European Journal of Business and Management
ISSN 2222-1905 (Paper) ISSN 2222-2839 (Online)
Vol 4, No.20, 2012

Does Military Expenditure Spur Inflation? Autoregressive Distributed Lag (ARDL) & Causality Analysis for Nigeria.

AIYEDOGBON, JOHN O. (Ph.D)
Department of Economics
Nigerian Defence Academy, Kaduna
PMB 2109, Kaduna.
johnomolara@yahoo.com

OHWOFASA, BRIGHT O.
Delta State Polytechnic, Otefe-Oghara
brightohwofasa@yahoo.com

IBEH, SONI E.
Delta State Polytechnic, Otefe-Oghara
Fetans2007@yahoo.co.uk

Abstract
This study unfold the relationship between inflation and macroeconomic variables of military expenditure, exchange rate, economic growth proxy by gross domestic product and gross fixed capital formation. The finding revealed that military expenditure does not induce inflation in Nigeria and thus recommended that the current funding of the military sector should be sustained for effective combat readiness both internally and externally.
Key word: Military Expenditure, Inflation, Vector Error Correction Model, Granger Causality.

Introduction

The recent revival of interest in growth theory has also revived interest among researchers in verifying and understanding the linkages between fiscal policies and inflation. This empirical literature varies in terms of data sets, econometric techniques, and often produces conflicting results as to what determines inflationary trend (Grier & Tullock, 1989). Two reasons are been adduced for these rather conflicting results. First, it is the differences in the set of conditioning variables and initial conditions across studies that are responsible for the lack of consensus in the results. The second category consists of a handful of studies where variations in their results were due to omission or ignoring the implications of government budget constraint in their regressions (Kneller, et al, 1999).

In addition to these conflicting views, the existing literature displays a disturbing trend. Most of the conclusions drawn regarding the growth effects of public spending are based either on the experiences of a set of developed countries or on the basis of large samples consisting of a mixture of developed and developing countries. In Nigeria, expenditure is being made to the military on a regular basis to guarantee internal security such as kidnapping, armed robbery and the recent Boko Haram upsurge. Whether such expenditure has impact on inflation is the center focus of this paper. The objective of this paper therefore is to look at the impact of military expenditure on inflation in Nigeria. The linkages between military expenditure and economic growth are well documented in the literature (see for example Egwaikhide & Ohwofasa, 2009), but studies on military expenditure and inflation in Nigeria does not exist to the best of our knowledge. The present study is meant to fill the lacuna.

The paper is divided into five sections. Section two contains a review of related studies. In section three, the methodology import of the paper is explored. Whilst section four presents the results of findings, section five ends the paper with concluding remarks.

Review of Related Literature

Much of the literature on this question of defence versus- growth tradeoffs tends to assume a unidirectional causal relationship that flows from defence allocations to economic distortions. Thus, Steve & David (1993) employed a granger analysis to their study on defence allocation, inflation and unemployment in South Korea and Taiwan. The paper applied VAR model to time series data obtained from South Korea and Taiwan. The findings revealed that with the exception of South Korean, results fail to indicate direct and simple causal connections between the variables within the period of study. Ozsoy (2010) on the relationship between defence spending and macroeconomic variables which include inflation uses VAR model and granger causality for four Middle-East countries of Egypt, Israel, Jordan and Turkey. The study found that while Egypt and Israel have unidirectional causality running from defence spending to inflation, for other countries, no causality was found.

Looney (1989)'s analysis extended possible inflationary impacts of military spending, suggesting two possible sources of greater inflation in arms - producing states. The analysis showed that military spending restricts growth in non-producing states while enhancing it in producing states. Olaniyi (1993) evaluated the impact of defence expenditure on national economic indicators such as the growth in GDP, unemployment, inflation and balance of payment equilibrium using the ordinary least square (OLS) method. His results revealed that the Nigerian defence sector contributed positively to real growth in GDP, but has a progressive distributional and a dampening effect on inflation. Aiyedogbon (2007) investigated the impact of macroeconomic variables on military expenditure. The macroeconomic variables in the study included inflation and found among other things that inflation has a negative relationship with military expenditure in Nigeria.

Methodology

The method employed for the study is cointegration technique and vector error correction model and to avoid spurious regression the study also tested for the presence of unit root. The data employed which are measured in million were culled from the central Bank of Nigeria annual report and statement of account for various years.

$$INF = f\,(MILEX, GDP, EXCH, GCF)\ldots\ldots\ldots\ldots\ldots\ldots..(1)$$

In linear stochastic form equation (1) becomes:

$$INF = \beta_0 + \beta_1 logMILEX + \beta_2 logGDP + \beta_3 EXCH + \beta_4 logGFCF + v\ldots.(2)$$

Where: INT = Inflation Rate, MILEX = Military Expenditure, GDP = Gross Domestic Product at 1990 constant prices, EXCH = Exchange Rate, GFCF= Gross Fixed Capital Formation, v = error term

Econometric Framework

If a statistical test, like co-integration establishes co-movements in time series, the residuals from the regression can be used as error correction terms in the dynamic first-difference equation. Two methods are used in practical application to test stationarity namely Augmented Dickey-Fuller (ADF) test and the non-parametric adjustment Phillip-Perron (PP) test. The Augmented Dickey-Fuller test requires the following as.

$$\Delta MILEX_t = \propto + \beta_t + \delta\, MILEX_{t-1} + \theta \sum \Delta MILEX_{t-1} + e_t \text{ ---------------}(3)$$

$$\Delta INF_t = \propto + \beta_t + \delta INF_{t-1} + \theta \sum \Delta INF_{t-1} + e_t \text{ ----------------------------}(4)$$

Where e_t in the two equations are assumed to be identically and independently distributed (iid) random variable. The Johansen and Juselius (1990) test for the multivariate co-integration approach is based on the following econometric model of the VAR process:

$$\Delta MILEX = \beta_{oy} + \beta_{1yt} - \pi_y INF_{t-1} + \sum r_{1y} \Delta INF_{t-1} + \phi_y w_t + e_t \text{ ------------}(5)$$

where $INF_t = (y_t, z_t)$,

$MILEX_t$ is an M_y * 1 vector of jointly determined endogenous I(1) variables,

INF_t is an M_t * 1 vector of exogenous I(1) variables:

$$\Delta Z_t = \beta_{oz} + \sum r_{1z} \Delta INF_{t-1} + \phi z W_t + V_t \text{ ------------------------------------}(6)$$

W_t is a q x 1 vector of I(0) variables excluding the interception and trends, the stochastic term vector e_t and v_t fulfill.

$$U_t = ({}_{vt}{}^{et}) \sim iid\,(0, \Omega)$$

Where Ω is a symmetric positive - definite matrix, the stochastic term U_t are distributed independently of W_t: $E(U_t/W_t) = 0$, the intercept and trend coefficients, β_{0y} and β_{1y} are M_y x 1 vectors: π_y is the M_y x M long-run multiplier matrix, $m = m_x + m_y,\ r_{1y}, \ldots., r_{(p-1)y}$ are M_y x M coefficient matrices capturing the short-run dynamic effects and φ_y is the $M_y \lambda$ q matrix of coefficients on the I(0) exogenous variables. The Augmented Engle-Granger is applied in testing order of integration of the co-integrating regression error term. Assuming the integration of order 1 and co-integration between the logarithm of the levels of military expenditure and inflation, the following ECM, based on Engle & Granger (1987) is formulated to carry out the standard granger causality test:

$$\Delta \ln MILEX_t = \propto_o + \sum \propto_j \Delta \ln MILEX_{t-1} + \sum P_i \Delta \ln INF_{t-1} + \gamma ECT_{t-1} + e_t \text{ ------(7)}$$

$$\Delta \ln INF_t = \beta_0 + \sum \beta_i \Delta \ln MILEX_{t-1} + \sum \lambda_j \Delta \ln INF_{t-1} + \tau ECT_{t-1} + e_t \text{ --------(8)}$$

Where Δ depicts the difference operator, e_t implies a non- zero serially independent random stochastic term, $ECT_{t-1}$and is the error-correction term obtained from the long-run co-integrating regression and represents the ratio by which the long run disequilibrium in the dependent variable is being corrected in each short-run period.

Presentation and Analysis of Results

Table 1: Results of Stationarity Tests

	ADF TEST			PHILIP PERRON TEST		
Variable	ADF Test	Mackinnon C.V.	Order	PP Test	Mackinnon C.V.	Order
INF	-5.1413	1%=-3.6852	I(I)	-5.7192	1%= 4.3082	I(I)
LMILEX	-4.0951	1%=-3.6852	I(I)	-8.4561	1%=3.6752	I(I)
LGDP	-3.1193	5%=-2.9705	I(I)	-4.1229	1%=-3.6752	I(I)
EXCH	-3.3204	5%=-2.9705	I(I)	-5.1604	1%=-4.3082	I(I)
LGFCF	-6.5955	1%=-3.6852	I(I)	-11.7407	1%=-4.3082	I(I)

The table above shows that both the ADF and the PP tests revealed that the series were non stationary at level but became stationary at integration of order one, ie,I(I) at either 1 or 5 percent confidence level.

Table 2: Results of Cointegration Test

From the table below, both the trace and the maximum eigenvalue tests reveal that there exists a long run equilibrium relationship between the variables employed for the study and were therefore, cointegrated.

Null Hypothesis	Alternative Hypothesis	Statistical Value	5 Percent Critical Value	1 Percent Critical Value	Eigen Value
Trace Tests					
r** = 0	r ≥ 0	117.2	76.07	84.45	0.85
r** ≤0	r ≥ 0	61.9	53.12	60.16	0.63
Max-Eigenvalue Test					
r** = 0	r = 1	55.3	34.40	39.79	0.85
r* ≤1	r = 2	29.6	28.14	33.24	0.63

*(**) denotes rejection of the hypothesis at 5% (1%) level.

Long Run Static Regression

INF= 37.51- 0.33LMILEX + 6.90LGDP -0.30EXCH – 10.37LGFCF
(2.37) (-0.13) (3.33) (-4.29) (-11.33)

Log likelihood = -294.3

The long run results show that there is a negative relationship between inflation and military expenditure, exchange rate and gross fixed capital formation while positive relationship exists between inflation and economic growth proxied by gross domestic product. However, only military expenditure is statistically insignificant in explaining inflation within the review period. This means that although military expenditure is likely to reduce inflation rate in the long run in Nigeria, the impact is not felt on the system. The log likelihood of the equation is relatively high for the results to be reliable. The results are contrary to the findings of Ozsoy (2010) on Turkey.

Short Run Dynamics Results

DINF=-5.74 + 0.19DINF (-1) + 4.04DLMILEX + 33.58DLGDP – 0.35DEXCH -
(1.13) (1.16) (0.75) (1.67) (-1.24)

4.42DLGFCF – 0.93ECM_{t-1}
(-2.71) (4.24)

R^2= 0.51, F-Stat = 3.8

In the short run, past value of inflation, Milex, and GDP have insignificant positive impact on inflation in Nigeria. However, the positive nature of Milex and GDP is a pointer that their growth in Nigeria has the tendency to induce inflation. On the other hand, exchange rate and gross fixed capital formation have negative coefficients with only gross fixed capital formation statistically significant in explaining inflation in Nigeria. The R^2 shows that the independent variables explained about 51 percent of inflation in Nigeria while the F-stat shows that the entire equation is significant. The ECM has the usual negative sign and is statistically significant showing that the speed of adjustment of 93 percent is extremely high to correct the movement in equilibrium between short run and long run state.

Granger Causality Results

Pairwise Granger Causality Tests
Date: 08/31/11 Time: 12:33
Sample: 1980 2010
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Probability
DLOG(MILEX) does not Granger Cause D(INF)	28	0.29989	0.74375
D(INF) does not Granger Cause DLOG(MILEX)		0.15469	0.85757

Here, the results granger causal test show that the null hypothesis that causality did not exist between inflation and military expenditure could not be rejected. This means that within the period of the study, neither inflation nor military expenditure causes each other in Nigeria. The results gave credence to the findings of Steve & David (1993) on South Korea and Taiwan.

Concluding Remarks

The study explored the relationship between inflation and military expenditure in Nigeria. A number of other macroeconomic variables such as exchange rate, GDP and gross fixed capital formation were modeled alongside these two variables. All the investigations were carried out which include long run static regression, vector error correction model and granger causality test. The tests failed to attribute a rise in inflation in Nigeria to increases in military expenditure within the period 1980-2010. It is our conclusion therefore that military expenditure does not induce inflation in Nigeria especially in the long run where the impact is likely to be negative and recommend that the current level of funding the military sector should be sustained for effective results.

References

Aiyedogbon, J.O.(2007). An Analysis of the Structures and Determinants of Defence Expenditure in Nigeria, 1986-2006. Being an Msc thesis in the Department of Economics, Ahmadu Bello Uiversity, Zaria, August.

Engle, R.F., & Granger, C.W.J. (1987). Co-integration and Error Correction:Representation, Estimation and Testing. Econometrica, 55,pp.251-276.

Grier, K.B., & Tullock, G. (1989).An Empirical Analysis of Cross-National Economic Growth, 1951-1980. Journal of Monetary Economics,24, pp.259– 276.

Johasen, S. and Juselius, K (1990); Maximum Likelihood Estimation and Inference on Cointegration with Applications to the Demand of Money. Oxford Bulletin of Economics and Statistic, Vol.52, 169 –210.

Kneller, R., Bleany, M.F. & Gemmell, N. (1999). Fiscal Policy and Growth: Evidence from OECD Countries. Journal of Public Economics, 74, pp. 171 – 190.

Looney, R. E. (1989). Impact of Arms Production on Income Distribution and Growth in the Third World. Economic development and culture change. pp. 147-151.

Egwaikhide, C.I & Ohwofasa B.O.(2009). "Some Determinants of Military Expenditure in Nigeria, 1986-2006. An Empirical Analysis". The Nigerian Journal of Economics and Management Studies, pp.119-129.

Ozsoy, O. (2010). The Relationship between Defence Spending and Macroeconomic Variables. International Journal of Economic and Finance Studies, 2,(1).

Olaniyi, O. (1993). Nigeria's national defence and Economic Development: An Impact analysis. Scandinavian Journal of Development Alternative, xii (2 & 3), pp. 241-254.

Steve, C. & David R. D. (1993). Defense Allocation, Inflation, and Unemployment in South Korea and Taiwan: A Granger Analysis. The Korean Journal of Defence Analysis.