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Trade Openness and Government Expenditure Nexus in Nigeria: A Bounds Test Cointegration Approach

Olusola Joel Oyeleke[1] and Taiwo Akinlo[2*]

[1]Department of Economics, Obafemi Awolowo University, Ile-Ife, Nigeria.
[2]Department of Economics, Adeyemi College of Education, Ondo, Nigeria.

Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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ABSTRACT

This study examined the trade openness and government Expenditure nexus in Nigeria over the period 1980-2013. To analyze the relationship among openness, recurrent expenditure, capital expenditure, total expenditure and exchange rate we adopted ARDL modelling approach to cointegration which is most appropriate technique over some other techniques of integration after examined the stationarity of data through ADF and KPSS tests. The bound testing procedure is used to determine the existence of long run relationships among variables. The results show that there is no cointegration among the variables. Capital expenditure and recurrent expenditure have negative and significant effect on openness while total expenditure and exchange rate on the other hand are positive and significant.

Keywords: Trade openness; government expenditure; economic growth; Nigeria.

**Corresponding author: E-mail: taiwoakinlo@yahoo.com;*

1. INTRODUCTION

The renewed interest in the type of relationship, either short run, long run or causality, that exists between an economy's openness and the government expenditure, using different methodology has dominated empirical literature, most especially the developed economies in the recent time. The most powerful tool of fiscal policy among other macroeconomic policies is government expenditure, which from theoretical evidence has profound influence on economic growth and stabilisation of an economy, depending upon its utilisation pattern and management by the government. Equally, there are sustained presumptions in the empirical literature [1,2], (among others) that the degree of economy's openness influences the level of government expenditure of a country. Also, quite a number of empirical evidence reveals that openness may have desirable as well as undesirable effects on the macroeconomic variables. Therefore, the sustained increases in the size of government expenditure in most of the developing and developed economies in the past decades have frequently engaged the economic researchers in evaluating the relationship between openness and macroeconomic policies [3,4,5].

[6], through compensation hypothesis, emphasises that an economy's openness is positively connected with government expenditure due to its greater risks because governments could afford social insurance against external risks. 6 argued that, the more economies are exposed to international competitiveness, the greater the risk as a result of the possible turbulences in the international markets, which can affect their domestic economy. The author however, admits that the fiscal policy can exert an influence over the external risk, increasing its participation in the whole economy. However, his view is contradicted by [1], which argued that openness decreases the domestic cost of taxation, [7] and [8] argued in similar direction that openness reduced government expenditure.

The global economic meltdown which started in 2007 and persisted till 2009 had serious retrogressive effects on the real economic activities of many countries in Africa, including Nigeria. The impacts of that global economic crisis were pervasive and its adverse effect remained conspicuous in the areas of finance, agriculture, industry and the wholesale sub-sectors in Nigeria which necessitated discretionary government responses in diverse ways. To cushion the effects of that economic meltdown, Nigerian government increased supply of funds into critical physical infrastructure, human capital development and the implementation of sectoral reforms [9].

The relationship between openness and government expenditure is still controversial and subject of debate in spite of many empirical studies carried out across the economies. This is due to the application of different macroeconomic policies, either monetary or fiscal, to ensure that their economies are insulated or protected from the possible negative effects of foreign economic diseases or ailments, technically called external shocks, especially from developing countries to developed ones. Most importantly, successive Nigerian governments usually take strong measures to boost revenue from external trades as well as to halt or lessen, at least, the effects of external shocks to the economy through different fiscal policies. These have resulted in the use of domestic macroeconomic policies to re-engineer the economy and provide some palliative measures that can assist in stabilizing and engendering growth.

This study is very important at this particular time as Nigeria economy is moving towards total economic deregulation, trade liberalization and globalization. Therefore, government interventions are necessary to ensure that the economy is resilient against numerous implications of trade openness.

2. OVERVIEW OF GOVERNMENT SPENDING PATTERN AND TRADE OPENNESS'S PROFILE IN NIGERIA

Evidence has shown in Nigeria that total expenditure in terms of capital and recurrent expenditure has been on the rise for some decades. The total expenditure which is at 10.48 million in 1980 has increased to 60.27million in 1990. While in 2000 the total expenditure has increased to 701.05 million and in 2013 the total expenditure stand at 4,797.47 billion. The recurrent expenditure has also been on the increase, as at 1980 the recurrent expenditure stand at 4.87million and by 1990 it increased to 36.2196. This increase continues as it increased to 461.6 million in 2000 while the recurrent expenditure stands at 3,689.1 Million in 2013. Capital expenditure on the other hand is also on the increase since 1980. For example, the total

capital expenditure is 5.672 Million in 1980. By 1990 it has been increased to 24.0486 Million while in 2000 it stood at 239.4509 and it stood at 1108.3865Miliion. Fig. 1 shows that capital expenditure is fluctuating more than both recurrent and total expenditure during the study period. Between 1980 and 1983 capital expenditure is higher than recurrent expenditure but capital expenditure fell below recurrent expenditure beginning from 1984 and continued till 1995. Between 1996 and 1999 capital expenditure rose above recurrent expenditure and from 2000 till now the recurrent expenditure is higher than capital expenditure in Nigeria. Fig. 1 also shows the trend of government expenditure, trade openness and exchange rate in Nigeria. From this figure, it could be seen that from 1980 to 1989 the trade openness is higher than government expenditure. From 1990 government expenditure has been increasing till 2013 while openness is fluctuating and almost constant till 2008. Openness fell in 2009 and picked up in 2010 and from 2012 till end of this study period is has been on decrease. The relationship between exchange rare and government expenditure is different as government expenditure is increasing in response to exchange rate.

Fig. 2 shows the trend of import and export as % of GDP in Nigeria. From this figure below it is shown that export and import are highly volatile during the study period. It is shown that from 1980 export was declining and this continues to 1986. This decline is due to the neglect of the agricultural sector. Before 1980's agricultural products form the bulk of Nigeria export but since the discovery of oil in 1956, the attention of successive governments shifted away from agriculture and the effect of this was so evident in early 1980's. The rise of exports from 1987 and which reached its peak in 1989 might be due to the introduction of Structural Adjustment Programme (SAP) in 1986. At the introduction of SAP, naira was devalued and this made the price of exports cheaper and there was an increase in demand for exports at the international market. Exports reached the highest level in 2000 and from 2010 exports in Nigeria were at the lowest level since the past two decades.

The trend of imports in Nigeria is similar to exports as it also showed fluctuation. Import was at the minimum level between 1984 and 1985 and was at the highest level between 1997 and 1998. From 2009, import has been declining in Nigeria which might be due to the barn place on some imported products. From Fig. 2 it is evident that Nigeria is exporting more than importing but the fact is that Nigeria exports is dominated by exportation of crude oil. Accordingly and as expected, total trade openness fluctuated over the study period.

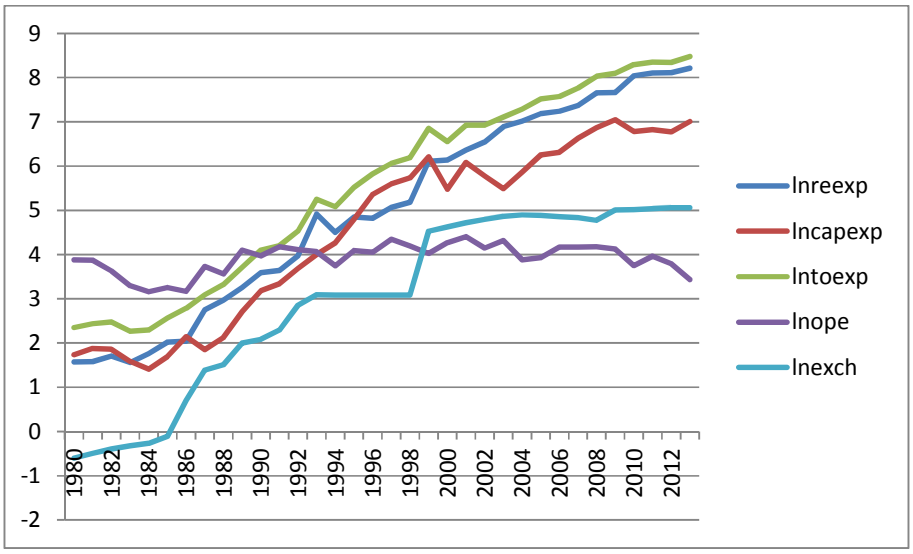

Fig. 1. Government expenditure, trade openness and exchange rate in Nigeria (1980-2013)

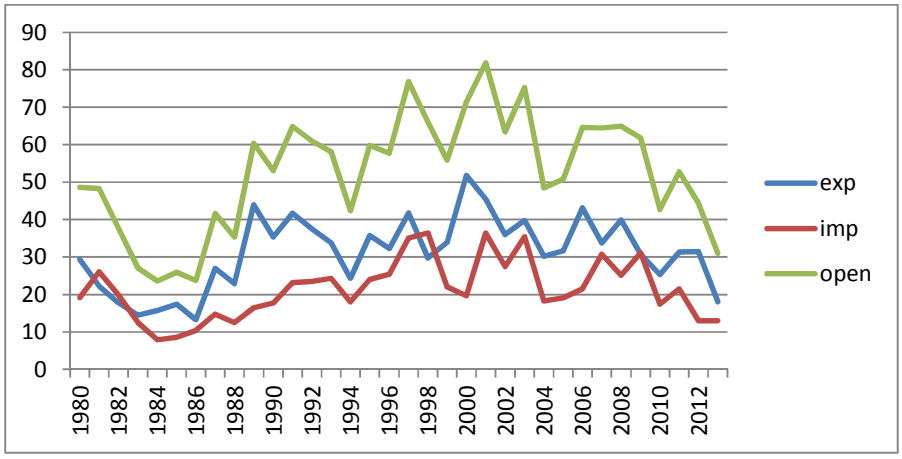

Fig. 2. Trade openness in Nigeria

3. REVIEW OF LITERATURE

[10] argued that trade openness has positive relationship with government size of ECO countries while financial openness has negative effect on economic growth. 10 was not however, country specific to determine the degree of their relation with outside world which culminated into fallacy of composition or general analysis instead of partial equilibrium analysis. [2] investigated the relationship between openness and government expenditure in Turkey between 1974 and 2001. Using residual based co-integration approach, they fail to find an evidence of a long run relationship between the variables. Furthermore, the authors did not provide causal support of compensation hypothesis in Turkish economy.

[11] investigated the impacts of trade and financial openness on government size in Pakistan. Using Fully Modified Ordinary Least Square technique of cointegration and Error Correction Method for short run analysis, the authors results revealed that trade openness was positively connected with upward trend of government expenditure in Pakistan within the period of investigation. Their result on openness and government size was in consonance with [12] and [6] hypothesis, while the relationship between financial openness and government size was found to be inverse and insignificant. However, the disaggregation of the openness into trade openness and financial openness might be a factor for obtaining the results credited to the authors in terms of diversification between trade openness and financial openness relationship to government size.

[13], employment of broad economic globalisation measures have not resulted in significantly impacting the government expenditure. Conversely, integration to the global economy could influence welfare-state change in order to put the budget on the sustainable path and to build credibility.

[14] examines the long run equilibrium relationship between trade openness and government size in Saudi Arabia, using cointegration technique and the direction of causality relationship in the long and short runs between the variables. He utilized the Vector Error Correction Model (VECM) as well. The cointegration test indicated the existence of the long run equilibrium relationship between trade openness and government size. The causality test indicated that there was a unidirectional causal relationship that runs from government size to trade openness in the long run.

[15] analyzed the effects of trade openness on budget balances by differentiating the effects of unconditional openness from those of conditional trade-policy openness, using the GMM system estimator. The results revealed that trade openness increases a country's exposure to external shocks irrespective of its underlying causes. He however submitted that trade openness influenced budget balances through several other channels such as corruption, income inequalities and so on.

[3] analysed government spending, trade openness and economic growth in India using a time series. The author examined the impact of aggregate government expenditure on the

growth rate of economic activities in the Indian, using structural vector autoregression (SVAR) methodology for examining the dynamic response. The author considered public expenditure to be an important fiscal policy instrument as well. The study revealed that public expenditure did have significant influence on the growth rate of Indian economy. Summarily, it is inferred that aggregate government that caused openness measure to increase in India. The position of this author, however negated other authors afore reviewed.

4. ECONOMETRIC ANALYSIS

4.1 Measurement of Variables and Data Source

This study made use of secondary data. The data were obtained from the Central Bank of Nigeria. Specifically, data on economic growth, Government expenditure, recurrent expenditure and capital expenditure were obtained from Central Bank of Nigeria (CBN) Statistical Bulletin, 2013. The data on exchange rate were obtained from and National Bureau of Statistic (NBS). The following variables were used for the regression. Openness (Open) – this is measured as sum of export and import as a percentage of GDP. Government expenditure (Gexp) – this is measured as share of government in GDP. Recurrent expenditure (Rexp) is measured as total payments for transactions within one year. Capital expenditures (Cexp) are payments for non-financial assets used in production process for more than one year. Exchange rate (Exch) is the real effective exchange rate.

4.2 Methodology

Following [16] Aregbeyen and Ibrahim (2014), the relationship between openness and government expenditure could be bidirectional and unidirectional. We therefore specified the functional form of the relationship as

$$Topen=f(Gexp) \quad (1)$$

where Open represents trade openness and Gexp represent government expenditure. From Nigeria federation account the government expenditure is divided into recurrent expenditure and capital expenditure. Therefore, we split government expenditure (Gexp) into two.

$$Gexp=Rexp+Cexp \quad (2)$$

Hence, Eq. (1) becomes

$$Topen=f(Rexp,Cexp) \quad (3)$$

But to know the joint effect of both recurrent expenditure and capital expenditure on openness we retain government expenditure. Therefore, by combining Eq.(1) and (3) we have

$$Topen=f(Rexp,Cexp,Gexp) \quad (4)$$

Evidence from previous studies shows that exchange rate is a major determinant of openness. We therefore include Exchange rate (Exch) which will also serve as control variable.

$$Topen=f(Rexp,Cexp,Gexp,Exch) \quad (5)$$

By expressing Eq. (5) in econometrics form it becomes long-run form as

$$Topen_t = \alpha_0 + \alpha_1 Rexp_t + \alpha_2\ Cexp_t + \alpha_3 Gexp_t + \alpha_4 Exch_t + e_t \quad (6)$$

4.3 Estimation Technique

This study adopted Autoregressive distributive lag (ARDL) model to estimate the long run relationship between openness and government expenditure. The ARDL cointegration test which is also known as the ARDL bounds testing model is a general dynamic specification, which applies lags of the dependent variable and the lagged and contemporaneous values of the explanatory variables, through which the short-run impacts can be directly estimated, and the long-run relationship can be indirectly estimated. This model is preferred to other models due to its advantage over other co-integration methods like Johansen; Engle and Granger, as the bounds test allows the co-integration relationship to be estimated by OLS once the lag order of the model is identified and its ability to combine variables with *I*(0) and *I*(1) together which means performing unit root test is not necessary. Nevertheless, this study will perform unit root test so as to ensure the variables are not *I*(2) or beyond because the bounds test is based on the assumption that the variables are *I*(0) or *I*(1) and for its benefit of estimating both the long-run and short run parameters of the models simultaneously.

There are two steps involved in estimating the long-run relationship between openness and government expenditure. The first step is to examine the presence of a long-run relationship

among all variables in the equation. If the long run relationship is confirmed in the model, the long-run coefficients will be estimated using the associated ARDL model. To examine for cointegration in Eq.(5) by the bounds test proposed by [16], following unrestricted Error Correction Model.

$$\Delta Open_t = \beta_{10} + \beta_{11} Open_{t-1} + \beta_{12} Rexp_{t-1} + \beta_{13} Cexp_{t-1} + \beta_{14} Gexp_{t-1} + \beta_{15} Exch_{t-1} + \beta_{16} \sum_{i=1}^{p} \Delta Open_{t-1} + \beta_{17} \sum_{i=0}^{p} \Delta Rexp_{t-1} + \beta_{18} \sum_{i=0}^{p} \Delta Cexp_{t-1} + \beta_{19} \sum_{i=0}^{p} \Delta Gexp_{t-1} + \beta_{20} \sum_{i=0}^{p} \Delta Exch_{t-1} + \varepsilon_1 \quad (7)$$

where ε_{1t} and Δ are the white noise term and the first difference operator respectively. The ARDL method estimates $(p+1)^k$ number of regressions in order to obtain the optimal lag length for each variable, where p is the maximum number of lags to be used and k is the number of variables in the equation. An appropriate lag selection based on a criterion such as Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC). The ARDL co-integration method is based on the F or Wald-statistics. The F-test is used for testing the existence of long run relationship among the variables. The null hypothesis is tested by considering the Unrestricted Error Correction Model in equation (7) while excluding the lagged variables $\Delta Open_t$, $\Delta Rexp_t$, $\Delta Cexp_t$, and $\Delta Gexp_t$, based on the Wald or F-statistic. The asymptotic distribution of the F-statistic is non-standard under the null hypothesis of no co-integration relationship between the examined variables, without recourse to whether the underlying explanatory variables are purely *I*(0) or *I*(1). The null hypothesis of no co-integration (H_0: $\beta_{10} = \beta_{11} = \beta_{12} = \beta_{13} = \beta_{14} = \beta_{15}$) is therefore tested against the alternative hypothesis (H_1: $\beta_{10} \neq \beta_{11} \neq \beta_{12} \neq \beta_{13} \neq \beta_{14} \neq \beta_{15}$).

Thus, [17] compute two sets of critical values for a given significance level. One set assumes that all variables are *I*(0) and the other set assumes they are all *I*(1).If the computed *F*-statistic (test statistic) is above the upper bound critical value, then the null hypothesis will be rejected irrespective of the orders of integration for the time series. On the other hand, if the test statistic falls below the lower bound critical value, then the null hypothesis cannot be rejected. Lastly, if the test statistic falls within the critical value bounds, the result is inconclusive. Consequently, the order of integration for the underlying explanatory variables must be known before any conclusion can be drawn. If there is evidence of co-integration among the variables, the following long-run model is estimated:

$$Topen_t = \varphi_{1+} \beta_1 \sum_{i=1}^{p} Topen_{t-1} + \alpha_1 \sum_{i=0}^{p} Rexp_{t-1} + \gamma_1 \sum_{i=0}^{p} Cexp_{t-1} + \psi_1 \sum_{i=0}^{p} Gexp_{t-1} + \Pi_1 \sum_{i=0}^{p} Exch_{t-1} + \varepsilon_1 \quad (8)$$

The next step is the estimation based on ECM-ARDL (thereafter ECM) model. If there is a cointegration between the variables, then the ECM model can be utilized. This model is derived from obtaining the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This can be expressed as follows;

$$\Delta Open_t = \varphi_{1+} \beta_1 \sum_{i=1}^{p} \Delta Open_{t-1} + \mu_1 \sum_{i=0}^{p} \Delta Rexp_{t-1} + \rho_1 \sum_{i=0}^{p} \Delta Cexp_{t-1} + \mathrm{r}_1 \sum_{i=0}^{p} \Delta Gexp_{t-1} + \emptyset_1 \sum_{i=0}^{p} \Delta Exch_{t-1} + \psi ECT_t + \varepsilon_1 \quad (9)$$

According to [18] if there is no cointegration among the variables, then the ECM model without error correction term can be used as follows;

$$\Delta Open_t = \varphi_{1+} \beta_1 \sum_{i=1}^{p} \Delta Open_{t-1} + \mu_1 \sum_{i=0}^{p} \Delta Rexp_{t-1} + \rho_1 \sum_{i=0}^{p} \Delta Cexp_{t-1} + \mathrm{r}_1 \sum_{i=0}^{p} \Delta Gexp_{t-1} + \emptyset_1 \sum_{i=0}^{p} \Delta Exch_{t-1} + \varepsilon_1 \quad (10)$$

All coefficients of the short-run equation are coefficients relating to the short-run dynamics of the model's convergence to equilibrium and ψ in equation (9) above represents the speed of adjustment.

5. EMPIRICAL RESULTS

In order to do meaningful policy analysis with the results, using both ADF and KPSS test, we perform unit root tests in log level and first differences to determine univariate properties of the series being examined (Table 1). That is, to test for the presence of the unit roots or non-stationarity. The results from both ADF and KPSS statistics shows that all the variables are stationary at first difference which means the variables are integrated of order *I*(1). Therefore, we can reject the null hypothesis of unit root.

The presence of long-run relationships between the variables is tested by using the equation (8). The determination of the appropriate lag length for each equation is necessary in order to whiten the residuals. The Wald tests (*F* tests) for joint null hypothesis that the coefficients of the lagged variables in level form are zero (no cointegration between the variables), and the results of the calculated *F*-statistics and the values for both upper and lower bound are presented in Table 2.

The calculated F-statistics is 1.83 which is less than the lower bound critical values of 2.04 and 2.57 at the 10% and 5% levels respectively. Therefore, the null hypothesis of no cointegration cannot be rejected and this indicates that there is no long-run relationship among the variables.

Having established that there is no long run relationship among the variables meaning that we could no longer estimates error correction model. We therefore, present the results of long run coefficients in Table 3.

Table 1. Unit root test result

Series	ADF		KPSS	
	Level	1st difference	Level	1st difference
OPEN: (contant)	1.9686	-7.2172*	0.3143***	0.1498
(contant & linear trend)	0.6080	-4.2638**	0.1493***	0.0990
REXP: (constant)	-0.7567	-8.0090***	0.6676***	0.1333
(constant &linear trend)	-2.5465	-7.9386***	0.1385***	0.1150
CEXP: (constant)	-0.7007	-5.8615***	0.6363***	0.1116
(constant &linear trend)	-1.4776	-5.7880***	0.1340***	0.1418
GEXP: (constant)	0.9750	-2.4259	0.3143***	0.1498
(constant &linear trend)	-0.8956	-3.6414*	0.1493***	0.0990
EXCH: (constant)	-1.7836	-4.8709***	0.6368***	0.3042
(constant &linear trend)	-0.8197	-5.2321***	0.1819***	0.0646

Note. Mackinon critical values for rejection of hypothesis of a unit root.
*** Denote significant at 5% level. ***Denote significant at 1% level*
The critical values for ADF are: -3.6463, -2.9540, and -2.6158 (constant only @ level); -3.7537, -2.9571, and -2.6174 (constant only @ 1st difference); -4.3733, -3.622, and -3.6032; (constant & trend @ level); -4.3560, -3.5069 and -3.2334 (constant and trend @ 1st difference) at 1%, 5% and 10% level of significance respectively. However, the critical values for KPSS test are: 0.7390, 0.4630 and 0.3470 (with constant only); 0.2160, 0.1460 and 0.1190 (constant and trend) at 1%, 5% and 10% level of significance, respectively

Table 2. ARDL bound test for cointegration model

F (Rexp, Cexp, Gexp, Exch)	F-statistic: 1.83	K=4	N=33
Critical values: 10%	Upper bound: 2.38	Lower bound: 2.04	
5%	3.94	2.57	

Table 3. Estimated ARDL long-run coefficients dependent variable OPEN: ARDL (1,0,0,0,0)

Regressors	Coefficient	t-statistics	p-value
Cexp	-2.5958	-5. 3731	0.000
Rexp	-4.5170	-6.3350	0.000
Gexp	-6.4938	8.2156	0.000
Exch	0.7805	2.2801	0.030

The estimated coefficients of the long-run relationship between openness and government expenditure in Table 3 show that capital expenditure (Cexp) has negative and significant impact on openness in Nigeria. The coefficient of capital expenditure is -2.5958 which is significant at 1%. Recurrent expenditure is negative with the coefficient of -4.5170 and statistically significant at 1%. This implies that 1% increase in recurrent expenditure will lead to 259.58 decreases in openness. The coefficient of government expenditure is positive and statistically significant at 1%. The coefficient of the government expenditure is 6.4938 implying that 1% increase in government expenditure will lead to 649.38 increases in trade openness.

This results show that neither recurrent expenditure nor capital expenditure alone is enough to positively impact trade openness. It is the combination of the two that is total government expenditure that is enough to caution the effect of trade openness. Based on this results the government in Nigeria must able to strike balance between recurrent expenditure and capital expenditure so as to ensure that government expenditure contributes to economic growth in Nigeria. This result supported compensated hypothesis and consistence with [11].

5.1 Diagnostic Tests

J-B normality test for residual is conducted to see if residual are normally distributed or not. This is very necessary because one of the assumptions of CLRM is residual are normally distributed with zero mean and constant variance. Breusch-Godfrey LM test is conducted to check the serial autocorrelation in our model. Autoregressive conditional heteroskedasticity (ARCH) is conducted to check the autocorrelation in the variance of error term. So, our models pass all diagnostic tests. The outcomes of all these tests in the same order are given in the Table 4 in the appendix.

5.2 Stability Test

In order to check the stability of the Models, we plot the cumulative sum of recursive residuals CUSUM and cumulative sum of recursive residuals of square CUSUMS. The test for stability is necessary because according to [19], the fact that variables are cointegrated does not necessarily imply that the estimated coefficients are stable. Therefore, the result of the stability is presented below. The results show that coefficients in our estimated models are stable as the graph of CUSUM and CUSUMS statistics lies in the critical bounds. The absence of divergence in CUSUM and CUSUMS graphs confirm that in our ARDL Models, long run estimates are stable.

6. CONCLUSION

This study examined the relationship between openness and government expenditure in Nigeria over the period of 1980-2013. The estimation process starts with examining stationary property of the underlying time series data by applying unit root test. The estimated result confirmed that Openness, capital expenditure, recurrent expenditure, government expenditure and exchange rate are not stationary at levels under ADF test but they are all stationary at first level. Using KPSS test all the variables are stationary at level.

The ARDL results shows that there is no cointegration among the variables while the long run test shows that capital expenditure and recurrent expenditure has negative and significant effect on openness. Government expenditure and exchange rate are positive and significantly impacted openness. This results show that government needs to increase its expenditure so as to ensure that increase in the degree of openness does not have negative effect on the economy.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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APPENDIX

Table 4. ARDL – VECM model diagnostic tests

Test statistics	LM
Serial correlation	$\chi^2(1) = 4.3608(0.037)$
Functional form	$\chi^2(1) = 5.7611(0.016$
Normality	$\chi^2(2) = 1.8960(0.388)$
Heteroscedacity	$\chi^2(1) = 0.1538(0.696)$

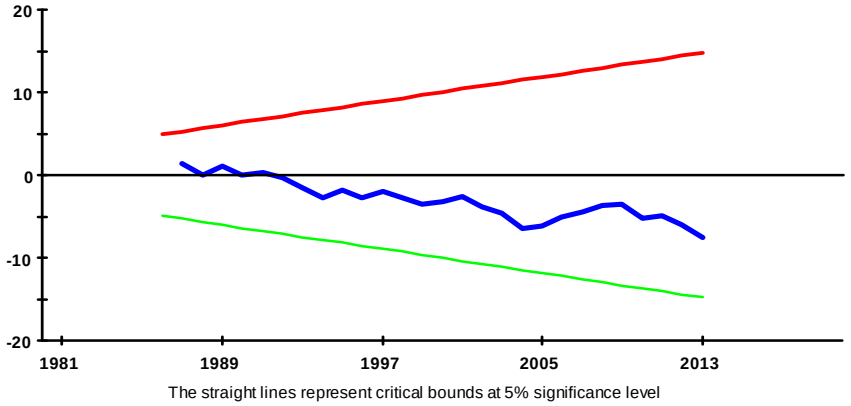

Fig. 3. Plot of cumulative recursive residuals

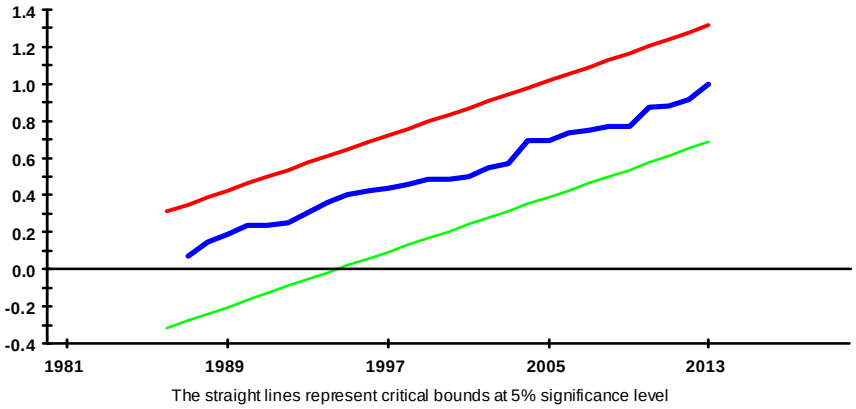

Fig. 4. Plot of cumulative sum of squares of recursive residuals

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