lowering spending and raising revenue. Debate has surrounded the effect of fiscal consolidation on India's overall economy. On the one hand, supporters contend that fiscal reform might result in a drop in interest rates, which can encourage private investment and economic expansion. By lowering government borrowing and discouraging private investment, it can also aid in the control of inflation. On the other hand, detractors contend that fiscal consolidation could harm the economy by lowering government

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expenditure, which could result in a decrease in aggregate demand and a slower rate of economic expansion. Additionally, it can be detrimental to social welfare and employment programmes.

The effect of fiscal consolidation on India's macroeconomic environment has been the subject of numerous research. Fiscal consolidation might benefit the economy in the short term by lowering interest rates and boosting private investment, according to a study by Patra and Kapur (2012). However, the study also pointed out that fiscal consolidation might have a detrimental effect on the economy in the short term by cutting government spending and slowing economic growth (Patra & Kapur, 2012). A few more studies have discovered that fiscal consolidation can hurt the economy since it lowers government spending and slows economic growth. According to the study, structural changes could be implemented to boost productivity and lower operating costs in order to lessen the adverse effects of fiscal consolidation on the economy (Singh, 2015; Ramu & Gayithri, 2017). In summary, the macroeconomic effects of fiscal consolidation on India's economy are complex and depend on a number of factors, including the timing and nature of the measures, the health of the economy, and the success of structural reforms.

Methodology

To examine the impact of fiscal consolidation (Fiscal Deficit) on the economic growth of India, a multiple linear regression model is developed on the basis of some relevant studies (Islam & Hossain, 2016). The model is presented in Eq. 1.

$$\boldsymbol{lnGDP_t = \beta_0 + \beta_1 lnFD_t + \beta_2 lnINFL_t + \beta_3 lnINV_t + \varepsilon_t} \qquad \textbf{Eq.1}$$

GDP = Gross Domestic Product at Market Price (Real term)

FD = Fiscal Deficit (Real term)

INFL = Inflation (GDP Deflator taken as Proxy for Inflation)

INV = Investment (Real Gross Fixed Capital Formation)

ε = Error term t = Time period ln = Natural Log

The study uses secondary data on government fiscal deficit, gross domestic product at market price, gross fixed capital formation, GDP deflator (taken as proxy inflation) from 1970 to 2022. The various reports of Handbook of Statistics on Indian Economy, published by the Reserve Bank of India (RBI), are the source for all data series. Data are deflated by GDP deflator and presented in real terms.

To achieve stationarity in variance, all data series are transformed to the natural logarithmic (ln) form and used for analysis of Vector Error Correction Model (VECM) (Nguyen Thi Thu Ha, 2018). The study examines the impact of fiscal consolidation on macro economy and also examines the nexus between fiscal consolidation and economic growth by using Johansen's cointegration procedure and VECM as developed by Granger (1969) and (1986), Engel & Granger (1987). Several tests are available for testing whether a series is stationary. In this study uses the PP (Phillips-Perron) test for stationarity, which is designed to be robust for the presence of autocorrelation and heteroscedasticity (Phillips,1988; Diggle et al, 2002; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016; Mohanty & Mishra 2017; Pujari & Biradar, 2023).

$$\Delta \boldsymbol{y_t = \beta D_t + \eta y_{t-1} + u_t} \qquad \text{(Eq.2)}$$

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Here, u_t is heteroscedastic and I(0). In the PP test, the test statistics t_{n-1} and T$\hat{n}$ are directly changed to account for the serial correlation and heteroscedasticity in errors (u_t). The PP test follows a Z-distribution under the null hypothesis that is $\eta = 0$, and the estimated statistics have the same asymptotic distributions as the ADF t-statistic and normalized bias statistics (Pal & Das, 2015). Over ADF statistics, the PP test provides two benefits. Firstly, the PP tests demonstrate robustness against various forms of heteroscedasticity in the error term, u_t. Secondly, specifying a lag period is unnecessary as the Newey-West bandwidth is provided to accommodate structural changes. (Diggle et al, 2002; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016; Pujari & Biradar, 2023).

Pairwise Granger causality tests are used to establish the direction of causation between the variables. By estimating the following vector autoregressive models, the Granger causality test determines whether there is any unidirectional or bidirectional causality between the variables, say Xt and Yt, of a cointegrating vector (Granger, 1969; Diggle et al, 2002; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016; Islam & Hossain, 2016).

$$\boldsymbol{Y_t = \alpha_1 + \sum_{i=1}^{n} \beta_i X_{t-i} + \sum_{j=1}^{n} \gamma_t Y_{t-j} + \varepsilon_1} \quad \text{Eq. 3}$$

$$\boldsymbol{X_t = \alpha_2 + \sum_{i=1}^{n} \lambda_i Y_{t-i} + \sum_{j=1}^{n} \mu_t X_{t-j} + \varepsilon_2} \quad \text{Eq. 4}$$

In Equations 3 and 4, n indicates the lag length chosen by AIC. It is assumed that both ε1 and ε2 are uncorrelated white error noise terms. The null hypothesis of no Granger causality between X_t and Y_t is tested against the alternative hypothesis of the presence of Granger causality between the variables. Chi-square statistic is used to test the hypotheses (Diggle et al, 2002; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016; Ayaj Rana & Wahid 2017; Islam & Hossain, 2016).

After the long-run relationship between the variables is detected and explained by Johansen cointegration test and OLS regression analysis, respectively, it becomes necessary to use error correction mechanism to determine the short-run disequilibrium and the speed of adjustment from the short-run equilibrium to the long-run equilibrium state. The Vector Error Correction Model (VECM) is used to tie the short-run behavior of GDP to its long-run value. The short-run equation of the long-run cointegrating equation can be written in the form of Eq. 5 (Diggle et al, 2002; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016; Ayaj Rana & Wahid 2017; Islam & Hossain, 2016).

$$\boldsymbol{\Delta lnGDP_t = \alpha_1 + \sum_{i=1}^{m} \alpha_2 \Delta lnFD_{t-i} + \sum_{i=0}^{m} \alpha_3 \Delta lnINFL_{t-i} + \sum_{i=0}^{m} \alpha_3 \Delta lnINV_{t-i} + \lambda ECM_{t-1} + \varepsilon_{1t}} \quad \text{Eq. 5}$$

ECM_{t-1} is the one-period lagged value of the error term of the cointegrating regression equation, and ε_t denotes the stochastic error term. The absolute value of λ indicates the speed of adjustment from the short-run to the long-run equilibrium. The sign of λ is expected to be negative. If λ is negative, the dependent variable $\Delta lnGDP_t$ will also become negative to restore the equilibrium, in other words, the negative sign of λ indicates that $lnGDP_t$ is above its equilibrium value and will start falling in the next period to restore the equilibrium through correcting the equilibrium error (Diggle et al, 2002; Gujarati, 2003; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016; Ayaj Rana & Wahid 2017; Islam & Hossain, 2016).

Results and Discussion

Phillips Perron Unit Root Test

In time series analysis, it is crucial to assess the stationarity of the data, as it expects the data to possess a stationary nature. Therefore, it is essential to examine whether the considered data exhibits a unit root

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or not (Diggle et al, 2002; Gujarati, 2003; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016; Ramu & et al 2016; Pujari & Biradar 2023). The PP unit root test is used and results of the Phillips Perron unit root (PP) test on each variable in the level and first difference are given in Table 1. The results show that all variables are stationary at first difference in both considered period. And it indicates that variables are integrated at the order of one I (1). Therefore, results suggest that there may exist a long-term relationship between economic growth and fiscal deficit, inflation and investment. For the selection of lags study used the Akaiki Information Criteria (Table 1)

Table 1

Phillips Perron unit root (PP) test results

Variables	At Level		First Difference		Order of Integration
	With Constant	With Constant & Trend	With Constant	With Constant & Trend	
Pre New Economic Policy					
LNGDP	5.38	-2.02	-5.01***	-8.53***	I(1)
LNFD	-0.03	-3.01	-6.33***	-5.72***	I(1)
LNINFL	-0.33	-2.52	-3.79**	-3.72**	I(1)
LNINV	2.87	-0.70	-3.68**	-4.83***	I(1)
Post Economic Policy					
LNGDP	-0.71	-1.34	-4.68***	-4.67***	I(1)
LNFD	-0.59	-2.82	-5.77***	-5.72***	I(1)
LNINFL	-1.60	-2.53	-2.11**	-1.67**	I(1)
LNINV	-0.93	-1.28	-5.00***	-4.99***	I(1)
Total Period					
LNGDP	5.38	-2.02	-5.01***	-8.53***	I(1)
LNFD	-0.03	-3.01	-6.33***	-5.72***	I(1)
LNINFL	-0.33	-2.52	-3.79**	-3.72**	I(1)
LNINV	2.87	-0.70	-3.68**	-4.83***	I(1)

Note: (*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%

Lag Length based on SIC

Probability based on MacKinnon (1996) one-sided p-values.

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Cointegration Analysis

The unit root findings suggest that every variable is integrated into order one I (1). Therefore, study adopts the Johansen and Jusilius cointegration test to examine the long-term relationship between the economic growth and fiscal deficit, inflation and investment. The study chooses the optimal lag based on VAR approach. With the assumption that there is no trend in the level data but that there is an intercept in the cointegrating equations, the test statistics are calculated. The test is administered at central level (Diggle et al, 2002; Gujarati, 2003; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016).

Pre Economic Policy period considered, due to trace statistics (74.41) above the critical value, the null hypothesis of no cointegration, r=0, is rejected at the 5 percent level (47.86). Due to trace statistics (32.68) exceeding the critical value; hence, the null hypothesis is rejected i.e. more than one cointegrating equation exist, r=1 (29.80). The maximum eigenvalue statistics (41.72) is higher than the critical value, hence, rejected the null hypothesis of no cointegration, r=0, at the 5 percent level (27.58). Thus, there is cointegrating vector between economic growth and fiscal deficit, inflation and investment. Because the trace and maximum eigen value statistics are greater than the critical value at level and most one, therefore, the null hypothesis is fails to accepted. The cointegration results reveal that there is a long-run relationship between economic growth and fiscal deficit, inflation and investment. Therefore, study employed VEC model to estimate the short-run and long-run impact of fiscal consolidation on macro economy (Diggle et al, 2002; Gujarati, 2003; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016).

Post Economic Policy period considered, due to trace statistics (49.28) above the critical value, the null hypothesis of no cointegration, r=0, is rejected at the 5 percent level (47.86). The maximum eigenvalue statistics (24.81) is lower than the critical value, hence, accepted the null hypothesis of no cointegration, r=0, at the 5 percent level (27.58). Based on Trace statistics results there is cointegrating vector between economic growth and fiscal deficit, inflation and investment. Because the trace statistics value is greater than the critical value at level, therefore, the null hypothesis is fails to accepted. The cointegration results reveal that there is a long-run relationship between economic growth and fiscal deficit, inflation and investment. Therefore, in the table 2, study employed VEC model to estimate the short-run and long-run impact of fiscal consolidation on macro economy (Diggle et al, 2002; Gujarati, 2003; Tsay, 2010; Gajurel & Dangal, 2010; Montgomery et al, 2015; Box et al, 2016).

Total period considered, due to trace statistics (0.30) below the critical value, the null hypothesis of no cointegration, r=0, is fails to rejected at the 5 percent level (47.86). The maximum eigenvalue statistics (18.08) is lower than the critical value, hence, accepted the null hypothesis of no cointegration, r=0, at the 5 percent level (27.58). Because the trace and maximum eigen value statistics are smaller than the critical value at level and most one, therefore, the null hypothesis is fails to rejected. The cointegration results reveal that there is no long-run relationship between economic growth and fiscal deficit, inflation and investment. Therefore, in table 2, study estimated only short-run effects of fiscal consolidation on macro economy by using VAR (Diggle et al, 2002; Gujarati, 2003; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016).

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Table 2

Cointegration Results

Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Hypothesized No. of CE(s)	Max-Eigen Statistic	0.05 Critical Value	Long-run Relationship
Pre Economic Policy						
None *	74.41**	47.86	None *	41.72**	27.58	
At most 1 *	32.68**	29.80	At most 1	16.35	21.13	One
At most 2 *	16.33**	15.49	At most 2	13.48	14.26	cointegrating vector
At most 3	2.86	3.84	At most 3	2.86	3.84	
Post Economic Policy						
None *	49.28**	47.86	None	24.81	27.58	
At most 1	24.46	29.80	At most 1	17.29	21.13	One
At most 2	7.17	15.49	At most 2	6.60	14.26	cointegrating vector
At most 3	0.57	3.84	At most 3	0.57	3.84	
Total Period						
None	0.30	47.86	None	18.08	27.58	
At most 1	0.26	29.80	At most 1	14.94	21.13	No
At most 2	0.10	15.49	At most 2	5.20	14.26	cointegrating vector
At most 3	0.03	3.84	At most 3	1.41	3.84	

Note: Max-eigenvalue test indicates no cointegration at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

The causality between economic growth, fiscal deficit, inflation and investment in India

This study applies the Granger causality test to investigate the causality between economic growth, fiscal deficit, inflation and investment in India. Its results displayed in the table 6.3 (Diggle et al, 2002; Gujarati, 2003; Tsay, 2010; Montgomery et al, 2015; Box et al, 2016). Pre NEP period considered, the causality goes from GDP to fiscal deficit, GDP to investment, inflation to GDP, inflation to fiscal deficit, investment to inflation and investment to fiscal deficit. Therefore, study indicates that unidirectional causality existed within the variables in pre NEP period (Table 3).

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Post NEP period considered, the causality goes from GDP to fiscal deficit, investment to fiscal deficit, investment to inflation indicating a unidirectional causal relationship, whereas inflation to fiscal deficit and fiscal deficit to inflation confirm a bidirectional causality between inflation and fiscal deficit in the post NEP period (Table 3).

Total period considered, the causality goes from GDP to fiscal deficit, inflation to GDP, investment to fiscal deficit indicating a unidirectional causal relationship, whereas inflation to fiscal deficit and fiscal deficit to inflation confirm a bidirectional causality between inflation and fiscal deficit in the total period (Table 3).

Table 3

Granger Causality Results

Causality	**Pre Economic Policy (Obs. 20)**		**Post Economic Policy (Obs. 30)**		**Total Period (Obs. 50)**	
Null Hypothesis:	F-Stat	Decision	F-Stat	Decision	F-Stat	Decision
LNFD does not Granger Cause LNGDP	0.06	Accepted	0.14	Accepted	1.48	Accepted
LNGDP does not Granger Cause LNFD	8.58***	Rejected	8.80***	Rejected	4.00**	Rejected
LNINFL does not Granger Cause LNGDP	10.93***	Rejected	2.44	Accepted	5.46***	Rejected
LNGDP does not Granger Cause LNINFL	1.22	Accepted	4.08	Accepted	0.44	Accepted
LNINV does not Granger Cause LNGDP	3.35	Accepted	2.59	Accepted	1.38	Accepted
LNGDP does not Granger Cause LNINV	10.07***	Rejected	3.30	Accepted	0.48	Accepted
LNINFL does not Granger Cause LNFD	8.39**	Rejected	6.14**	Rejected	3.33**	Rejected
LNFD does not Granger Cause LNINFL	3.79	Accepted	5.25**	Rejected	3.90**	Rejected
LNINV does not Granger Cause LNFD	5.50**	Rejected	8.18***	Rejected	3.44**	Rejected
LNFD does not Granger Cause LNINV	0.11	Accepted	0.00	Accepted	0.85	Accepted
LNINV does not Granger Cause LNINFL	4.78**	Rejected	7.38**	Rejected	0.57	Accepted
LNINFL does not Granger Cause LNINV	0.54	Accepted	0.35	Accepted	2.15	Accepted

(*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%

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Long-Run Impact of Fiscal Consolidation on Indian Economy

The cointegration test results indicate that there is at least one cointegrating vector among the variables. Therefore, conducting an OLS regression between these variables is appropriate and will not produce spurious results. The OLS regression can effectively explain the long-term relationship between the variables. To improve the reliability of the OLS regression results, diagnostic tests such as serial correlation, heteroscedasticity, and normality of the error term were conducted (Islam & Hossain, 2016).

According to pre NEP period, holding LNINFL and LNINV variables as fixed, the elasticity coefficient of real GDP with respect to LNFD is -0.06 which indicates that 1 percent increase in fiscal deficit, ceteris peribus, on an average decreases real GDP by 0.06 percent. It shows a negative impact of fiscal consolidation on economic growth but it's not statistically significant. These results are similar to that of the studies of Ayaj Rana & Wahid (2017) and Islam & Hossain (2016). According post NEP period, holding LNINFL and LNINV variables as constants, the elasticity coefficient of real GDP with respect to LNFD is 1.72, which reveals that 1 percent increase in fiscal deficit, ceteris peribus, on an average leads to an increase in real GDP by 1.72 percent. This shows that positive impact of fiscal consolidation on economic growth, which is statistically significant at 1 percent. These results are similar to the study of Hussain & Haque (2017). The cointegration estimates provide no evidence of long-run relationship among the variables with respect to total period. Therefore, long-run analysis has not been estimated in the study for total period (Table 4).

Short-run Impact of Fiscal Consolidation on Indian Economy

As shown in Table 6.4, the results of VECM indicate that the error correction term in ΔlnGDP equation is in expected sign and is statistically significant at 1 percent level with the speed of convergence to long run equilibrium of 51 percent per year. The inference, therefore, is that lnGDP is above its equilibrium value and is adjusted by 51 percent of the deviation from the long-run equation within 1 year.

In Short-run, LNINFL and LNINV variables as fixed, the elasticity coefficient of real GDP with respect to LNFD is -0.01, which indicates 1 percent increase in fiscal deficit, ceteris peribus, on an average decreases real GDP by 0.01 percent in the pre NEP Period. The Study found that there is a negative impact of fiscal consolidation on economic growth in pre NEP period but it is statistically insignificant. These findings exhibit a resemblance to the research conducted by Ayaj Rana and Wahid in 2017 and Islam & Hossain in 2016.

Holding LNINFL and LNINV variables constant, the elasticity coefficient of real GDP with respect to LNFD is 0.003, Which means 1 percent increase in fiscal deficit, ceteris peribus, leads to an increase in real GDP by 0.003 percent on average in the post NEP Period. The results show that there is a positive impact of fiscal consolidation on economic growth but statistically insignificant. These results are similar to the study of Hussain & Haque (2017).

Holding LNINFL and LNINV variables as fixed, the elasticity coefficient of real GDP with respect to LNFD is -0.01, which shows that 1 percent increase in fiscal deficit, ceteris peribus, decreases real GDP by 0.01 percent on average in the total Period. From the evidence of results, there is a negative impact of fiscal consolidation on economic growth but statistically insignificant. These results bear similarity to the studies conducted by Ayaj Rana and Wahid in 2017, as well as Islam and Hossain in 2016.

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Table 4

Short-run and Long-run impact of Fiscal Consolidation on Indian Economy

Variables	Pre NEP		Post NEP		Total Period	
	SR	**LR**	**SR**	**LR**	**SR**	**LR**
LNFD	-0.01 (-0.28)	-0.06 (-1.31)	0.003 (0.07)	1.72 (4.36)**	-0.01 (-0.38)	
LNINFL	0.33 (1.47)	0.46 (8.27)***	0.31 (0.89)	-6.98 (-5.39)	0.13 (0.82)	
LNINV	0.69 (3.21)***	-1.35 (-11.50)	0.04 (0.32)	2.50 (3.44)**	0.07 (0.67)	
C	-0.002 (-0.07)		0.04 (1.53)		0.04 (2.07)**	
ECT	0.51 (3.26)***		-0.01 (-0.34)			
R^2	0.60		0.05		0.04	
Adj R^2	0.44		-0.16		-0.04	
DW Test	2.6		1.91		1.90	
VEC Residual Serial Correlation LM Tests	17.52 [0.35]		18.82 [0.28]		13.83 [0.61]	
VEC Residual Heteroscedasticity Tests	119.38 [0.09]		119.63 [0.09]		88.70 [0.24]	

Note: *(*) Significant at the 10%; (**) Significant at the 5%; (***) Significant at the 1%*

() t- stat, [] probability

SR Short-run; LR Long-run

LM test H_0: No serial correlation at lag order h; Heteroscedasticity Tests: No Heteroscedasticity.

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Conclusions

This study does an econometrics analysis to comprehend the effects of fiscal Consolidation on economic growth in India after surveying theoretical literature on the relationship between deficit-growth from the perspectives of classical, Keynesian, and Neoclassical economics. However, the analysis's findings demonstrate that the fiscal deficit has a negative impact on the nation's GDP and support the neoclassical theory of deficit spending over the period. The OLS regression results showing the relationship between real GDP and the fiscal deficit imply that, while other variables held constant, a 1 percent rise in the fiscal deficit results in reduction of real GDP by 0.06 percent on average in pre NEP period but it is not statistically significant and which also a 1 percent rise in the fiscal deficit results which leads to increase in real GDP of 1.72 percent on average in post NEP period which is statistically significant at 5 percent.

The VECM results demonstrate that there is short-run disequilibrium in the lnGDP equation, and the error correction coefficient shows that real GDP is adjusted by 51 percent in pre NEP period and 1 percent in post NEP period of the short-run deviation from equilibrium from the previous year. The adjustment coefficient is found to be statistically significant at 1percent level in pre NEP period but not in Post NEP period. According to the findings of the paired granger causality test, which establishes the direction of the relationship between the variables, there is a unidirectional causal relationship that runs from the real GDP to fiscal deficit in both periods such as pre NEP, post NEP and total period.

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