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Defence Spending and Economic Growth in Nigeria: Is There Any Relationship? Vector Error Correction Model (VECM) Aproach

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This study investigates whether there exists any relationship between defense spending and economic growth in Nigeria, for the period of 1977 to 2010. We employed *ex-post facto* research design in this study as a set of some econometric techniques which utilized to investigate the relationship between defense spending and economic growth in Nigeria. The estimation regression result revealed that, defense (DEF) and Interest rate (INT) had a positive influence on economic growth in Nigeria in the long run, while in the short run defense (DEF) and Interest rate (INT) had a negative influence on economic growth in Nigeria. However, the pairwise granger causality test indicates a bi-directional relationship between defense and economic growth, while there was no causal relationship between interest rate and defense and economic growth respectively. Also, the VEC (Vector Error Correction) residual normality test indicates that the residuals are multivariate and are jointly normal. The study therefore, amongst others recommends that government should increase funding on defense and if possible seek foreign aid so as to adequately tackle the menace of "Boko Haram" insurgency in the northern part of Nigeria so as to attract foreign investment that would further stimulate economic growth and development in Nigeria.

Keywords: economic growth, co-integration, Vector Error Correction Model (VECM), "Boko Haram", insurgency

Introduction

Background of the Study

The role of defense in economic growth and development cannot be over emphasized as every country needs to defend its territorial boarders by equipping its armed force with latest and sophisticated weapons, thus public expenditure on defense is very essential.

In Nigeria, due to insecurity in the country, public expenditure on defense has been increasingly steadily over the years in absolute terms. In 2013, Federal Government in its budget allocated the sum of ₦348.91 billion to defense. This development generated a lot of debate amongst policy makers and public office holders that the amount was too large when compared to other critical sectors of the economy such as agriculture, education, and health.

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Despite the huge budgetary allocation on defense, the issue of "Boko Haram" attacks in the northern part of Nigeria persists, resulting to Federal Government declaring a state of emergency on three states in the North, namely Borno, Yobe, and Adamawa states respectively.

It has been argued that government spending on defense reduces the volume of resources available for spending in other areas of the economy, including education (Adebiyi & Oladele, 2005).

Various empirical studies on the relationship between government expenditure and economic growth also arrived at different and even conflicting results. Some studies suggest that increases in government expenditure on social economic and physical infrastructures impact on long-run growth rate. For instance, government expenditure on health and education raises productivity of labour and increases the growth of national output. Similarly, expenditure on infrastructures such as road, power etc., reduces production costs. It increases private sector investment and profitability of firms, thus ensuring economic growth (Aschauer, 1989; Barro, 1990).

Others observed that growth in government spending, mainly based on non-productive spending accompanied by a reduction in income growth has given rise to the hypothesis that the greater the size of government intervention, the more negative its impact (Akpan, 2005; Olopade & Olopade, 2010; Abu & Abdullahi, 2010).

The broad objective of this study is essentially to examine whether there is any relationship between defense and economic growth in Nigeria. As usual, the paper is structured as follows: Section two provides the empirical literature review, and Section three states the research methodology and the sources of data, while Section four discussed the empirical result. Lastly, Section five provides the conclusion, and offers some recommendations based on the findings.

Theoritical Framework

The theoretical framework that will guide this study has to do with Wagner's Law of increasing state of activities.

Wagner's Law of Increasing State of Activities

The theory as propounded by Adolph Wagner (1835-1917) states that there are inherent tendencies for the activities of different tiers of government in Nigeria Federal, State and local government to increase over time both intensively and extensively, and that these increase of state of activities necessitated the increase of public expenditure.

Wagner's Law therefore postulates that:

- The extension of the functions of the state activities leads to an increase in public expenditure on administration and regulation of the economy.
- Cost overrun with tendencies of inflationary trends over time and with attendant increase in public expenditure on goods and services.
- The rising of drift of population from rural and urban areas with the resultant urbanization demanding for larger per capital expenditure.
- The need to finance these economic plans and growth targets necessitated increasing public expenditure over time.
- State activities continue to grow both in scope and over time beyond the confines of defense, justice, law, and order.

Emperical Literature Review

The relationship between spending and economic growth has attracted the attention of many scholars with no consensus agreement on the above as this has produced mixed results.

Heo (2010) studies the relationship between defense spending and economic growth using feder-ram based and augmented Solow models to test the defense growth nexus in the United States for the period 1954 to 2005; the results indicated that defense spending does not significantly affect the U.S economy. Odusela and Adeyodele (1996) adopted a simultaneous equations model to capture the interrelationship between military expenditure and economic growth in Nigeria and the result suggested that aggregate military expenditure is negatively related to growth.

Also, Oyinlola (1993) examined the relationship between the Nigeria's defense sector and economic development, and the result indicates a positive impact of defense expenditure on economic growth.

Similarly, Donald and Shuanglin (1993) investigated the differential effects of various categories of expenditures on economic growth for a sample of 58 countries; their findings suggest that government expenditures on education and defense have positive effect on economic growth.

Olabode (2012) examined the relationship between the components of defense spending and poverty reduction in Nigeria for the period 1990-2010. Four models were estimated using Dynamic Ordinary Least Square (DOLS) method. The result suggests that military expenditure per soldier, military output per capital square was positively related to poverty indicator. The variables were found to be statistically significant in model two. Military expenditure, secondary school enrolment, and output per capital were negatively related to poverty level. He observed that total military expenditure was statistically significant in model one and three, while output per capital in model three was statistical significant, while others were statistically insignificant.

Anyanwu and Aiyedogbon (2011) investigate the relationship between defense expenditure and economic growth proxy by Gross Domestic Products (GDP). They use macroeconomic variables such as exchange rate, inflation rate, lending rate, gross capital formation, and unemployment rates as well as Structural Adjustment Programme (SAP) included dummy variable to capture the impact of policy changes. The co-integration and vector error correction mechanism were employed to analyzed the all the variables. The result suggests that all the variables have a long-run relationship and that there was positive relationship between military expenditure and economic growth in the long run and short run. However, the variance decomposition results indicated very little contribution of the military sector to the variables employed. They thus recommended that the present level of funding of the military should be sustained.

Chowdhury (1991) examined three causal relationships between military expenditure and economic growth in 55 LDCs using granger causality test for the period of 1961-1987. The result indicates that there is lack of consistent causal relationship between military expenditure and growth across different countries.

Oriawote and Eshenake (2013) studied the impact of security expenditure on the level of economic growth in Nigeria, using data for the period of 1980-2010; the Error Correction Model (ECM) result indicates that expenditure on defense has a negative impact on economic growth while expenditure on internal security played an important role in generating the desired level of economic growth in Nigeria. They observed that the significance was below expectations. The results of the variance decomposition show that the shocks of expenditure on defense did not significantly explain changes on economic growth in Nigeria while the result of the Johansen co-integration test shows that there exists a long rain relationship between the variables.

Also Ferda (2004) used new macroeconomic theory and multivariate co-integration procedure, examined defense spending and economic growth in Turkey between 1950 and 2002 and found positive long-run relationship between aggregate defense spending and aggregate output in the country.

Similarly, Serzgin (2001) studied Turkey's defense growth relationship and found out that defense spending in Turkey benefited growth.

In a cross sectional data for 64 countries by Galvin (2003) who used three equations to investigate the impact of defense spending on economic growth, found that military spending has a negative impact on economic growth.

Study by Olaniyi (1993) observed that defense spending in Nigeria contributed positively to real growth of GDP and had a dampening effect on inflation rate and stated that the impact was statistically low when compared.

Also, Dakurah, Davies, and Sampath (2001) studied the causal relationship between military burden and economic growth for 62 countries using co-integration and error correction model and found no causal relationship between military burden and economic growth among these countries.

This study therefore focuses on covering the research gap with the aim at investigating the relationship between defense spending and economic growth in Nigeria as deficiency on several studies on the above.

Research Methodology

Research Design

We adopted *ex-post facto* research design in this study as a set of multivariate estimation techniques were applied to investigate the relationship between defense spending and economic growth in Nigeria.

Sources of Data

Sources of data are an important part of research study. Thus the data set used was completely secondary sources of data and was sourced from reputable journals, Central Bank of Nigeria (CBN), and those of the National Bureau of Statistics (NBS) for the period 1977-2010.

Model Specification

One of the basic relationship in economic theory is the Cobb-Douglas production function which relates output to factor inputs such as labour (L) and capital (K). The general form of this relationship is thus given as:

$$Y_r = f(K_t, \mathrm{L}_t) \tag{1}$$

where

Y = Output

K = Capital

L = Labour

t = the annual time series.

Furthermore, in order to explore the dynamic nature of the variables and precisely capture the relationship between defense spending and economic growth in Nigeria, the study employs a Vector Error Correction Model (VECM) approach as expressed below.

Vector Error Correction Model (VECM)

A Vector Error Correction Model (VECM) is a restricted VAR, specifically designed for use with non-stationery series/variables that are known to be co-integrated. Thus, VECM is a multivariate model that incorporates co-integrating equations. In this study, we adopted Afees (2012) Model for our analysis. The model is specified as follows:

$$Y_t = C + \prod_1 Y_{t-1} + \prod_2 Y_{t-2} + \ldots \prod_p Y_{t-p} + \xi_t; \ t = 1, \ldots T \quad (2)$$

where $Y_t = (Y_{1t,}, Y_{2t,} Y_{3t,} \ldots, Y_{nt})$, n denotes the numbers of endogenous variables; P is the lag length and $\prod$ is an (n x m) matrix of coefficients and t is the time period.

Equation (2) above can now be expressed as:

$$\Delta Y_t = \Gamma_1 \Delta Y_{t-1} + \Gamma_2 \Gamma \Delta Y_{t-2} + \ldots \Gamma_{p-1} \Delta Y_{t-p} + \Phi Y_{t-1} + \xi_t; \ t = 1, \ldots T \quad (3)$$

where, $\Gamma_t = -(\mathrm{I}-\prod_1 - \prod_i)$ ($i = 1 \ldots p-1$) and $\Phi(\mathrm{I}-\prod_1 - \ldots - \prod_p)$. $\Phi = a\beta$, where a represents the speed of adjustment to disequilibrium and β is a matrix of long-run coefficients. Thus, the term βY_{t-1} embedded in equation (3) above is equivalent to the error correction term in a single equation, except that βY_{t-1} contains up to (n-1) vectors in a multivariate model.

The study commenced first by conducting or testing for unit root tests; this is so because most time series variables are non-stationary, thus using a non-stationary variable in the model might lead to a spurious regression (Granger, 1969).

In this study, we adopted Augmented Dickey-Fuller (ADF).

Discussion of Empirical Result

Augment Dickey-Fuller (ADF) Test. The test for unit roots result indicates that all the variables are stationary at first difference. The variables were all integrated of the same order 1 (1) see Table 1 as presented.

Table 1

Augmented Dickey-Fuller (ADF) Nut Root Test Result

Variables	ADF Test statistics	5% Critical values	10% Critical values	Order of integration	Remark
RGDP	-3.259064	-1.951687	-1.610579	1 (1)	Stationary
DEF	-6.460278	-1.952066	-1.608793	1 (1)	Stationary
INT	-7.215638	-1.951687	-1.610579	1 (1)	Stationary

Source: Eview output.

Johansen Cointegration Test

The Johansen co-integration test as developed by Johansen (1988) essentially used to determine the rank and identify a long-run relationship between variables. The result of the co-integration tests are reported below in Table 2.

Table 2

Co-integration Test Results. Trend Assumption: Linear Deterministic Trend Series: RGDP DEF INT

Hypothesized No of CE(S)	Eigen value	Trace statistics	0.05 Critical value	Prob**
None*	0.551123	35.69087	29.79707	0.0093
At Most 1	0.172795	10.05865	15.49471	0.2762
At Most 2*	0.117177	3.988165	3.841466	0.0458

Notes. Trace test indicates 1 co-integration eqn(s) at the 0.05 level; * denote rejection of the hypothesis at the 0.05 level; ** Mackinnon-Hang-michelis (1999) P-Values. Source: Eview output.

From Table 2 above, the co-integration test result indicates that there exists one unique cointegrating relationship between the variables at the 5% level of significance, thus, we can conclude that there exists a long-run relationship between the variables of interest such as RFDP, DEF, and IINT. The test statistics therefore denote the rejection of the null hypothesis of no co-integration relation between the variables at the 5% level of significance.

Vector Error Correction Model (VECM) Test Results

Base on the Johansen co-integration rank test (Trace) results, we proceeded to perform the VECM test. The results of the VECM test as hereby presented below in Table 3.

Table 3

Vector Error Correction Model (VECM) Test Results

Variables	D(RGDP)	D(DEF)	D(INT)
D(RGDP (2))	2.060101	-2.189335	6.14E-05
	(1.83130)	(2.75687)	(0.00020)
D(DEF(2))	-4.331701	4.134717	8.96E-05
	(3.89962)	(5.87056)	(0.00042)
D(INT(2))	-2146.281	-288.9936	-0.347426
	(2020.54)	(3041.75)	(0.21930)
D(ECM(2))	-2.126346	2.264363	60.0E-05
	(1.81048)	(2.72552)	(0.00020)
R-Squared	0.344149	0.512505	0.368401

Source: Eview output.

From Table 3 above the VECM test result shows that DEF and INT has a negative effect of economic growth. However, our findings did not support finding of Eregba, Sede, and Onotaniyohwo (2012). Furthermore, the ECM as expected indicated the correct sign.

Pairwise Granger Causality

To enable us determine the existence of short-run causality in the model, we proceeded furthermore to estimate the Pairwise Granger Causality test. Table 4 therefore presents the results.

Table 4

Pairwise Granger Causality Tests. Sample: 1997-2010. Lags: 2

Hypothesis	Obs	F-Statics	Prob
DEF does not Granger Cause RGDP	32	4.45895	0.0212
RGDP does not Granger Cause DEF		4.77581	0.0168
INT does not Granger Cause RGDP	32	0.85202	0.4377
RGDP does not Granger Cause INT		0.3445	0.7116
INT does not Granger Cause DEF	32	0.26301	0.7707
DEF does not Granger Cause INT		0.23687	0.3062

Source: Eview output.

Based on the probability values as reported above in Table 4, the result indicates that relationship between DEF and RGDP is bi-directional as it runs from DEF to RGDP and RGDP to DEF as shown above. We therefore reject the null hypothesis and concluded that at 5% significance level, DEF granger cause RGDP. From the results above defense spending granger cause economic growth in Nigeria. The second and the third row as reported indicate no causal relationship between INT and RGDP and also DEF and INT, respectively.

VEC Residual Normality Test

A VEC Residual Normality diagnostics test was carried out to further validate the results shown above, thus Table 5 presents the result of the VEC Residual Normality Test.

Table 5

VEC Residual Normality Tests Orthogonalization: Cholesky (Lutkephl) Included Observation: 30

Component	Skewness	Chi-sq	Df	Prob
1	2.260347	25.5484	1	0.0000
2	3.708013	58.07276	1	0.0000
3	-0.427603	0.914223	1	0.3390
4	-0.339538	0.596430	1	0.4470
Joint		85.10925	4	0.0000
Component	Kurtosis	Chi-sq	Df	Prob
1	10.22251	65.20581	1	0.0000
2	16.69776	234.5353	1	0.0000
3	4.287571	2.072299	1	0.1500
4	5.463722	7.58748	1	0.0059
Joint		309.4014	1	0.0000
Component	Jarqua-Bera	Df	Prob	
1	90.45164	2	0.0000	
2	222.6086	2	0.0000	
3	2.986522	2	0.2246	
4	8.163838	2	0.0169	
Joint	394.5106	8	0.0000	

Source: Eview output.

From Table 5 above VEC Residual Normality Test suggests that the residuals normality tests are all normal as the probability values are jointly and statistically significant at 5% level respectively.

Conclusion and Recommendations

This study investigates whether there is any relationship between defense spending and economic growth in Nigeria, for the period of 1977 to 2010. The study employs Vector Error Correction Model (VECM) approach and utilizes Pairwise Granger Causality tests, with other diagnostics test such as VEC Residual Normality test carried out to further examine the short-run dynamics and causal relationship between the variables of interest. The ADF unit root tests result indicates that all the variables were stationary at first difference. The Johansen co-integration test result revealed the existence of one co-integration equation relationship between the variables at the 5% level of significance. The estimation regression result revealed that defense (DEF) and interest rate (INT) has a positive influence on economic growth in Nigeria in the long run but with negative effect in the short run. The Pairwise Granger Causality test indicates a bi-directional relationship between defense and economic growth while there was a causal relationship between interest rate and defense and economic growth respectively. Finally, the VEC Residual Normality test indicates that residuals are multivariate jointly normal. In view of the above, the study strongly recommend amongst others that government should increase funding on defense so as to adequately tackle the menace of “Boko Haram” Insurgency in Nigeria and further attract foreign investment that would stimulate economic growth and development and that monetary authorities should effectively apply appropriate interest rates in the country so as to encourage borrowing and accelerate economic growth and development in Nigeria.

References

Abu, N., & Abdulahi, U. (2010). Government expenditure and economic growth in Nigeria, 1970-2008: A disaggregated analysis. *Business and Economic Journal, 4*(3), 237-330. Retrieved from http://astoujournals.com

Aebiyi, M. A., & Oladele, O. (2005). *Public education expenditure and defense spending in Nigeria: Empirical investigation*. Akoka-Yaba, Lagos: Department of Ecnomic University of Lagos.

Afees, A. S. (2012). *Econometric Workshop on VAR and VECM Lecture Notes*. University of Ibadan, Nigeria.

Akpan, N. (2005). Government expenditure and economic growth in Nigeria: A disaggregated approach. *CBN Economic and Financial Review, 43*(1), 51-69.

Anyauwu, S., & Aiydegboon, J. O. (2011). Defense expenditure and economic in Nigeria: A Vector Error Correction Model (VECM) approach. *Asian Journal of Empirical Research, 1*(2), 31-40.

Aschauer, D. (1989). Is public expenditure productive? *Journal of Monetary Economics, 232*(2), 177-220.

Barro, R. J. (1990). Government spending in a simple model of endogenous growth. *The Journal of Political Economy, 98*(5), 103-125.

Chowdhury, A. R. (1991). Defense spending and economic growth. A casual analysis. *Journal of Conflict Resolution, 35*(1), 80-97.

Donald, N. B., & Shuanglin, L. (1993). Different effects on economic growth of government expenditures on education, welfare and defense. *Journal of Economic Development, 18*(1).

Dakurah, H., Davies, S., & Sampath, R. (2001). Defense spending and economic growth in developing countries: A causality analysis. *Journal of Policy Modelling, 23*(6), 651-658.

Eregba, P. B., Sede, P. I., & Onotaniyohwo, F. O. (2012). Does the composition of public expenditure matter for growth in Nigeria. A Vector Error Correction Approach. *Pakistan Journal of Social Science, 9*(3), 125-131.

Ferda, H. (2004). Defense spending and economic growth in Turkey. An empirical application of new macroeconomic of new Theory. *Review of Middle East Economic and Finance, 2*(2), 193-200.

Galvin, H. (2003). The impact of defense spending on economic growth of developing countries: A cross section study. *Defense and Peace, 14*(1), 51-59.

Heo, U. K. (2010). The relationship between defence spending and economic growth in the United States. *Political Research Quaterly*. University of Wiscosin Milwankee.

Odusela, F., & Adeyodele, F. (1996). Military expenditure and economic growth. *Nigerian, Journal of Economic and Social Studies, 38*(1, 2, & 3), 199-211.

Olabode, P. O. (2012). Defenses spending and poverty reduction in Nigeria. *American Journal of Economic, 2*(6), 122-127.

Olaniiyi, O. (1993). Nigeria nation defense and economic development: An impact analysis. *Nigeria Journal of Economic and Social Studies, 38*(1).

Olopade, B. C., & Olopade, D. O. (2010). The impact growth and development in developing countries: Nigeria as a case study. Igbinedion University Okada, Edo State, Nigeria.

Oriavwope, V. E., & Eshenake, S. J. (2013). A Vector Error Correction Modeling of security spending and economic growth in Nigeria. *Journal of Accounting and Finance, Research, 2*(2), 59-68.

Oyinolola, O. (1993). Nigerian's national defense and economic development: An impact analysis. *Scandinavian Journal of Development Alternative, 12*(3), 241-252.

Serzgiu, S. (2001). An empirical analysis of Turkey's defense growth relationship with a multi-equation model. *Defense and Peace Economics, 12*(1), 69-81.

Appendix A

Estimation Regression Result

Dependent Variable: RGDP

Method of least squares

Date: 07/05/15

Time: 15:59

Sample: 1997-2010

Included observation: 3x

Variable	Coefficient	Std error	T-statistics	Prob
C	162620.4	54187.67	3.001060	0.0053
DEF	2.136469	0.282033	7.5755232	0.0000
INT	5486.781	3890.750	1.410212	0.1684
R-Squared	0.650791		Mean Dependent Var.	322018.2
Adj. R-Squared	0.628261		S. D. Dependent Var.	200095.2
S. E. of Reg.	121998.8		Akaike Info Criterion	26.34551
Log Likelihood	-444.8736		Haunan Quinn Criter	26.39144
F-Statistic	28.88598		Durbin-Watson Stat	1.384887
Prob(F-Statistic	0.000000			

Source: Eview output.