MILITARY EXPENDITURE AND MACROECONOMIC PERFROMANCE – THE CASE OF AN EMERGING COUNTRY

Patrick OLOGBENLA[*]
Obafemi Awolowo University, Nigeria

Abstract: The study investigates the nexus between military expenditure and macroeconomic performance in Nigeria between 1980 and 2017. Data on military expenditure and some macroeconomic variables such as output (GDP), exchange rate and inflation rate are used in the study. The Vector Auto-regression technique VAR is applied so as to study the interactions among the variables in the short run. The result shows that military expenditure in Nigeria is significantly influenced by output and exchange rate shocks. It was also revealed that military expenditure does not make significant contributions to the behaviour of output in Nigeria. Military expenditure appears to be insulated against inflation shock since the largest chunk of military expenditure is traded in foreign currency hence less affected by domestic prices.

1. Introduction

All over the world attention of development economists have been shifting towards researches on military expenditure in the recent years (Abbas & Wizarat, 2018; Odehnal, 2015). The reason behind this might not be unconnected to the fact the expenditure on the military usually constitute the largest chunk of total government expenditure in annual budgets of countries. In the developed countries expenditure on military often vary between 20% to 25% of the total annual budgeted government expenditure while in the developing countries on the average it ranges between 10% and 20% of the annual budget expenditure (UNICEF, 2018). In Nigeria, the percentage of military expenditure in the government budget rose from 12% in 2010 to about

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[*]Corresponding author. Obafemi Awolowo University, Nigeria,
E-mail: ologbenlapatrick@gmail.com

16% in 2014, the figure jumped to 18% in 2017 at the heat of insurgence attack on the country. However, the current military expenditure to the GD of Nigeria is about 0.43% compared to developed country like US with 4.8% (UNICEF, 2018).

This statistics underscore the importance of military expenditure across the globe and the situation is the same for Nigeria. The rising trend of military expenditure is becoming epidemic as it has spread across various economic blocs across the globe. In BRICS, both Brazil and China committed more money to the military within last one decade and making the percentage to rise by 5% and 4.6% in 2018 respectively for the two countries (Zhang, Liu & Wang, 2017). The issue of the relationship between military expenditure and macroeconomic performance is expected be a symbiotic (Anifowose, Adeleke, & Mukorera, 2019). According to their study, it is expected that a safe country guaranteed by sophisticated military apparatus is important for peaceful co-existence. This, according to them will create an enabling environment for economic activities to thrive and in the long run promote macroeconomic performance of the country.

However, with the rising expenditures on the military year by year in Nigeria and the attendant macroeconomic instability bedevilling the country often questions the role of military expenditure in performing the roles highlighted above.

Furthermore, an important reason for investing in the military is the fact that it will improve security and guarantee peace that will create an investment-friendly enabling environment, which will, in turn, engender sustainable economic growth and improve macroeconomic performance. These hypotheses have been supported by various kinds of literature and theories of economic development. (Keynes, 2016; Zhang, Liu, Xu, & Wang, 2017) from their models concluded that military expenditure might not promote economic growth as expected because an increase in military expenditures will only attract more external aggression that will hinder the growth process. However, countries across the globe appear not to be cognizant of these as military expenditure data show that military spending has been on the rise globally including Nigeria (Farzanegan, 2014).

A major gap in the literature which this paper intends to fill is the fact that previous studies in Nigeria have focused more on the impact of military expenditure on the growth of Nigerian economy alone without considering her macroeconomic performance in general which included growth. The reason behind this is that the linkage between military expenditure and economic growth can further be evident if other macroeconomic variables in the economy are brought into perspective.

Consequently, this study will fill this gap with the main objective of investigating the interactions between military expenditure and some macroeconomic variables such as output GDP, inflation rate and exchange rate. The rest of the paper is divided into the methodology, results and discussions as well as the conclusions.

2. Literature review

Zhao, Zhao, & Chen (2015) examined the military–growth nexus in China for the period of 1952 to 2012.They used an impulse response function based on vector

error correction model and granger causality technique. Their result revealed that there are two long-run relationships and that there exists a negative and unidirectional granger on growth.

Also Furuoka, Oishi, & Karim (2016) explored the impact of military expenditure on growth in China. They confirmed that the increase in military expenditure is mainly driven by Chinese economic development expansion for the period of 1989 to 2011. However, Meng, Lucyshyn, & Li's (2015) findings indicate that an increase in Chinese military expenditure has contributed to the expansion of income disparity in China from 1989 to 2012 using Granger approach.

Obasi, Asogwa and Nwafee (2018) examined the impacts of expenditure on the military on development of human capital in Nigeria. The study covers period spanning through 1970 to 2014. The methodology adopted is Auto-Regressive Distributed Lag ARDL. After some pre estimation and post estimation tests their results showed that military expenditure does not have significant positive impact on education which is one of the proxies of human capital in the study. However, the same military expenditure has significant negative impact on health component of human capital which is infant mortality rate. Based on the results, the study concluded that military expenditure does not have significant positive impact on human capital in Nigeria and it was recommended that government at all levels in Nigeria should improve their efforts on developing human capital in Nigeria.

In another perspective, introducing military expenditure variable as a proxy for capital intensiveness, (Kentor & Kick, 2008) military expenditure-growth debate for both developed and developing countries. Their result indicates that an increase in military expenditure per soldier leads to a significant reduction in gross domestic product per capita, especially in developed countries. Also, Smith and Tuttle (2008) revisit United States of America military expenditure-growth debate by employing Atesoglu's (2002) model. Their outcome indicates negative military expenditure effect on growth.

Applying the Keynesian hypothesis, Shahbaz & Shabbir (2012) revisit the milex-growth nexus using Pakistan as a case study. Their finding suggests that an increase in military expenditure slow-down the economic growth rate.

Wijeweera & Webb (2011) investigated the impact of expenditures on military on the growth of five South Asian Economies. The period covered 1988 to 2007 and the following countries were involved in the study, India, Pakistan, Nepal, Sri Lanka and Bangladesh. Panel cointegration analysis was applied. Findings from the study show that GDP rose by 0.04% after a unit increase in military expenditure. Consequently, it was concluded from the study that military expenditure contributed little to the growth of these economies

Faini, Annez, & Taylor (1984) further examined the impact of military expenditure on investment and growth of 69 countries from 1950 to 1972, employing the fixed effect model. Their result revealed that military expenditure has an adverse impact on economic growth and investment. Thus, military expenditure crowds out investment and retards economic growth for the countries under studied.

Deger (1986) examined military expenditure and investment relationship, where military expenditure was the independent variable and investment equations as the dependable variable. The result revealed the military expenditure coefficients

on investment equations are negative and statistically significant. Thus, military expenditure partly crowds out investment in emerging countries.

Knight, Loayza, & Villanueva (1996) investigated the military expenditure–investment nexus for 79 countries including control variables such as human capital proxy, war proxy and trade. Their result found an inverse relationship between military expenditure and investment, therefore, confirming the crowd out effect.

Feder (1983) re –examined the 3 sectors model on two group of countries (8 Asians and 16 Latin America). The pooled time series, cross sectional techniques was employed. Their result affirmed military expenditure and other expenditure do have direct positive impact on economic growth in Asian countries whereas military expenditure and non-military expenditure have a negative impact on the growth of Latin America countries.

Yildirim, Sezgin, & Öcal (2005) explore the military expenditure –growth relationship for Middle Eastern countries and Turkey, by employing the two-sector model they confirmed the military expenditure stimulate economic growth for the period of 1989-1999 and that military expenditure (industries) were more productive than the civilian sector.

Sezgin (2001) explored the impact of military expenditure, military size on economic growth using Turkey as a case study covering 1950-1993 by utilising the two-sector Feder model. They, however, expanded the two-sector model by incorporating human capital. Their result confirmed that both military size and size of military budgetary allocation does matter and positively impact on growth; however, the externality effect from the military sector was negative.

Reitschuler & Loening (2005) employed two-sector Feder model to empirically analysis the impact of military expenditure on the economic growth of Guatemala for the period of 1951-2001. The empirical analyses indicate that military expenditure threshold of around 0.33% of GDP is preferred and have a positive impact on growth whereas above the threshold of 0.33% military expenditure will have an adverse effect on growth. As regards the externality effect, they assert the military sector has less productivity and externality effects on the civilian sector.

Galvin (2003) investigated the military expenditure and economic growth relationship by employing a panel data analysis framework based on 2 SLS and 3SLS estimation technique. The result shows that military expenditure has a negative effect on the 64 countries economic growth and affirmed that military expenditure adverse impact is greater in middle-income countries and less in low-income countries.

In summary none of the study examined empirically investigated the relationship between military expenditure and macroeconomic performance of Nigeria as a country. this study among others as highlighted in the introduction will be filling these gaps.

3. Methodology

Vector–Autoregression (VAR) Model

Econometrics literature has identified VAR as a veritable means of studying the effect of shocks on economic variable in both short and medium terms (Elborne,

2007; Mordi & Adebiyi, 2010). Formulation of VAR model is strongly dependent on shocks identification in the VAR model and this often depends on the objectives of the researcher as well as literatures.

In this study we are interested in studying macroeconomic shocks effects on military expenditure and vice versa the resultant implication on the macroeconomic performance of Nigeria.

The macroeconomic variables used in these study are GDP, exchange rate and inflation rate. Other variables included in the VAR model are military expenditure and population. VAR models are seen as independent large scale macro econometric model that do not rely on unrealistic assumptions (Elbourne, 2007). The foremost theoretical framework of VAR analysis as proposed by Sims (1980) used Choleski decomposition to get impulse responses.

The construction of our VAR model follows the conventional method where the initial model is specified thus:

$$y_t = A_1 y_{t-1} + A_2 y_{t-2} +, \ldots \ldots \ldots + A_p y_{t-p} + \mu_t \ldots \ldots \ldots \ldots (1)$$

where:

y_t represents an (nx1) vector containing n endogenous variables,

A_i(i=1, 2,…, p) are (n x n) matrices coefficients,

and μ_t is an (n x 1) vector containing error terms.

Though the error is $\mu_t \sim iid \ N(0, \Omega)$ but errors do possess tendency of correlating contemporaneously in all the equations.

There exist pn^2 Parameters in the A matrices. Equation 3.9 can be written in other form with the usage of the lag operator L which is selected through $L^k x_t = x_{t-k}$. the equation becomes:

$$A(L)y_t = \mu_t \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots (2)$$

where:

$$A(L) = A_0 L^0 - A_1 L^1 - A_2 L^2 - \cdots \ldots \ldots - A_p L^p \ldots \ldots \ldots (3)$$

A_0= I (identity matrix) it is required that *A(L)* lies outside the unit circle for stationarity to be ensured.

The VAR model estimated for the purpose of this study is as follows;

$$GDP_t = [milexp_t, infr_t, exch_t, pop_t] \ldots \ldots \ldots \ldots \ldots \ldots \ldots (4)$$

where GDP is the output, milexp is the military expenditure, infr is the inflation rate; exch is the exchange rate and pop is the population all at period t.

Both the impulse response function and the variance decomposition analysis is done to thoroughly examine the response of the fiscal variables to the identified shocks and also to assess the resultant effect on output growth of Nigeria.

Generalized Impulse Response Function for VAR

Furthermore, the analyses for the nexus between military expenditure and macroeconomic performance in Nigeria will be carried out using the impulse response functions and the variance decomposition of the VAR because of the good economic interpretations attached to the impulse response functions and variance decomposition for all the variables in the model. Both have been proven to be especially useful for describing the dynamic behaviour of economic and financial time series and for forecasting.

The generalized impulse response function refers to the reaction of any dynamic system in response to some shocks or changes. In a VAR framework, the impulse response function traces out the reaction of the endogenous variable to shocks to each of the other individual variables. To assist this study, the impulse response function will be used to investigate the relationship between military expenditure and macroeconomic performance in Nigeria. The process through which the shocks transmit in the economy will be the focus in our context and the cumulative impulse response function to help in the interpretation of the overall effects of shock upon dependent variable in a given period. According to Stock and Watson (2001) the analysis of the impulse response function traced out the effects of a one-unit shock to a variable's error term on the dependent variables that made up the VAR model. Wouter (2011) identifies three types of structural shocks as; productivity shock, preference shock and policy shock. According to his definition, "the impulse response function gives the Jth-period response when the system is shocked by a one-standard-deviation shock through a sequence of shock and alternative series of shocks". Impulse response function can be analyzed in different ways but this study follows the multivariate extension of factorization technique of the Cholesky Orthogonalisation approach as it is consistent with previous studies of(Cheng, 2006) that are related to this study.

Variance Decomposition for VAR

This is another application of multivariate time series analysis that will be used in the interpretation of the VAR results. It is known as Forecast error variance decomposition (FEVD). It explains how each variable contribution to other variables in a regression model by determining the rate at which the forecast error variance of each variables is explained by the exogenous shocks to other variables and further consider the portion of the observed variation that is attributed to the orthogonalised shock in a variable. According to (Svensson, 2002) the variance decompositions explain the fraction of the observed variable in the that can either be ascribed to that variables been affected by shock or that of another endogenous variable. The application of this analysis will assist in analysing the behaviour of macroeconomic indicators in the Nigerian economy.

Sources of data

Data on all the variables are sourced from a secondary source specifically from the World Bank database. For instance, the data on the military expenditure are in million US dollars and they are extracted from the World Bank Tables, 2018. The same source is used for extracting data on population. However, data on exchange rate, inflation rate and the GDP were collected from the IFS 2018 edition.

4. Research findings

The interaction and the relationship between military expenditure and some important macroeconomic variables are explained within the Vector Auto regression framework under this section. However, the analysis starts with the unit root test because it is important that all the variables in the VAR model are all stationary.

Unit root test

The study explores the time series properties of the variables for their suitability for the VAR. the augmented dickey fuller until root test is conducted to ascertain the levels of stationarity of the variables that are used in the model.

Table 1: Unit root test results

Variable	T Statistics	Order of Integration
LEXCH	-4.134778	I(0)
GDP	-3.920895	I(1)
LINFLATION	-4.242094	I(1)
LMIL_EXP	-3.111569	I(1)
LPOP	-2.824324	I(1)

Source: Author's Computation

Analysis of the interactions between military expenditure and macroeconomic indicators

The VAR is used to achieve this objective. It is also referred to as the unrestricted VAR where all the variables are allowed to interact with one another within the VAR framework without imposing any restriction. The two major tool used by VAR are the IRFs that is impulse response functions and the Variance decomposition models. Their results are presented as follows;

Impulse response results

      The impulse response analysis of the relationship between military expenditure and macroeconomic performance in Nigeria is based on the four identified shocks namely; military expenditure shocks, output shocks, inflation rate shocks and exchange rate. First, we consider the reactions of the variables to shock from each of the identified shocks, in other words the spiral effects of the shocks emanating from some macroeconomic variables such as output, exchange rate and inflation rate is examined as it affects military expenditure. Secondly, in the same perspective we also assess the responses the output, inflation and exchange rate to military expenditure shocks.
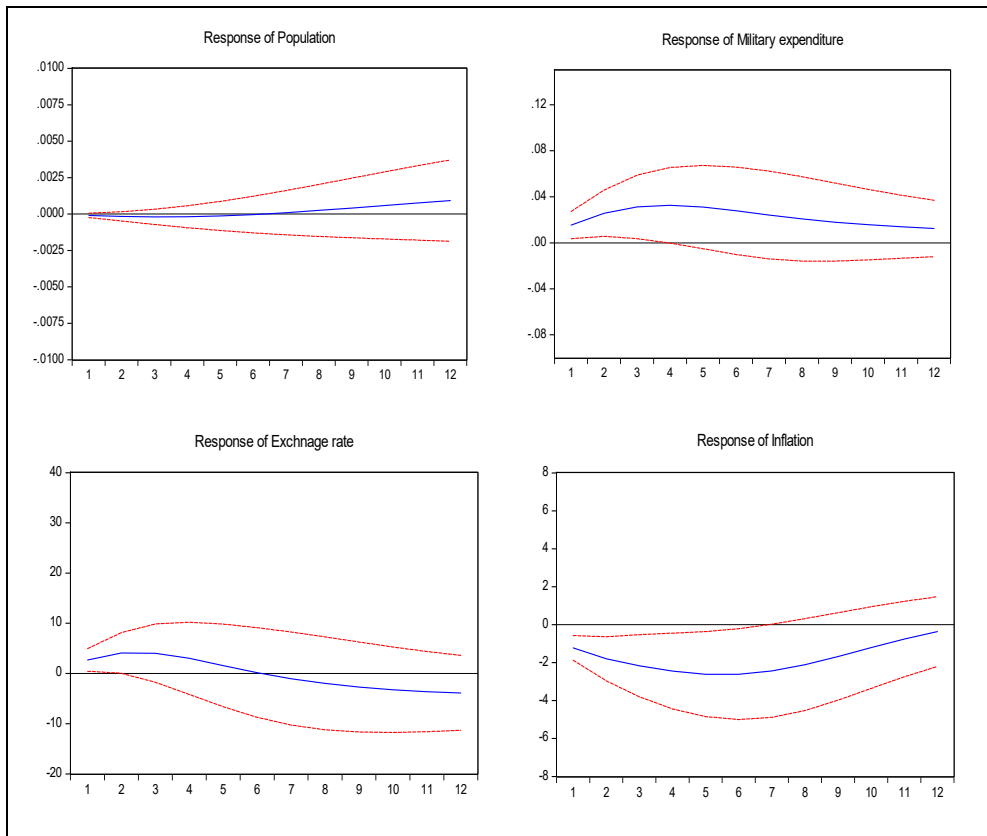

Figure 1: response to output shocks
Source: Author's computation, 2019

      The responses of the other variables apart from the output to the output shock is presented in figure 1. In other words the figure shows the responses of population, exchange rate military expenditure and inflation to one percent standard

74

deviation in output. The results shows that military expenditure rises significantly to output shock, which is an indication that 1% positive innovation in output will bring about increase in military expenditure. This shock also allows exchange rate to appreciate and inflation falls significantly to the same shock. It is obvious form the IRF that the only variable without significant response to output shock is the population.
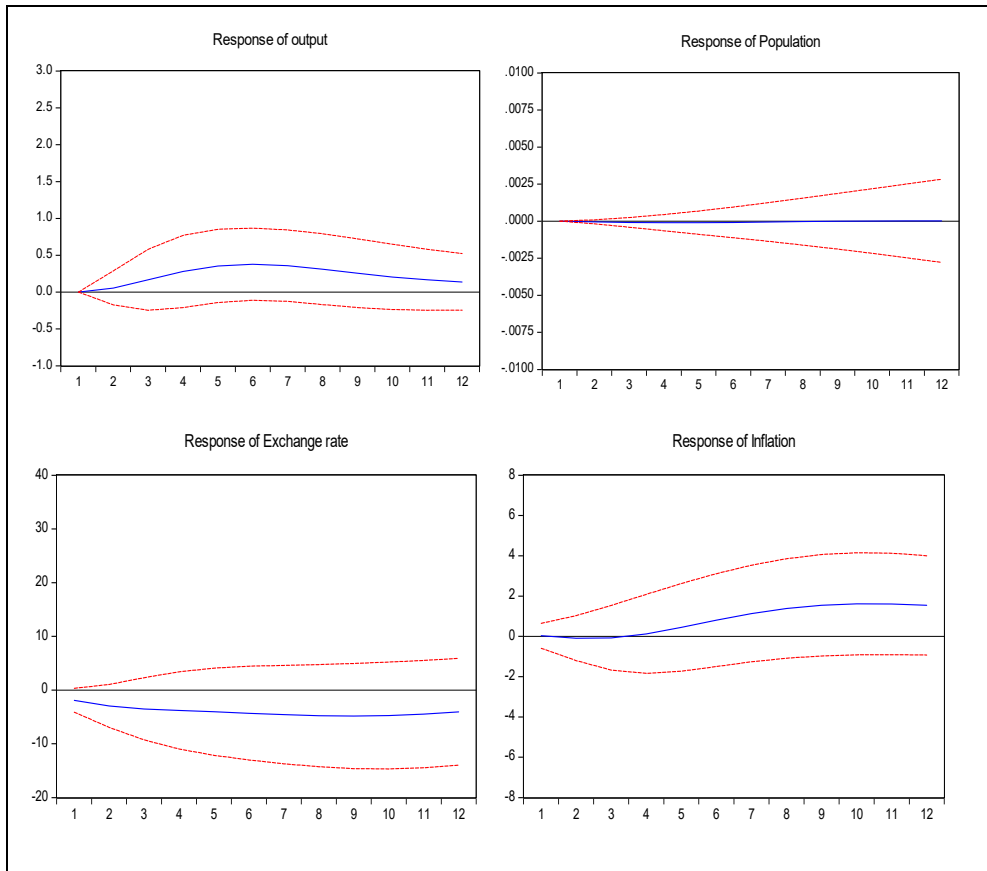

Figure 2: Impulse response to Military expenditure shocks

Figure 2 indicates that all the variables fail to respond to military expenditure significantly during the period under consideration. The output, the population and other macroeconomic variables such as exchange rate and inflation rate do not response significantly to the shocks from military expenditure.
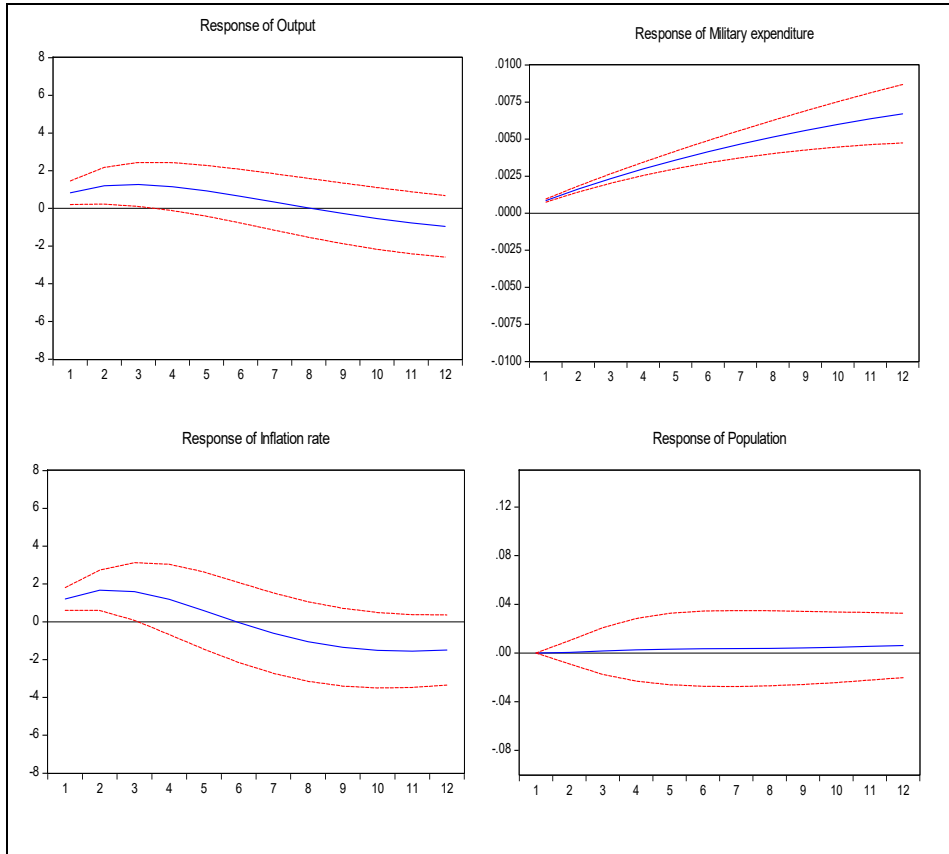
Figure 3: Impulse response to exchange rate shocks

The responses of the variables to one standard deviation in exchange rate is shown in figure 3. Output, military expenditure and inflation rate all respond significantly to the shock except population. The result shows a positive shock to exchange rate which means currency depreciation will cause the output to fall significantly and military expenditure also to rise significantly. Inflation rate is another macroeconomic variable that responds significantly to the shock from the exchange rate as it causes inflation to rise significantly. Population still remains irresponsive to macroeconomic shocks.
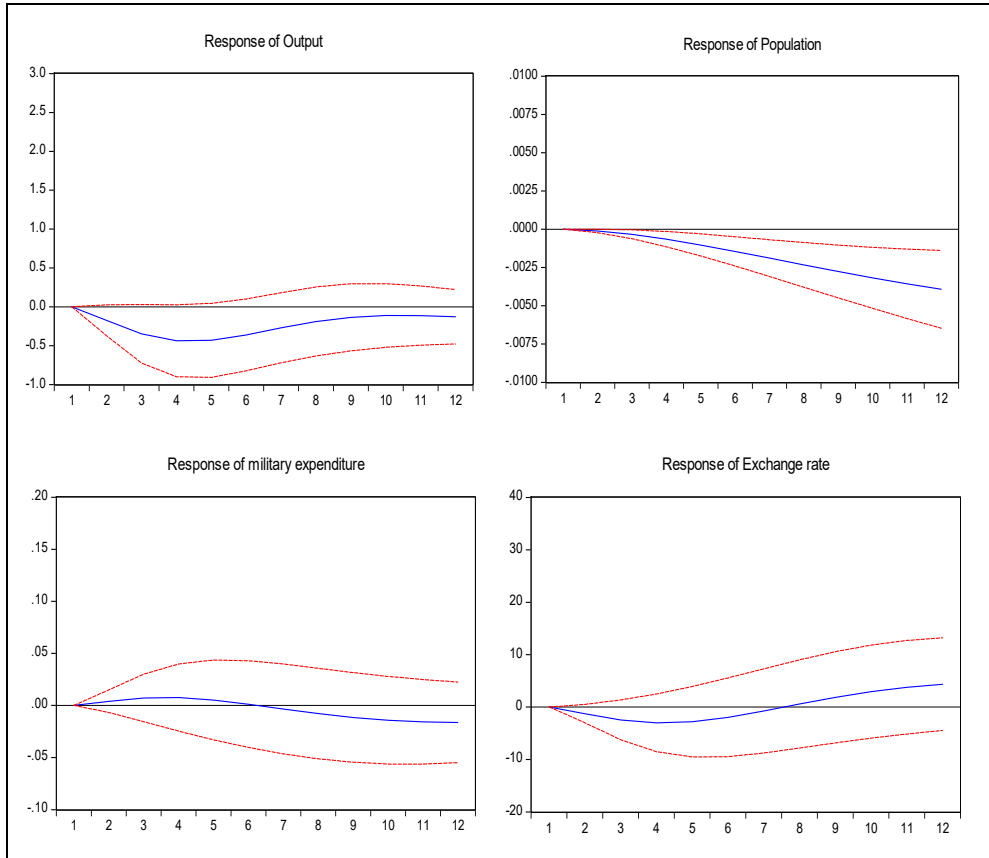
Figure 4: Response to inflation shocks

Responses to one percent positive innovation to inflation is shown in figure 4. The result shows that output, population and military expenditure all respond significantly to the inflation shock. Only exchange rate failed to show a significant response to this shock. A shock to inflation causes the output to fall significantly but the response of military expenditure is not significant Population shows significant response and it indicates that population only respond significantly to inflation rate among the macroeconomic variables. However, exchange rate is the only variable that fail to react significantly to the shock from inflation.

Variance decomposition

Variance decomposition explains the percentage or unit response of each variable in our model to the different structural shocks. In other words we try to explain the contribution of various structural shocks to the behavior of military expenditure and macroeconomic variables.

Table 2: Variance decomposition of military expenditure

Period	Output	Population	Military expenditure	Exchange rate	Inflation
3	1.364685	0.106694	96.92465	0.800747	0.803229
6	7.015666	0.075344	90.55052	2.118957	0.239512
9	13.35770	0.029207	83.39902	2.974041	0.240035
12	18.26971	0.014035	77.45864	3.591742	0.665874

Table 2 shows the contributions of each structural shock to the behaviour of military expenditure in Nigeria. The result shows that output and exchange rate are the two most important macroeconomic variables that affect the behaviour of military expenditure in Nigeria. Apart from its own shock, the output contribute the next shock followed by the exchange rate.

Table 3: Variance decomposition of output

Period	Output	Population	Military expenditure	Exchange rate	Inflation
3	97.76162	0.055857	0.093122	0.357007	1.732393
6	89.60612	0.961428	0.474618	3.279182	5.678655
9	83.41822	2.716925	2.187217	5.385188	6.292450
12	80.37181	4.027492	3.345235	5.877194	6.378270

From table 3 it was shown that the behaviour of output is mostly affected by the macroeconomic variables such as inflation rate and exchange rate. Population is also shown to contribute some shocks to the behaviours output in Nigeria. However, military expenditure again show no significant contributions to the output of Nigeria during the period under consideration as shown from the variance decomposition result on the output.

Table 4: Variance decomposition of exchange rate

Period	Output	Population	Military expenditure	Exchange rate	Inflation
3	2.122749	0.314277	3.474086	93.43044	0.658450
6	2.634247	0.203344	1.856678	94.28399	1.021741
9	3.687355	0.189981	1.683654	93.57577	0.863242
12	4.584314	0.299350	2.359892	91.04132	1.715128

The behaviour of exchange rate in the VAR is mostly affected by the output. The implication is that table 4 which shows the contributions of each of the structural shocks to the behaviour of exchange rate shows that the GDP of Nigeria contributes the highest shock to the behaviour. However, military expenditure has been shown to have high contributions as well to the behaviour of exchange rate. This partly indicates that the weight of military expenditure in our foreign exchange consumption.

Table 5: Variance decomposition of inflation rate

Period	Output	Population	Military expenditure	Exchange rate	Inflation
3	10.10051	3.990966	0.015575	7.259306	78.63364
6	14.05639	3.066197	0.424674	4.136905	78.31583
9	15.94911	2.464454	2.442620	4.466057	74.67776
12	15.27414	2.862739	4.822587	6.439575	70.60096

The behaviour inflation rate is mostly affected by output and exchange rate. Table 4 shows the contributions of each of the structural shocks to the behaviour of inflation rate. These two are followed by the population as the next contributor to the behaviours of inflation rate. However, military expenditure shows little contribution to the behaviour of inflation rate

5. Discussion of results

The findings show a positive and significant relationship between output and military expenditure in Nigeria. This is evident from the history of the two variables in Nigeria. In the year 2013 and 2014 when the oil price rose to about 100 USD, the GDP of Nigeria rose by about 4% during this period and within the last decade that period was when the highest expenditure was recorded for military expenditures in Nigeria (Nnanna, 2002) The implication of this result is that military expenditure is highly susceptible to output shocks in Nigeria. The same conclusion was obtained in the study of Anifowose, Adeleke, & Mukorera, 2019) who established a significant relationship between output growth and military spending.

Again, the VAR result shows that military expenditure shocks does not affect macroeconomic variables in Nigeria significantly. This findings support the conclusions form (Yildirim & Öcal, 2016) which confirmed a unidirectional relationship between Nigerian economic growth and military expenditure and that it output that affect military expenditure and not otherwise. It is important to note here that this explains why rich countries with huge national income have large volume money to spend on their military. For instance the expenditure on the military in the US alone is more than the entire budget expenditure in Nigeria and similar story goes for other advanced or rich countries. The higher a country's output the more money is available to spend on the military.

Furthermore, the analysis has also revealed that exchange rate shocks affect military expenditure in Nigeria significantly. The same position was held by (Saba & Ngepah, 2019) who identified foreign exchange as a major factor affecting military spending mostly in the developing countries. Their study pointed out that expenditure on the military are denominated in foreign currency especially the US dollars. This has been identified as the main reason whily there is a strong linkage between military expenditure and exchange rate in most developing countries who develop majorly on importation to equip their military. Moreover, continuous increase in military spending despite currency depreciation might not be wise enough since it has been confirmed from this study that military expenditure has not been contributing significantly to the output of the country.

6. Conclusions

The findings reveal different forms of relationship among military expenditures and macroeconomic indicators in Nigeria that might lead to some important policy decisions. However, the following conclusions arise from the findings of this study.

Firstly, it can be concluded that output shock is an important shock affecting military expenditure in Nigeria. An upsurge in output of the country will simultaneously lead to significant increase in the military expenditure in Nigeria.

Secondly, the findings establish the fact that macroeconomic variables are not significantly responsive to military expenditure shocks. For instance, the results shows that output is not affected by military expenditure shocks in other words expenditure on military does not have any significant positive influence on output in Nigeria.

Thirdly, the study shows that apart from output shocks, military expenditure also responds significantly to exchange rate shocks. However, the study indicates that when the Naira falls in value, the Nigerian government increases expenditure on the military because of the priority given to it and the fact that costs of military apparatus rise during this period since they are traded in foreign currency. The implication is that even when the domestic currency is weak government of Nigeria still increase funding of the military significantly. However, this might not be a good line of action on the part of the government as it piles more pressure on the domestic currency.

In addition this study shows the inflation shock does not constitute problem to military expenditure in Nigeria. The reason for this might not be unconnected with the fact that military expenditure which the largest percentage is on capital goods are bought from foreign countries hence they are not affected by domestic prices.

Finally, the study brings evidence that the chunk of military expenditure on our foreign transactions is very high hence military expenditure has been shown as an important variables affecting Nigeria exchange rate. The findings reveal that the behavior of the naira is significantly affected by military expenditure.

However, the limitation of the study is in the area of proxy used for military expenditure. The study used the total spending on military expenditure in dollars. However, some literatures believe that the percentage of the military expenditure could be a better measure of military expenditure (Ali & Solarin, 2019; Khalid, Okafor, & Aziz, 2019). Although this position is still contentious, further study can be conducted using percentage of the military expenditure of the GDP as a proxy for military expenditure and see if there will be significant difference in the findings compare to the findings in this study. Again, more macroeconomic variables such as unemployment rate might be added to further assess the effect of military expenditure on economic performance of the country rather than using output alone which was used in this study.

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