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Impact of Public Capital Expenditure on Economic Growth in Nigeria

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Abstract
This study investigates the impacts of capital expenditure on the rate of growth of the Nigerian economy during the period 1981 to 2017 using the Engel-Granger 2–step error correction technique. The study reveals that there is a negative influence of capital spending on economic growth due to shortfall between funds disbursement and utilization. It was further discovered from the study that exchange rate and inflation rates have positive and negative relationships with economic growth respectively. More so, there appears to be cointegration between the variables and an error correction of 28.5 percent was found in the event of any disturbance in the short-term equilibrium. The study suggests that proper machinery be put in place in order to checkmate the spending and implementation of projects for which government funds are intended and a favourable flexible exchange regime which will be properly tailored to the requirements of the Nigerian economy be adopted.

Keywords: Capital Expenditure, Economic Growth, Public Finance, Error-correction, Nigeria,
JEL Classification: E62, E63

1. Introduction

The need to improve the living condition of people of every nation is a key priority of every government. This can be achieved through increase in government expenditure from the capital angle. This enables the government to have at its disposal enough fund to finance its capital expenditures, which will be accompanied by increase in economic output of the nation.

Government expenditure is identified by economists as a way of contracting or expanding a nation's economy. Increased government spending will in turn expand the economy through increased economic activities while lowering government spending contracts the economy

through reducing inflationary gap which as well is capable of reducing economic activities or output (Rosoui, 2015).

In recent years, the Nigerian government has engaged in more expenditure in order to stimulate growth of the economy. Government expenditure is divided into two namely; Recurrent expenditure and Capital expenditure. Recurrent expenditure deals with overhead or running cost of government such as payment of salaries, pension and so on while capital expenditure deals with accruing physical or tangible goods such as building infrastructures, accruing machines and so on (Darma, 2014). Although, research evidence shows that even with rapid increase in both capital and recurrent expenditures, the economy has remained stagnant or moved in a sluggish manner (Modebe, Okafor, Omoumere & Ibe, 2012).

Wagner (1883) posited in his theory of public expenditure that government spending results to economic growth while Keynes (1936) also posits that growth cannot occur without government expenditure. Smith (1776) in his Wealth of Nations argues that government should focus on critical sectors of the economy such as defense, health and public (infrastructural) development, expenses made to other sectors aside from those he pointed out were regarded as a wastage. In recent times, the Nigerian government has invested tremendous amount in capital expenditure due to infrastructural deficiency as identified by policy makers as one of the reasons why the nation's economy has not received massive investments from investors both within and outside the country.

Barro (1990) endogenized state spending in a growth model and examined the relationship between the size of a government and rates of savings and economic growth. His submission was that increase in funds which are made to non-productive government services is related to low per capita growth and therefore concluded that for state expenditure to enhance growth, it has to tend towards productive services.

Over time, government capital expenditure has been unstable, rising and dropping. In 1894, the amount spent on capital projects was ₦4.10 billion while it increased to ₦24.05 billion in 1990. During this period, the highest level of economic growth was in 1990 when there was a growth of 12.8 percent. From 1991 till date, capital expenditure has been on a constant rise from ₦28.34 billion in 1991, ₦121.14 billion in 1995, ₦552.39 billion in 2006 and ₦1,152.80 billion in 2009 after which it became fairly unstable with rise and fall until 2017 when it was at ₦979.50 billion (CBN, 2017). However during this period, the increase in capital spending did not reflect much on the economy as even in 2009 when the highest amount was observed, there was only a growth rate of 6.9 percent in the economy.

Previous studies such as Nurudeen and Usman (2010); Modebe, Okafor, Onwumere, and Ibe (2012) among others examined the impacts of capital expenditure alongside recurrent expenditure thereby not really been able to separate the effects of both types of spending. This study however, examines the impacts that capital expenditure has on economic growth being independent of the influence of recurrent expenditure. This paper is organized in five sections. The first section is the introduction, section two reviews related literature; model and methodology are in section three, while sections four and five are discussion of results and conclusion and recommendation respectively.

2. Literature Review

A nation is said to experience economic progress when its annual output increases at a steady rate over years. Todaro (1994) cited Kuznet's (1955**)** definition of growth as "a sustained increase in a nation's gross national income-per capita over a long period of time ". Kuznet (1955**)** noted that a country is in a static state if the population of the country and its gross national product are growing proportionately. This means that if GNP grows faster than population, then the economy is experiencing economic growth. He therefore sees growth as quantitative increase in economy without considering its quality.

There have been numerous studies on the relationship between government expenditure and economic growth. For instance, Nkechukwu and Okoh (2013) examined the relationship between capital expenditure at disaggregated level on economic growth in Nigeria from 1981-2013. They employed ordinary least square to predict economic growth while cointegration and vector auto regression was adopted to analyze the long-run and short-run relationship between capital expenditure and economic growth. The findings of the study showed a positive long-run relationship between capital expenditure on education and road and economic growth as well as a negative long-run relationship between capital expenditure on health and agriculture on economic growth.

Komain and Brahmasrene (2007) used the Granger causality test to examine the influences of government spending on economic growth in Thailand. The study revealed that state expenditures are not cointegrated with economic growth. A unidirectional causality was found to run from expenditure to economic growth and a significant positive relationship was found to have existed between government spending and economic growth. Study by Darma (2014) on federal capital expenditure and its impact on economic growth in Nigeria from 1980-2010, employed ordinary least square to ascertain the relationship between the two variables. The result of the study revealed that total capital expenditure, capital expenditure on administration, capital expenditure on social investment and capital expenditure on transfer impacted positively on economic growth in Nigeria.

Nurudeen and Usman (2010) studied the impacts of public spending on economic growth in Nigeria from 1970 to 2008 using the Engel-Granger ECM technique and found that total capital expenditure and inflation had negative relationship with economic growth. In the same vein, using the ordinary least square, Modebe, Okafor, Onwumere, and Ibe (2012) found a negative relationship between capital expenditure and economic growth while exchange rates and recurrent expenditure were found to have positive coefficients.

Ebong, Ogwumike, Udongaro and Ayodele (2016) conducted a research on the impact of government expenditure on economic growth using annual data from 1970-2012. The study employed the ordinary least square technique and the results showed that capital expenditure on agriculture had no significant influence on economic growth in both long-run and short-run while capital expenditure on education had a significant impact on economic growth. It was further revealed by the study that capital expenditure on health had a negative impact on economic growth and the relationship was in fact, insignificant. Lastly, capital expenditure on human capital through social services was observed to have promoted economic growth unlike that of agriculture.

In another study, Rosoui (2015) investigated the impact of current and capital expenditure on economic growth in Romania covering the period 1995 to 2013. The study adopted the vector autoregression model for data estimation. Findings of the study revealed a decreasing real gross domestic product as current expenditure increased while on the other hand, the study showed a positive and significant relationship between Real Gross Domestic Product and capital expenditure such that an increase in capital expenditure increases economic growth.

Aregbeyen (2007), in his study, found out a significant positive correlation between government capital expenditure, public investment and economic growth. The study further revealed that both consumption and recurrent expenditure had negative impact on economic growth. Laudau (1983) studied the effect of government (consumption) expenditure on economic growth for a sample of 96 countries. From his findings, it was revealed that government recurrent expenditure contributed negatively on economic growth while capital expenditure contributed positively on real output.

Oyeleke, Raheem and Falade (2016) examined the influence of disaggregated functional capital expenditure on economic growth in Nigeria between the periods of 1970-2013. The error correction model was employed to estimate data both on economic growth and capital expenditure. Findings of the study revealed that there was a long run relationship between the components of public expenditure and economic growth. The study further depicted that disaggregated functional capital expenditure of government did not generate the needed growth to real economic activities. However, the study showed that capital expenditure on economic services was negative and insignificantly related to economic growth and also that inflation rate had a positive coefficient.

3. Methodology

The data used in this study which is aimed at investigating the relationship between capital expenditure and economic growth from the period 1981-2017 are annual time series data. The model which was adopted from Nurudeen and Usman (2010) was tailored to suit the aim of this study which studies capital expenditure independent of recurrent expenditure, it is stated in its functional form as follows:

$$GDP = f(CEX, INF, EXR) \quad \ldots\ldots 1$$

Where *GDP* is Gross Domestic Product growth rate, which is the dependent variable, *CEX* is Capital expenditure (in billions of Naira) which is the focal explanatory variable, *INF* is inflation rate and *EXR* is Official Naira to Dollar exchange rates. Inflation and exchange rates are control variables added for the purpose of getting an all-encompassing robust result. All data were gotten from the World Bank World Development Indicators (WDI) (2017) except for capital expenditure which was gotten from CBN annual statistical bulletin (2017). For empirical analysis, equation (1) is restated as thus:

$$\mathrm{GDP_t} = \alpha_0 + \gamma_1 \mathrm{CEX_t} + \gamma_2 \mathrm{INF_t} + \gamma_3 \mathrm{EXR_t} + \mu_t \quad \ldots\ldots 2$$

Where: α_0 is the intercept of the; $\gamma_1 - \gamma_3$ re the slopes of the expression; t shows the period of the observation and θ is the disturbance term. This having been stated, the stationarity test is conducted to ascertain the unit root properties of the data obtained. This serves as an

anchor towards the technique of analysis to be used for the study. If the variables are all stationary at the first difference that is, I(1), then the Engel-Granger ECM technique can be used. The Engel-Granger (1987) method of Error correction is a technique based on two steps, first is the test for cointegration. The variables are tested for the presence of long-run relationship using the Johansen system of cointegration, if there exists cointegration afterwards, the following model will be estimated:

$$\Delta GDP_t = \alpha_0 + \gamma_1 \Delta CEX_t + \gamma_2 \Delta INF_t + \gamma_3 \Delta EXR_t + \theta \varepsilon_{t-1} + \mu_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where: Δ denotes the first difference of variables, θ is the coefficient of the error correction term *(ECT)* which is one-period lag of the disturbance term while ε_{t-1}captures the speed of adjustment back to short-run equilibrium. All variables must be integrated at I(1) for the viability of the Engel-Granger ECM as this is a prerequisite and if otherwise, **equation (2)** can be estimated using some other technique. The most important characteristic of the error correction term (*ECT*) is that it must have a negative coefficient so as to show convergence back to equilibrium.

4. Result

4.1 Descriptive Statistics

From Table 4.1, the mean value of the dependent variable *GDP* is 3.45 and its standard deviation is 7.52 which shows that there is not much deviation through the series. *CEX* has a mean value as well as standard deviation of 389.63 and 389.69 respectively which show a very little difference, thereby pointing that there is not much difference in the annual values of the series.

Table 4.1: Descriptive Statistics

Variable	Mean	Std. Deviation	Maximum	Minimum	Skewness	Kurtosis	Jarque-Bera	Probability
GDP	3.45	7.52	33.74	-13.13	1.26	8.93	63.95	0
CEX	389.63	389.69	1163.2	4.1	0.63	2	3.95	0.14
INF	19.52	17.45	72.84	5.38	1.7	4.68	22.15	0
EXR	82.66	80.34	305.79	0.62	0.72	2.88	3.2	0.2

Source: Authors' computation using Eviews 7.

All variables appear to be having fairly stable standard deviations as they are not too distant from the mean values. The Kurtosis and Skewness appear to be normal except for *GDP* which seems to be platykurtic while according to the Jarque-Bera statistics, *GDP* and *INF* are not normally distributed while *CEX* and *EXR* are normally distributed. All variables have 37 observations each across the series.

4.2 Stationarity Test

Employing the Augmented Dickey-Fuller test for stationarity, the null hypothesis of not stationary (has a unit root) is tested against the alternative that it is stationary (has no unit root). The null hypothesis is rejected if the ADF-statistic is greater than the critical value in absolute terms at 1%, 5% or 10% level of significance. Table 2 shows the results of the ADF stationarity test. It is seen that all variables are stationary at the first difference [I(1)] therefore, we can go ahead with the co-integration test.

Table 4.2: Stationarity Test

Variables	ADF-Statistic	5% Critical Value	Order of Integration
GDP	-8.902391	-2.948404	I(1)
CEX	-7.621081	-2.948404	I(1)
INF	-5.514717	-2.948404	I(1)
EXR	-3.297372	-2.948404	I(1)

Source: Authors' computation using Eviews 7.

4.3 Cointegration Test

The Johansen system of cointegration was used for testing the existence of a long-run relationship between variables in this study. The null hypothesis of no cointegration was tested against its alternative. The null hypothesis was rejected if the Trace statistic or the Max-Eigen statistic (depending on the selected choice) was greater than the critical value at 1%, 5% or 10% level of significance.

Table 4.3: Cointegration Test

Hypothesized No. of CE	Trace Statistic	5% Critical Value	Probability
*None**	48.24850	47.85613	0.0459

Source: Authors' computation using Eviews 7.

The Johansen cointegration test shows a Trace statistic of 48.24850 which is greater than the 5% critical value of 47.85613, which translates to one cointegrating equation in the relationship. Therefore, there exists a long-run relationship between the variables and hence, we can reject the null hypothesis of no cointegration. Having established a long-run relationship in the model, we go further to estimating the error correction model.

4.4 Discussion of ECM Estimates

Having conducted the cointegration test, the model in equation 3 was estimated. The results are presented in Table 4. From the results, the coefficient of capital expenditure (*CEX*) is -0.037086 which means that there is an inverse relationship between the amount government expend on capital projects and the rate at which the economy grows. This implies that, a 1 percent increase in capital expenditure brings about a 3.7 percent decrease in economic growth in the short-run. This does not conform to theoretical apriori as it is expected that increase in government expenditure increases the tendency of a positive economic change, hence increases the general output (Wagner, 1883; Smith, 1776). However, the relationship is significant judging from the p-value of 0.0001. The deviation from theory can be tied to the fact that there is gross mismanagement on funds released by the government over years for this purpose. Many at times, projects end up getting less than half of what is allocated for them thereby leading to inefficacy of the funds. This finding supports the claims of Nurudeen and Usman (2010), Rosoui (2015) and contradicts the findings of Laudau (1983) and Darma (2014).

Table 4.4: Result

Dependent Variable: D(GDP)				
Variables	Coefficient	Std. Error	T-statistic	Probability
C	12.61712	3.073588	4.105012	0.0003
D(CEX)	-0.037086	0.008107	-4.574592	0.0001
D(EXR)	0.080154	0.069243	1.157573	0.2559
D(INF)	-0.658204	0.129839	-5.069379	0.0000
ECT	-0.285235	0.185642	-1.536479	0.1346
R^2 = 0.8382				
Adjusted R^2 = 0.8174				
F-statistic = 40.17578				
Probability = 0.0000				
D-W statistic = 1.9503				

Source: Authors' computation using Eviews 7.

A further look at the result from Table 4.4 shows the coefficient of exchange rate (*EXR*) as 0.080154 with a probability value of 0.2559. This implies that there is a direct relationship between exchange rate and economic growth hence, a percent increase in the Naira to Dollar exchange rate leads to an 8 percent increase in the rate of economic growth. This points toward the importance of currency depreciation. If the value of the Naira falls (increased exchange rate) compared to the Dollar, the rate of economic growth increases since it encourages export to some extent. This affirms the findings of Modebe, Okafor, Onwumere and Ibe. (2012). However, this relationship appears to be insignificant judging from the probability value of the variable.

Inflation rate (*INF*) has a coefficient of -0.658204 which implies an inverse relationship between inflation and rate of economic growth. If inflation increases by 1 percent, the rate of economic growth is retarded by 65.8 percent. This conforms to theory as it is known that higher levels of inflation are unfavourable to the growth of an economy. This finding is consistent with the findings of Nurudeen and Usman (2010) and in contradiction with Oyeleke, Raheem and Falade (2015). This relationship is further backed by the probability value of 0.0000 which indicates that it is indeed a very significant relationship.

Lastly, the error correction term (*ECT*) satisfies the most important condition of a negative coefficient as it is seen to have a coefficient of -0.285235 which implies that when there is a disturbance in the system established by the relationship, it is corrected and adjusted towards short-run equilibrium at a speed of adjustment of 28.5 percent. Although the speed of adjustment seems to be quite low, this may be because the error correction term does not satisfy the second condition- which is in fact, a secondary condition- of a significant p-value. This only means that the error correction is necessary for adjustment but not sufficient.

Table 4.5: Diagnostic Tests

Test Statistics	Result
Serial Correlation: Chi-square(2)	0.0780
Heteroscedasticity: Chi-square(4)	0.4031
Normality: Jarque-Bera	0.4066(0.8160)
Functional Form: Ramsey RESET F-Statistic(1, 30)	0.1788

Source: Authors' computation using Eviews 7.

However, the model is good fit and acceptable for decision making as it is seen from the R-squared value of 0.838292 which implies that about 84 percent of the deviations in economic growth is explained by the variables in the model while the probability of F-statistics shows that the variables are jointly significant in explaining the rate of economic growth and also results of diagnostic tests which indicate that there is neither the presence of serial-correlation nor heteroskedasticity and the estimates portray no indication of multicollinearity.

5. Conclusion and Recommendations

The study employed the Engel-Granger 2-step Error correction technique in estimating the impact of capital expenditure on economic growth from 1981 to 2017. The results indicate a negative and significant relationship between capital expenditure and economic growth while it was discovered from the study that a higher exchange rate improves the economy in the short-run while higher levels of inflation are detrimental to growth of the economy. Furthermore, it was discovered that there is adjustment towards short-run equilibrium at a speed of 28.5 percent if the system is disturbed.

From these, it is therefore recommended that relevant authorities should set a proper system of checks and monitoring on disbursement of funds for capital purposes and execution of projects so as not to have short-fall of the allocated funds. Also, it is required of the appropriate authorities to monitor inflation rates so as to make sure it does not exceed what is necessary for smooth running of the economy. Proper control can be achieved by improving the efficacy of liquidity control instruments. Lastly, a favourable exchange rate system should be maintained and this should be built around a flexible regime so as to ensure that the rates do not wander too far from the required equilibrium which ensures optimal functioning of the economy.

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