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Causal Nexus between Fiscal Deficit and Economic Growth in Odisha: An Empirical Investigation

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Abstract

This paper examines the relationship between fiscal deficit and economic growth for the period 1950-51 to 2014-15 in case of Odisha. The empirical result of Johansen-Juseilius cointegration approach established the long run association between fiscal deficit and economic growth and through VECM model we conclude unidirectional causality that runs from fiscal deficit to economic growth both in the short run and long run. This empirical finding goes in favor of Keynesian school of thought. It is recommended to implement a suitable deficit management policy to achieve sustained economic growth with stability in Odisha.

JEL classification numbers: E620, O4, C32
Keywords: Budget Deficit; Economic Growth, VECM.

1 Introduction

The relationship between fiscal deficit and economic growth is one of the mostly debatable issues in all the developing economies. Every economy aims to achieve and maintain higher economic growth with stability. The economic growth and stability of developing countries in recent times has brought the issues of fiscal deficit into sharp focus. Although the government of India implemented Fiscal Responsibility and Budget Management Act (FRBM), still, the high level of fiscal deficit poses a serious threat to macroeconomic stability in India.

Three schools of economic thought namely, Keynesian, Neoclassical and Ricardian relating to the issue of a country's budget deficit have been evolved so far. More specifically, Keynesian economists advocate that budget deficit produces positive impacts on the whole economy by boosting economic growth, the Neoclassists would rather propose the opposite

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conclusion. However, Ricardian economists believe that there is neutral relationship between budget deficit and economic growth (Berheim, 1989).

The dispute on the effectiveness of fiscal deficit as a tool for encouraging growth and development remains indecisive, given the conflicting results of current researches. While some empirical studies (e.g. Thornton, 1990; Maji, 2012) have provided evidence in favour of a net positive effect, others (e.g. Baily, 1980; Feldstein, 1980; Fischer, 1991, 1993; Easterly and Rebelo, 1993; Adak, 2010) have indicated a negative net effect. Also, Ariyo and Raheem (1990) and Rahman (2012) reported that there was no stated objective underlying the deficit profile to have been observed. Therefore, it is in the light of this that the study aimed at examining the relationship between fiscal deficit and economic growth in Odisha. Further, no State specific studies analyzing the association between fiscal deficit and economic growth are there to the best of our knowledge. We considered Odisha to analyze the relation and the direction of causality between fiscal deficit and economic growth.

This study will contribute to the existing fiscal policy-growth literature in different ways. Firstly, it examines the relationship and direction of causality between fiscal deficit and economic growth for the State of Odisha. Secondly, it uses the historical time series data for the period 1950-51 to 2014-15 for Odisha. Thirdly, realizing the endogeneity problem from a priori, we used Vector Error Correction Framework (VECM) causality framework.

The remaining part of the paper is organized as follows: Section 2 explains the trends in Fiscal Deficit Ratio (FDR) and Gross State Domestic Product (GSDP) growth rate for the period 1950-51 to 2014-15 for Odisha. The detailed methodology in terms of analytical framework and data sources is presented in section 3. The section 4 presents the empirical results; and section 5 concludes with policy implications.

2 Trends in Fiscal Deficit Ratio and Gross State Domestic Product in Odisha

The average fiscal deficit ratio (FDR) for the period 1950-51 to 1989-90 was -3.6 per cent in Odisha. But, the average FDR went up to -5.5 for the period 1992-93 through 2003-04. However, in the post Fiscal Responsibility and Budget Management (FRBM) period, the average FDR drastically fell down to -0.5 per cent. The average growth rate in GSDP (nominal) for the pre reform period (1951-52 to 1989-90) was close to 10 per cent which slightly went up to 12 per cent for the period 1992-93 through 2003-04. The average nominal growth rate was highest for the period 2004-05 to 2014-15. The FDR was higher in the pre-FRBM period and suddenly slowed down in the post FRBM period (see Fig.1). The GSDP growth rate has been steadily increased with yearly fluctuations. The correlation coefficient between GSDP rate and FDR is 0.26 (positive and statistically significant at 5% level).

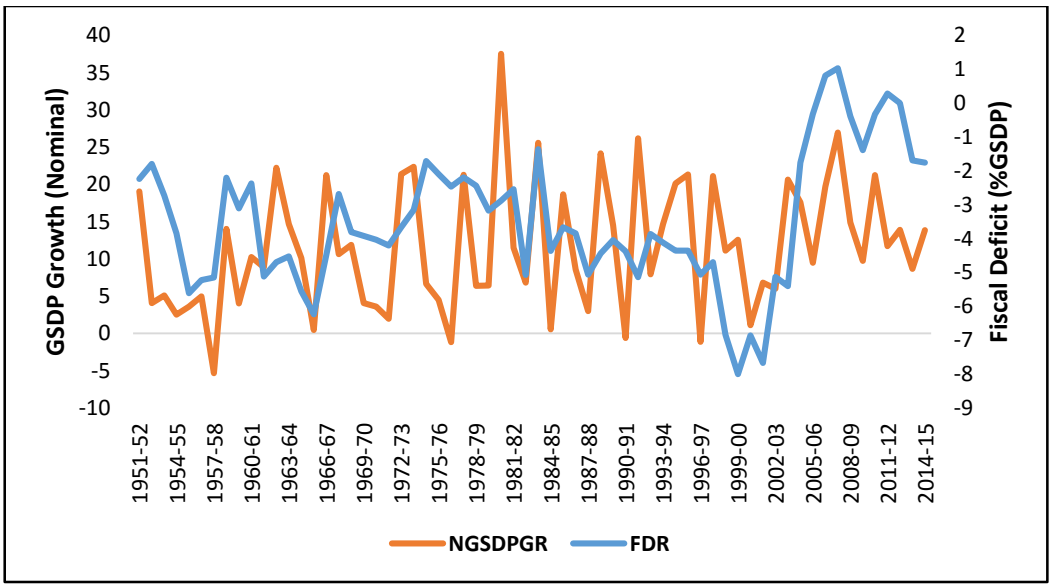

Figure-1: GSDP Growth and Fiscal Deficit Ratio (FDR)

Since, there is close association between GSDP growth rate and FDR, we need to know the long run relationship and to examine the direction of causality between these two variables.

3 Data Sources and Methodology

3.1 Data Sources

All data has been compiled from Finance Account, Government of Odisha. The Gross State Domestic Product (GSDP) is defined as the value of an economy at current prices and the fiscal deficit ratio is defined as the fiscal deficit as per cent of GSDP. We transfer GSDP into logarithm term. The reasons for applying the logarithm conversion were mainly to seasonally adjust the variable and for the magnitude change of the variable.

3.2 Johansen and Juselius cointegration Approach

This paper used Johansen and Juselius (1990) cointegration method in order to show the existence of a long-run relationship between and economic growth over the period of 1950-51 to 2014-15. The approach of Johansen and Juselius (1990) model stated that, if Y_t is a vector of n stochastic variable, then there exists a p-lag vector auto regression with Gaussian error of the following form:

$$\Delta Y_t = k + \Gamma_1 \Delta Y_{t-1} + \cdots + \Gamma_{p-1} \Delta Y_{t-p+1} + \Pi Y_{t-1} + z_t \quad (1)$$

Where Γ_1, Γ_{p-1} and Π are coefficient matrices, z_t is a vector of white noise process and k contains all deterministic elements.

The focal point of conducting Johansen's cointegration tests is to determine the rank (r) of matrix Γ_k. In the present application, there are three possible outcomes. First, it can be of full rank, (r=n), which would imply that the variables are stationary processes, which would contradict the earlier finding of non-stationarity. Second, the rank of k can be zero (r=0), indicating that there is no long-run relationship among the variables. In instances when Γ_k is of either full rank or zero rank, it will be appropriate to estimate the model in either levels or first differences, respectively. Finally, in the intermediate case when there are at most r cointegrating vectors $0 \leq r \leq n$ (i.e., reduced rank), it suggests that there are (n-r) common stochastic trends. The number of lags used in the vector auto-regression is chosen based on the evidence provided by Akaike's Information Criterion (AIC). The cointegration procedure yields two likelihood ratio test statistics, referred to as the maximum eigenvalue (λ-max) test and the trace test, which will help determine which of the three possibilities is supported by the data.

3.3 Vector Error Correction Model (VECM)

Once the study finds existence of long run relationship between public debt and economic growth, the next step is to investigate causality, since the variables are cointegrated: there is causality in at least one direction (Engel and Granger, 1987). This study will proceed to determine the speed of adjustment coefficient by using Vector Error Correction Model (VECM). Vector error correction model (VECM) is given in the following form.

$$\Delta z_t = \mu + \alpha t + \lambda z_{t-1} + \sum_{i=1}^{p-i} \gamma_t \Delta y_{t-i} + \sum_{i=1}^{p-1} \gamma_t \Delta x_{t-i} + \varepsilon_t \qquad (2)$$

Where, Δ is the first-difference operator. The long-run multiplier matrix λ is defined as:

$$\lambda = \begin{bmatrix} \lambda_{YY} \lambda_{YX} \\ \lambda_{XY} \lambda_{XX} \end{bmatrix}$$

The diagonal elements of the matrix are unrestricted, so the selected series can be either I(0) or I(1). If $\lambda_{YY} = 0$, then *Y* is I(1). In contrast, if $\lambda_{YY} < 0$, then *Y* is I(0). The VECM procedures described above are imperative in the testing of at most one cointegrating vector between dependent variable y_t and a set of regressors x_t.

4 Main Results

The empirical analysis of the present study began with assessing the stationarity conditions of the variables used in our study by applying Augmented Dicky-Fuller (ADF) and Phillips-Perron (PP) unit root test. The results of the unit root test are reported in the Table 1. The unit root test results conclude that both the variables such as DFR and LGSDP are stationary at first order difference.

Table 1: Results of Unit Root test

Variables	ADF test		Phillips – Perron test		Inference
	Level	First Diff.	Level	First Diff.	
DFR	-3.03	-10.46	-2.12	-8.72 (0.00)	I(1)
	(0.13)	(0.00)	(0.52)		
LGSDP	-2.20	-8.75	-2.99	-10.46 (0.00)	I(1)
	(0.47)	(0.00)	(0.14)		

Note: Figure in Parentheses are P-Values.

Once the stationarity of the variables is determined, this study used the Johansen and Juselius (1990) Co-integration technique to trace the existence of long-run relationship between them. The results are presented in Table 2. Before conducting the Johansen and Juselius (1990) test, this study choose the optimal lag 1 through VAR model by following AIC, SC and HQ criteria. It is observed from the Table 2 that there is at most 1 co-integrating vector exist between fiscal deficit and economic growth.

Table 2: Results of Johansen and Juselius Co-integration Test
Dependent Variable LNGDP

Null Hyp.	Alternative Hyp.		95% Critical Value
λ_{trace} test		λ_{trace} value	
r = 0	r > 0	50.34	20.26
r ≤ 1	r > 1	6.25	9.16
λ_{max} test		λ_{max} value	
r = 0	r =1	44.08	15.89
r = 1	r = 2	6.25	9.16

Note: Figure in Parentheses is P-Value and *** indicates significant at 1 percent Level.

From the above Table 2, it is concluded that the null hypothesis of no co-integration is rejected but the null of at most 1 co-integration relationship between the variables cannot be rejected because Both the trace test as well as max Eigen test confirm 1 co-integrating relation between two variables. This implies the existence of long-run association between fiscal deficit and economic growth in Odisha.

Further, in order to trace the speed of adjustment in terms of the relation between fiscal deficit and economic growth, this study conducted vector auto regressive model (VECM). The error correction term of the one period lag (ECM_{t-1}) shows the speed of adjustment between fiscal deficit and economic growth in Odisha. The result is presented in the Table 3. The ECM_{t-1} term is negative and significant when the GSDP is the dependent variable whereas it is not significant when the fiscal deficit is the dependent variable. Hence, it is concluded that fiscal deficit in the long run causes economic growth but not the other way. This implies that both the variables i.e. fiscal deficit and economic growth are adjusting around 16 percent every year.

Table 3: Vector error correction mechanism (VECM)

Error Correction:	D(LGSDP)	D(LFD)
D(LGSDP(-1))	-0.12 (-0.98)	-0.23 (-0.09)
D(LFD(-1))	-0.02** (-2.13)	-0.23 (-1.68)
C	0.12* (7.80)	0.04 (0.11)
e_{t-1}	-0.16* (-4.33)	-0.24 (-0.33)

Notes: * and ** denote significance at 1 per cent and 10 per cent level. t- values are given in the parentheses.

After examining the long run causality between fiscal deficit and economic growth, we moved further to assess the direction of short run causality between fiscal deficit and economic growth using VEC Granger causality/ block exogeneity Wald test. The VEC granger causality test again confirmed the unidirectional causality that runs from fiscal deficit to economic growth. The estimated block exogeneity Wald test results are reported in Table 4.

Table 4: VEC Granger causality/block exogeneity Wald tests

Null Hypothesis	**X^2**	**P- Value**	**Inference**
D(FDR) does not Granger Cause LGSDP	4.52**	0.03	D(FDR) →D(LGSDP)
D(LGSDP) does not Granger Cause D(FDR)	0.01	0.92	

Note: FDR = Fiscal Deficit Ratio; LGSDP = Gross State Domestic Product; * and ** indicates the significant at 10 and 5 percent level respectively.

5 Conclusion

The present paper firstly examines the long run association between fiscal deficit and economic growth for the period 1950-51 to 2014-15 in Odisha context. Divergent views still persist regarding the impact of fiscal deficit on economic growth. While Keynesian economists advocate that fiscal deficit produces positive impacts on the whole economy by boosting economic growth, the neoclassical economists put the opposite views. However, Ricardian economists believe that there is neutral relationship between fiscal deficit and economic growth (Berheim, 1989). The Johansen-Juselius co-integration test establishes the long term relationship between fiscal deficit and economic growth. Further, we used VECM framework to identify the long run and short run causal direction between fiscal deficit and economic growth in case of Odisha. The VECM results conclude the unidirectional relationship that runs from fiscal deficit to economic growth in Odisha in the long run. Further, the VEC Granger causality/block exogeneity Wald tests also suggest that fiscal deficit causes economic growth but not the reverse. Thus, this empirical result goes in favor of Keynesian school of thought.

More specifically, both fiscal deficit and economic growth have long run association and fiscal deficit causes economic growth rate both in the long run and short run. Hence, policies should be framed accordingly to fiancé investment through fiscal deficit if its domestic savings is less. However, high fiscal deficit may have adverse effect on economic growth and other macroeconomic variables. Thus, the government should go for fiscal deficit up to the point where fiscal deficit positively affects economic growth. In the present

paper we did not discuss the threshold level of fiscal deficit above which fiscal deficit will negatively affect economic growth and below that it enhances the economic growth. Hence, calculation of fiscal deficit threshold is the future area of research in the fiscal deficit – economic growth literature in Odisha context.

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