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Abstract
This study investigates whether there is statistical evidence for a causal relationship between federal government expenditures and growth in real per-capita GDP in the Nigeria, using long and up to date available time series data (1961-2011). After studying the time-series properties of these variables for stationarity and cointegration, we adopted Toda and Yamamoto's (1995) Granger non-causality tests and investigate Granger causality in detail in the context of a Vector Autoregressive Model. The Empirical results from cointegration test indicate that there exists no long-run relationship between government expenditure and economic growth in Nigeria. The Toda and Yamamoto's causality test results show that Wagner's Law does not hold over the period being tested. However, using VAR Granger causality test we found a weak empirical support in the proposition by Keynes that public expenditure is an exogenous factor and a policy instrument for increasing national income in the short run.

Keywords: Federal government size, Wagner's Law, Cointegration, Granger causality, Vector Autoregression

## 1.0 INTRODUCTION

Over the past three decades, the relationship between government expenditure and economic growth has continued to generate series of controversies among scholars in economic literature. While numerous studies have been conducted, no consistent evidence exists for a significant relationship between government spending and economic growth as some studies provide positive or negative relationship or no causal relationship. For instance, some authors found out that the effect of government expenditure on economic growth is negative or insignificant (Laudau, 1983, Taban,2010; Vu Le and Suruga, 2005), others believed that the impact is positive and significant (Komain and Brahmasrene, 2007, Alexiou, 2009; Belgrave and Craigwell, 1995). These variations in findings might be accounted for by difference in country/region, analytical method employed, and categorisation of public expenditures. In Nigeria, studies conducted to validate the causal relationship between government expenditure and economic growth are also inconclusive. Among such studies that have support for the Wagner's Law are; Essien (1997), Aregbeyen, (2006), Akpan (2011), Ogbonna (2012), Oriakhi & Arodoye (2013). Aigbokhan (1996) study reported a bi-directional causality between government total expenditure and national income and studies like Olukayode (2009) and Nurudeen & Usman (2010) found inconsistent relationship.

In theoretical front, the relationship between government expenditures and economic growth is ambiguous. For instance, certain functions of government such as the protection of lives and properties and the operation of judiciary system to resolve disputes should enhance economic growth. In traditional Keynesian macroeconomics, many kinds of public expenditures, even of a recurrent nature, can contribute positively to economic growth, through multiplier effects on aggregate demand; high levels of government consumption are likely to increase employment, profitability and investment. On the other hand, government consumption may crowd out private investment, dampen economic stimulus in the short run and reduce capital accumulation in the long run. The crowding-out almost always results from a fiscal deficit and the associated effect on interest rates, but adverse economic impacts may be due to government spending in general.

One of the theoretical explanations that have been advanced is Wagner's Law which has been used to analyze the relationship between aggregate income and public expenditure. Wagner (1890) stated that during the industrialization process, as real income per capita of a nation increases, the share of public expenditures in total expenditure increases. On the other hand, Keynes argued that public expenditure is an exogenous factor and a policy instrument for increasing national income. Therefore, he posits that the causality of the relationship between public expenditure and national income runs from expenditure to income. The relationship between public expenditure and economic growth is especially important for developing countries, like Nigeria, most of which have experienced increasing level of public expenditure over time (Lindauer and Valenchik, 1992).

Figure 1: Trends of Government Expenditure and Real Gross Domestic Product (1961-2011)

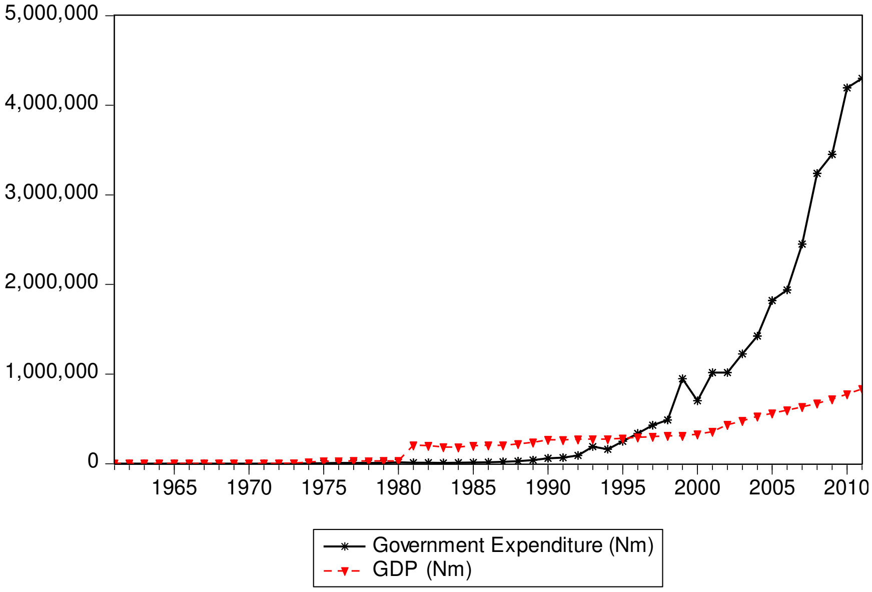
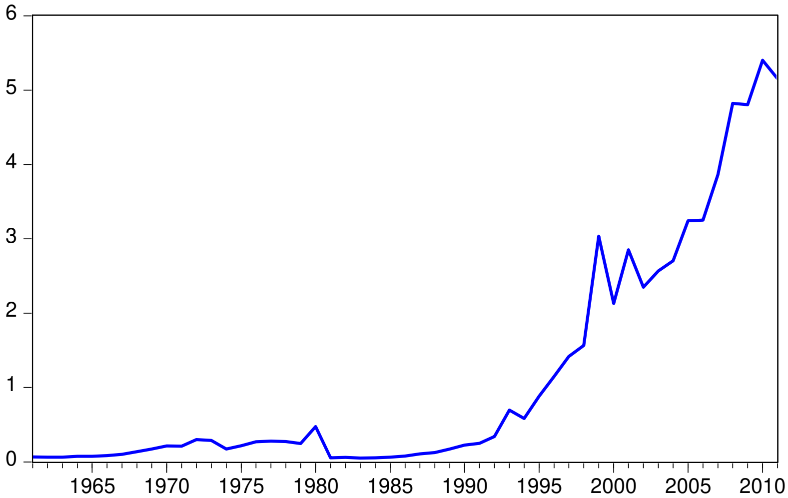



Figure 2: Ratio of Government Expenditures to Real GDP (1961 - 2011)




The statistical description in Figure 1 and Table 1 show that Nigerian economy has moved from level of billion-naira to trillion-naira on the expenditure side of the budget especially in the last decade. For example, government expenditures jumped from the average of ₦366 billion in ten year (1991 – 2000) to average of ₦2.3 trillion naira between 2001 & 2011, whereas, average real GDP in the same periods are ₦287 billion and ₦595 billion. From Figure 2, the ratio of federal government expenditure to the real GDP is relatively low between 1961 and 1993, on average of 0.3. Thereafter, the ratio starts to increase, exponentially to about 3.8 on average between 2001 and 2011 but over the study period it is 1.13. This evidently shows that the growth of government expenditure is far higher than real GDP growth.

**Table 1: Some Basic Descriptive Statistics Relating to the Government Expenditure and Real GDP: 1961 - 2011**

| Government Expenditures (m) | | | | | | |
|---|---|---|---|---|---|---|
| Time period | 1961 – 1970 | 1971 – 1980 | 1981 – 1990 | 1991 – 2000 | 2001 - 2011 | 1961 - 2011 |
| Mean | 329.4796 | 5,972.890 | 22,323.05 | 366,156.8 | 2,371,503 | 588,908.9 |
| Median | 245.7820 | 6,674.650 | 14,632.40 | 292,992.9 | 1,938,003 | 16,223.70 |
| Maximum | 903.9000 | 14,968.50 | 60,268.20 | 947,690.0 | 4,299,155 | 4,299,155 |
| Minimum | 163.8980 | 997.2000 | 9,636.500 | 66,584.40 | 1,018,026 | 163.8980 |
| Std. Dev | 232.8497 | 4,397.583 | 16,614.53 | 282,968.8 | 1,238,097 | 1,109,729 |
| Sum | 3,294.796 | 59,728.90 | 223,230.5 | 3,661,568 | 26,086,530 | 30,034,352 |
| | | | | | | |
| **Real GDP (m)** | | | | | | |
| Mean | 2,957.920 | 20,938.40 | 211,003.8 | 291,645.6 | 598,998.6 | 232,440 |
| Median | 2,886.600 | 28,159.27 | 205,014.3 | 287,576.4 | 595,821.6 | 205,222.1 |
| Maximum | 4,219.000 | 31,546.76 | 267,550.0 | 329,178.7 | 834,161.8 | 834,161.8 |
| Minimum | 2,501.200 | 4,715.500 | 183,563.0 | 265,379.1 | 356,994.3 | 2,501.200 |
| Std. Dev | 518.3428 | 11,881.15 | 25,080.02 | 21249.68 | 146,642.0 | 233,137.4 |
| Sum | 29,579.20 | 209,384.0 | 2,110,038 | 2,916,456 | 6,588,985 | 11,854,442 |
| | | | | | | |

This study aims at examining the relationship between public expenditure and economic growth in Nigeriacovering the period 1961-2011. If the causal link is Keynesian, it then suggests that government expenditure should be an important policy variable that could be used to spur economic growth anddevelopment; but if the reverse is the case, then it could be taken that government expenditure exerts a passive influence on economic growth and may not berelied upon as a veritable policy instrument. Thus the study will provide insight and in-depth understating to policy makers on the choice of government expenditure as policy variable towards achieving growth in national income.

The remainder of the paper is organized as follows. Following section one is section two which deals with data and methodology. In Section three, the empirical results are discussed and section four concludes the paper.

## 2.0 DATA AND METHODS

We start by defining *y* as the natural logarithm of Nigeria real per-capita GDP, and $g = \ln(G/Y)$, i.e. as the natural logarithm of the ratio of federal government expenditures, including transfers, to real GDP. Data on the two series are from the CBN Statistical Bulletin, various issues.

**The causality and cointegration analysis**

The most common way to test the causal relationship between two variables is the Granger-Causality proposed by Granger (1969). The test involves estimating the following simple vector autoregressions (VAR):

$$X_t = \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{j=1}^{n} \beta_j X_{t-j} + \mu_{1t} \qquad (1)$$

$$Y_t = \sum_{i=1}^{m} \lambda_i X_{t-i} + \sum_{j=1}^{m} \delta_j Y_{t-j} + \mu_{2t} \qquad (2)$$

Where it is assumed that the disturbances $\mu_{1t}$ and $\mu_{2t}$ are uncorrelated. Equation (1) represents that variable X is decided by lagged variable Y and X, so does equation (2) except that its dependent variable is Y instead of X.

Granger-Causality means the lagged Y influence X significantly in equation (1) and the lagged X influence Y significantly in equation (2). In other words, researchers can jointly test if the estimated lagged coefficient $\Sigma\alpha_i$ and $\Sigma\lambda_j$ are different from zero with F-statistics. When the jointly test reject the two null hypotheses that $\Sigma\alpha_i$ and $\Sigma\lambda_j$ both are not different from zero, causal relationships between X and Y are confirmed. The Granger-Causality test is easy to carry out and be able to apply in many kinds of empirical studies. However, traditional Granger-Causality has its limitations.

First, a two-variable Granger-Causality test without considering the effect of other variables is subject to possible specification bias. As pointed out by Gujarati (1995), a causality test is sensitive to model specification and the number of lags. It would reveal different results if it was relevant and was not included in the model. Therefore, the empirical evidence of a two-variable Granger-Causality is fragile because of this problem.

Second, time series data are often non-stationary (Maddala, 2001). This situation could exemplify the problem of spurious regression. Gujarati (2006) had also said that when the variables are integrated, the F-test procedure is not valid, as the test statistics do not have a standard distribution. Although researchers can still test the significance of individual coefficients with t-statistic, one may not be able to use F-statistic to jointly test the Granger-Causality. Enders (2004) proved that in some specific cases, using F-statistic to jointly test first differential VAR is permissible, when the two-variable VAR has lagged length of two periods and only one variable is nonstationary. Other shortcomings of these tests have been discussed in Toda and Phillips (1994).

Toda and Yamamoto (1995) propose an interesting yet simple procedure requiring the estimation of an augmented VAR which guarantees the asymptotic distribution of the Wald statistic (an asymptotic $\chi^2$-distribution), since the testing procedure is robust to the integration and cointegration properties of the process.

We use a bivariate VAR ($m + d_{max}$) comprised of real GDP per capita (y) and the ratio of federal government expenditures to real GDP (g), following Yamada (1998); we examine the non-causality between size of Federal Government expenditure and Economic Growth;

$$y_t = \omega + \sum_{i=1}^{m} \theta_i y_{t-i} + \sum_{i=m+1}^{m+dmax} \theta_i y_{t-i} + \sum_{i=1}^{m} \delta_i g_{t-i} + \sum_{i=m+1}^{m+dmax} \delta_i g_{t-i} + v_{1t} \quad (3)$$

$$g_t = \psi + \sum_{i=1}^{m} \phi_i g_{t-i} + \sum_{i=m+1}^{m+dmax} \phi_i g_{t-i} + + \sum_{i=1}^{m} \beta_i y_{t-i} + \sum_{i=m+1}^{m+dmax} \beta_i y_{t-i} + v_{2t} \quad (4)$$

Where ω, θ's, δ's, ψ, ϕ's and β's are parameters of the model. dmax is the maximum order of integration suspected to occur in the system; $\nu_{1t} \sim N(0, \Sigma_{v1})$ and $\nu_{2t} \sim N(0, \Sigma_{v2})$ are the residuals of the model and $\Sigma_{v1}$ and $\Sigma_{v2}$ the covariance matrices of $\nu_{1t}$ and $\nu_{2t}$, respectively. The null of non-causality from government expenditure to economic growth can be expressed as $H_0$: $\delta_i = 0$, $\forall i=1, 2, ..., m$. Let $\delta = vec(\delta_1, \delta_2, \ldots \delta_m)$ be the vector of the first $m$ VAR coefficients. For a suitable chosen R, the Modified Wald Statistic for H0 is;

$$W = T(\hat{\delta}'R'(R\hat{\Sigma}_v R')^{-1}R\hat{\delta}) \quad (4)$$

Where $\hat{\delta}$ is the ordinary least squares estimate for the coefficient δ and $\hat{\Sigma}_v$ is a consistent estimate for the asymptotic covariance matrix of $\sqrt{T}(\hat{\delta} - \delta)$. The test statistic asymptotically distributed as a $\chi^2$ with $m$ degree of freedom.

Two steps are involved with implementing the procedure. The first step includes the determination of the lag length ($m$) and the second one is the selection of the maximum order of integration ($d$max ) for the variables in the system. Measures such as the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), Final Prediction Error (FPE) and Hannan-Quinn (HQ) Information Criterion can be used to determine the appropriate lag order of the VAR.

We used the Augmented Dickey-Fuller (ADF), DF-GLS and Philip-Perron (PP) tests for which the null hypothesis is non-stationarity as well as Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test for which the null hypothesis is stationarity to determine the maximum order of integration. We choose KPSS to have a cross-check. While the Augmented Dickey-Fuller approach accounts for the autocorrelation of the first differences of a series in a parametric fashion by estimating additional nuisance parameters, the Phillips-Perron unit root test makes use of non-parametric statistical methods to take care of the serial correlation in the error terms without adding lagged difference terms (Gujarati and Porter, 2009). As pointed out by Idowu (2005), due to the possibility of structural changes that might have occurred during the period covered by this study, the Augmented Dickey–Fuller test might be biased in identifying variables as being integrated. But the Phillips-Perron test is expected to correct this short-coming.

In order to re-enforce the causality test results, we apply some complementary strategies. Using pre-testing of unit roots and cointegration and, depending on the outcomes, we test for causality is within VAR models of different specifications. When both series are deemed I(0), *case a*, a VAR model in levels is used. When one of the series is found I(0) and the other one I(1), *case b*, VAR is specified in the level of the I(0) variable and in the first difference of the I(1) variable. When both series are determined I(1) but not cointegrated, *case c*, the proper model is VAR in terms of the first differences. Finally, when the series are cointegrated, *case d*, we can use a vector error correction model (VECM) or, for a bivariate system, a VAR model in levels.

Cointegration tests are conducted to see if there is a long-run or equilibrium relationship between the variables. Two popular cointegration tests, namely, the Engel-Granger (EG) test and the Johansen test are used. The EG test is contained in Engel and Granger (1987) while the Johansen test is found in Johansen (1988) and Johansen and Juselius (1990). The EG test involves testing for stationarity of the residuals. If the residuals are stationary at level, it implies that the variables under consideration are cointegrated. The EG approach could exhibit some degree of bias arising from the stationarity test of the residuals from the chosen equation. As pointed out by Idowu (2005), the EG test assumes one cointegrating vector in systems with more than two variables and it assumes arbitrary normalization of the cointegrating vector. Besides, the EG test is not very powerful and robust when compared with the Johansen cointegration test. Thus, it is necessary to complement the EG test with the Johansen test.

## 3.0 RESULTS AND INTERPRETATIONS

Our main reason for conducing unit root tests is to determine the stationarity of the series and know the extra lags to be added to the vector autoregressive (VAR) model for the Toda and Yamamoto test.

**Table 2: Unit Root Tests for both y and g**

| Variables | ADF/1 | DF-GLS/2 | Philip-perron/3 | KPSS/4 |
|---|---|---|---|---|
| *Levels* | | | | |
| y | -1.32 | -1.42 | -1.33 | 0.20** |
| g | -2.31 | -1.45 | -2.31 | 0.141* |
| *1st Difference* | | | | |
| y | -6.47*** | -6.53*** | -6.47*** | 0.09 |
| g | -9.13*** | -9.06*** | -8.85*** | 0.07 |
| | | | | |

1/The null hypothesis is that the series contains an autoregressive unit root.
ADF is the t-ratio corresponding to the Augmented Dickey-Fuller test.
The critical values for 1%, 5%, and 10% levels are, respectively: -4.17, -3.51, -3.18

/2: The null hypothesis is that the series contains an autoregressive unit root
DF-GLS is the t-ratio corresponding to the Dickey-Fuller test applied on a GLS regression
The critical values for 1%, 5%, and 10% levels are, respectively: --3.77, -3.19, -2.89

/3: The null hypothesis is that the series contains an autoregressive unit root.
Phillips-Perron is the t-ratio stemming from an autoregression of the series with no lagged first diff.
The critical values for 1%, 5%, and 10% levels are, respectively: -4.15, -3.50, -3.18

/4: The null hypothesis is that the series is stationary (i.e., no autoregressive unit root exists)
KPSS is the Lagrange Multiplier, LM statistic.
The critical values for 1%, 5%, and 10% levels are, respectively: 0.21, 0.146, 0.11

1% (***), 5% (**), and 10%(*)

Table 2 show that both y and g series are integrated of order one at the 1% significance level under unit root tests except KPSS, where the null hypothesis of stationarity is rejected at 5% for y and 10% for g series. Hence, VAR models will add only one extra lag (i.e dmax=1) for the implementation of the causality test. Following the modelling approach described earlier, we determine the appropriate lag length and conducted the cointegration test.

**Table 4: Lag Length Selection**

| Lag | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|
| 0 | NA | 3.32 | 6.87 | 6.95 | 6.90 |
| 1 | 240.05* | 0.007* | 0.75* | 1.00* | 0.84* |
| 2 | 4.25 | 0.007 | 0.83 | 1.24 | 0.98 |
| 3 | 4.74 | 0.008 | 0.88 | 1.47 | 1.09 |
| 4 | 5.98 | 0.008 | 0.89 | 1.64 | 1.16 |
| 5 | 3.12 | 0.009 | 0.98 | 1.90 | 1.32 |
| 6 | 1.20 | 0.011 | 1.13 | 2.22 | 1.53 |
| 7 | 8.08 | 0.01 | 1.02 | 2.27 | 1.47 |
| 8 | 7.14 | 0.009 | 0.91 | 2.34 | 1.43 |
| 9 | 2.71 | 0.01 | 0.99 | 2.57 | 1.56 |
| 10 | 4.38 | 0.01 | 0.96 | 2.72 | 1.60 |

*indicates lag order selected by the criterion
LR: sequential modified LR test statistics (each test at 5% level)
FPE: Final Prediction Error
AIC: Akaike Information Criterion
SC: Schwarz Information Criterion
HQ: Hannan-Quinn Information Criterion

Table 4 reports the optimal lag length of one(i.e m=1) out of a maximum of 10 lag lengths as selected by the five criterion. We employed VAR Residual Serial Correlation LM Tests, reported in Table 5, and inverse roots of the characteristic AR polynomial and found that the VAR is well-specified; there is no autocorrelation problem at the optimal lag at 10% level, all the inverse roots of the characteristic AR polynomial lies inside the unit circle and the modulus values are 1.00, 0.91, 0.26 and 0.18 thus VAR satisfies the stability condition.

**Table 5: VAR Residual Serial Correlation LM Tests**

| Lags | LM-Stat | Prob. |
|---|---|---|
| 1 | 6.044003 | 0.1959 |
| 2 | 5.420044 | 0.2468 |
| 3 | 3.449995 | 0.4855 |
| 4 | 0.420540 | 0.9808 |
| 5 | 0.817372 | 0.9361 |
| 6 | 9.060132 | 0.0596 |
| 7 | 9.354896 | 0.0528 |
| 8 | 2.618812 | 0.6235 |
| 9 | 2.092916 | 0.7187 |
| 10 | 1.206739 | 0.8770 |
| 11 | 1.459567 | 0.8338 |
| 12 | 3.628493 | 0.4586 |

The EG test presented in table 6 shows that the residuals from government expenditure equation are not stationary at level, that is, it is integrated of order one. Therefore, the Engel - Granger cointegration test indicates that the variables in question are not cointegrated.

| Table 6: Stationarity Test of the Residual from g equation | | | | |
|---|---|---|---|---|
| Variable | ADF | PP | KPSS | Order of Integration |
| Residual | -1.036486 [-7.791754*] | -0.997583 [-7.773055*] | 0.320415 | I(1) |

To complement the EG test, the Johansen test is conducted and reported in Tables 7. Table 7 provides the results from the application of Johansen cointegration test among the data set. Empirical findings show that both the maximum eigenvalue and the trace tests do not reject the null hypothesis of no cointegration at both 5 percent and 10 percent significance levels according to critical value estimates. The result show a cointegration rank of zero in both trace test and max-eigen value test at 5% significance level. Thus maximum order of integration for the variables in the system is zero. The results above are based on the assumptions of linear deterministic trend and lag interval in first difference of 1 to 2. Overall, the Johansen cointegration test suggests that there is non-existence of a sustainable cum long-run equilibrium relationship between economic growth proxied by real gross domestic product and the size of government expenditure. This suggests no causality between the series. It, however, does not frustrate the application of causality test only that it provides a possible cross-check on the validity of results at the very end of the analysis.

| Table 7: Result of Cointegration Test | | | | |
|---|---|---|---|---|
| | Null Hypothesis | Test Statistics | 0.05 Critical Value | Probability Value |
| Lags | | 1 | | |
| | | | | |
| Trace Statistics | r=0 | 2.90279 | 15.4971 | 0.9704 |
| | r=1 | 0.003254 | 3,84166 | 0.9528 |
| Max-Eigen Statistics | r=0 | 2.920279 | 15.49471 | 0.9704 |
| | r≤1 | 0.003254 | 3.841466 | 0.9528 |
| Trace | No of Vectors | 0 | | |
| Max-Eigen | No of Vectors | 0 | | |
| [a]Denotes rejection of the null hypothesis at 0.05 level | | | | |

**T-Y Granger Causality Test**

The empirical results of Granger Causality test based on Toda and Yamamoto (1995) methodology is estimated through MWALD test and reported in Table 8. The estimates of MWALD test show that the test result follows the chi-square distribution with 1 degrees of freedom in accordance with the appropriate lag length along with their associated probability.

| Table 8: Toda-Yamamoto Causality (modified WALD) Test Result | | | |
|---|---|---|---|
| Null Hypothesis | Chi-sq | Prob. | Direction of Causality |
| y does not granger cause g | 0.683720 | 0.4083 | No Causality |
| g does not granger cause y | 0.964294 | 0.3261 | |

It is clear from Table 8 that we cannot reject the null of no causality from economic growth to size of government expenditure and from size of government expenditure to economic growth even at the 10% significance level. Therefore, there is no evidence of causality between the series. This is thus consistent with the result obtained from cointegration tests.

**Vector Autoregressive Model**

We have thus established that both series are unit root processes and there is no cointegration. The variables do not share common trends or move together overtime. Hence, the appropriate model is a VAR in first differences involving no long-run elements.

Our estimable VAR model uses both variables in logarithmic first differences and is of the following form:

$$\Delta g_t = \alpha_0 + \Sigma\alpha_1\Delta g_{t-i} + \Sigma\alpha_2\Delta y_{t-i} \quad (5)$$

$$\Delta y_t = \beta_0 + \Sigma\beta_1\Delta y_{t-i} + \Sigma\beta_2\Delta g_{t-i} \quad (6)$$

Since only lagged values of the endogenous variables appear on the right-hand side of the equations, simultaneity is not an issue and equation-by-equation OLS yields consistent estimates. Moreover, even though the error terms may be contemporaneously correlated, OLS is efficient and equivalent to GLS since all equations have identical regressors (Guerrero and Parker, 2007).

Result of our VAR(1)model is reported in Table 9. The first column reports the estimate of the growth in the size of the government equation, and the second column reports the estimate of the economic growth equation. As usual with macroeconomic series, the autoregressive components are important statistical determinants of both series in both columns. The lag of economic growth per capita is statistically insignificant explanatory factor for the size of the federal government, whereas the lag of government size growth is statistically significant in explaining economic growth per capita in the second equation.

Table 9: Vector Autoregressive estimates

| | $\Delta g$ Equation | $\Delta y$ Equation |
|---|---|---|
| $\Delta g_{t-1}$ | -0.296490<br>(0.15231)<br>[-1.94665] | 0.386346<br>(0.18980)<br>[2.03559] |
| $\Delta y_{t-1}$ | -0.031623<br>(0.12206)<br>[-0.25908] | 0.178327<br>(0.15210)<br>[1.17242] |
| Constant | 0.219697<br>(0.04695)<br>[4.67917] | 0.012011<br>(0.05851)<br>[0.20528] |
| R-squared | 0.080948 | 0.086128 |
| Adj. R-squared | 0.040989 | 0.046395 |
| Sum sq. resids | 2.744753 | 4.262155 |
| S.E. equation | 0.244271 | 0.304394 |
| F-statistics | 2.025794 | 2.167648 |
| Log Likelihood | 1.084181 | -9.697874 |
| Akaike AIC | 0.078197 | 0.518281 |
| Schwarz SC | 0.194022 | 0.634106 |
| Standard error in () and t-statistics in brackets in [] | | |

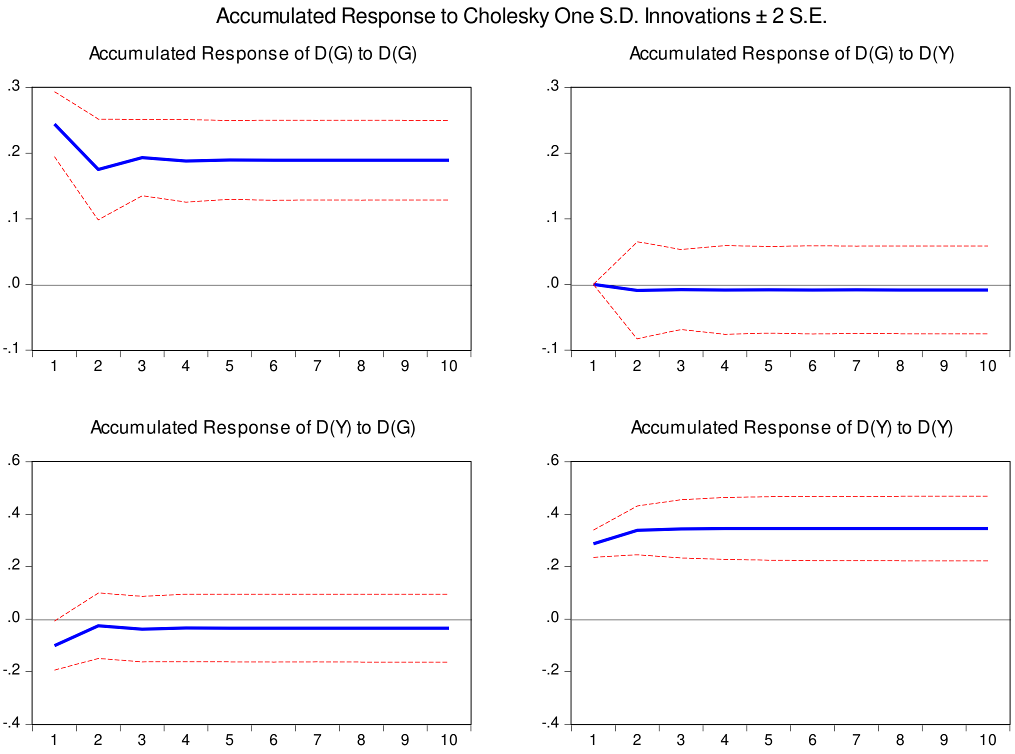
In order for the VAR to be stationary, all the inverse roots of the characteristic AR polynomial must lie inside the unit circle. If this is not the case, impulse-response inferences are not valid. In this case, the modulus values are 0.998769 and 0.912516, and so the VAR is stationary and we can proceed to the impulse-response analysis.

We report both the impulse response functions (IRFs) and the variance decompositions (VDs) to examine the Effect of Federal Government Size on Economic Growth. With the IRFs, we can trace the impact of a one-time shock to a variable on all variables in the VAR over the future time horizon. The VDs would also allow us to capture the percentage variation in the economic growth that is accounted for by the size of government spending. In effect, the VAR model is also useful to see the dynamic relationships between variables.

Impulse Response Analysis:

In order to show the overall effects of innovations to both government expenditure size and economic growth over a long time horizon, we report accumulated impulse-response graphs over a ten-year window in Figure 1.

Figure 1: Accumulated Response to Cholesky One S.D. Innovation




The growth in the size of the government seems to have a statistically significant accumulated effect on economic growth in year 2 , a finding that lends support to Keynesian view, while economic growth has statistically-insignificant effects on the growth in the size of the government at all lags.

**Forecast Error Variance Decomposition**

To further examine the dynamic effects of economic growth and Government size, we examined the Forecast Error Variance Decomposition (FEVD). The test results are presented in tables 9 .An examination of the variance decomposition of growth of size of government in Table 9 (Panel A) shows that a substantial amount of thevariation experienced by government size is attributed to its own shock(100%) in the first period, but the shock fadesout slowly to about 99.87% at the end of period 10. However, the contribution of economic growth marginally follows anincreasing trend from the first to the fifth period, thereafter remains constant till end of the horizon where it stood at 0.129%.

An assessment of the variance decomposition of economic growth in Table 10 (Panel B) shows that a large amount of the variationswitnessed by economic growth is attributed to its own shock ranging between about 83.93% to 88.93% within the timehorizons, but the shocks were noticed to be petering out marginally from the first period to the end of the horizon. The contribution ofgovernment size marginally follows an increasing trend till the end of the period where it stood at about 16.06%.

Table 10: Variance Decomposition of Δg and Δy

| | **(A) Variance Decomposition of Δg** | | | **(B) Variance Decomposition of Δy** | | |
|---|---|---|---|---|---|---|
| Period | S.E | Δg | Δy | S.E | Δg | Δy |
| 1 | 0.244271 | 100.0000 | 0.0000 | 0.304394 | 11.07402 | 88.92598 |
| 2 | 0.254052 | 99.87233 | 0.127666 | 0.317961 | 15.90903 | 84.09097 |
| 3 | 0.254699 | 99.87121 | 0.128791 | 0.318281 | 16.04729 | 83.95271 |
| 4 | 0.254748 | 99.87088 | 0.129121 | 0.318319 | 16.06492 | 83.93508 |
| 5 | 0.254751 | 99.87087 | 0.129134 | 0.318320 | 16.06589 | 83.93411 |
| 6 | 0.254751 | 99.87087 | 0.129135 | 0.318321 | 16.06587 | 83.93402 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 7 | 0.254751 | 99.87087 | 0.129135 | 0.318321 | 16.06598 | 83.93402 |
| 8 | 0.254751 | 99.87086 | 0.129135 | 0.318321 | 16.06598 | 83.93402 |
| 9 | 0.254751 | 99.87086 | 0.129135 | 0.318321 | 16.06598 | 83.93402 |
| 10 | 0.254751 | 99.87086 | 0.129135 | 0.318321 | 16.06598 | 83.93402 |

Finally, we employed traditional Granger causality test to the causal relationship between the growth in the size federal government and growth rate of real per capita GDP (proxy for economic growth). As presented in table 11, the result supports Keynesian view for causality run strictly from growth in the size federal government to growth rate of real per capita GDP and there is no evidence feedback.

**Table 11: VAR Granger Causality/Block Exogeneity WaldTest Result**

| Null Hypothesis | Chi-sq | Prob. | Direction of Causality |
|---|---|---|---|
| Δy does not granger cause Δg | 0.067124 | 0.7956 | Uni-directional |
| Δg does not granger cause Δy | 4.143623 | 0.0418 | Δg → Δy |

## 4.0 Conclusion:

This paper applies unit-root test based on ADF and KPSS and Johansen and Juselius Cointegration test and VAR based Granger Causality Test proposed by Toda-Yamamoto (1995) to investigate whether there is statistical evidence for a causal relationship between federal government expenditures and growth in real per-capita GDP in the Nigeria, using 51- year time series data (1960-2011). After studying the time-series properties of these variables for stationarity and cointegration, we adopted Toda and Yamamoto's (1995) Granger non-causality tests and investigated Granger causality in detail in the context of a Vector Autoregressive Model. The Empirical results from cointegration test indicate that there exists no long-run relationship between government expenditure and economic growth in Nigeria. This study is consistent with Aigbokhan (1996), Essien (1997), Aregbeyen (2006), Babatunde (2007) among others, which suggested that there is no long-run relationship between government expenditure and economic growth. The Toda and Yamamoto's causality test results show that Wagner's Law does not hold for over the period being tested. However, using VAR Granger causality test we found a weak empirical support in the proposition by Keynes that public expenditure is an exogenous factor and a policy instrument for increasing national income in the short run.

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