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# Empirical Analysis of Banking Sector, Stock Market and Economic Growth Nexus in Nigeria

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***Author's contribution***

*The sole author designed, analysed, interpreted and prepared the manuscript.*

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## ABSTRACT

This explores the direction of the causal relationship between banking, stock market and economic growth, while controlling for relevant variables in Nigeria for the period 1981–2014. Using principal component analysis for the construction of the financial development indices, Auto-regressive Distributed Lag (ARDL) and the Granger causality approach. Our results are in three folds: First, the causal effect of stock market development on economic growth is found to be positively significant in the long-run and short-run but bank sector development is found to be positively insignificant suggesting the weakness of financial intermediary sector in resource mobilisation and allocation in Nigeria. Second, this study finds no causality running from economic growth to financial development in both at the long run and short run positions. Third, the causal effect of macroeconomic variables on finance-growth nexus is found to be uni-directional in the long-run, suggesting that crude oil price and government expenditure are the key drivers of long-term development of the Nigerian financial sector and as such among the underlying factors that determine the amount of economic activities passing through the Nigerian financial sector. The policy recommendation is to make the banking sector more accessible to enhance financial deepening and indeed a policy that will encourage diversification of the economy rather than solely dependence on oil revenue.

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## 1. INTRODUCTION

A large and growing amount of theoretical and empirical work has emerged since the pioneering work of Schumpeter [1] who pointed out the productivity and growth enhancing effects of services provided by a developed financial sector. He had argued that financial intermediaries play a crucial role in mobilising savings, monitoring managers, evaluating investment projects, managing and pooling risks and facilitating transactions. This postulation was different from the Keynesian paradigm which stated that financial deepening occurs due to autonomous spending by the government.

McKinnon [2] and Shaw [3] supported Schumpeter [1] of the role of financial sector in promoting economic growth but criticised the Keynesian or financial expressionists view adopted by many governments in developing countries in the early 1970s. They argued that government restrictions on the banking system such as interest rate ceiling, high reserve requirements and direct credit programmes hinders financial development and reduce output growth.

These policies, King and Levine [4] argued alter the efficiency of financial intermediation and exert a first-order influence on growth. They empirically demonstrated that financial indicators strongly and positively correlated with an economy's level of real production which is directly related to the citizens' standard of living. In support of this view, Onwumere et al. [5] noted that the search for ways of bettering the standard of living of citizens has opened the corridors for alternative viewpoints on paradigms for economic growth and development.

The search for this alternative view point identified financial deepening as one of those strategies whose implementation can quicken the pace of development- the second view is financial inclusion. Hashmi and Naqvi [6], Greenwood and Jovanovic [7], King and Levine [4], fundamentally acknowledged that the financial intermediaries embark on the costly procedure of investigating the possibility of better investment for magnification of returns and reduction of risks associated with them. Thus optimality achievement results in reducing associated costs, efficient allocation of the scarce resources resulting in accelerated growth for the economy. Hicks [8] stated clearly that for an industrial revolution, a financial revolution is required. Financial intermediaries serve to mobilise savings from disparate saving units and investors. They overcome transaction costs, overcome information asymmetries and make multiple bilateral contracts between agents who have surplus resources and units which are productive in raising capital. Better mobilisation of savings results in an increase in capital accumulation, improved resource allocation and boosting of growth in the economy.

According to Mirdala [9], the various effects of financial deepening have come to the centre of academics as well as policy-makers discussions especially in relation to the financial sector development. Together with financial liberalisation and international financial integration, economists and policymakers now focus their attention to financial deepening especially due to its potential effects on the real economy.

However, the link between finance and growth has also been controversially debated in economic literatures. Despite the great deal of effort devoted empirically in disentangling the impact of financial development on growth as accurately as possible, there is still no consensus as to the existence, the level or the direction of such relationship [10]. Some of the researchers have asserted that there still exists great dichotomy regarding the role of financial intermediaries in facilitating sustainable economic growth especially in the long run.

Considering the rising debate and insistency in the research arena, this study aims to contribute to the still scarce literature by localising the study and at the same time examining the dynamic causal relationship between banking, capital market and economic growth using Granger causality and ARDL approach to dynamic relationship. Even though few studies in Nigeria have tried to investigate the subject, but issues like multicollinearity and omitted variables have been left out. To achieve this objective, we introduce principal component analysis and indeed decomposed finance-growth nexus

into banking-growth and stock-growth nexus (see for instance [11]. Secondly, understanding the dynamic relationships that exist among financial sector development, economic growth and macroeconomic variables is important since financial sector development represents an important channel for resource mobilisation and allocation in the economy. Any impact of macroeconomic variables on financial sector development will significantly determine the pace of economic growth. Hence, the results of this study will be a guide to policy makers in designing policy that rekindle the financial sector performance in Nigeria. The remainder of this study is structured as follows: Section 2 presents the data and methodology of the study. Section 3 presents and discusses the empirical results. Finally, section 4 offers some concluding remarks on the findings.

## 2. DATA, MODEL AND METHODOLOGY

### 2.1 Data and Variables

We follow previous study that used annual data covering the period from 1981 to 2014. Economic growth is defined as the real GDP per capita, in line with theoretical underpinning and related studies (see; [12,13,14,15,7,16,17] and many others). The variables used in this study are as follows: Aggregate financial sector development, banking sector development (BNKINDEX), stock market development (STKINDEX), per capita economic growth (GDP), and a set of four other macroeconomic variables (MAC), namely gross capital formation (KAP), inflation (INFL), brent prices (OILP) and government financial expenditure (GOVEXP). Data for financial development indicators are from World Development Indicators (online), whereas form oil price is from investing.com

Banking sector development means a process of enhancement in the standard and efficiency of banking services. This process involves the interaction of many activities, and consequently cannot be captured by a single measure (see [13,14,15]. The incumbent study employs three commonly-used measures of banking sector development, namely deposit money bank asset (DMBA), bank asset (BA), and domestic credit to the private sector (PCRD) (see [18,19,13,14,20], among others).

In the same direction, stock market development is defined as a process of improvements in the quantity, quality and efficiency of stock market services. It also involves the interaction of many activities and cannot be captured by a single measure. The incumbent study deploys three commonly-used measures of stock market development, indeed, captures various components of the stock market development in Nigeria. Stock market capitalisation to GDP ratio (Mcap) captures the size of the Nigerian stock market; value of trades of domestic stocks over GDP (Vtrd) measures the liquidity of the stock market while turnover ratio (Turn) captures the efficiency of the stock market in resource allocation [18,19,13,14,20,21] among others. All the variables and sources are summarised in Table 1.

Modelling various related financial deepening indicators in the linear form could lead to issues of multicollinearity (see [20]). However, the linear combination may be more efficient rather than modelling each indicator separately. Therefore, we bring the two sector market variables together by employing principal Component Analysis (PCA). Hence, three specific indices are constructed for each group. Principal component analysis (PCA) has commonly been used to address the problem of multicollinearity by reducing a large set of correlated variables into a smaller set of uncorrelated variables [22] and has been widely employed in the construction of financial development indices in recent studies (see for instance [23,24]). Table 2 shows that the first principal component accounts for about 70% of the total variation in the six financial market indicators indicators; the second PCA account for about 94% of the total variation in the three bank sector indicators and the third PCA account for about 85% of the total variation in the three stock sector indicators Therefore, FINDEX1, BNKINDEX and STKINDEX are calculated as a linear combination of the three stock market indicators with weights given as the first eigenvector.

### 2.2 Models Formulation

Our first objective is to identify finance-growth nexus in Nigeria. Therefore, in our model, we augment the neoclassical Cobb–Douglas production function by incorporating financial development and selected macroeconomic variables in addition to the capital and labor force (see [13,23,24,14,15,20,19] among others).

**Table 1. Definition of variables used in defining Aggregate, bank & stock market development**

| Variables | | Variable Definition | Source |
|---|---|---|---|
| FINDEX1 | **SMD+BSD** | Composite index of stockmarket development and banking sector development. | World Development Indicators<br>Beck, Demirguc-Kunt, & Levine, 2000. |
| STKINDEX | **SMD** | Composite index of stockmarket development: This utilizes four stock market indicators: MCAP, VTRD, TURN. | Financial development and structure |
| | *MCAP* | MAC Market capitalization: Percentage change in the market capitalization of the listed companies. | data-set 2016 version |
| | *VTRD* | TRA Traded stocks: Percentage change in the total value of traded stocks. | |
| | *TURN* | TUR Turnover ratio: Percentage change in the turnover ratio in the stock market. | |
| BNKINDEX | **BSD** | Composite index of banking sector development: This utilizes three banking sector indicators: DMBA, BA, PCRD | Beck, Demirguc-Kunt, & Levine, 2000. |
| | *DMBA* | Deposit money bank asset: Total assets held by deposit money banks as a share of GDP. Assets include claims on domestic real nonfinancial sector which includes central, state and local governments, nonfinancial public enterprises and private sector. | Financial development and structure data-set 2016 version |
| | *BA* | Bank Asset: The ratio of bank assets to GDP measures the size of the banking sector, while the ratio of bank deposits to GDP captures the role of the banking sector in savings mobilisation. | |
| | *PRCD* | Domestic credit to the private sector: This credit, expressed as a percentage of gross domestic product, refers to to financial resources provided to private sector, such as through loans, purchase of non-equity securities, trade credits and other accounts receivable that establish a claim for payment. | Beck, Demirguc-Kunt, & Levine, 2000. Financial development and structure data-set 2016 version |

*Note 1: All monetary measures are in real US dollars.*
*Note 2: We use the natural log of these variables in our estimation.*

**Table 2. Eigenvalues, proportion and eigenvectors of each principal component**

| | Eigenvalues | Proportion | Eigenvectors (loadings) | | | | | |
|---|---|---|---|---|---|---|---|---|
| **INDEX** | | | **DMBA** | **PRCD** | **BA** | **MCAP** | **VTRD** | **TURN** |
| FINDEX1 | 4.239876 | 0.7066 | 0.414688 | 0.444658 | 0.414688 | 0.369593 | 0.414104 | 0.38764 |
| BNKINDEX | 2.826235 | 0.9421 | 0.58673 | 0.58673 | 0.558119 | | | |
| STKINDEX | 2.563216 | 0.8544 | | | | 0.575479 | 0.542009 | 0.612413 |

*Source: various computation from eview9*

$$Y = AK^{\alpha}L^{1-\alpha} \quad (1)$$

Where $Y = aggregate\ GDP, L = labor, K = capital\ and\ A = TFP$

Dividing by L and taking the natural logs

$$\frac{Y}{L} = A\left(\frac{K}{L}\right)^{\alpha}$$

$$ln\left(\frac{Y}{L}\right) = ln\,A + \alpha \ln\left(\frac{K}{L}\right)$$

Denote TFP as a function of financial deepening and selected macroeconomic variables:

$A = f(FD, MAC)$ where FD is financial deepening variables and MAC is selected macroeconomic variables. This suggests our model as thus:

$$\left({}^{Y}/_{L}\right)_t = \alpha_0 + \alpha_1 FD_t + \alpha_2 MAC_t + \alpha_3\left({}^{K}/_{L}\right)_t + \varepsilon_t \quad (2)$$

where Y/L is GDP per worker in constant 2005 prices, FD is the financial development indicator, K/L is capital stock per worker. RGDPC captures the demand for financial intermediary services in the economy [25]. It is believed that the growth of the economy will encourage high demand for financial intermediary services. Three control variables and gross fixed capital formation per labour force are included in the model in equation (2): oil price (OILP), government final expenditure (GOVEXP), and inflation. Apriori, they are expected to have positive signs except inflation. Inflation captures the degree of macroeconomic stability in the economy. According to Boyd et al. [26] high rates of inflation could lead to the following economic consequences; reduce the volume of liquid liabilities issued by financial intermediaries, reduce the size of bank assets and discourage incentives for private sector activities and demand for credit facilities. The negative effect of inflation on the development of financial sector intermediation has also been documented by Bittencourt [27] and Naceur et al. [28] for Brazil and MENA countries, respectively.

## 2.3 Empirical Methodology

In order to empirically analyse the long-run relationships and short-run relationship between finance–growth nexus and selected macroeconomic variables, this study applies the autoregressive distributed lag (ARDL) cointegration technique as a general vector autoregressive (VAR). The ARDL cointegration approach was developed by Pesaran et al. [29]. This method has its credit over the traditional cointegration technique proposed by Johansen and Juselius [30]. Firstly, it requires small sample size. Two sets of critical values are provided, low and upper value bounds for all classification of explanatory variables into pure I(1), purely I(0) or mutually cointegrated. Indeed, these critical values are generated for various sample sizes. Narayan [31] argues that existing critical values of large sample sizes cannot be employed for small sample sizes. Secondly, Johensen's procedure requires that the variables should be integrated of the same order, whereas ARDL approach does not require variables to be of the same order. Thirdly, ARDL approach provides unbiased long-run estimates with valid t'statistics if some of the model repressors are endogenous [31] and [32]. Fourthly, this approach provides a method of assessing the short run and long run effects of one variables on the other and as well separate both once an appropriate choice of the order of the ARDL model is made (see [33] The ARDL model is written as follow;

$$\Delta lnrgpdc_t = \beta_0 + \sum_{i=1}^{n}\beta_{1i}\Delta lnrgdpc_{t-1} + \sum_{i=0}^{n}\beta_{2i}\Delta lnfindex_{1_{t-1}} + \sum_{i=0}^{n}\beta_{3i}\Delta lnKap_{2_{t-1}} + \sum_{i=0}^{n}\beta_{4i}\Delta lninfl_{3_{t-1}} + \sum_{i=0}^{n}\beta_{5i}\Delta lnoip_{4_{t-1}} + \sum_{i=0}^{n}\beta_{6i}govexp_{4_{t-1}} + \beta_7 lnrgdpc_{t-1} + \beta_8 lnfindex_{t-1} + \beta_9 lnKap_{t-1} + \beta_{10} lninfl_{t-1} + \beta_{11} lnoilp_{t-1} + \beta_{12} lngovexp_{t-1}\varepsilon_t \quad (3)$$

$$\Delta lnfindex_t = \beta_0 + \sum_{i=1}^{n}\beta_{1i}\Delta lnfindex_{t-1} + \sum_{i=0}^{n}\beta_{2i}\Delta lnrgdpc_{1_{t-1}} + \sum_{i=0}^{n}\beta_{3i}\Delta lnKap_{2_{t-1}} + \sum_{i=0}^{n}\beta_{4i}\Delta lninfl_{3_{t-1}} + \sum_{i=0}^{n}\beta_{5i}\Delta lnoip_{4_{t-1}} + \sum_{i=0}^{n}\beta_{6i}govexp_{4_{t-1}} + \beta_7 lnrgdpc_{t-1} + \beta_8 lnfindex_{t-1} + \beta_9 lnKap_{t-1} + \beta_{10} lninfl_{t-1} + \beta_{11} lnoilp_{t-1} + \beta_{12} lngovexp_{t-1}\varepsilon_t \quad (4)$$

**Table 3. Proposed hypotheses**

| Null hypothesis of no co-integration | Alternative hypothesis | Equation |
|---|---|---|
| $H_0: \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = 0$ | $H_1: \beta_7 \neq \beta_8 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq \beta_{13} \neq 0$ | 3 |
| $H_0: \beta_7 = \beta_8 = \beta_9 = \beta_{10} = \beta_{11} = \beta_{12} = 0$ | $H_1: \beta_7 \neq \beta_8 \neq \beta_{10} \neq \beta_{11} \neq \beta_{12} \neq \beta_{13} \neq 0$ | 4 |

*Source: author's design*
*Note: all the variables defined previously*

Where Δ is the difference operator while $\varepsilon_t$ is white noise or error term. All other variables have been previously defined in Table 1. The bounds test is mainly based on the joint F-statistic whose asymptotic distribution is non-standard under the null hypothesis of no cointegration. The F-statistics will be based on the coefficients of lagged variables for examining the existence of a long-run relationship among the variables. The first step in the ARDL bounds approach is to estimate the equations (3 & 4) by ordinary least squares (OLS). The estimation of this equation tests for the existence of a long-run relationship among the variables by conducting an F-test for the joint significance of the coefficients of the lagged levels of the variables. The null hypothesis of no co-integration and the alternative hypothesis which are presented below as thus:

Two sets of critical values for a given significance level can be determined [31]. The first level is calculated on the assumption that all variables included in the ARDL model are integrated of order zero, while the second one is calculated on the assumption that the variables are integrated of order one. The null hypothesis of no cointegration is rejected when the value of the test statistic exceeds the upper critical bounds value, while it is not rejected if the F-statistic is lower than the lower bounds value. Otherwise, the cointegration test is inconclusive.

### 2.3.1 Error correction model

Following ([32,31,13,23,24,14,15,20,19] among others) we obtain the short-run dynamic parameters by estimating an error correction model associated with the long-run estimates. This study uses Akaike Information Criterion (AIC) for selecting the optimal lag length. The existence of cointegration between the variables implies that causality exists in at least one direction. The error correction model for the estimation of the short-run relationships is specified as:

$$\Delta lnrgdpc_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnrgdpc_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta lnfindex_{1_{t-1}} + \sum_{i=0}^{n} \beta_{3i} \Delta lnKap_{2_{t-1}} + \sum_{i=0}^{n} \beta_{4i} \Delta lninfl_{3_{t-1}} + \sum_{i=0}^{n} \beta_{5i} \Delta lnoilp_{4_{t-1}} + \sum_{i=0}^{n} \beta_{6i} govexp_{4_{t-1}} + \lambda_1 ECM_{t-1} + \mu_{2t} \quad (5)$$

$$\Delta lnfindex_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i} \Delta lnfindex_{t-1} + \sum_{i=0}^{n} \beta_{2i} \Delta lnrgdpc_{1_{t-1}} + \sum_{i=0}^{n} \beta_{3i} \Delta lnKap_{2_{t-1}} + \sum_{i=0}^{n} \beta_{4i} \Delta lninfl_{3_{t-1}} + \sum_{i=0}^{n} \beta_{5i} \Delta lnoilp_{4_{t-1}} + \sum_{i=0}^{n} \beta_{6i} govexp_{4_{t-1}} + \lambda_2 ECM_{t-1} + \mu_{2t} \quad (6)$$

$ECM_{t-1}$ is the error correction term obtained from the cointegration model. The error coefficients $(\lambda_1 \,\&\, \lambda_2)$ indicate the rate at which the cointegration model corrects its previous period's disequilibrium or speed of adjustment to restore the long run equilibrium relationship. A negative and significant $ECM_{t-1}$ coefficient implies that any short run movement between the dependent and explanatory variables will converge back to the long run relationship.

### 2.3.2 Granger causality

This study uses the Granger causality test augmented by the error correction term for detecting the direction of causality between the variables. The advantage of using vector error correction (VECM) modelling framework in testing for causality is that it allows for the testing of short-run causality through the lagged differenced explanatory variables and for long-run causality through the lagged ECM term. A statistically significant $ECM_{t-1}$ term represents the long-run causality running from the explanatory variables to the dependent variable. If two variables are non-stationary, but become stationary after first differencing and are cointegrated, the *p*th-order vector error correction model for the Granger causality test assumes the following equation:

$$\Delta lnX_t = \alpha_{10} + \sum_{i=1}^{p_{11}} \theta_{11i} \Delta ln\, X_{t-1} + \sum_{i=1}^{p_{12}} \partial_{12j} \Delta ln\, Y_{t-j} + \delta_{13} ECM_{t-1} + u_{1t} \quad (4)$$

$$\Delta lnY_t = \alpha_{20} + \sum_{i=1}^{p_{21}} \theta_{21i} \Delta ln\, X_{t-1} + \sum_{i=1}^{p_{22}} \partial_{22j} \Delta ln\, Y_{t-j} + \delta_{23} ECM_{t-1} + u_{2t} \quad (5)$$

Where $\theta$ and $\boldsymbol{\partial}$ are the regression coefficients, $u_t$ is error term and $p$ is lag order of $x$ and $y$ Table 4 indicates that the optimal lag order based on the This study uses Akaike Information Criterion (AIC) is 2. The presence of short-run and long-run causality can be tested. If the estimated coefficients of $y$ in Eq. 2 is statistically significant, then that indicates that the past information of y has a statistically significant power to influence $x$ suggesting that $y$ Granger causes in the short-run. The long-run causality can be found by testing the significance of the estimated coefficient of $ECM_{t-1}$ ($\delta_{23}$).

## 3. EMPIRICAL RESULTS

### 3.1 Descriptive statistics

Fig. 1 displays scatter plots of the relationship between composite financial sector development and economic growth for Nigeria. The figure shows a relatively positive correlation between the variables exists for Nigeria country over the period 1981-2014 and indeed, highlights the linear relationship between the variables but does not show the magnitude of the causal effects or nexus between the variables in the economy.

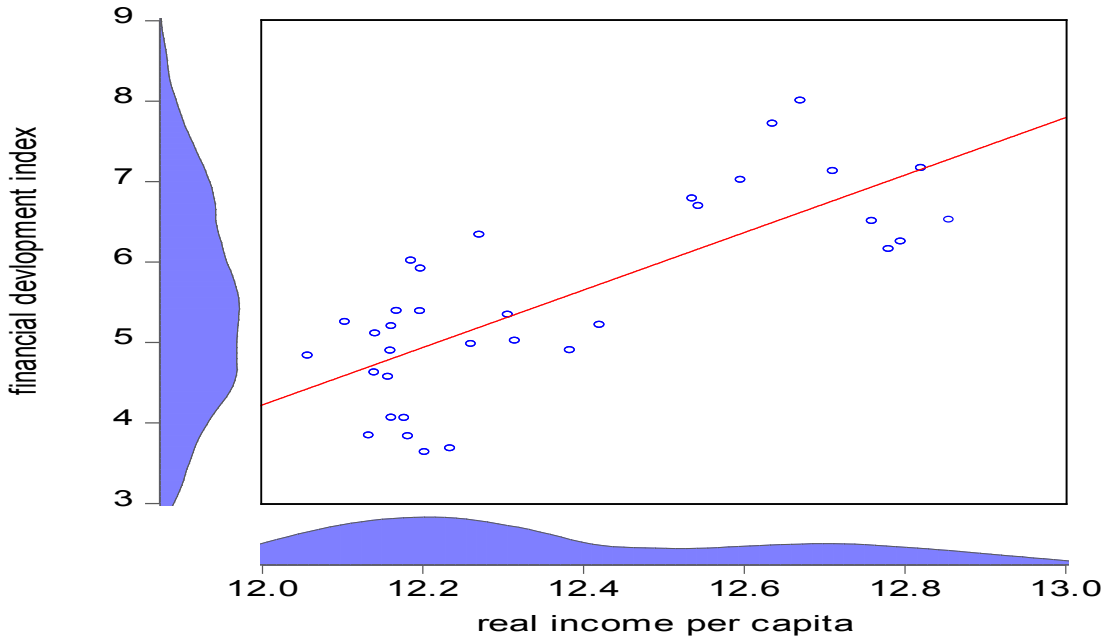


**Fig. 1. Trends in financial deepening (aggregate composite index) and economic growth in Nigeria**

**Table 4. ADF and PP unit root tests**

| Variables | ADF test | | PP test | |
|---|---|---|---|---|
| | I(0) | I(1) | I(0) | I(1) |
| *lrgdpc* | 0.5355 | -4.2583*** | 0.2542 | -4.2436*** |
| *lFindex* | -1.1064 | -5.1157*** | -1.0380 | -5.1245*** |
| *lBnkindex* | -2.6275* | -4.3460*** | -2.7211* | -4.6261*** |
| *lStkindex* | -1.0885 | -5.1646*** | -1.0218 | -5.1646*** |
| *lKap* | 0.7164 | -3.1931*** | -0.5424 | -4.4141*** |
| *lInfl* | -3.0902** | -6.3013*** | -3.0286** | -5.9956*** |
| *lOilp* | -0.3360 | -6.2565*** | -0.2474 | -6.2547** |
| *lGovex* | -3.6037** | -3.3419** | 2.6854* | -6.3590*** |

*All the variables are in the natural log form. *Significance at 10%. **Significance at 5%. ***Significance at 1%. The asterisks indicate the rejection of the null hypothesis of unit root.*

## 3.2 Unit Root Tests

Given that the ARDL-bounds cointegration testing approach allows variables to be integrated of different orders [I(0) and I(1)], it does not require any of the variables to be integrated of order 2 [I(2)]. The F-statistics is calculated by Pesaran et al. [29] and Narayan [31] are established on the assumption that the variables are I(0) or I(1), it is essential to examine the stationarity of the variables to ensure that none of the variables is integrated of order 2 [I(2)], otherwise, the series would explode. We determine the order of integration of all variables using unit root tests by testing for null hypothesis $H_o: \beta = 0$ (i.e $\beta$ has a unit root), and the alternative hypothesis is $H_1: \beta < 0$ .The stationarity property of indicators of economic growth (lnrgdpc), financial development (composite index) from banking sector development (Bnkindex) and stock market development (Stkindex), gross capital formation per capita (Kap) and selected macroeconomic variables are examined using the Augmented Dickey Fuller (ADF) and Phillip Perron (PP) unit root tests. The results in Table 4 show that both tests yield consistent set of results.

## 3.3 Co-integration Test

The results of the cointegration test, based on the ARDL-bounds testing approach, are presented in Table 5. Cointegration were tested on the three specifications (Model 1, Model 2 and Model 3) using each of the composite index constructed from various financial indicators of financial. The results show that the F-statistic for the growth model (specifications 1–3) is higher than the upper bound critical value at 10 and 5 per cent level of significance using restricted intercept and no trend. These results suggest the presence of cointegration in all the specifications of the economic growth model. Based on the results, the null hypothesis of no cointegration is rejected in three models. This implies that indicators of financial intermediary development (financial index), economic growth and the three control variables are all bound by a long-run relationship in Nigeria.

**Table 5. ARDL bounds cointegration test results**

| Estimated models | Optimal lag length | F-statistics | Decision |
|---|---|---|---|
| Frgdpc(rgdpc/findex,kap,infl,oilp,govex) | 1,2,2,1,1,1 | 4.0239* | cointegration |
| Frgdpc(rgdpc/Bnkindex,kap,infl,oilp,govex) | 1,0,2,1,1,0 | 3.7075* | cointegration |
| Frgdpc(rgdpc/stkndex,kap,infl,oilp,govex) | 1,2,2,1,1,1 | 4.9498** | cointegration |
| | critical values (T= 34 ) | | |
| Significant level | Lower bounds I(0) | | Upper bounds I(1) |
| 1% level | 3.9 | | 5.419 |
| 5% level | 2.91 | | 4.193 |
| 10% level | 2.407 | | 3.517 |

*ARDL Models selected on Akaike Information Criteria, k = 5*
**** indicates sign. at 1% level;**5% *10% Restricted intercept and no trend*
*Source of critical value bounds: [31] Appendix: Case II*

**Table 6. Long-run and short run coefficients**

| **Dependant variable=lrgdpc** | | | **Panel A** | | | |
|---|---|---|---|---|---|---|
| **Long run analysis** | **Coefficient** | **t-Stat** | **Coefficient** | **t-Statistic** | **Coefficient** | **t-Statistic** |
| Variable | Specification 1 | | Specification 2 | | Specification 3 | |
| Lfindex | 0.102032 | 1.7220 | | | | |
| Lbnkindex | | | 0.003398 | 0.0465 | | |
| Lstkindex | | | | | 0.1012* | 1.7441 |
| LKap | 0.019984 | 0.2013 | -0.041745 | -0.5357 | 0.0279 | 0.2700 |
| Linfl | 0.0853* | 1.8743 | 0.052811 | 1.5259 | 0.0962* | 1.9272 |
| Loilp | 0.2735*** | 3.1200 | 0.4088*** | 8.1049 | 0.2636* | 2.8624 |
| Lgovexp | -0.1719* | -1.7368 | -0.068454 | -1.03 | -0.1795 | -1.7128 |
| C | 10.8198*** | 11.516 | 11.4420*** | 16.3073 | 10.736*** | 11.0325 |
| **Short run analysis** | | | **Panel B** | | | |
| D(FINDEX1) | 0.0229 | 1.4822 | | | | |
| D(FINDEX1(-1)) | -0.0392* | -2.4161 | | | | |
| D(BNKINDEX1) | | | -0.046 | -1.1301 | | |
| D(STKINDEX1) | | | | | 0.0242* | 1.7510 |
| D(STKINDEX1(-1)) | | | | | -0.0385** | -2.6577 |
| D(GFCF) | -0.0817* | -1.9667 | -0.041423 | -0.932696 | -0.0802* | -1.9761 |
| D(GFCF(-1)) | 0.0678* | 2.0129 | 0.0947** | 2.471376 | 0.0684* | 2.0662 |
| D(LINFL) | -0.0159 | -1.4045 | -0.004896 | -0.389727 | -0.01546 | -1.3747 |
| D(OILP) | 0.0524* | 1.8088 | 0.1125*** | 3.356158 | 0.0476 | 1.6624 |
| D(GCEXP) | -0.0148 | -0.5445 | 0.003437 | 0.101709 | -0.0128 | -0.4863 |
| ect(-1) | -0.4821*** | -6.6262 | -0.5759*** | -5.320929 | -0.460*** | -6.7970 |
| $R^2$ | 0.9827 | | 0.9752 | | 0.9833 | |
| F-statistics | 78.953*** | | 82.634*** | | 81.767*** | |
| D-W | 2.0172 | | 2.0349 | | 2.0253 | |
| Short run diagnostic test | | | | | | |
| Test | F-statistics | P-value | F-statistics | P-value | F-statistics | P-value |
| $x^{2\ SERIAL}$ | 0.7917 | 0.47 | 0.633589 | 0.5415 | 0.831455 | 0.4534 |
| $x^{2\ ARCH}$ | 0.3802 | 0.5423 | 0.103392 | 0.7501 | 0.452567 | 0.5064 |
| $x^{2\ REMSEY}$ | 0.9365 | 0.3467 | 0.177805 | 0.6778 | 0.852561 | 0.3687 |

*Note: *, **, and ***indicate significance at 10, 5 and 1%, respectively, t-statistics. Note: R2 means R-squared. SC means Breusch–Godfrey serial correlation LM test. Hetro is the ARCH test for heteroscedasticity. RESET means Ramsey RESET test. All the variables are in the natural log form.*

### 3.4 Long Run and Short Run Estimates

Table 5 (Panel A) presents the long-run coefficients for Model 1 model 2 and Model 3 estimated using ARDL approach. The three specifications of the economic growth models show that the long-run coefficient of aggregate index (Findex1 and Bnkindex) are positive and statistically insignificant in model one and two. Stkindex is positive and significant at 10% level indicating weak relationship with economic growth in model 3. This implies that 1% increase in stock market development will cause economic growth to increase by more than 0.10 per cent and vice versa. Coefficient of gross capital formation (Kap) is found to be positive and statistically insignificant in the models. Controlling for the influence of macroeconomic variables in the like of inflation, brent oil prices and government final expenses. We found that these variables are positive and statistically significant. Interestingly, the strong relationships were pronounced with the inclusion of aggregate financial index (Findex1) and the macroeconomic variables. Indeed, this result highlights the high dependence of the Nigerian economic growth on the selected macroeconomic variables.

Table 6 (Panel B) presents the short-run estimates for all the three specifications. The coefficient of ECM (-1) in each of the three specifications is negative and significant at 1 per cent level. The coefficients suggest that over 46 per cent of the short-run disequilibrium is corrected in the long-run equilibrium in each of the four specifications of the economic growth model. This highlights the weakness of the Nigerian financial intermediary sector in savings mobilisation and resource allocation. The short-run coefficient of aggregate FIndex1 at lag level is negative and statistically significant at 5 per cent level indicating that previous performance in the aggregate financial sector could have a significant impact on the current economic activities in the country. However, banking sector development remains statistically insignificant in the short. This shows that the Nigerian economy is yet to exploit the potentials financial development and indeed financial deepening is yet to be achieved. This result is in line with [23] empirical findings of the finance-growth for Saudi Arabian economy. Stkindex coefficient is found to be positive and negative statistically significant at level and lag position respectively. There are mixed results evaluating the macroeconomic variables. Lagged values of gross capital formation and brent oil prices showed evidence of positive and statistical significant at 5 per cent level. The coefficients of inflation and government final expenditure remained negative and statistically insignificant in all the models. In sum the results indicate no influence of banking sector development and weak influence of stkindex and the selected macroeconomic variables on economic growth.

### 3.5 VECM-Granger Causality Analysis

The results of the causal relationship between the variables by using VECM based Granger causality test are summarised in Table 7. Specifications 1-3 in Table 6 presents the long-run and short run causal relationship between economic growth and financial development in Nigeria while controlling for the influence of inflation, brent oil price and government final expenditure. We found a uni-directional relationship from aggregate Findex1 and macroeconomic to economic growth in the long run at 5 per cent level. Spec. 2 and 3 do not indicate any long-run causal influence from any direction since error correction term (ect) shows evidence of statistical insignificance. Therefore, any interpretation to the respective (ect) coefficients will not make economic sense.

Specifications 1 to 3 in Table 7 presents the short-run causal effects of economic growth and financial intermediary development in Nigeria controlling for the influence of inflation, brent oil price and government final expenditure. We do not record any short run causal influence between financial sector development and economic growth. This confirms our earlier findings that the Nigeria economy is yet to exploit the potentials financial development and indeed financial deepening is yet to be achieved.

### 3.6 Diagnostic and Stability Tests

The diagnostic tests results in Table 7 show that there is no evidence of serial correlation, heteroscedasticity and functional form misspecification in each of the ARDL models specified. Figs 2–4 indicate the cumulative sum of recursive residuals (CUSUM) and the cumulative sum of squares (CUSUMSQ) stability test results as proposed by Brown, Durbin, & Evans,(1975) were also tested The CUSUM and CUSUMSQ are within the critical boundaries for the 5 per cent significance level (within the two straight lines). Thus, the CUSUM and CUSUMSQ tests indicate that the coefficients of the ARDL model in each of the specifications are stable.

**Table 7. VECM granger causality analysis**

| **Panel A** | | | | **Type of causality** | | | |
|---|---|---|---|---|---|---|---|
| **Spec. 1** | | **short run** | | | **F-Statistics** | | **Long run** |
| **Variables** | **Δlnrgdpc** | **Δlnfindex** | **Δkap** | **Δinfl** | **Δoilp** | **Δgovexp** | **ect & t-stat** |
| Δlnrgdpc | | 0.2516 | 4.4260** | 0.5023 | 0.5110 | 2.1649 | -0.0374** |
| | | (0.616) | (0.0354) | (0.4785) | (0.4747) | (0.1412) | [-2.08288] |
| Δlnfindex | 1.10789 | | 0.09020 | 0.66939 | 3.995** | 0.05199 | 0.079436 |
| | (0.2925) | | (0.7639) | (0.4133) | (0.0456) | (0.8196) | [ 0.48615] |
| Δkap | 3.8487** | 2.889* | | 6.582** | 1.690 | 1.347 | -0.2946*** |
| | (0.0498) | (0.0892) | | (0.0103) | (0.1937) | (0.2458) | [-5.96914] |
| Δinfl | 0.0225 | 0.0196 | 4.0373** | | 3.9100** | 1.3935 | 0.773736 |
| | (0.8807) | (0.8886) | (0.0445) | | (0.048) | (0.2378) | [ 3.65319] |
| Δoilp | 0.6996 | 0.3322 | 0.0537 | 0.0555 | | 0.8140 | -0.100062 |
| | (0.4029) | (0.5643) | (0.8167) | (0.8137) | | (0.3669) | [-1.10731] |
| Δgovexp | 0.1400 | 2.1406 | 2.4156 | 0.0419 | 5.5759** | | 0.049735 |
| | (0.7083) | (0.1434) | (0.1201) | (0.8378) | (0.0182) | | [ 0.50823] |
| **Panel B** | | | | | | | |
| **Spec. 2** | **Δlnrgdpc** | **Δbnkindex** | **Δkap** | **Δinfl** | **Δoilp** | **Δgovexp** | |
| Δlnrgdpc | | 0.6610 | 5.3618* | 0.6849 | 2.3152 | 2.7611 | 0.006936 |
| | | (0.7186) | (0.0685) | (0.7100) | (0.3142) | (0.2514) | [ 0.03203] |
| Δbnkindex | 1.1719 | | 1.0568 | 1.9415 | 9.435*** | 0.7168 | -0.457715 |
| | (0.5566) | | (0.5895) | (0.3788) | (0.0089) | (0.6988) | [-0.59574] |
| Δkap | 2.7966 | 0.3380 | | 2.6472 | 1.4903 | 6.1631 | -0.332407 |
| | (0.247) | (0.8445) | | (0.2662) | (0.4747) | (0.0459) | [-0.52544] |
| Δinfl | 0.0864 | 0.5990 | 2.5824 | | 0.2954 | 4.3244 | -2.99349 |
| | (0.9577) | (0.7412) | (0.2749) | | (0.8627) | (0.1151) | [-1.48254] |
| Δoilp | 2.2207 | 0.0912 | 1.6291 | 0.0943 | | 1.1044 | 0.368272 |
| | (0.3294) | (0.9554) | (0.4428) | (0.9539) | | (0.5757) | [ 0.39491] |
| Δgovexp | 1.8278 | 5.4257* | 3.1841 | 1.8436 | 7.2849** | | 1.675118 |
| | (0.4009) | (0.0663) | (0.2035) | (0.3978) | (0.0262) | | [ 1.65334] |
| **Panel C** | | | | | | | |

| Spec. 3 | Δlnrgdpc | Δstkindex | Δkap | Δinfl | Δoilp | Δgovexp | |
|---|---|---|---|---|---|---|---|
| Δlnrgdpc | | 3.9888 | 6.9264** | 6.3844** | 0.5588 | 3.8228 | 0.003516 |
| | | (0.1361) | (0.0313) | (0.0411) | (0.7563) | (0.1479) | [ 0.02623] |
| Δstkindex | 1.1369 | | 2.3426 | 5.4875* | 0.5061 | 1.0060 | -2.261995 |
| | (0.5664) | | (0.3100) | (0.0643) | (0.7764) | (0.6047) | [-2.00553] |
| Δkap | 5.5858 | 3.6102 | | 5.5983* | 4.7350* | 4.0648 | -1.0428*** |
| | (0.0612) | (0.1645) | | (0.0609) | (0.0937) | (0.131) | [-3.30083] |
| Δinfl | 0.9601 | 2.7888 | 4.3181 | | 0.9317 | 7.210** | -1.309486 |
| | (0.6188) | (0.248) | (0.1154) | | (0.6276) | (0.0272) | [-0.96167] |
| Δoilp | 3.5746 | 0.3753 | 1.5673 | 4.3809 | | 2.9518 | 1.04667 |
| | (0.1674) | (0.8289) | (0.4567) | (0.1119) | | (0.2286) | [ 1.80728] |
| Δgovexp | 1.7278 | 3.0080 | 1.9954 | 2.2966 | 3.6232 | | 0.608647 |
| | (0.4215) | (0.2222) | (0.3687) | (0.3172) | (0.1634) | | [ 0.84587] |

*All the variables are in the natural log form.*

**Significance at 10%. **Significance at 5%. ***Significance at 1%. t-statistics in [] P-values in (0.005).*

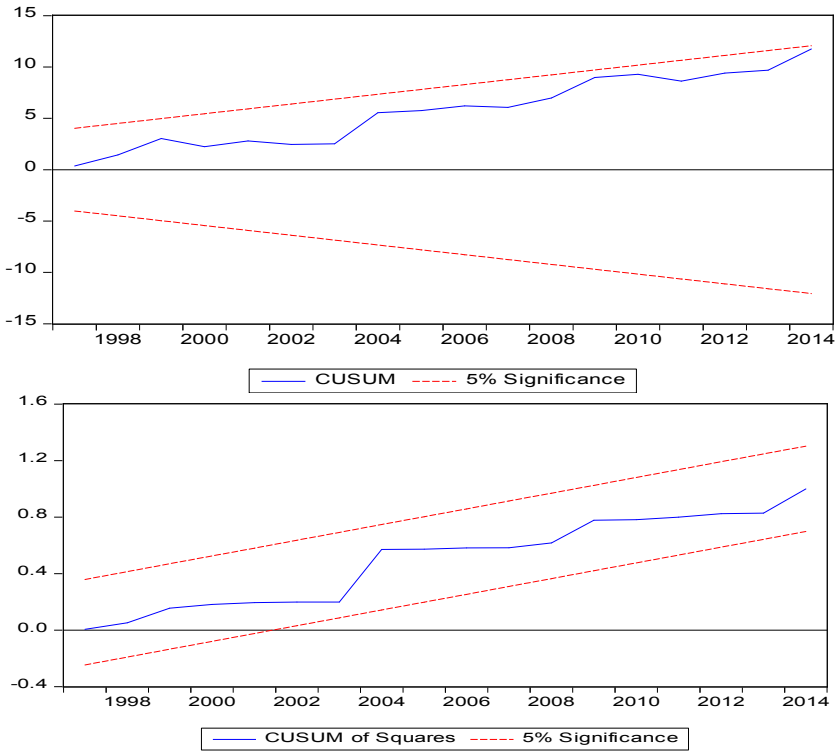


**Fig. 2. Plot of CUSUM and CUSUMQ for Specification**

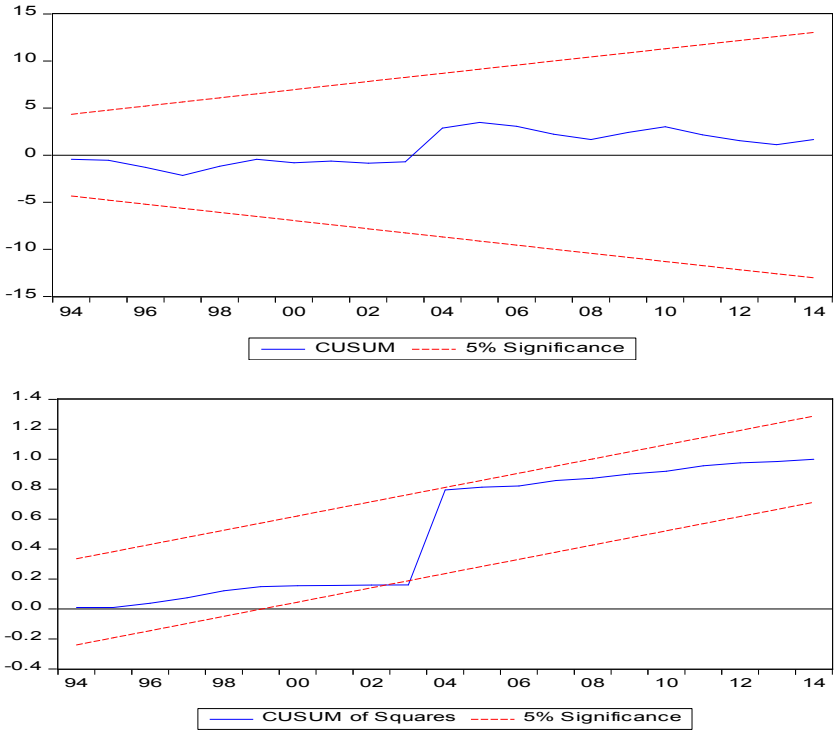


**Fig. 3. Plot of CUSUM and CUSUMQ for Specification**

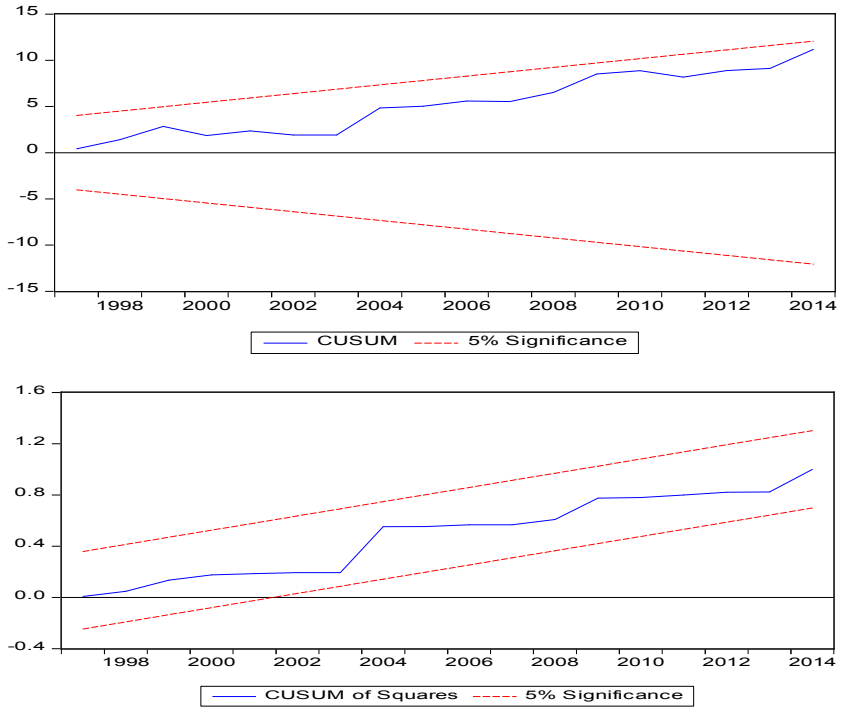


**Fig. 4. Plot of CUSUM and CUSUMQ for specification**

## 4. CONCLUSION AND POLICY IMPLICATION

This paper examined the relationship between financial deepening and economic growth with Nigeria in focus over the period of 1981 to 2014. Unlike the existing studies, the majority of them have mainly used either the residual-based cointegration test associated with [34], or the maximum-likelihood test based on [30], which may not be appropriate when the sample size is too small, or even choose arbitrary different proxies for financial sector development without considering the issue multicollinearity and omitted variables. In a bid to address the methodological and variable issues associated with the previous studies, the current study divides financial sector development (financial deepening) into two namely bank sector development and stock market development and employs principal component analysis to extract information from a large data set that captures the groups. We then employed the newly developed ARDL-Bounds testing and VECM granger non- causality approach to examine the possible causal relationship between finance and growth in the presence of selected macroeconomic variables. Hence, our results are three folds: First, the causal effect of financial sector development on economic growth is found to be positively significant in the long-run and short-run. This finding revealed the weakness of financial intermediation in saving mobilisation and resource allocation as documented by Samargandi et al. [23], Bittencourt [27] considering the fact that only the stock market development index played such a role. Comparatively, this study supports the proposition that the financial sector plays a minimal roles on economic growth at long run. This also support the finding of Ang [13], Demirgüç-Kunt and Levine [14]. Second, the causal effect of economic growth on financial sector development is found to no causality running from economic growth to financial development in both at the long run and short run positions. Contrary to the heated debate in finance-growth nexus, our finding is in line with earlier theoretical proposition of paradox on finance-growth nexus. More current researchers who found no clear evidence that financial development is affected by economic growth (see [13,14]). Third, the causal effect of macroeconomic variables on finance-growth nexus is found to be uni-directional in the long-run, suggesting that crude oil price and government expenditure are a key driver of long-term development of the Nigerian financial sector and as such among the underlying factors that

determine the amount of economic activities passing through the Nigerian financial sector.

Even though we reported weak finance-growth nexus in our study, it is worth to note that banking sector development and stock market development, as well as other macroeconomic variables, matter in the determination of long-run economic growth. Our results have important policy implications; First, with regard to the banking sector development-economic growth nexus: policy makers must call for an efficient allocation of financial resources combined with sound regulation of the banking system. Relevant studies have argued that a sound banking system impact gradual confidence among the savers so that resources can be effectively mobilised to increase productivity in the economy. With regard to the stock market development-economic growth nexus: To promote economic growth, a well-developed stock market will likely be necessary for Nigeria. A sound and reliable stock market system is indispensable to ensure the smooth-functioning of the financial system and to increase the productivity of the economy. To achieve these objectives, a well-articulated policy framework that will protect the Nigerian macroeconomic environment from oil price shocks is needed. This will involve well-structured economic diversification. The high dependence on oil revenue and government expenditure suggest the need to lessen the dominance of the public sector in resource allocation in the economy.

## COMPETING INTERESTS

Author has declared that no competing interests exist.

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