ON THE ESTIMATION OF EXPORT-LED GROWTH: A COMPARATIVE STUDY BETWEEN ARDL AND JOHANSEN PROCEDURES

[1]Mayaki, J. & [2]Adenomon, M. O.
[1]Niger State Bureau of Statistics, Minna, Niger State. jmayaki42@gmail.com
[2]Statistics Unit, Department of Mathematical Sciences, Nasarawa State University, Keff, Nasarawa State. admonsagie@gmail.com; Tel No: 07036990145

ABSTRACT

The Study was an estimation of export-led growth in the long-run by comparing ARDL and Johansen procedures. It examined the validity of export-led hypothesis in Nigeria using time series annual data over the period of 1981 to 2015 for Nigeria. The two approaches were used to test for cointegration, and for estimating long-run coefficients. The variables considered were, Gross Domestic Product (GDP) as proxy for economy growth, Exports, Imports, Gross Fixed Capital Formation as proxy for capital and total labour force as proxy for labour. The series were tested for unit root and were found to contain unit root but are integrated of order one I(1) in exception of labour that was integrated of order zero I(0) . The cointegration test by Johansen procedure showed one cointegrating equation in the VAR model, also, ARDL model indicated long run relationship between the variables therefore confirming the validity of export-led growth in Nigerian economy. The long run coefficients derived for the Export-led growth give the same results by the signs of the coefficients using the two methods. However, there is a slight difference in determinants parameters magnitudes. The coefficient of determination in ARDL model was higher than that of the Johansen procedure. However, the diagnostic test for normality of the residual was not in favour of Johansen VECM approach.

Keywords: Export-Led growth, long run, cointegration, ARDL, Johansen, Cointegration

1. Introduction

Economic growth means an increase in the productive capacity of an economy over time to bringing about rising levels of national production and income (Wikipedia, 2015). Every country (developed and the developing) is concerned about its rate of economic growth. Economic experts, policymakers, public and private sectors work ceaselessly towards attaining economic growth by the use of development models and policies. In this study, the export-led growth in Nigeria is examined.

The export-led hypothesis has been one of the most debated theory in the recent past; nevertheless, there exist persistent controversies regarding their actual impacts. According to Ozturk et al (2010), the basic hypothesis about export-led growth suggests that the expansion of aggregate exports has a favourable impact on economic growth. The general debate here is that the overall growth of both developed and the developing countries could be achieved not only by increasing the amount of labour and capital but also by expanding foreign trade (Olusegun, 2009).

The argument is fundamental to the inquiry of whether strong economic performance is export-led or growth-driven. This question is important because the determination of the causal pattern between exports and growth has important implications for policy-makers' decisions about the appropriate growth and development strategies and policies to adopt Awokuse, (2003). In the 19th century, Alfred Marshall declared that, the causes which determine the economic progress of nations belong to the study of international trade, Marshall (1959). Robertson (1938) famously described exports as an engine of growth while Minford *et al.* (1995) hailed foreign trade as an elixir of growth. This subject continues to elicit responses from trade and growth theorists.

In Nigeria, recent works that have looked into the causal links between exports and economic growth include; (Omisaki, 2009), (Chimobi, 2010), and (Alimi, 2012), and their findings are mixed.

This study seeks to compare the two methods that can be used in estimating the long-run coefficients of the regressors, that is, the Autoregressive Distributed Lag (ARDL) and Johansen procedures. In addition, to examine the nature of relationship that exist between total exports, total imports, labour, to Gross Domestic Product (GDP), five variable were considered exports, imports, labor proxy by the total labor force and capital proxy by Gross Fixed Capital Formation (GFCF).

2. The Empirical Literature Review on Export-Led Growth Hypothesis in Nigeria

The empirical literature on the role of export performance in the process of economic growth can be considered to be vast, results are, however contradictory for both Developing Countries and Less Developed Countries and for studies carried out using different methodologies. This made the study of the role of exports for economic growth a recurrent research theme in trade and development literature (Todaro and Smith, 2003).

In Nigeria, some authors had examined the performance of foreign trade and economic growth. For instance, Egwaikhide (1991) examines the qualitative effects of export (non-oil) expansion on Nigeria's economic growth over the period, 1960 to 1983. Based on simulation experiment, he observes among others, that a 75 per cent rise in non-oil export led to 1.4 per cent increase in real GDP. He concluded that there is need to promote export in order to enhance GDP growth in Nigeria.

Ogbokor (2001), investigated the macroeconomic impact of oil exports on the economy of Nigeria. Utilizing the popular OLS technique, he observed that economic growth reacted in a predictable fashion to changes in the regressors used in the study. He also found that a 10% increase in oil exports would lead to 5.2% jump in economic growth. He concluded that export oriented strategies should be given a more practical support.

Olusegun (2009), examines the export-led growth hypothesis for the period, (1970-2006), he uses five important variables, GDP, export value, import value, exchange rate, labour force and gross capital formation. He investigated both causal and dynamic long run nature of the variables using ARDL and Toda-Yamamoto causality test. The findings showed that there is a bidirectional relationship between output and export hence, a support for export-led growth for Nigeria.

Usman (2011), evaluated the performance of foreign trade and economic growth in Nigeria using linear multiple regression model for the period 1970 to 2005. Using five important variables, including export, import, economic openness, exchange rate and per capital income, found that export, import and exchange rate are all negatively related to real output of Nigeria for the study period and therefore, the variables are not instruments of growth in Nigeria

Ojide and Ogbodo (2014), examined export-led growth hypothesis from 1970 to 2011, considering three variables GDP, non-oil export and exchange rate. The findings from regression and co-integration analysis revealed that, growth evidence of non-oil exports exists in Nigeria.

However, the lack of consistent or problem of mixed result may be as a result of the methods employed. The study seeks to compare two method of estimating cointegration and long run coefficients which are paramount to the validity of export-led growth.

3. Model Specification

We base our empirical model on the Feder (1983) model. Starting with a general neoclassical Aggregate Production Function:

$$Y_t = A_t K_t^{\alpha} L_t^{\beta} \qquad (3.1)$$

where, Y_t= aggregate production of the economy at time *t*, A_t = level of Total Factor Productivity (TFP), K_t= capital stock at time *t*, L_t= stock of labour at time *t*. According to Feder (1983) and Bhagwati (1978) the impact of exports on economic growth possibly operates through total factor productivity (A_t). In order to investigate if and how exports affect economic growth through changes in TFP, we assume that TFP can be expressed as a function of exports X_t, and other exogenous factors C_t, thus:

$$A_t = f(M_t, X_t, C_t) = M_t^{\delta} X_t^{\gamma} C_t \qquad (3.2)$$

Where IM_t = capital goods imports, which are also considered potential to boost productivity through technological sophistication embodied in them ‘especially in LDCs’ (Herzer *et al*., 2004). Moreover, omission of this variable can result in spurious conclusions regarding the ELG hypothesis (Riezman *et al*., 1996). Combining equation (3.2) and equation (3.1) we obtain:

$$Y_t = C_t K_t^{\alpha} L_t^{\beta} M_t^{\delta} X_t^{\gamma} \qquad (3.3)$$

where α, β, δ, and γ are the elasticities of production with respect to K_t, L_t, M_t and X_t respectively. Taking natural logs (*L*) of both sides of equation (3.3) gives an explicit estimable linear function:

$$LY_t = c + \alpha LK_t + \beta LL_t + \delta LM_t + \gamma X_t + \varepsilon_t \qquad (3.4)$$

In which all coefficients are constant elasticities, accordingly, γ =productivity effects of exports on economic growth, δ =productivity effects of capital goods imports on economic growth, α=elasticity of capital, β=elasticity of labour, c = constant parameter, and ε = white noise error term.

3.1. Unit Root Test

Unit root test usually is a test for checking whether a time series data is stationary or not. This project work adopted the use of Augmented Dickey-Fuller (ADF, 1979) test approach. The ADF test is considered as an appropriate tool for checking the stationarity of time series data (Mehmood & Ahmad, 2012; Mehmood, 2012a; and Mehmood, 2012b). The time series is said to be non-stationary if the Mackinnon critical value for rejection of hypothesis of a unit root is lower than ADF test statistic, subsequently null hypothesis is rejected and the series is decided to be non-stationary.

The Hypothesis to be tested is

H_o : Series is non-stationary

H_1 : Series is stationary

If all the sets of data are found to be stationary after taking the first difference that is, if the series are integrated of order one (I(1)), and if the regression of the residual are stationary without taking any difference (integrated of order zero I(0)), the equation is said to be co-integrated. On the other hand, if there are two variables, X_t and Y_t which are both non-stationary in levels but stationary in first differences, then X_t and Y_t would become integrated of order one, I(1), and their linear combination should have the form:

$$Z_t = x_t - ay_t \tag{3.5}$$

(Gilmore et al, 2009).

However, if there is a I(0) such that Z_t is also integrated of order zero, I (0), the linear combination of X_t and Y_t is said to be stationary and the selected variables are also to be cointegrated (Engle & Granger, 1987). If two variables are co-integrated, there will be an underlying long-run relationship between them.

To determine the presence of unite roots, an extension of the Dickey and Fuller (1981) method has been applied. The ADF test uses a regression of the first differences of the series against the series lagged once, and lagged difference terms, with optional constant and time trend terms:

$$\nabla y_t = a_o + a_1 t + \gamma y_{t-1} + \sum b_i y_{t-1} + \varepsilon_t \tag{3.6}$$

In the equation ∇ is the first-difference operator, a_0 is an intercept, $a_1 t$ is a linear time trend, ε_t is an error term, and I is the number of lagged first-differenced terms such that

ε_t is the white noise. The test for a unit root has the null hypothesis that signifies $\gamma = o$. If the coefficient is significantly different from zero, the hypothesis that Y_t contains a unit root is considered as rejected. If the test on the level series fails to reject, the ADF procedure is then applied to the first-differences of the series. Rejection leads to the conclusion that the series is integrated of order one, I(1).

3.2. Augmented Dickey–Fuller test for Unit Root

In statistics and econometrics, an augmented Dickey–Fuller test (ADF) is a test for a unit root in a time series sample. It is an augmented version of the Dickey–Fuller test for a larger and more complicated set of time series models. The augmented Dickey–Fuller (ADF) statistic, used in the test, is a negative number. The more negative it is, the stronger the rejection of the hypothesis which indicate that the series is non-stationary (presence of unit root) at some level of confidence

3.3. Testing Procedure (ADF)

The testing procedure for the ADF test is the same as for the Dickey–Fuller test but it is applied to the model

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \delta_1 \Delta y_{t-1} + ... + \delta_{\rho-1} \Delta y_{t-\rho+1} + \varepsilon_t \tag{3.7}$$

Where α is a constant, β the coefficient on a time trend and P the lag order of the autoregressive process. Imposing the constraints $\alpha = 0$ and $\beta = 0$ corresponds to modelling a random walk and using the constraint drift. By including lags of the order p, the ADF formulation allows for higher-order autoregressive processes. This means that the lag length p has to be determined when applying the test. One possible approach is to test down from high orders and examine the t-values on coefficients. An alternative approach is to examine information criteria such as the Akaike Information Criterion (AIC), Schwarz Information Criterion (SIC), Bayesian Information Criterion(BIC) or the Hannan-Quinn Information Criterion (HQIC).

The unit root test is then carried out under the null hypothesis $\gamma = 0$ against the alternative hypothesis of $\gamma < 0$ once a value for the test statistic

$$DF_\tau = \frac{\hat{\gamma}}{SE(\hat{\gamma})} \tag{3.8}$$

is computed, it can be compared to the relevant critical value for the Dickey–Fuller Test. If the test statistic is less (this test is non-symmetrical so we do not consider an absolute value) than (a larger negative) the critical value, then the null hypothesis of $\gamma = 0$ is retained and no unit root is present. This implies that the time series data is stationary.

3.4. Model Selection Criteria

There is need to choose among competing models the best model that fit a particular time series data for some reasons which may be to study the pattern of the series over time or mainly for forecasting purposes. There are several criteria that are in use for these purposes and all these criteria aim at minimizing the residual sum of square (RSS) by imposing a penalty for including an increasing large number of regressors. The criterions are also useful tools in reduction or selection of lags. For the purpose of this study two statistical criterion are considered, the Akaike or Schwarz information criterion.

3.4.1. Akaike Information Criterion (AIC)

The Akaike information criterion is a measure of the relative goodness of fit of a statistical model. Akaike (1973) suggests measuring the goodness of fit for some particular model by balancing the error of the fit against the number of parameters in the model. It provides the measure of information lost when a given model is used to describe reality. It can be said to describe the tradeoff between bias and variance in model construction.

$$AIC = e^{2k/n} \frac{\sum \hat{\mu}_i^2}{n} = e^{2k/n} \frac{RSS}{n} \tag{3.9}$$

Where, k is the number of regressors (including the intercept) and n is the number of observations. For mathematical convenience the formula is written as

$$\ln(AIC) = \left(\frac{2k}{n}\right) + \ln\left(\frac{RSS}{n}\right) \tag{3.10}$$

Where, ln(AIC)=natural log of AIC and 2k/n=penalty factor. In comparing two or more models, the model with the lowest value of AIC is preferred.

3.4.2. Schwarz Information Criterion

Similar in spirit to the Akaike Information Criterion (AIC), the Schwarz Information Criterion (SIC) is defined as

$$SIC = n^{k/n} \sum \frac{\hat{\mu}^2}{n} = n^{k/2} \frac{RSS}{n} \tag{3.11}$$

Or

$$\ln SIC = \frac{k}{n} \ln(n) + \ln\left(\frac{RSS}{n}\right) \tag{3.12}$$

Where, [(k/n)ln(n)] is the penalty factor. Schwarz Information Criterion (SIC) imposes a harsher penalty than Akaike Information Criterion (AIC). And like Akaike Information Criterion (AIC), the lower the value of SIC, the better the model.

3.5. Co-integration Analysis

Co-integration was defined by Granger (1981) as the statistical implication of long-run relationship between economic variables. The basic idea behind co-integration is that, if in the long-run two or more series move closely together, even though the series are trended, the difference between them is constant, Hall and Henry (1989). The absence of cointegration suggests that, the variables under observation have no long-run relationship and in principle they can wander arbitrary far away from each other, Dickey and Fuller (1981).

3.5.1. Johansen Procedures

This study adopted multivariate maximum likelihood cointegration testing procedure developed by Johansen and Juselius (1990) to examine the cointegration relationship between GDP, export, import, labour and capital. The method involved two basic test statistics, first the trace test while the second is the maximal eigenvalue test. The Johansen cointegration test is full information maximum likelihood approach; it is based on the following vector autoregressive (VAR) model of order p:

$$Y_t = A_1 Y_{t-1} + - - - + A_p Y_{t-p} + BX_t + \varepsilon_t \qquad (3.13)$$

Where Y_t is a k – vector of non – stationary I(1) variables; X_t is a d-vector of deterministic variables; and e_t is a vector of innovations. One can rewrite this VAR as follows:

$$\Delta Y_t = \Pi Y_{t-1} + \sum_{i-1}^{p-1} \Gamma_t \Delta Y_{t-i} + BX_t + e_t \qquad (3.14)$$

Where: $\Pi = \sum_{i-1}^{p} A_i - I, \Gamma_i = -\sum_{j=i+1}^{p} A_j$ (3.15)

The Granger's representation theorem asserts that if the coefficient matrix Π has reduced rank r<k, then there exists $k \times r$ matrices α and β, each with rank r such that $\Pi = \alpha\beta'$ and $\beta' Y_t$ is I(0); r is the number of cointegrating relations (i.e. the rank) and each column of β is the cointegrating vector. The elements of α are known as the adjustment parameters in the vector error correction model. The Johansen's approach is to estimate the Π matrix from an unrestricted VAR and to test whether we can reject the restrictions implied by the reduced rank of Π. The first statistics which considers the hypothesis that the rank of Π is less than or equal to r cointegrating vectors is given by the trace test as:

$$\lambda_{trace} = -T \sum_{i=r+1}^{n} \ln(1 - \lambda_i) \qquad (3.16)$$

Where the null being tested is r=f against the more general alternative r<=n. The second test statistic is known as the maximal eigenvalue test which computes the null that there is exactly r cointegrating vectors in X_t and is given by:

$$\lambda_{max} = -T \ln(1-\lambda_r) \tag{3.16}$$

The distributions for these tests are not given by the usual chi-squared distributions. The asymptotic critical values for these likelihood ratio tests are calculated via numerical simulations Johansen and Juselius (1990) and Osterwald-Lenum (1992).

3.5.2. The Autoregressive Distributed Lag (ARDL) Approach

It will be followed by Autoregressive Distributed Lag (ARDL) Bound Testing model.

The ARDL bounds testing model to be estimated is as follows:

$$\Delta LY_t = \lambda_1 LY_{t-1} + \lambda_2 LK_{t-1} + \lambda_3 LL_{t-1} + \lambda_4 LM_{t-1} + \lambda_5 LX_{t-1} + \sum_{i-1}^{n} a_i \Delta LY_{t-i}$$

$$+ \sum_{i=1}^{n} b_i \Delta LX_{t-i} + \sum_{i=1}^{n} c_i \Delta LM_{t-i} + \sum_{i=1}^{n} d_i \Delta LL_{t-i} + \sum_{i-1}^{n} f_i \Delta KX_{t-i} + \varepsilon_t \tag{3.17}$$

where ε_t are white noise errors, Δ is the first difference operator and n is the optimal lag length. All variables are in natural logarithms. The parameters, λ_i , i=1,2,3,4, and 5 function as long-run multipliers, while the a_i, b_i, c_i, d_i, f_i parameters function as the short-run dynamic coefficients of the underlying ARDL model.

The Wald test (F-Statistic) is conducted by imposing restrictions on the estimated long-run coefficients.

Hypothesis to be testes are

$H_0 : \lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = 0$ (no long-run relationship)

$H_1 : \lambda_1 \neq \lambda_2 \neq \lambda_3 \neq \lambda_4 \neq \lambda_5 \neq 0$ (a long-run relationship exists)

Test statistic = F-statistic

Decision rule:

1. Reject H_0 of no cointegration when the F-value exceeds the upper critical bounds value

2. Do not reject H_0 if the F-value is lower than the lower bounds

3. The decision about cointegration is inconclusive, if the calculated F-statistic falls between the lower and upper-bound critical values.

3.6. Models Residual Based Diagnostic Check

The residuals of the models used in this study were further diagnosed of Serial Correlation, Hetroskedasticity and Normality.

The Hypotheses tested were:

1. H_0: Residuals are not serially correlated

   H_1: Residuals are serially correlated

2. H_0: Residuals are homoskedastic

   H_1: Residuals are heteroskedastic

3. H_0: Residuals are normally distributed

   H_1: Residuals are not normally distributed

Decision criteria: Reject H_0 if P-value<0.05 significant value otherwise H_0 is retained.

4. Materials and Methods

Data on gross domestic product (Y_t), exports (X_t), imports (M_t), total labour force (L_t) and Gross fixed capital formation (K_t) for Nigeria were used for the study periods 1981-2015. The sources of secondary data are Central Bank of Nigeria Statistical Bulletin 2014 and 2015 retrievable from http://www.cenbank.org/ and Africa Development Indicators, Retrievable from http://data.worldbank.org/data-catalog/Africa-development-indicators/. The following steps will be followed; first, since both cointegration tests and the estimation of long run coefficients of the regressors depend upon the stationary properties of time series data, the stationarity of the time series data was investigated using the Augmented Dickey-Fuller (ADF) (1979) test in order to determine the order of integration of each time series observation.

Also, since Autoregressive Distributed Lag (ARDL) bound testing approach and Johansen Co-integration required the lag length k in the level VAR system, the lag length of the level VAR system was determined.

These were followed by the cointegration tests from ARDL and Johansen approaches and finally, the long run coefficients were estimated through the procedures.

5. Results and Discussions

This section begins with unit root testing of the variables

Table 1: Augmented Dickey-Fuller (ADF) Test Results

Variables	Calculated Value	Significance level		Results
		99%	95%	
$\ln GDP$	1.39575	-2.63473	-1.95100	Not Stationary
$\Delta lnGDP$	-5.47033	-2.6369	-1.95133	Stationary
$lnExport$	1.57318	-2.63473	-1.95100	Not Stationary
$\Delta lnExport$	-5.465579	-2.6369	-1.95133	Stationary
$lnImport$	0.84319	-2.63473	-1.95100	Not Stationary
$\Delta lnImport$	-6.17793	-2.6369	-1.95133	Stationary
$lnGFCF$	0.78472	-2.63473	-1.95100	Not Stationary
$\Delta lnGFCF$	-5.678039	-2.6369	-1.95133	Stationary
$lnLabour$	-7.637706	-2.63473	-1.95100	Stationary

Critical values are from Mickinnon (1996)

The results of ADF test in table 1 above showed that the null hypothesis of unit root are accepted at level accept for labour, which implies that the variables are not stationary at level but became stationary after first difference.

Table 2: VAR lag Order Selection Criteria lnGDP, lnExport, lnImport, lnCapital and lnLabour (1981-2015)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-48.98019	NA	2.24e-05	3.482593	3.713881	3.557987
1	62.59253	179.9560*	8.61e-08*	-2.102744	-0.715014*	-1.650379*
2	77.60480	19.37067	1.88e-07	-1.458374	1.085797	-0.629038
3	104.1571	25.69577	2.51e-07	-1.558522	2.142090	-0.352215
4	140.0308	23.14432	3.12e-07	-2.260051*	2.597003	-0.676772

* indicates lag order selected by the criterion

The results in table 2 above revealed that the maximum lag length for the VAR model is one using Schwarz information criterion and Hannan-Quinn information criteria.

Table 3: Trace and Max-Eigen Cointegration test for lnGDP, lnExport, lnImport, lnCapital and lnLabour (1981-2015)

Null Hypothesis	Trace Statistic		Max-Eigen Statistic	
	Statistic	Critical Value (5%)	Statistic	Critical Value (5%)
r=0*	77.39485	69.81889	38.50010	33.87687
r<=1	38.89474	47.85613	19.34236	27.58434
r<=2	19.55239	29.79707	10.20079	21.13162
r<=3	9.351602	15.49471	9.350350	14.26460
r<=4	0.001251	3.841466	0.001251	3.841466

In table 3 above, the maximal eigenvalue test and trace test revealed one cointegrating equation, denoting the rejection of the null hypothesis of no cointegration between the variables at 5% level of significance. The existence of a cointegrating equation implies existence of a long run relationship between the variables.

Table 4: The Estimated Johansen Long-Run Coefficients (GDP as Dependent Variable)

Variables	Coefficients	Std Error	T-Stat	Remark
Export	1.11799	0.04876	22.9287	Significant
Import	0.24182	0.04063	5.95235	Significant
Capital	-0.1596	0.03411	-4.67730	Significant
Labour	-0.8598	0.14564	-5.90359	Significant
Constant	-2.7806			

The results of the Johansen long run coefficients of table 4 above revealed that the coefficients of export and import are positive that is 1.12 and 0.24 respectively and are statistically significant. This suggested that, on the long run, an increase in total exports and total imports of 1 percent will lead to 1.12 and 0.24 percent increase in GDP respectively. However, capital and labour were reported to have a negative impact on the GDP that 1% increase in capital and labour will lead to about 0.16 and 0.86 percent decrease in GDP respectively.

Table 5: **Results of Models Diagnostic Check for Johansen Procedure**

VEC Residual Serial Correlation LM Test		
Lags	LM-Stat	Prob-value
1.	17.34315	0.8690
2.	13.67625	0.9671
3.	20.30156	0.7308
4.	21.65173	0.6558
5.	23.31653	0.5591

VEC Residual Heteroskedasticity Tests (Cross Terms included

χ^2	Degree of freedom	Pro
167.5559	180	0.7377
Jarque-Bera Joint VEC Residual Normality Test		
Jarque-Bera	df	Prob-vale
1101.840	10	0.001

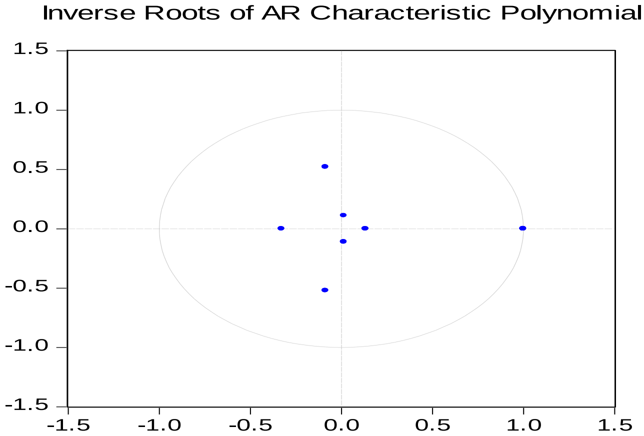

Table 5above are results of the model diagnostic tests of the residual for vec serial correlation, vec heteroskedasticity and vec normality test and inverse roots of AR characteristic polynomial graph for stability check. The results indicated that there was absent of VEC multivariate correlation and heteroskedasticity but the residuals jointly are not normally distributed. Report of the inverse roots of the characteristic AR polynomial estimated indicated that VEC model is stable, since all roots have modulus less than one and lie inside the unit circle.

Table 6: Results from Bound Test with unrestricted intercept and no trend

ARDL (11111)						
Wald F-Statistic	Significance Level					
	10%		5%		1%	
	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
5.296	2.45	3.52	2.86	4.01	3.74	5.06

Critical values are from Pesaran et al. (2001), table CI (iii) case III

The results in table 6 above revealed the existence of cointegration at 1% levels of significance since 5.296 is above the upper critical bound values of 5.06. This is an evidence of long run relationship jointly among GDP, exports, imports, labour and capital.

Table 7: The Estimated ARDL Long-Run Coefficients (GDP as Dependent Variable)

Variables	Coefficients	Std Error	T-test	Remark
Export	1.085757	0.069354	15.65529	Significant
Import	0.221104	0.062678	3.527617	Significant
Capital	-0.120664	0.051615	-2.337770	Significant
Labour	-0.800557	0.234501	-3.413875	Significant
Constant	-2.542052	0.993058	-2.559822	Significant

The results of the Johansen long run coefficients of table 6 above revealed that the coefficients of export and import are positive that is about 1.09 and 0.22 respectively and are statistically significant. This suggested that, on the long run, an increase in total exports and total imports of 1 percent will lead to 1.09 and 0.22 percent increase in GDP respectively. However, capital and labour were reported to have a negative impact on the GDP that 1% increase in capital and labour will lead to about 0.12 and 0.80 percent decrease in GDP respectively.

Table 8: Results of Models Diagnostic Check for ARDL Model

Breusch-Godfrey Serial Correlation LM Test		Breusch-Pagan-Godfrey Heteroskedasticity Test		Jarque-Bera Normality Test	
Obs R-square	P-value	Obs R-square	P-value	JB-value	P-value
2.0986	0.1474	19.2392	0.1560	0.2389	0.8874

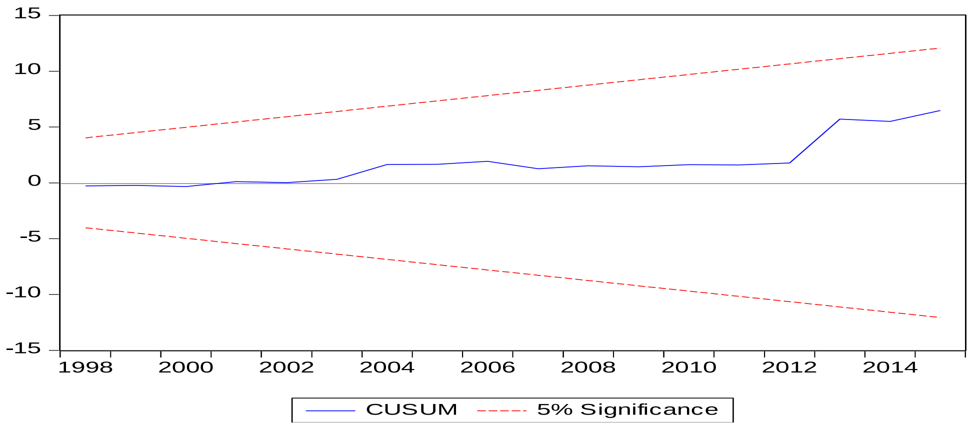

Table 8 above indicates the results of the diagnostic test of ARDL (1,1,1,1,1) model residual. The results revealed that autoregressive distributed lag (ARDL) model passes the entire test that characterized a good ordinary least squared method and was also stable based on the cusum-chart. The plot of the CUSUM statistics stayed within the critical bound of 95% level of significance.

6. Conclusion

This study estimated the export-led growth by comparing two methods of estimations, ARDL and Johansen procedures. The results of unit root test indicated that the variables, GDP, export, import, and capital are integrated of order one I(1) and only labour was integrated of order zero I(0). Cointegration results from the two methods indicated that the variables are cointegrated therefore, revealing the presence of long run relationship among the variables thereby validating export-led growth in Nigeria Economy. The long run coefficients of the regressors derived from the two methods have the same sign and the corresponding coefficient figures are much closed. Therefore, we concluded the same results for but methods.

7. Recommendations

Based on the preceding conclusions on the results of the analysis, the following were hereby recommended that:

1. Government should diversified it economy to maximum its export potential which in turn will bring about economic growth.

2. The use of ARDL and Johansen procedure may give the same results, therefore, any one of the methods could be used for estimating Long run coefficients of the regressors.

REFERENCE

Akaike, H. (1975) “Information Theory and an Extension of the Maximum Likelihood Principle: *Second International Symposium on Information Theory* pp. 267-281

Alimi, S (2012) Is the Export-Led Growth Hypothesis Valid for Nigeria? *Research Journal of Economics and Business studies*, 12(2), 8-14

Awokuse, T. O. (2003)"Is the Export-Led Growth Hypothesis Valid for Canada?" *Canadian Journal of Economics*, 36, 126-136

Bhagwati, J. N. (1978), “Foreign Trade Regime and Economic Development: Anatomy and Consequences of Exchange Controls Regime”. *Cambridge, M. A: Ballinger.*

Central Bank of Nigeria, (2014) “*Central Bank of Nigeria Statistical Bulletin 2011* retrieved from: http://www.cenbank.org/.

Central Bank of Nigeria, (2015) “*Central Bank of Nigeria Statistical Bulletin 2011* retrieved from: http://www.cenbank.org/.

Chimobi, O.P. (2010), The Estimation of Long-run Relationship between Economic and Growth, Investment and Export in Nigeria. *International Journal of Business and Management*, 5(4), 215-222

Dickey, D.A. and Fuller, (1981). The likelihood ratio statistics for autoregressive Time Series with a unit root. *Econometric Rev.*, 49: 1057-1072.

Egwaikhide, F. O. (1991) “Economic Growth through Export Expansion: Evidence from Nigeria”, *NISER Monograph series* No. 10, pp 41

Engle, R.F. and C.W.J. Granger (1987) "Cointegration and Error Correction: Representation Estimation and Testing" *Econometrica,* 55, 251-76

Feder, G. (1983), “On exports and economic growth”, Journal of Development Economics, 12, 2, 59-73

Gilmore, C.G, McManus, G. M., and Sharma, R. (2009) “The Dynamics of Gold Prices, Gold Minning Stock Prices and Stock Market Prices Co movements” *Research in Applied Economics* 2(11)

Granger, C. W. J. (1981), “Some properties of Time Series Data and their use in Econometric Model Specification”. *Journal of Econometrics, Annals of Applied Econometrics*,vol.16: pp.121-30.

Hall, S.G. and S.S.B. Henry, (1989) *Macroeconomic Modelling* Elsevier Science Publishers Amsterdam. Netherlands.

Herzer, D & Nowak-Lehmann F. D. (2004) “Export Diversification, Externalities and Growth” *Ibero American Institute for Econ. Research, Discussion papers 093*

Johansen, S and Juselius, K (1990)"Maximum Likelihood Estimation and Inference on Cointegration with Application to Demand for Money" *Oxford Bulletin of Economics and Statistics*, vol 52, pp 169-210

Mackinnon, J. G. (1996), "Numerical Distribution Functions for Unit Root and Cointegration Tests", *Journal of Applied Econometrics, 11, 601-618*

Marshall, A. (1959). "*Principles of Economics*" 8th Edition, Macmillan for the Royal Economic Society

Mehmmod S. (2012b) "Effect of Different Factors on Gross Domestic Product: A Comparative Study of Pakistan and Bangladesh: *Academy of Contemporary Research Journal*, 1(1), 18-35

Mehmmod S. and Ahmad, Z. (2012) "Forecasting Pakistan's Exports to SAARC: An Application of Univariate ARIMA Model. *Journal of Contemporary Issues in Business Research,* 1(3), 41-45

Mehmood, S. (2012a) "Dynamics of Exports and Economic Growth of Regional Level: A Study on Pakistan's Exports to SAARC: *Journal of Contemporary Issues in Business Research,* 1(1), 11-19

Minford, P.; J. Riley and E. Nowell (1995). "The Elixir of Growth: Trade, Non-traded Goods and Development". Centre for Economic Policy Research *Discussion Paper* No. 1165.

Ogbokor A, (2001) "Oil and Economic Growth: An Econometric Analysis" *Journal Development Alternatives and Area Studies*, 20:124-130

Ojide, G.M., Ojide C.K., and Ogbodo (2014). "Export-Led Growth Hypothesis in Nigeria: Applications of ARDL model and Co-integration Analysis: *Global Journal of Emerging Market Economies 6:5-13*

Olusegun, A. O., (2009), "Export-Led Growth Hypothesis: Further Econometric Evidence from Nigeria, *Pakistan Journal of Social Sciences,* 6(4), p.219-23

Omisakin, O.A (2009) "Export-Led growth Hypothesis: Further Econometric Evidence from Nigeria. *Pakistan Journal of social science*, 6(4), 219-223

Osterwald-Lenum, M. (1992) "A Note with Quantiles of the Asymptptic Distribution of the Maximum Likelihood Cointegration Rank Test Statistics: Four cases", *Oxford Bulletin of Economics and Statistics vol. 54, pp.461-72*

Ozturk, I. and Ali, A (2010) Testing the Export-Led Growth Hypothesis: Empirical Evidence from Turkey" *The Journal of Developing Areas*, vol. 44, No 1 pp 245-54

Pesaran, M.H, Y. Shin and R.J. Smith(2001) Bounds Testing Approaches to the Analysis of level Relationship" *Journal of Applied Econometric,* 16:289-326

Riezman, R. G.; Summers, P. M. & Whiteman, C. H. (1996) “The Engine of Growth or its Handmaiden? A Time Series Assessment of Export-led Growth. *Empirical Economics 21, 77-113*

Robertson, D.H (1938). "The Future of International Trade". *Economic Journal,* 48 (189), March.

Todaro, P. and S. C. Smith, (2003) "*Economic Development”* (Eighth Edition), Addison Wesley, Singapore

Usman, O. A. (2011), “Performance Evaluation of Foreign Trade and Economic Growth in Nigeria”. *Research Journal of Finance and Accounting vol. 2. No. 2*

Wikipedia, (2015) *https//en.m.wikipediap.org/wiki/Economic_growth*

World Bank, (2016) *Africa Development Indicators*, Retrieved from http://data.worldbank.org/data-catalog/Africa-development-indicators/