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A STUDY ON THE ASSOCIATION BETWEEN PUBLIC EXPENDITURE AND ECONOMIC GROWTH IN ODISHA DURING 1980-2018

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ABSTRACT

An attempt has been made in this write-up to examine the linkage between aggregate public spending and growth of the economy in Odisha during the study period 1980-2018. Time series technique has been employed towards this end. It is observed that both the series are non-stationary at level but becomes stationary after first difference. From the estimated cointegrating equation, it is found that there exists a long run relationship between Aggregate Expenditure and Gross State Domestic Product. The Granger Causality Test, which exposes the short-term relationship between any two variables, reveals that causality runs from Aggregate Expenditure to Gross State Domestic Product.

JEL Classification: C32, H72, O15

KEY WORDS: *Aggregate Expenditure, Time Series Analysis, Granger Causality*

INTRODUCTION

Public Expenditure is that expenditure incurred by the public authorities, either Central or State or local governments, to satisfy those common wants which the people in their individual capacity are unable to satisfy effectively and efficiently. The rising trend of Public Expenditure has been a common phenomenon in modern times. There is a great deal of debate by different group of economists regarding the necessity of public expenditure. The role of public expenditure differs from economy to economy. In an underdeveloped / developing economy public expenditure plays as an instrument for re-allocation of resources to narrow down the differences between social and private marginal productivity of the capital investment. In developed economy the role of public expenditure is to maintain stabilization. However, public expenditure serves a very vital role for controlling inflation, unemployment, balance of payments disequilibrium in both. There is a positive relationship between growth of public expenditure and growth of the economy. Government expenditure plays an important role in an economy. At the beginning of the century the total expenditure constituted around 40 per cent of the Odisha State Budget, but it came down to less than 20 per cent in last budget. However, when we look at Gross State Domestic Product (GSDP) of the State we are observing a contradictory result. The growth rate of GSDP in current prices was a meagre 1.36 in 2000-01 when the public expenditure was 41.79, but the growth rate has shown significant improvement and reaching all time high of 26.94 per cent in the year 2008-09, even though public expenditure was slashed to a level of 17.67 per cent. In the last two to three years there appears a downturn in this relationship and again there is one digit growth with fast declining share of Total Expenditure in the GSDP.

Hence certain issues are worth discussing. These are:

1. To examine the level and pattern of public expenditure in Odisha
2. To find out the linkage between total public spending and the growth of the economy of Odisha.

To pursue the aforesaid objectives the present study has been divided into five sections. Section I gives a brief description of relevant literature on the issue. Section II brings out the source of data and methodology employed for analysis. Section III discusses growth and structure of aggregate expenditure of government of Odisha. Section IV presents empirical analysis and last section concludes the paper.

SECTION I

In theory the relationship between government expenditure and economic growth is confusing and ambiguous. Thomas Hobbes (1651) described life without government as "nasty, brutish and short" and argued that the law and order provided by government was a necessary component of civilized life. Traditional economists held the view that the State should not interfere in the affairs of the Public. Government is merely an agent of the people to keep political organization intact. However, in the latter half of nineteenth century, a German fiscal theorist Adolf Wagner (1883) produced his hypothesis popularly known as Wagner's law of increasing state activities, where he established a functional relationship between state activities and the relative growth of public expenditure owing to the social progress to be realized through state participation in economic fields. As the industrialization progresses and real per-capita income increases, the share of public expenditure in total expenditure increases. Hence growth causes public expenditure. But the situation is just opposite in a sluggish economy that reeling under depression. Keynes put forth the argument that during recessionary phase of the business cycle public expenditure could be the most potent instrument of recovery. Thus in the Keynesian economics public expenditure causes growth. Hence the relationship between public expenditure and economic growth is not a unidirectional one; rather there exists a bidirectional relationship between them.

The relationship between government expenditure and economic growth has been an ongoing debate in the literature of economic development. Two basic approaches are generally adopted in the literature to address this issue. The approaches are spearheaded by Adolph Wagner and J. M. Keynes with their apparently contrasting view points on the causal relation.

A good number of empirical attempts have been made by different researchers at different point of time both in national and international level to examine the role of public spending in the growth process of the economy. The focus of these empirical works was to examine the validity of Wagner's Law vis-à-vis the Keynesian Approach. Some empirical studies support the Wagner's Law while others endorse the Keynesian Approach. All the empirical works may safely be clubbed into three compartments. Some favoured the Wagner's Law; others supported the Keynesian Approach; and third preferred none.

Let us concentrate on empirical works undertaken on Indian economy.

Singh and Sahni (1984) examined the nature and direction of causality between government expenditure and national income in India for the period 1950-1981. They have utilized the Granger Sims framework and the analysis has been carried out both at the aggregate and the disaggregate level. The result of the analysis up holds both the Wagnerian and the Keynesian notions of causality with respect to expenditures on administration, social and development, and defence, while it reaffirms the Keynesian for debt servicing.

Data on Government Final Consumption Expenditure and Gross National Product at market price both in nominal and real terms of India for the period 1960-2000 was analysed by Tulsidharan (2006). The causal relationship between the two variables is investigated by using the test of Integration, Cointegration and Eroor Correction Mechanism. The main result is that in nominal terms higher economic growth invariably is accompanied by an increase in the Final Consumption Expenditure.

The effect of government development expenditure on economic growth in India during the period 1950-2007 was examined by Ranjan and Sharma (2008). They have observed a significant positive impact of government expenditure on economic growth and also reported the existence of co-integration among the variables.

Verma and Arora (2010) in their attempt to examine the validity of Wagner's Law in India over the period 1950-51 to 2007-08, have estimated different versions of Wagner's hypothesis with the help of Engle-Granger approach of cointegration and ECM. Two structural breaks have been observed in Indian economy on the growth of public expenditure. It has been found that the first structural break for mild-liberalization period causes insignificant changes in the growth elasticity of public expenditure. However, in the second phase of intensive liberalizationis change in the elasticity is statistically significant. It is evident from the empirics that the public expenditure is growing more rapidly than the income of the economy and hence validates Wagner's law in case of India.

The absence of short run causality between economic growth and developmental expenditure of government which neither supports Keynesian approach nor Wagner's law In India was confirmed by Ray and Ray (2012).

Srinivasan (2013) investigated the causal nexus between public expenditure and economic growth in India over the period from 1973 to 2012 using cointegration approach and Vector Error Correction Model (VECM). From cointegration analysis it is confirmed the existence of a long-run equilibrium relationship between public expenditure and economic growth, while the error correction model results indicated a one-way causality that ran from economic growth to public expenditure in both the short- and long-run.

Gangal and Gupta (2013) analysed the impact of total public expenditure (TPE) on economic growth (proxy by GDP) in India during 1998-2012. 'ADF Unit Root Test, Cointegration Test and Granger Causality Test' techniques have been applied. The results of the study confirmed the existence of long run equilibrium relationship between public expenditure and economic growth as revealed by the linear stationarity in both the variables and there is a positive impact of public expenditure on economic growth. That is, GDP responds positively to a shock in TPE as confirmed by Impulse Response Function (IRF) results. The Granger Causality test also supported the result of IRF that there is a unidirectional relationship from TPE to GDP and not the other way. Thus, according to their finding, an increase in public expenditure encourages economic growth.

Altaf & Khan (2016) examined the impact of total government expenditure along its components, revenue & capital on economic growth measured by the growth rate of real per capita Gross State Domestic Product (GSDP) in Assam from 1981 to 2007 using the Autoregressive Distributed Lag (ARDL) bounds testing approach to cointegration. It is found that the share of total government expenditure and the share of revenue expenditure in GSDP have positive and statistically significant impact on the growth rate of real per capita GSDP in the long run, but, the effect is negative but statistically insignificant in short run. Again the study found no significant impact of capital expenditure on the growth rate of real per capita GSDP in Assam.

An econometric analysis of the relationship between public expenditure and growth in Odisha from 1990 to 2010 was attempted by Mohanty (2011) with the help of stationarity test, Granger causality and error-correction modeling techniques. The results of the error-correction mechanism revealed that there is strong uni-directional causality from GSDP of Orisa to public expenditure and weak reverse causality between them. Accordingly, growth augmenting public expenditure or size of the government is stronger than its reverse causality.

Lhoungu & Mishra (2016) have estimated the growth effect of government expenditure in Nagaland during the thirty year period 1980-2010. Seven type of Government Expenditure, viz., Administrative Service, Education, Health, Agriculture, Transport & Communication, Rural Development and Power have been taken into account. Multivariate co-integration analysis & Vector Error Correction Model used are used. Findings of the study reveal that in the long run expenditure variables are found to be significant to explain economic growth. But in the short run the conclusion is not uniform. Expenditure on education is found to be positively significant, expenditure on agriculture shows a negative relation with economic growth and all other expenditure are not significant.

Rizvi and Shamam, (2010) investigated the relationship between government expenditure and gross provincial product (GPP) in the Sindh province of Pakistan. The study used data for the period 1979-2008 and employed unit root test, cointegration and error correction model (ECM) to investigate the order of the relationship, to check the long run relationship and to investigate the short run dynamics respectively. Moreover, impulse response functions (IFS) was also applied to observe the shock of government expenditure on economic growth. Result of the study found a long run relationship between development expenditure and economic growth and a unidirectional causality running from GDP to development expenditure.

SECTION II: DATA AND METHODOLOGY

The purpose of this paper is to make an empirical analysis of the relationship between total expenditure and the growth of the economy of Odisha. Gross State Domestic Product (GSDP) is considered here as the proxy variable to measure the growth of the economy. We have used the data collected from secondary sources on different fiscal indicators and GSDP figures. For fiscal data we take resort of Reserve Bank of India (RBI) website and RBI publication 'State Finances: A Study of Budgets' various issues. For GSDP data we rely on Estimates of State Domestic Product of Odisha, Directorate of Economics & statistics, Government of Odisha.

We are interested to employ time series analysis to examine the stated objectives. Under the time series analysis longer the period better the result. Hence, keeping in view the availability of data our period of analysis runs from the fiscal year 1980-81 to 2017-18.

Since public expenditure data have been collected at current prices, GSDP has also been taken at current prices to strike compatibility. For estimating the relative elasticity, the natural logarithms (NL) of all the variables have been utilised. An advantage of expressing the variables in natural logarithmic form is to achieve stationarity in the lower order of integration in case the logs of these variables are non-stationarity at levels.

With a view to accomplish the objectives of our study, following econometric methods related to modern time series analysis have been adopted. The estimation procedure involves three steps. The first step is to test for stationarity of the time series with the help of unit root tests. The widely used techniques in this context are Augmented Dickey Fuller (ADF) (1988) and Phillips-Perron (PP) (1988) test. In the second step we will examine the cointegration test. Tests of cointegration specify no cointegration as the null hypothesis against existence of cointegration as the alternative. As a test of cointegration here we apply the residual-based test, as proposed by Engle-Granger (1987). In the third step we will examine the short-run relationship between variables. For examining the short-run dynamics we employ the 'Granger Causality Test' of the variables.

SECTION III: TRACKING AGGREGATE EXPENDITURE AND GSDP OF ODISHA

Gross state Domestic Product and Aggregate Expenditure of the state, their annual and five year average growth rates, and AE as percentage of GSDP are depicted in Table I. GSDP of the state has been increased from Rs. 10904 crore in 1990-91 to Rs. 415982 crore in 2017-18, i.e., around 38 times with in a period of 26 years. The annual average growth rate of GSDP ranges from a low of 0.85 per cent in 2000-01 to a high of 28.1 in 1991-92. Except for the year 1996-97 in all the years Odisha recorded a positive growth of GSDP. In 1996-97 growth of GSDP was negative (-2.26). This was due to failure in crop production in 28 out of 30 districts of the state being affected by unprecedented drought. Even though the annual average growth rate of GSDP is not consistent over the period, yet it shows a higher trajectory in post 2003-04 period as compared to the earlier. The five years average growth rate of GSDP reveals that highest achievement was recorded during 1990-95, (19.72 per cent) followed by 2005-10 (16.14 per cent).

So far as AE is concerned, it has been increased from Rs. 3051 Crore in 1990-91 to 107234 Crore in 2017-18. In relative term it has been increased around 35 times with in a period of 26 years. The annual average growth rate of AE moves from a low of 2.06 per cent in 2004-05 to a high of 26.09 in 1998-99. 2005-06 recorded a negative growth of AE to the tune of -0.88. This was due to the state level fiscal reform measures adopted by the Government of Odisha in a vigorous manner to settle the fiscal crisis of the state. Even though the annual average growth rate of AE does not depict a clear trend, yet it is more or less constant during the decade 2006-07 to 2015-16. The five years average growth rate of AE reveals that expenditure compression measures were at its high (adopted by Government of Odisha) during 2000-05, hence the growth of AE was only 9.54, as compared to the previous quinquennial, a high of 15.38 per cent during 1995-2000.

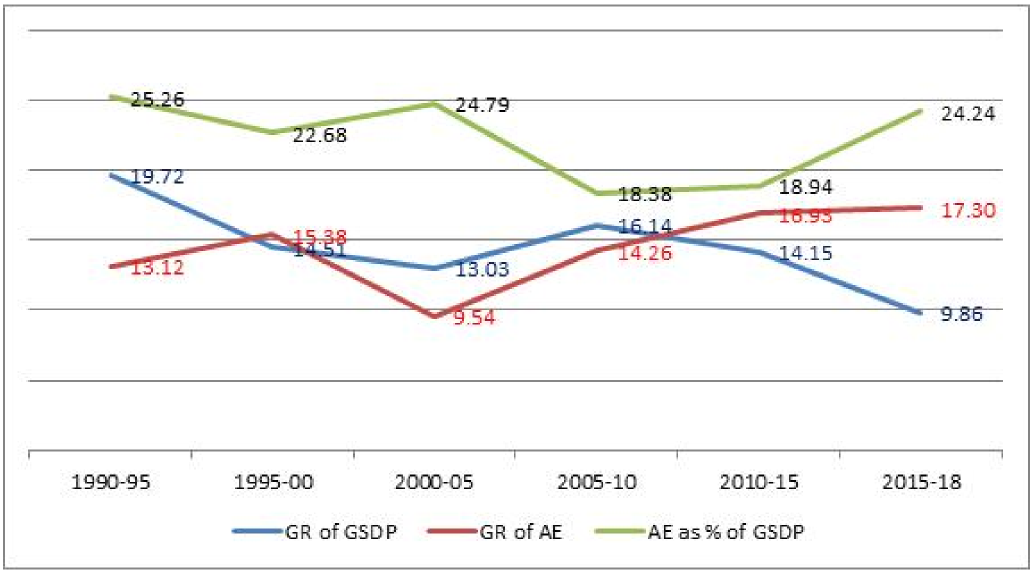
Aggregate Expenditure as percentage of GSDP was more than 20 per cent prior to 2005-06, but thereafter it was hovering around 18 per cent till 2013-14. However, it again picks up to 21.22 per cent in 2014-15 and reached a high of 25.78 per cent in 2017-18. Five years average also reflected the same. During the decade 2005-15 it was 18 per cent, whereas in rest of the period it was more than 22 per cent.

Chart I, exhibits the trend of five years average growth rate of GSDP, AE, and AE as percentage of GSDP. GSDP growth rate declines from 19.72 per cent in 1990-95 to 13.03 per cent during 2000-05. It increased to 16.14 per cent in the next five year period, however, thereafter it declines continuously. AE on the other hand increased initially from 13.12 per cent in 1990-95 to 15.38 per cent in 1995-2000, and decreased to 9.54 per cent in 2000-05, but afterward increased continuously to a high of 17.30 per cent till 2017-18. AE as percentage of GSDP begins with 25.26 in 1990-95 and ends with 24.24 during 2015-18 except the decade 2005-15 with a value of around 18 per cent.

Table I: Gross State Domestic Product and Aggregate Expenditure in Odisha

Year	GSDP (Rs. in Cr.)	Growth Rate of GSDP	Aggregate Expenditure	Growth Rate of Agg. Exp.	Agg. Exp. As % of GSDP
1990-91	10903.75		3051		27.98
1991-92	14012.49	28.51	3640	19.31	25.98
1992-93	15137.52	8.03	3915	7.55	25.86
1993-94	18536.66	22.46	4456	13.82	24.04
1994-95	22223.98	19.89	4982	11.80	22.42
1995-96	27117.62	22.02	5563	11.66	20.51
1996-97	26504.41	-2.26	6310	13.43	23.81
1997-98	32234.96	21.62	6854	8.62	21.26
1998-99	35581.37	10.38	8642	26.09	24.29
1999-00	42986.08	20.81	10120	17.10	23.54
2000-01	43350.95	0.85	11047	9.16	25.48
2001-02	46755.74	7.85	12065	9.22	25.80
2002-03	49712.61	6.32	13267	9.96	26.69
2003-04	61007.93	22.72	15565	17.32	25.51
2004-05	77729.43	27.41	15886	2.06	20.44
2005-06	85096.49	9.48	15746	-0.88	18.50
2006-07	101839.5	19.68	19346	22.86	19.00
2007-08	129274.5	26.94	22844	18.08	17.67
2008-09	148490.7	14.86	26672.86	16.76	17.96
2009-10	162946.4	9.74	30540.64	14.50	18.74
2010-11	197529.9	21.22	36051.31	18.04	18.25
2011-12	230987.1	16.94	42105.11	16.79	18.23
2012-13	261699.6	13.30	47255.62	12.23	18.06
2013-14	296475.4	13.29	56130.92	18.78	18.93
2014-15	314267.1	6.00	66679.82	18.79	21.22
2015-16	330873.8	5.28	79114.11	18.65	23.91
2016-17	377201.8	14.00	86902.79	9.84	23.04
2017-18(RE)	415981.7	10.28	107234.3	23.40	25.78
Memo					
1990-95	16162.88	19.72	4008.8	13.12	25.26
1995-00	32884.89	14.51	7497.8	15.38	22.68
2000-05	55711.33	13.03	13566	9.54	24.79
2005-10	125529.5	16.14	23029.9	14.26	18.38
2010-15	260191.8	14.15	49644.56	16.93	18.94
2015-18	374685.7	9.86	91083.73	17.30	24.24

Chart I: Growth Rate of GSDP & AE



SECTION IV: EMPIRICAL VERIFICATION

In line with the analytical framework mentioned in previous section we have poised the following model for empirical estimation.

$$lngsdp_t = \alpha_1 + \sum_{j=1}^{p} \beta_j \, lngsdp_{t-j} + \sum_{j=1}^{p} \gamma_j \, lnae_{t-j} + u_{1t}$$

$$lnae_t = \alpha_2 + \sum_{j=1}^{p} \lambda_j \, lngsdp_{t-j} + \sum_{j=1}^{p} \mu_j \, lnae_{t-j} + u_{2t}$$

Where,
ln is the Natural logarithm
GSDP: Gross State Domestic Product AE: Aggregate Expenditure
u's are stochastic error terms

As proposed earlier now we shall empirically verify the short run and long run relationship that exist between economic growth and expenditure in the state of Odisha during the period 1980-81 to 2017-18.

Stationarity Test

In time series econometrics 'Stationarity Test' is the initial step. An attempt has been made to apply both Augmented Dickey Fuller (ADF) Test and Phillips-Perron (PP) Test to examine the stationarity of both the series namely LNGSDP and LNAE and the order of integration. Here we have employed trend & intercept and Intercept alone models to ascertain the presence of unit root.

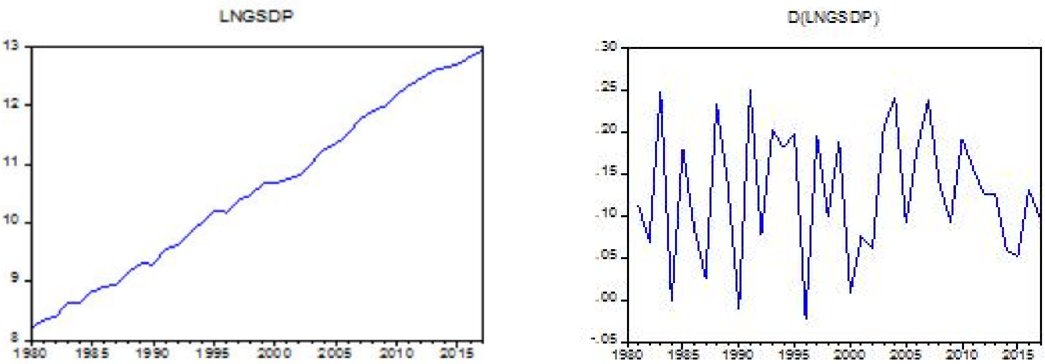
The results of unit root test are presented in Table II. From the table it is observed that both tests confirmed that the series, viz., LNGSDP and LNAE (Natural logarithm of Gross State Domestic Product and Aggregate Expenditure) are non-stationary at level. But by taking the first difference of each series, it is seen that each differenced series is stationary. Hence, each original series is considered as I(1), i.e., integrated of order one.

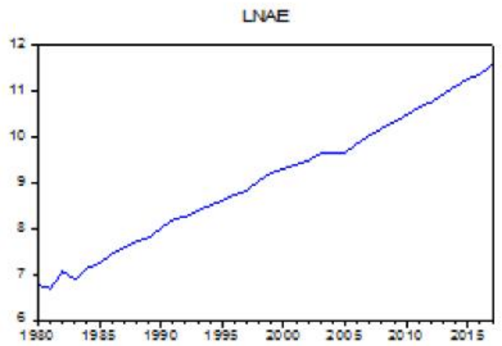
Table II: Results of Unit Root Test

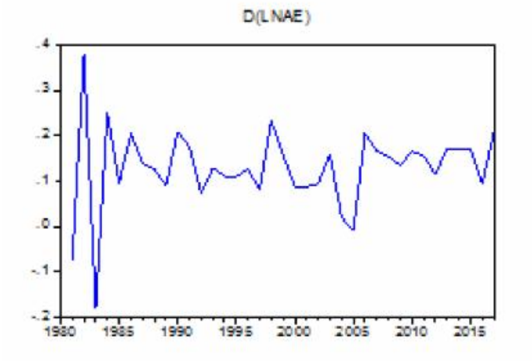
The Estimated τ Statistic Value under Unit Root Test					
Variable	Augmented Dickey Fuller (ADF) Test				Remark
	Intercept alone		Intercept + Trend		
	Level	1st difference	Level	1st difference	
LNGSDP	-0.068	-8.154*	-3.004	-8.034*	I(1)
LNAE	0.582	-12.099*	-3.622**	-11.988*	I(1)
	Phillips-Perron (PP) Test				
LNGSDP	-0.018	-8.185*	-2.969	-8.062*	I(1)
LNAE	1.654	-12.008*	-3.832**	-11.989*	I(1)

Note: MacKinnon (1996) critical value has been used for testing of unit root (H_N: The series has unit root against, H_A: The series does not have unit root); The asterisk '* & **' indicate stationarity at 1% & 5% levels respectively. The optimal lag length for ADF test is selected using the AIC while the bandwidth for PP tests are selected using the Newey-West Bartlett kernel.
Source: Computed by the author

Chart II: Time Series Plot of LNGSDP & LNAE







Above figures clearly reveals that both LNGSDP & LNAE are not stationary at level but become stationary after first difference, i.e., both the series are integrated of order one [I(1)].

Vector autoregressive model

After stationarity test the next step is estimation of vector autoregressive model. By employing the ADF and PP test, we found that both the LNGSDP and LNAE series are non-stationary at 'level' but stationary in 'first-difference' form. Therefore, while estimating the VAR model, we shall use first-difference of these variables. The estimated VAR Model is given below.

Table III: Estimation Output for VAR (1) Model

Vector Autoregression Estimates
Standard errors in ( ) & t-statistics in [ ]

	D(LNGSDP)	D(LNAE)
D(LNGSDP(-1))	-0.229385	-0.145265
	(0.16068)	(0.15812)
	[-1.42763]	[-0.91869]
D(LNAE(-1))	0.294351	-0.594475
	(0.13666)	(0.13449)
	[2.15385]	[-4.42017]
C	0.119851	0.230125
	(0.03276)	(0.03224)
	[3.65830]	[7.13772]
Akaike information criterion		-4.736817
Schwarz criterion		-4.472897

On the basis of our results, it can be observed that higher growth of aggregate expenditure [d(LNAE)] during period (t-1) leads to higher growth of gross state domestic product [d(LNGSDP)] in period t. This is revealed from statistical significance of computed t for the estimated coefficient of d[LANE(-1)].

To examine the robustness of the VAR we have to verify the autocorrelation and normality test. Two celebrated tests in this field are: (i) Godfrey LM test for autocorrelation and (ii) Jarque-Bera test for Normality.

The results of Autocorrelation Test as reported in Table IV shows that the computed LM statistics (which follows Chi-square distribution) is statistically significant as p>0.10 even for lag one. This implies we do not reject the null hypothesis of absence of serial correlation in the estimated VAR model.

Table IV: VAR Residual Serial Correlation LM Test

Null Hypothesis: no serial correlation at lag order h

Lags	LM-Stat	Prob
1	4.123289	0.3896
2	6.641268	0.1561
3	1.219303	0.8749
4	4.314840	0.3651
5	5.936995	0.2039

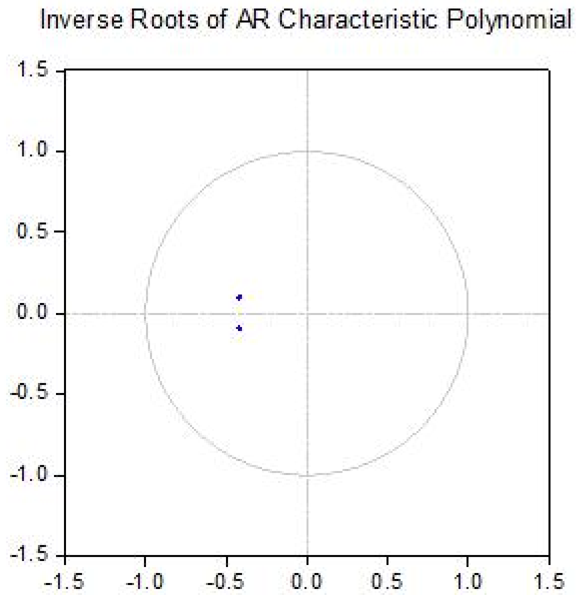
Probs from chi-square with 4 df.

The normality of VAR is examined with the help of Jarque-Bera residual test. The outcome is reported in Table V. It is evident from the Jarque-Bera statistics that all the residuals are normally distributed in the estimated VAR model.

Table V: VAR Residual Normality Test

Null Hypothesis: residuals are multivariate normal			
Component	**Jarque-Bera**	**df**	**Prob.**
1	2.420477	2	0.2981
2	2.795836	2	0.2471
Joint	5.216313	4	0.2658

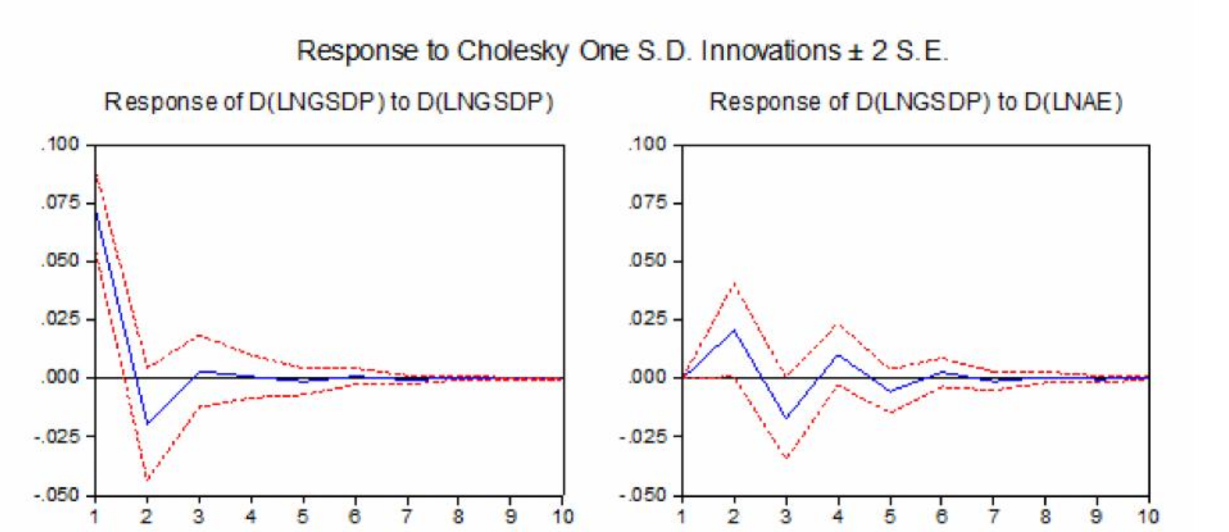
The estimated VAR is considered to be stable if all roots lie inside the unit circle. Therefore, it is found that our estimated VAR model satisfies the stability condition.

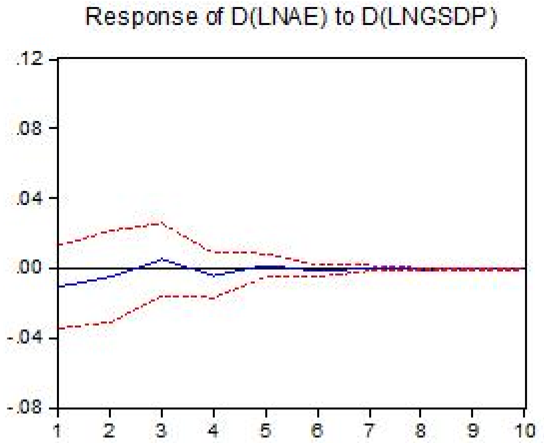


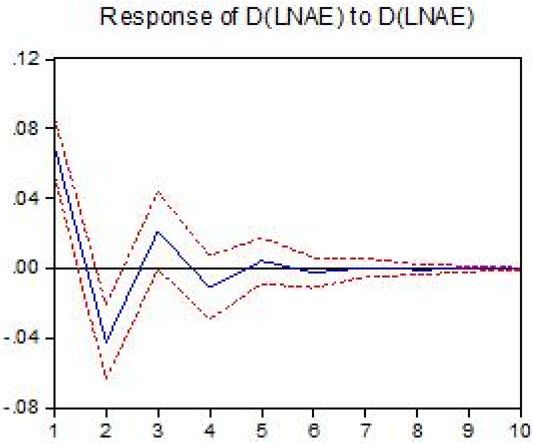
Impulse Response Function

The Impulse Response Functions provide information to analyze the dynamic behaviour of a variable due to a random shock or innovation in other variables. Specifically, the Impulse Response Functions trace out the effects on current and future values of the endogenous variables of the system as a result of one standard deviation shock to a variable. The recursive structure assumes that variables appearing first contemporaneously influence the latter variables but not vice versa. Impulse response functions are shown in Chart III. A unit shock in GSDP creates very small fluctuations in aggregate expenditure and will die out in long run, likewise a unit shock in aggregate expenditure also leads to a small variation in GSDP and finally dies off in a long period.

Chart III: Combined Impulse Response Graphs







Granger Causality

The results of pairwise Granger Causality Test is shown in Table VI. We find that there exists a unidirectional causality between Gross State Domestic Product and Aggregate Expenditure and the causality runs from Aggregate Expenditure to Gross State Domestic Product. This implies AE Granger Cause GSDP, but GSDP does not Granger Cause AE. Symbolically, AE '! GSDP.

The conclusion derived from the causality test is same as that of the VAR estimation result, which implies that aggregate expenditure in one period lead to growth of gross state domestic product in the next period. Thus, causality runs from Aggregate Expenditure to Gross State Domestic Product.

Table VI: Pair wise Granger Causality Tests

Null Hypothesis	F-Statistics	P Value	Decision
D(LNAE) does not Granger Cause D(LNGSDP)	4.63909	0.0387	Reject Null
D(LNGSDP) does not Granger Cause D(LNAE)	0.84399	0.3649	Do not Reject Null

Cointegrating Test & Error Correction Model

We know that trended time series can potentially create major problems in empirical econometrics due to spurious regressions. Granger (1981) introduced a link between nonstationary processes and the concept of long-run equilibrium, through the concept of cointegration. Engle and Granger (1987) further formulized this concept by introducing a very simple test for the existence of co-integrating relationships. 'Cointegrating regression retains the terms in levels but only in linear combinations that are stationary' (Bhaumik, 2015).

Cointegration becomes an overriding requirement for any economic model using nonstationary time series data. In the present context both the series viz., Gross State Domestic Product and Aggregate Expenditure are nonstationary at level but become stationary after first difference, i.e., both the series are integrated of order one [I(1)]. Therefore we have to go for cointegration test. This test involves two steps: 1) Estimate the long-run (possible co-integrating) relationship 2) Check for (cointegration) the order of integration of the residual. If the residual is found to be stationary, the variables are cointegrated.

'The cointegrating equation gives long-run relationship between the two variables. However, cointegrating equation does not shed any light on short-run dynamics although its existence indicates that there must be some short-term forces that are responsible for keeping the long-run relationship intact. Thus, it is necessary to construct a more comprehensive model which combines short-run and long-run dynamics. This is done by the error correction model (ECM)' (Bhaumik, 2015).There may be disequilibrium in the short-run of the ECM, however, equilibrium will be restored in long-run if and only if the coefficient of the estimated error term included in the model is negative and significant.

From empirical data we may write the estimated cointegrating relationship as:

$$LNAE = -1.153114^{*} + 0.966373^{*}LNGSDP$$

t: (-7.194860) (64.30532)

p: (0.0000) (0.0000)

R^2: 0.991369; DW: 1.004840

* implies significance at 1% level

The above equation provides the long-run relationship between LNAE and LNGSDP. As both the variables are expressed in logs the estimated slope coefficient 0.966373 represents long-run elasticity of aggregate expenditure to change in gross state domestic product.

It is found that the above cointegrating relationship has been validated by the Augmented Dickey Fuller (ADF) unit root test for residuals. The Estimated τ Statistic of the residual is -3.2285 with p-value 0.0262. Here we have employed Intercept alone model to ascertain the presence of unit root. This implies that the residual series is stationary and therefore the variables are cointegrated.

Now the estimated Error Correction Model runs as:

$$d(LNAE) = 0.152054^{*} - 0.186988\, d(LNGSDP) - 0.270468^{*}(res)_{t-1}$$

t: (5.351921) (-0.973521) (-2.325245)

p: (0.0000) (0.3372) (0.0262)

R^2: 0.205891 DW: 2.555795

* implies significance at 1% level

These results are quite consistent as the coefficient of the residual term is negative (-0.270468) and statistically significant, which implies that if there were any short-term disturbance from the long-run stable relationship as depicted by the cointegrating relationship then such disturbance would be corrected over the time and the long-run stable relationship would be restored. The coefficient of LNGSDP gives short-run elasticity of aggregate expenditure with respect to the change in Gross state Domestic Product; however, this is statistically not significant.

SECTION V: CONCLUSION

This write-up presents the results for testing the causal relationship between public expenditure and Gross State Domestic Product (a proxy variable for economic growth) for Odisha covering the time series data 1980-2018. There are usually two contrasting propositions widely accepted in the literature: Wagner's law states that as GSDP grows the public expenditure grows; and the Keynesian frame work postulates that public expenditure causes GSDP to grow. By employing the time series econometric analysis we observe that in Odisha aggregate public expenditure causes GSDP. It is observed that both the series are non-stationary at level but becomes stationary after first difference. The Granger Causality Test, which exposes the short-term relationship between any two variables, reveals that causality runs from Aggregate Expenditure to Gross State Domestic Product. From the estimated cointegrating equation, it is found that there exists a long run relationship between Aggregate Expenditure and Gross State Domestic Product. Therefore the results of our study is quite consistent with the Keynesian proposition.

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