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THE GRANGER CAUSALITY TESTS ON THE IMPACT OF GOVERNMENT EXPENDITURE ON ECONOMIC GROWTH IN NIGERIA

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ABSTRACT

In the last decade, Nigeria economy has metamorphosed from the level of millions of naira to billions of naira and postulating into trillions of naira on the expenditure side of the budget This study is to examine the impact of government expenditure on economic growth in Nigeria. Using annual data of total government expenditure and gross domestic product from 1977 to 2012. The econometrics employed was the unit root, co-integration and the granger causality test. Firstly from the Augmented Dickey Fuller (ADF) test, Agriculture Expenditure, Defence expenditure, Education Expenditure, Health Expenditure and Transport and Communication expenditure are non-stationary at zero level, and later became stationary at first difference. Secondly the co-integration test shows that there is no co-integration (or long run) relationship between government expenditure and economic growth. Thirdly in the Granger causality test it was found that the total government expenditure on Agriculture has a significant effect on gross domestic product (GDP), it also found that the total government expenditure on Defence (security), Transport and communication has a positive impact on economic growth in Nigeria.

Keywords: *Government Expenditure, Economic Growth, Recurrent Expenditure, Capital Expenditure, Co-integration*

INTRODUCTION

Over the past decades, the public sector spending has been increasing in geometric term through government various activities and interactions with its Ministries, Departments and Agencies (MDE's), (Niloy et al. 2003). Although, the general view is that public expenditure either recurrent or capital expenditure, notably on social and economic infrastructure can be growth enhancing in financing such expenditure to provide essential infrastructural facilities including transport, electricity, telecommunication, education and health can be growth retarding (for example, the negative effect associated with taxation and excessive debt). The size and structure of public expenditure will determine the pattern and form of growth in output of the economy (Taiwo and Abayomi, 2011).

The structure of Nigeria public expenditure can broadly be categorized into capital and recurrent expenditure. The recurrent expenditure is government expenses on administration such as wages, salaries, interest on loans, maintenance etc whereas expenses on capital project like

roads, airport, education, telecommunication, electricity generation etc. are referred to as capital expenditure. One of the main purposes of government spending is to provide infrastructure facilities (Taiwo and Abayomi 2011).

The effect of government spending on economic growth is still an unresolved issue theoretically as well as empirically. Although the theoretically positions on the subject are quite diverse. The conventional wisdom is that a large government spending is a source of economic instability or stagnation. Empirical research however, does not conclusively support the conventional wisdom. A few studies report positive and significant relationship between government spending and economic growth while several others find significantly negative or no relationship between an increase in government spending and growth in real output.

In the light of the above, this study intends to examine the impact of government expenditure on economic growth in Nigeria using econometrics tools such as the co-integration and granger causality test.

STATEMENT OF THE PROBLEM

In the last decade, Nigeria economy has metamorphosed from the level of millions of naira to billions of naira and postulating into trillions of naira on the expenditure side of the budget. We will not be surprised if the economy is experiencing surplus or equilibrium on the records of balance of payment. Better still, if there are infrastructures to improve commerce with the system or social amenities to raise the welfare of average citizen of the economy. All these are not there, yet we always have a very high estimated expenditure. This indicates that something is definitely wrong either with the ways government expands budget or with the ways and manners it has always been computed.

Unfortunately, the rising government expenditure has not translated to meaningful growth and development, as Nigeria ranks among the poorest countries in the world. In addition, many Nigerians have continued to wallow in abject poverty, while more than 50 percent live on less than U$2 per day. Couple with this, is dilapidated infrastructure (especially roads and power supply) that has led to the collapse of many industries, including high level of unemployment (Nurudeen and Usman 2010).

Moreover, macroeconomic indicators like balance of payments, import obligation, inflation rate, exchange rate, and national savings reveals that Nigeria has not fared well in the last couple of years.

MATERIAL AND METHOD

This study is to examine the impact of government expenditure on economic growth in Nigeria. The method of data collection used by this research work is secondary data which was collected from the records of National Bureau of Statistics (NBS).

The study used annual data of government expenditure (TPE) and gross domestic product (GDP) from 1977 to 2012 while including specific components of government expenditure: Total Capital Expenditure (TCE), Total Recurrent Expenditure (TRC), Defence Expenditure (DE), Agriculture Expenditure (AGE), Transport And Communication Expenditure (TACE), Education Expenditure (EE), Health Expenditure (HE) and Power Expenditure (PE). The granger causality and the unit root test will be used to analysis the data.

Unit Root Test

The efficacy of the VAR model in establishing the relationship among variables is conditional on the assumption that the variables must be stationary. Therefore, before conducting a Granger causality test based on the VAR, the time series must be stationary. In the case of non-stationary time series, it implies the variables may be co-integrated. This means that stationarity and co-integration test musts precede the Granger Causality test.

According to Greene (2003), the Augmented Dickey Fuller (ADF) test can be employed to test for unit root based on the following equations:

$$Y_t = a + \beta y_{t-1} + \Sigma \beta_f \Delta y_{t-1} + g_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

$$Y_t = a + y_t + \beta y_{t-1} + \Sigma \beta \Delta y_{t-1} + g_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, equations (1) and (2), indicate Augmented Dickey Fuller (ADF) tests without trend and with trend respectively. Thus, the ADF unit root test posits a null hypothesis = 0 versus an alternative hypothesis $\beta < 0$, where the ADF statistics were compared with the observed Mackinnon critical values. Hence, implying that if the series have unit root, one can conclude that co-integration is necessary.

Co-integration Test

If the series are non-stationary, then there can be a meaningful long-run relationship among them which can be exploited by identifying a combination of the non-stationary series that give the same order of integration by using co-integration techniques. Two series Y_t and X_t are co-integrated if both series are integrated of say I(1) and the residuals from the equation ε_t is I(0) where ε_t is a vector of innovations.

To check if there exist any long-run tendencies between government expenditure and economic growth we employed the Johansson (1988) and Juselius (1990) maximum likelihood test which focuses on the rank of a matrix π. using the Johansen approach we assume the VAR model below:

$\Delta y_t - \sum y_t + \Delta y_{t-1} + \pi y_{t-1} + e_t$…….(3)

Where $\pi = \sum (A_i - I)$ and $\tau_t = \sum_{f=t+1}^{F} A_f$

Granger's representation theorem asserts that if the coefficient matrix π has reduced rank $r < k$, then there exist k x r matrices α and β each with rank r such that $\pi = \alpha \beta^I$ and $\beta^I Y_t$ is I(0). r is the number of co-integration relations (the co-integrating rank) and each column β is the co-

integrating vector. The matrix is composed only of $A_i - I$ with a rank equal to unity (r = 1) and a unique stationary combination of the endogenous variables. The first one is the Maximum Eigen value (ME) test:

$$\lambda max(r,r+1) = -T \ln (1 - \lambda i) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Where T is the number of observations and λi is the maximum Eigen value. The null hypothesis that there is r of co-integrating vectors is tested against the alternative that there are r + 1 co-integrating vectors.

The Johansen test can be seen as a multivariate generalization of the Augmented Dickey-Fuller test. The generalization is the examination of linear combinations of variables for unit roots. The Johansen test and estimation strategy (maximum likelihood) makes it possible to estimate all co-integrating vectors when there are more than two variables. If there are three variables each with unit roots, there are two possible co-integrating vectors. More generally, if there are n variables, there are n - 1 possible co-integrating vectors. The Johansen test provides estimates of all co-integrating vectors. Just as for the Dickey-Fuller test, the existence of unit roots implies that standard asymptotic distributions do not apply. Slight digression for an assertion: If there are n variables and there are n co-integrating vectors, then the variables do not have unit roots. Why? Because the co-integrating vectors can be written as scalar multiples of each of the variables alone, this implies that the variables do not have unit roots.

Granger Causality Test

The main objective of this study is to investigate the causality between government expenditures and economic growth. Granger (1996) proposed the concept of causality and exogeneity: a variable Y_t is said to cause X_t, if the predicted value of X_t is ameliorated when information related to Y_t is incorporated in the analysis. We adopted the augmented level VAR with integrated and co-integrated processes developed by Toda and Yamamoto (1995) used by Jamshaid et al. (2010). Toda and Yamamoto (1995) method used a Modified Wald (MWALD) test for restrictions on the parameters of the VAR (k) model. This test has an asymptotic chi-squared distribution with k degrees of freedom in the limit when a VAR (k + q max) is estimated (where k is the lag order of VAR and q max is the maximal order of integration for the series in the system). The underline objective of the Toda-Yamamoto causality test is to overcome the problem of invalid asymptotic critical values when causality tests are performed in the presence of non-stationary series or even co-integration. The Toda-Yamamoto based Granger causality test involves two steps. The first step involves determination of the lag length (k) and the maximum order of integration (q max) of the variables in the system. Given VAR (k) selected, and the order of integration (q max) is determined, a level VAR can then be estimated with a total of k + q max lags. The second step is to apply a standard Wald test to the first k VAR coefficient matrix to make a Granger causal inference. In order to test for Toda and Yamamoto (1995) based Granger causality between aggregate government expenditures and economic

growth; the bivariate VAR (k + q max) model showing the relationship between government expenditure and economic is represented as:

$$\begin{pmatrix} GDP_t \\ GE_t \end{pmatrix} = \begin{pmatrix} \alpha_1 \\ \alpha_2 \end{pmatrix} + \sum_{t=1}^{k+a} \begin{pmatrix} \beta_{1t} & \delta_{1t} \\ \beta_{2t} & \delta_{2t} \end{pmatrix} \begin{pmatrix} GDP_{t-1} \\ GE_{t-1} \end{pmatrix} + \begin{pmatrix} g_{1t} \\ g_{2t} \end{pmatrix} \text{.....(5)}$$

Where

$GDP = Real\ Gross\ Domestic\ Produc$

$GE_t = Aggregate\ Government\ Expenditures$

$\beta\ and\ \delta$ are the coefficients of GDP_t and GE_t respectively. $g_{1t}\ and\ g_{2t}$ are error terms that are assumed to be white noise.

The optimal lag length (k) of the VAR was determined by the Akaike (AI) and Schwarz Information Criterion (SIC). The null hypothesis can be drawn as "GE_t does not Granger cause GDP_t" if $\delta_{1t} = 0$ against the alternative hypothesis "GE_t does Granger-causeGDP_t" if $\delta_{1t} \neq 0$. We use the first k coefficients to compute Wald's test. Correspondingly, the same hypothesis can be drawn between $GDP_t$and GE_t since this study also aimed at investigating the causality between the different specific components of government expenditure and economic growth. We still apply Wald's test to the first k coefficient matrices using the standard chi square statistics.

Data Analysis

The data analysis was carry out using Econometrics tool (that is the unit root, co-integration and the granger causality test). The results obtained for the analysis were presented in the table below.

Table 1: Unit Root Test

Augmented Dickey Fuller (ADF)			
Govt. Expenditure	Order of integration	Non stationary	Stationary
AGRE	I(0)	-2.186791 (0.0295)	
Δ(AGRE)	I(1)		-7.597588 (0.0000)
DE	I(0)	-1.023525 (0.2694)	
Δ(DE)	I(1)		-7.875742 (0.0000)
EE	I(0)	2.152993 (0.9911)	
Δ(EE)	I(1)		-5.238238 (0.0000)
GDP	I(0)	2.699709 (0.9977)	
Δ(GDP)	I(1)		
HE	I(0)	1.167498 (0.9343)	
Δ(HE)	I(1)		-6.449316 (0.0000)
TACE	I(0)		-4.401211 (0.0001)

Δ(TACE)			
TCE	I(0)	1.000371 (0.9129)	
Δ(TCE)	I(1)		-7.561199 (0.0000)

Values in parenthesis are P-value for the ADF test statistics and Δ implies the first difference operator and the level of significance considered (1%, 5% and 10%).

Johansen Cointegration Test

Having confirmed that all the series were integrated of the same order I(1), the next step was to check if there were any long run tendencies between Government expenditure and economic growth. The Johansen (1988), and Johansen and Juselius (1990) maximum likelihood testing procedures on the number of co-integrating vectors, which also include testing procedures for linear restrictions on the co-integrating parameters, for any set of variables that were used. The statistics used is the maximum Eigen value test.

The analyses shows that the null hypothesis of the number of co-integration is therefore not rejected since the maximum Eigen value statistics indicates no co-integration at 5% level of significance, suggesting that there is no co-integration (or long run) relationship between Government expenditures and Economic growth.

Table 2: Granger Causality Test

	Test Statistcs	
Null Hypothesis	**F- Statistics**	**Prob**
GDP does not Granger Cause AGRE	2.17945 Cannot be rejected H_o	0.1313
AGRE does not Granger Cause GDP	9.09912 Reject H_o	0.0009
GDP does not Granger Cause DE	0.60574 Cannot be rejected H_o	0.5524
DE does not Granger Cause GDP	6.08683 Reject H_o	0.0062
HE does not Granger Cause GDP	0.76662 Cannot be rejected H_o	0.4738
GDP does not Granger Cause HE	15.8535 Reject H_o	2.E-05
TACE does not Granger Cause GDP	0.04173 Cannot be rejected H_o	0.9592
GDP does not Granger Cause TACE	6.23925	0.0056

	Reject H_o	
TCE does not Granger Cause GDP	8.86754 Reject H_o	0.0010
GDP does not Granger Cause TCE	2.32439 Cannot be rejected H_o	0.1158
EE does not Granger Cause GDP	8.01409 Cannot be rejected H_o	0.0017
GDP does not Granger Cause EE	8.8774 Reject H_o	0.0002

DISCUSSION OF RESULTS

Agriculture Expenditure, Defence expenditure, Education Expenditure, Health Expenditure and Transport and Communication expenditure are non-stationary at zero level, and later became stationary at first difference by the Augmented Dickey Fuller (ADF) test.

The co-integration test shows that there is no co-integration (or long run) relationship between Government expenditure and economic growth this result may not be surprising since the Nigerian's fiscal policy had undergone a series of regulations in the eighties. Most especially the structural Adjustment program (SAP) and others in ninety. Besides co-integration as a long run relationship between variables may be expected to exist only when the system is in a steady state (Ford 1997). In the Granger causality test above, it was found that the total government expenditure on Agriculture has a significant effect on gross domestic product (GDP), it also found that the total government expenditure on Defence (security), Transport and communication has a positive impact on economic growth in Nigeria.

CONCLUSION/ RECOMMENDATIONS

From the result we can conclude that government should spend more on Agriculture, Defence (security), Transport and Communication, since they have significant impact on the economic growth of the Nation. Less spending on Agriculture, Defence (security), Transportation and Communication sector has a negative effect on the Economic growth, For instance, some Northern States in Nigeria who are experiencing security challenges, no economic activities will be carried out in such states. Moreover, presently, Nigeria is not the only country producing crude oil, other countries are also into production too, which has greatly affect the nation's economic growth so government should spend more on Agriculture and allocation of public funds can now be checked and attention needs to be given to crucial sectors such as Agriculture, Defence (security), Transport and Communication. This is the evidence that these sectors can bring about economic growth in the Long run.

Finally the findings of the study, government capital spending in industries and agriculture if properly managed will raise the nation's production capacity and employment which in turn will increase economic growth in Nigeria, government should increase its expenditure on rural roads and electricity as this will accelerate the productive sectors as well as raise the standard of living of poor citizens in Nigeria, Anti-graft or anti-corruption agencies like the Economic and Financial Crime Commission (EFCC) and the Independent Corrupt Practices Commission (ICPC) should be practically independent to enable them to be more forceful in their actions. Those that divert and embezzle public funds should be treated as terrorists in Nigeria, government should not play politics with expenditure on public goods just to win cheap popularity, Government should monitor the contract awarding process of capital projects closely, to prevent against over estimation of execution cost. This will bring about significant impact of public investment spending on economic growth, There should be effective channelling of public fund to productive activities, which will have a significant impact on economic growth. The government consumption spending should be well coordinated by all arms of government to prevent "Crowd out" effect on government investment

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