Macroeconomic Determinants of Defence Expenditure in Nigeria (1970 – 2011)

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Abstract

This paper reviewed and analyzed the macroeconomic determinants of defence spending in Nigeria. Defence spending has continued to rise at the expense of limited financial resources, thus creating opportunity cost as other sectors of the economy are stifled of financial resources. Previous research studies provide mixed results on determinant of defence expenditures in developing countries. Macroeconomic variables like Revenue from oil and non oil sectors were ignored in previous studies. This study employed the technique of cointegration which helps to explain the long run relationship among variables. Also, the Granger causality test and vector autoregressive (VAR) model were utilized for the analysis of the study. The cointegration test revealed evidence of long run relationship of the variables in the model. The estimated least square equation showed that revenue from oil, revenue from other sectors and defence expenditure had a long run equilibrium relationship. The ganger causality test result showed evidence of unidirectional causality from oil and non oil revenue to defence expenditure. The result of the VAR model provides useful and reliable information about the response of a defence variable to innovations in another variable. The result was very robust as oil revenue, foreign exchange rate, real gross domestic product and non oil revenue had an outstanding long term influence on defence spending. The study recommends improve revenue collection, transparency and stable macroeconomic variables as a means of improving defence spending that creates a spin off effect in the economy.

Keywords: *Defence Expenditure, Revenue, Cointegration, Causality, Vector Autoregressive Models*

1.0 Introduction

Owing to the increasing rate of illiteracy received by children and the increasing HIV/AIDS scourge which have affected large number of the population and in turn limited the extent of labour supply in less developing countries, money should not be invested on needless arms. Unfortunately, spending on military activity has been on the increase. Over three decades, there have been different strands of theoretical and empirical studies, of which the basic objective is to unveil the various macroeconomic variables that affect defence spending in developing countries.

The Nigerian nation is currently passing through some terrible challenges in the area of insecurity. In fact the fear that the country is on the brick of total disintegrating appear to occupy many people's mind. The study of the determinants of government expenditures is very crucial and required a comprehensive analysis. Developing economies are faced with increase size of fiscal operations and defence sector burden is high. In Nigeria, budgeting for defence in order to equip and make the military sector combat ready to surmount the growing insecurity challenges is of paramount interest to the government of Nigeria. In the past particularly after the World War II, the need to reduce defence spending received some level of support. But, defence spending continued to fluctuate with an attendant concentration on the upward trends. Most important, the Nigerian defence expenditure is one of the most resilient expenditures such that any downward trend in defence expenditure results from the fall in oil revenue collection. There have been series of conflicting and complexes of opinions concerning macroeconomic variables that determined defence spending in Nigeria. Bello (1995), Odusola (1996), Adebiyi and Oderinde (2005), Aiyedogbon (2007) and Omojimite (2012) have used macroeconomic variables such as recurrent defence expenditure, capital defence expenditure, total defence expenditure, inflation, technology (the need for spin off effect), savings, exchange rates, employment and type of regimes to measure defence expenditure in Nigeria.

However, the analyses of these studies showed no consensus. Also, the series of studies on the determinants of defence expenditure failed to include revemue collection as a major determinant of defence spending in Nigeria. Smith (1980) argued that a response relative to available resources is one of the reasons for escalating level of defence spending.

In the views of Deger and Sen (1992), the use of revenue share is often considered appropriate in the calculation of defence expenditure. Niloy, Emranul and Dennis (2003) opined that previous studies on public expenditure treat the determinants of expenditure away from revenue. It is in the light of this major loophole that this present work attempts to analyze macroeconomic determinants of defence spending in Nigeria. This suggests the inclusion of revenue collection as one of the variables that determines defence expenditure. The quantity of defence budgetary allocation is a function of available revenue. Revenue in this study is separated into oil and gas and non oil and gas revenues. From a macroeconomic perspective, revenue collection depends on the taxes and sales of goods and services by the government. The collected revenue is made available as resources for financing various government ministries, agencies and trade which in turn increase economic activity that generate high potential for increase revenue. Basically, this study shall attempt to investigate the long run and causal relationship between defence expenditure and its determinants as well as the innovations in defence expenditure as a result of innovations in its determinants. This work is divided into five sections. Section one is the introduction. Section two dwells on the theoretical framework and literature review while section three is the methodology of the study and section four is the presentation of results and analysis of the macroeconomic determinants of defence expenditure in Nigeria. Section five is the conclusion of the study. This study spanned between 1970 – 2011. This period was chosen because of foreign exchange rate regime that was deregulated since 1986. This made the naira currency to determine its rate of exchange in the market.

2.0 Review of Literature

2.1 Theoretical Framework

This study adopts the growth of public expenditure theory postulated by Wiseman and Peacock (1961). The study found that public expenditure does not increase in a smooth and continuous manner, but in jerks or step like fashion. In their submission, Wiseman and Peacock (1961) maintained that disturbances create the need for increase public expenditure of which the existing public revenue could not meet. With a change in the initial level of revenue, public expenditure will increase to meet the growing need of the society. The new level of taxation that increase revenue is known as displacement effect.

In Nigeria the need to increase defence labour force and improve on their skills in order to reduce the growing insecurity has continued to increase defence budgetary allocation. Wiseman and Peacock also maintain that there is the apparent tendency for the central government economic activity to grow faster than that of the state and local governments. This results from the inherited expenditure obligations of the state and local governments during the disturbance period and after which it will find it difficult to transfer. This is the concentration effect of expenditure. The concentration effect appear to have a permanent influence on public expenditure, once the change towards centralization is made, it becomes easier to render it permanent. Wiseman and Peacock consider as well, within their analysis, the “inspection effect”, which operates from the demand-side: a war brings into focus problems which were not identified before and which require further government spending.

Bhatia (2008) opined that it is the inadequacy of the revenue as compared with the required public expenditure that creates an inspection effect. In periods of crises, the parliament will review the revenue position and the needs to find a solution of the important problems that came up and agree to the required adjustments to finance the increased expenditure. The Nigerian economy since 1999 has been a victim of growing domestic insecurity which manifested in the form of religious crisis, political, ethnicity, economic crisis and labour and student unrest. Each of these disturbances led the government assuming a larger proportion of the total national economic activity through defence spending. The Wiseman-Peacock hypothesis is very convincing and suitable for this study.

Musgrave and Musgrave (2005) provide some variables as the possible factors responsible for public expenditure growth. These are the growth of per capita income, technological change, population change, urbanization, availability of tax handles, war finance cost of public services, political factors like democratic set up etc. From the aforementioned, it is certain that the authors have proffered various means through which public expenditure increase.

Although, different techniques were used in their research especially on displacement effect, they converged on insecurity as the reason for defence expenditure increase but it's obvious that the size of revenue determines the volume of defence expenditure.

2.2 Empirical Literature

Dunne and Perlo-Freeman (2001) conducted a study on the demand for military spending in developing countries. The results suggest that military burden depended on neighbour's military spending and internal and external conflict. Nikolaidou (2008) employed an autoregressive distributed lag (ARDL) approach and cointegration test to estimate a general model of aggregate defence spending for each of the 15 core European Union countries over the period 1961 – 2005. The findings indicated that there is very little uniformity in the factors that determine each country's demand for military expenditure. However, population, share of trade balance, United States military burden, government expenditure and real gross domestic product were variables that affect military expenditure in the study.

Odusola (1996) developed a two stage least square method with instrumental variables to explain the trends of military expenditure in Nigerian economy during the period 1970 – 1996. Variables like recurrent and capital military spending were responsible for the volume of military spending in Nigeria. Olowononi and Aiyedogbon (2008) conducted a study on the trends of defence spending in Nigeria between 1986 – 2006. Using ordinary least square, the study finds that per capita income, openness, exchange rate and inflation were the main determinants of defence spending in Nigeria. In another study, Aiyedogbon (2011) adopted a co-integration test and vector error correction models to determine the relationship between military expenditure and gross fixed capital formation in Nigeria. The findings showed that gross fixed capital formation in Nigeria does not determine military expenditure. A high income may account for higher military spending particularly for Nigeria and this may translate into a higher military burden. Also, higher income can lead to structural changes, inequalities and hence conflict requiring higher military spending to maintain internal control (Maizels and Nissanke, 1986).

The effect of openness of a country on a is measured by the share of trade. This suggests that the more a developing country benefits from international trade, the higher the nation's spending on defence. Looney and Frederickson (1990) examine the economic determinants of military expenditure in selected Asian countries. The study developed a simple linear regression equation and discovered that increase in military spending is a function of increase in a country's expected gross national product. Tambudzai (2005) applied a log-linear model specification based on the standard neoclassical theory of Smith (1989 and 1995) to estimate the determinants of military expenditure in Zimbabwe. It utilizes OLS estimations on co-integrated variables and came up with long run and short run error corrections model (ECM). The empirical findings suggest that Zimbabwean military expenditure has been influenced by both external and internal factors. The significant factors include regional wars, military expenditure of neighbouring countries, income, government domestic borrowing ability and trade balance.

Military expenditure also depends on the actions of external weapons suppliers and donors of military aid. Dommen and Maizels (1988) found that the growth of foreign exchange was a significant determinant of military spending for the Asian region. Amongst the numerous economic demands for military expenditure, the growth and availability of foreign exchange was an important determinant of military spending especially for arms non-producers. Collier and Hoeffler (2004) measured internal threat by estimating the probability of a civil war breaking out using a logit model. The estimated variable of domestic threat had a more significant effect on military expenditure than international war in developing countries between 1960 and 1999.

Along similar direction, Harris (2002) opined that the relative strength and ability of the military pressure group affects military expenditure allocation. In another study Killian (1998) highlighted on factors such as size of territory and population in a country as a significant determinant of the level of military spending. These variables cannot be manipulated to minimize excessive spending. Qian and Qiao (1999) empirically investigated the determinants of China military expenditure between 1965 – 1993. The study showed that China's gross national product, its rivals (such as Japan, South and North Koreas) military expenditures, its border wars with neighbouring countries, and its leadership preferences are likely determinants of China military expenditures.

Hewitt (1992) developed a simultaneous equation to examine the trends in world military expenditures and their determinants in 125 countries within a timeframe of 1972 to 1988. The simultaneous equation framework based on a public choice model showed military expenditures as a ratio of GDP is influenced by the level of GDP, central government expenditures, other financial indicators, the form of government, and geographical characteristics of countries. Smith (1980) provided a historical explanation of the determinants of defence expenditure. The study revealed that the state decision making process, perception of threat, responses relative to available resources are the main determinants of the level of a countries defence spending. Landau (1994) in a World Bank study of military expenditures concluded that external threat was a key determinant of military spending. Within alliances, smaller countries tend to "free ride", spending less than larger countries even as a fraction of GDP. Countries located in Island, mountainous or remote environment are easier to defend and require less military spending. Anna (2010) estimated the demand function of military expenditure for developing countries using weighted average least squares, drawing on a database from 1986 to 2005 containing information on 75 developing countries. The outcome of the estimated results showed that the levels of international trade and neighbour's military expenditure as well as their interaction are important determinants of military expenditure. In another development Collier and Hoeffler (2007) indicates that aid is a significant component that determines military burden.

Hamid and James (2003) used panel regression with country level observations from 1987 – 1997 to investigate military spending and inequality relationship. The result indicates a consistent estimate of a positive effect of military expenditure on pay inequality. Given the close relationship between pay and income the result suggests that a country's reduction in military spending is influenced by series of economic, political, social and geographical factors. From the series of articles reviewed macroeconomic factors like revenue and natural resources have not been investigated as determinants of military spending in Nigeria. The variable revenue was decomposed into oil and non oil revenue. This was to isolate their respective influence on defence expenditure in Nigeria within the period under review.

3.0 Methodology

3.1 Source of Data

The source of data for this analysis is the Central Bank of Nigeria statistical bulletin volumes 19 and 20. Annual time series data were employed for the regression estimate. Time series variables are non-stationary and using non-stationary variables in the model might lead to spurious regressions and misleading interpretation (Granger, 1969). The data obtained for this study was subjected to econometric views for regression estimates in order to discuss the empirical outcome of the study.

3.2 Unit root Test

The first or second difference term of most variables will usually be stationary (Ramanathan, 1992). All the macroeconomic variables for this study were tested using the unit root test of Augumented Dickey-Fuller (ADF) and Phillip-Perron (PP) statistic. The macroeconomic variables involved in the unit root tests are log values of gross domestic product (LGDP), defence expenditure (LDE), foreign exchange rate (LFER), rate of inflation (LIR),oil revenue (LROGS) and non oil revenue (LNOGS). The results of ADF and PP tests are reported in Table

1. The ADF test is conducted using equation (1) which includes constant and time trend.

$$\Delta Y_t = b_0 + b_1 y_{t-1} + \sum_{i=1}^{k} b_1 \Delta Y_{t-I} + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

$$\Delta Y_t = b_0 + b_1 y_{t-1} + \sum_{i=1}^{k} b_1 \Delta Y_{t-I} + \Phi_t + u_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 2$$

Where ΔY_t = is the first difference of the time series Y, it assumed to be a linear time trend, b_0 is a constant, *k* is the lag order, *t* is the time series and u is the random error term.
The PP test was carried out with the expressed equation 3 below:

$$Y_t = a + bY_{t-1} + c(t + T/2) + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 3$$

Where *a, b* and *c* are the coefficient and T is the total number of observations.

3.3 Econometric Framework

This study utilized vector auto regression (VAR) model. VAR model is a statistical model used to capture and explain the linear interdependencies among multiple time series data. All the variables in a VAR model are treated symmetrically; each variable has an equation explaining its evolution based on its own lag and the lags of all the other variables in the model. This model was adopted because it was most successful, flexible, and easy to use for the analysis of multivariate time series. It is also useful especially in the description of dynamic behaviour of macroeconomic time series variables, for forecasting and policy analysis.

This paper assumed that a change in macroeconomic variables such as oil revenue, non oil revenue, inflation rate, foreign exchange rate and real gross domestic product will account for the nature and size or volume of military expenditures in Nigeria. The size of this shock can best be determined by a VAR model. The VAR model also provide access to forecast of error variance decomposition and impulse responses to be estimated (Omojimite, 2012; Adebiyi and Oderinde, 2005). The VAR model for this study was adopted from Omojimite (2012) and Adebiyi and Oderinde (2005), however, with some modification that suit this present study.

The VAR model is expressed as

$$Y_t = L\,M_1 Y_{t-1} + M_2 Y_{t-2} + ... + M_p Y_{t-p} + u_t \quad \text{.....4}$$

Where L is a k x 1 vector of constant or intercept. M is a k x k matrix (for every I = 1, … p) and U_t is a k x 1 vector of the vector of random errors that are normally distributed with mean zero and constant variance. Presenting the VAR model in a matrix notation showed the following equation:

$$Y = BZ + Y$$

$$\begin{matrix} Y_{1t} \\ Y_{2t} \end{matrix} = \begin{bmatrix} M_1 \\ M_2 \end{bmatrix} + \begin{bmatrix} L_{11} & L_{12} \\ L_{21} & L_{22} \end{bmatrix} \begin{bmatrix} Y_{1t-1} \\ Y_{2t-1} \end{bmatrix} + \begin{bmatrix} u_{1t} \\ u_{2t} \end{bmatrix} \quad \text{.....5}$$

The VAR model above can be transposed as

$$\begin{matrix} \Sigma Y_{1t} \\ \Sigma Y_{2t} \end{matrix} = \begin{bmatrix} 1 & M_{12} \\ M_{21} & 1 \end{bmatrix}^{-1} + \begin{bmatrix} U_{1t} \\ U_{2t} \end{bmatrix} \quad \text{.....6}$$

So that

$$\Sigma Y_{1t} = \frac{UY_{t-1} - M_{12} UY_{t2}}{1 - M_{12} M_{21}} \quad \text{.....7}$$

$$\Sigma Y_{1t} = \frac{UY_{t-2} - M_{21} UY_{t1}}{1 - M_{12} M_{21}} \quad \text{.....8}$$

Or, equivalently, as the following system of two equations

$$Y_{1t} = L_1 + M_{11} Y_{t-1} + M_{12} Y_{t-1} + u_{1t} \quad \text{.....9}$$

$$Y_{2t} = L_2 + M_{21} Y_{t-1} + M_{22} Y_{t-1} + u_{2t} \quad \text{.....10}$$

This study employed the cointegration model in order to demonstrate the existence of a long-run relationship between economic dependent and independent variables. The principle of testing for cointegration is to test whether two or more integrated variables deviate significantly from a certain relationship. In other words, if the variables are cointegrated, they move together over time so that short-term disturbances will be corrected in the long-term. This cointegration relationship implies that the variables share mutual stochastic trends and are linked in common long run equilibrium.

Granger (1988) argued that when the series becomes stationary only after being differenced once (integrated of order one), they might have linear combinations that are stationary. Such series are "cointegrated". If integration of order one is implied, then the next step is to use cointegration analysis in order to establish whether there exist a long-run relationship among the set of the integrated variables in question.

The macroeconomic variables for this study includes defence expenditure (LDE), real gross domestic product (LRGDP), foreign exchange rate (LFER), rate of inflation (LIR), poil revenue (LROGS) and nin oil revenue (LRNOGS). Defence expenditure (LDE) is the explained variable while other variables are the explanatory factors.

4.0 Presentation of Estimated Results and Analysis

Table 4.1: Augmented Dickey Fuller (ADF) and Phillip Peron (PP) Test Statistics Results.

Variable	95% ADF test statistics	Critical Value	Order of integration	95% PP test statistics	Critical value	Order of integration
LDE	-4.836453	-2.9422	I(1)	-6.797302	-2.9399	I(1)
LRGDP	-3.924566	-2.9422	I(1)	-5.537662	-2.9399	I(1)
LIR	-6.078978	-2.9422	I(1)	-6.280501	-2.9399	I(1)
LRNOGS	-3.772955	-1.9504	I(2)	-8.277034	-2.9399	I(1)
LROGS	-2.308817	-1.9504	I(2)	-9.226932	-2.9399	I(1)
LFER	-3.605664	-2.9422	I(1)	-5.271912	-2.9399	I(1)

4.1 The Unit root Statistic Test for Stationarity.

This study presents the result of Augmented Dickey-Fuller (ADF) and Phillip Peron (PP) unit root statistic test in Table 4.1 above. All variables were non stationary at the level, but after the first and second differencing at 5% all the variables became stationary indicating the avoidance or absence of a spurious regression estimates and misleading interpretation of results in this study. This finding suggests the presence of co-integration between the dependable variable LDE and its explanatory variables LRGDP, LIR, LRNOGS, LROGS and LFER. The estimated PP test statistic result indicates a long-run relationship between the variables in the model.

Table 4. 2: The Johansen Cointegrating System Test Result.

Date: 05/20/13 Time: 19:29
Sample (adjusted): 1972 2009
Included observations: 39 after adjustments
Trend assumption: Linear deterministic trend
Series: LDE LFER LIR LRGDP LRNOGSL ROGS
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigen-value	Trace Statistics	0.05 Critical Value	
None *	0.799765	61.11396	95.75366	0.0000
At most 1 *	0.676104	42.83868	69.81889	0.0000
At most 2 *	0.506932	26.87010	47.85613	0.0035
At most 3 *	0.354550	16.63670	29.79707	0.0292
At most 4	0.262019	11.54583	15.49471	0.0564
At most 5	0.090303	3.596450	3.841466	0.0579

Table 4.3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue).

Hypothesized No. of CE(s)	Eigen-value	Max-Eigen Statistic	0.05 Critical Value	Prob.**
At most 1 *	0.676104	42.83868	33.87687	0.0033
At most 2	0.506932	26.87010	27.58434	0.0615
At most 3	0.354550	16.63670	21.13162	0.1898
At most 4	0.262019	11.54583	14.26460	0.1289
At most 5	0.090303	3.596450	3.841466	0.0579

4.2 Analysis of Cointegration Results.

Table 4. 2 above depicts the result of Johansen conintegration test of two likelihood ratio test statistics – the Trace statistic and the Maximum Eigen value which are commonly used to determine the number of cointegrating vectors in a study. The Johansen cointegration test reveals that there are at least four cointegrating vectors in the series. This is an evidence of co-integration among the variables and it is an indication of a long-run relationship between the explained variable defence expenditure (LDE) and its explanatory variables - real gross domestic product (LRGDP), inflation rate (LIR), non oil revenue (LRNOGS), oil revenue (LROGS) and foreign exchange rate (LFER). The co-integration test was performed for the series as they are integrated at first difference or integrated of first order I(1). Linear deterministic trend was assumed in this test. From the result in Table 4.2, the trace statistics for null hypothesis for no co-integration relations is rejected at 5 percent level.

It is confirmed from the Maximum –Eigen statistic test in table 4.3 that the null hypothesis is rejected at 1 per cent and 5 per cent levels. This implies that the results of the unrestricted co-integration rank test confirmed a long run significant relationship between defence expenditure and its determinants.

Table 4:4 Long Run Estimated Regression Results.

Dependent Variable: LDE
Method: Least Squares
Date: 05/20/13 Time: 20:29
Sample (adjusted): 1970 2009
Included observations: 40 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LFER	519.9852	81.65075	6.368406	0.0000
LIR	-89.35026	129.2684	-0.691199	0.4941
LRGDP	0.045037	0.023163	1.944349	0.0602
LRNOGS	-0.181324	0.057104	-3.175301	0.0032
LROGS	0.035802	0.012349	2.899265	0.0065
C	-2867.817	4206.375	-0.681779	0.5000
R-squared	0.900403	Durbin-Watson stat		1.621721
Adjusted R-squared	0.885756			

4.3 The Long Run Regression Analysis.

The coefficient of the estimated results in Table 4.4 (OLS table) measures the long run LDE, LIR, LFER, LRGDP, LRNOR and LROGS. The variables of real gross domestic product (LRGDP), foreign exchange (LFER) and revenue from oil and gas sector (LROGS) are signed positive, whereas, inflation rate (LIR) and revenue from non oil and gas sector were signed negative. The result suggests that a 100 percent change in the explanatory variables of LRGDP and LRNOGS will increase DE by 4.5 percent and 3.6 percent respectively. On the contrary, a one percent change in the macroeconomic variable of LFER, LROGS and LIR will increase / decrease defence spending by 519.99 and -89.35 percents respectively.

This estimated result coincides with the outcome of the estimated parameters of Omojimite (2012), Alnfofum (2011), Gaiya (2011), Na Hou (2009) and Aiyedogbon (2007). The outcome of this results indicates that the impact of LROGS offset the negative impact of LRNOGS, thus overall effect of revenue on defence expenditure is positive within the period under review.

Table 4.5: The Pairwise Granger Causality Test Results.

Pairwise Granger Causality Tests Date: 05/20/13 Time: 20:32 Sample: 1970 2011 Lags: 2			
Null Hypothesis	Obs	F – statistics	Probabilty
LFER does not Granger Cause LDE LDE does not Granger Cause LFER	38	23.3790 0.21569	5.E-07 0.8071
LIR does not Granger Cause LDE LDE does not Granger Cause LIR	38	0.11657 0.46685	0.8903 0.6311
LRGDP does not Granger Cause LDE LDE does not Granger Cause LRGDP	38	0.04510 2.71524	0.6408 0.0810
LRNOGS does not Granger Cause LDE LDE does not Granger Cause LRNOGS	38	3.52199 0.71177	0.1211 0.0052
LROGS does not Granger Cause LDE LDEdoes not Granger Cause LROGS	38	4.44316 0.01420	0.4438 0.0051

4.4 Interpretation of the Granger Causality test Results.

Table 4.5 presents the estimated results of granger causality, where maximum lag is 2 obtained following Akaike information criterion (AIC). The lag length was considered appropriate in order to avoid the problem of spuriousness of regression at 5 percent level of significance. The Pairwise granger causality result in Table 5 revealed that both revenue from non oil and oil sectors granger causes defence spending in Nigeria. The result indicates that oil revenue, non oil revenue and foreign exchange rate granger cause defence expenditure. However, defence expenditure granger cause gross domestic product. The empirical outcome of this study suggests that the variables that determined defence spending in Nigeria are unidirectional and bidirectional. The case of no causality between defence expenditure and its determinants does not exist in this study. This outcome in part, supports the findings of Adebiyi and Oderinde (2005).

4.6 The Result of the Vector Autoregressive (VAR)

Table 4.6 below depicts the results of the estimated VAR model for the study. The result of the VAR model provides useful and reliable information about the response of defence expenditure variable to innovations in its determinants. The estimated VAR result revealed that oil revenue have a positive relationship with defence spending both in the short run and long run periods. This result basically suggests that a major reason for the persistent increase in defence spending is the increase in oil revenue. This result supports the view of Odusola (1996) that the fall in defence spending in the early 1980s was due to the fall in federal revenue. In Nigeria, fall in expenditure is majorly adduced to fall in oil revenue. In the same vein exchange rate had a positive influence on defence spending in Nigeria within the period of study. Put differently, this is the depreciation of the naira currency against the appreciation of the US dollar and other international currencies. The depreciation of the naira currency in relation to other major international currencies (exchange rate) is one of the unbridle factors responsible for the continuous increase in defence spending in Nigeria. This relationship was anticipated in this study.

The estimated VAR results of non oil revenue or revenue from the real sector and inflation rate variable showed an indirect relationship with defence spending in the short run but a positive influence in the long run. This outcome suggests that non oil revenue contribute less financial resources to defence activity than revenue from the oil sector. This outcome was expected in this study. The paper supports the views of Niloy, Emranul and Dennis (2003) and Deger and Sen (1992) which supports the place of revenue in government spending. The macroeconomic variable of inflation rate demonstrated its actual influence on defence spending increase.

The continuous depreciation of the naira has accounted for the rise in defence outlay. This has position inflation to impact positively on defence spending in the long run. The result was expected and is because the Nigerian defence sector depends on the external sector for its hardware. This study empirically proofed that oil revenue more than any macroeconomic variables impacted significantly on defence spending.

Table 4.6: Vector Autoregression (VAR) Estimates

Date: 05/21/13 Time: 16:33
Sample (adjusted): 1972 2010
Included observations: 38 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	LDEFEX	LFER	LIR	LRGDP	LRNOGS	LROGS
LDEFEX(-1)	-0.173986	-6.82E-05	-0.000156	0.297009	7.951208	38.81923
	(0.16700)	(0.00013)	(0.00023)	(0.61203)	(3.61807)	(17.3815)
	[-1.04183]	[-0.52993]	[-0.68298]	[0.48528]	[2.19764]	[2.23336]
LDEFEX(-2)	-0.157094	-6.96E-06	-0.000177	-0.127708	2.586849	12.61931
	(0.16161)	(0.00012)	(0.00022)	(0.59228)	(3.50130)	(16.8206)
	[-0.97206]	[-0.05584]	[-0.79793]	[-0.21562]	[0.73882]	[0.75023]
LFER(-1)	254.0984	1.177817	-0.090401	118.1839	-4140.640	-21144.29
	(145.780)	(0.11235)	(0.19975)	(534.266)	(3158.34)	(15173.0)
	[1.74302]	[10.4830]	[-0.45257]	[0.22121]	[-1.31102]	[-1.39355]
LFER(-2)	640.9503	-0.093100	0.197628	254.9728	-2685.442	-13315.07
	(190.020)	(0.14645)	(0.26037)	(696.400)	(4116.80)	(19777.5)
	[3.37306]	[-0.63571]	[0.75903]	[0.36613]	[-0.65231]	[-0.67324]
LIR(-1)	-4.717593	0.136880	0.511386	98.23197	389.8006	965.1245
	(131.296)	(0.10119)	(0.17990)	(481.182)	(2844.53)	(13665.4)
	[-0.03593]	[1.35269]	[2.84257]	[0.20415]	[0.13704]	[0.07063]
LIR(-2)	-185.6868	-0.321735	-0.139504	-187.5550	-213.7141	-4973.351
	(136.674)	(0.10534)	(0.18727)	(500.891)	(2961.04)	(14225.1)
	[-1.35861]	[-3.05436]	[-0.74493]	[-0.37444]	[-0.07218]	[-0.34962]
LRGDP(-1)	-0.006156	1.32E-05	-7.55E-05	0.848072	-1.163715	-5.587086
	(0.05518)	(4.3E-05)	(7.6E-05)	(0.20223)	(1.19550)	(5.74328)
	[-0.11157]	[0.31148]	[-0.99797]	[4.19358]	[-0.97341]	[-0.97280]
LRGDP(-2)	0.025955	-2.25E-05	0.000111	0.075478	1.605152	8.035753
	(0.05450)	(4.2E-05)	(7.5E-05)	(0.19973)	(1.18072)	(5.67227)
	[0.47624]	[-0.53578]	[1.48553]	[0.37790]	[1.35947]	[1.41667]
LRNOGS(-1)	0.030583	-0.000240	-0.000297	0.067487	0.998151	6.186400
	(0.11154)	(8.6E-05)	(0.00015)	(0.40879)	(2.41656)	(11.6094)
	[0.27419]	[-2.79353]	[-1.94153]	[0.16509]	[0.41305]	[0.53288]
	0.137118	0.000368	-0.000318	-0.030474	0.253576	0.415092

LRNOGS(-2)						
	(0.12464)	(9.6E-05)	(0.00017)	(0.45678)	(2.70026)	(12.9723)
	[1.10014]	[3.83535]	[-1.86052]	[-0.06672]	[0.09391]	[0.03200]
LROGS(-1)	-0.011916	5.33E-05	6.10E-05	-0.010627	-0.116707	-1.009297
	(0.02306)	(1.8E-05)	(3.2E-05)	(0.08452)	(0.49964)	(2.40032)
	[-0.51670]	[2.99907]	[1.93196]	[-0.12574]	[-0.23358]	[-0.42048]
LROGS(-2)	-0.034280	-2.28E-05	0.000124	0.002717	-0.367485	-1.791836
	(0.04948)	(3.8E-05)	(6.8E-05)	(0.18134)	(1.07199)	(5.14994)
	[-0.69280]	[-0.59729]	[1.83221]	[0.01498]	[-0.34281]	[-0.34793]
C	3215.118	3.251353	9.317019	22910.63	-29471.06	-78341.99
	(3692.14)	(2.84558)	(5.05900)	(13531.2)	(79990.4)	(384282.)
	[0.87080]	[1.14260]	[1.84167]	[1.69317]	[-0.36843]	[-0.20387]
R-squared	0.953239	0.987208	0.579854	0.977862	0.543040	0.492709
Adj. R-squared	0.930794	0.981067	0.378183	0.967236	0.323699	0.249210
Sum sq. resids	2.33E+09	1381.107	4365.300	3.12E+10	1.09E+12	2.52E+13
S.E. equation	9643.846	7.432649	13.21408	35343.45	208934.6	1003741.
F-statistic	42.46966	160.7758	2.875256	92.02383	2.475779	2.023452
Log likelihood	-394.5790	-122.1877	-144.0529	-443.9332	-511.4557	-571.0955
Akaike AIC	21.45153	7.115142	8.265944	24.04911	27.60293	30.74187
Schwarz SC	22.01175	7.675369	8.826170	24.60934	28.16316	31.30209
Mean dependent	25986.64	40.49005	19.78421	267904.3	74777.90	315117.8
S.D. dependent	36658.82	54.01811	16.75737	195258.6	254062.3	1158411.

5.0 Conclusion

The paper attempts to shed light on the determinants of defence expenditure in Nigeria between 1970 – 2010. In order to achieve the basic objectives of this study, federally collected revenue was disaggregated into oil and gas and non oil and gas revenues. The study adopts a cointegration test to identify long run relationship of the model, a granger causality technique for the causal direction of the variables while the vector autoregressive (VAR) model is one of the most successful, flexible, and easy to use models for the analysis of multivariate time series. The VAR model has proven to be useful for describing the dynamic behaviour of economic time series data and for policy making.

The outcome of the cointegration test showed that the series in the model are cointegrated with a long run relationship between defence spending and its determinants in Nigeria. The empirical result of the granger causality test revealed that the determinants of defence expenditure are unidirectional, indicating that a case of no causality does not arise in this study. Finally, the estimated VAR result was very remarkable as it provides useful and reliable information about the response of defence expenditure variable to innovations in its determinants. The results of VAR showed that revenue from oil and gas and revenue from non oil and gas sectors have over the years determined the level of military outlay in Nigeria.

The empirical findings revealed that revenue from oil and gas and revenue from the real sector were found to demonstrate innovations in defence expenditure. In addition, the investigation indicates foreign exchange and real gross domestic product to explain positive innovations in defence expenditure.

The need to improve, display transparency and fiscal discipline at all levels of governance will increase revenue. Increase revenue will raise the level of defence expenditure, which in the long run provides a spin off effect on the national economy.

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