Volume 18 Issue 26
Originally issued as E6



Global Journal of HUMAN-SOCIAL SCIENCE: E
Economics
Volume 18 Issue 6 Version 1.0 Year 2018
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460x & Print ISSN: 0975-587X

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By Oladotun Olaniran

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GJHSS-E Classification: *FOR Code: 910103*



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New Insights into Financial Sector Development and Economic Growth Nexus in Nigeria

Oladotun Olaniran

Abstract- This paper examined the relationship between financial sector development and economic growth in Nigeria. The paper used the Principal Component Analysis (PCA), Autoregressive Distributed Lag Model (ARDL),Structural Break Test and the Pairwise Granger Causality Test (PGC) to examine the effect of financial development on economic growth in Nigeria and to establish which theory holds for Nigeria between the demand-following and the supply-leading theory. Annual time series data between 1981 and 2016 was used for the study. Data on real gross domestic product, broad money supply/gdp, inflation, credit to the private sector/gdp, total liquid liabilities, total stocks/shares traded and total stock market capitalization were sourced from the Central Bank of Nigeria (CBN) statistical bulletin. The structural break unit root test revealed that all the variables are stationary at their first difference except for inflation that was stationary in its level form; the bound test cointegration analysis established the existence of long run relationship among the variables. The ARDL revealed that financial development negatively and insignificantly affected economic growth in Nigeria during the period of study. Furthermore, the pairwise granger causality found evidence in support of the supply-leading theory that says economic growth must be achieved before the financial sector can be stable in Nigeria. Therefore, the paper recommends that more attention should be paid to growth-driven policies because it will bring about financial sector stability in Nigeria.

I. Introduction

Financial sector development and economic growth are two integral parts of an economy that cannot be undermined in any country, be it developed or developing. This is because developing countries are continuously striving to achieve both in their economies while developed countries are faced with the task of maintaining the already attained stability in their financial and growth sectors. Financial development encompasses growth in all finance related sectors of the economy as a whole, including banking institutions, stock market (where short and long term securities are being traded), insurance companies, finance houses and other non-banking financial institutions. The role of these institutions cannot be trivialized in the economy especially foran economy that has not attained the desired level of economic growth.

Authors have made frantic efforts over the years to provide theoretical and empirical explanations on the nexus between financial development and growth under different frameworks (panel studies in developed and developing countries, country-specific studies, Middle East and North African countries and several others). However, the argument on the finance-growth relationship is still ongoing because this dearth of studies found mixed and inconclusive results in their studies. Particularly, what remains distinctly unclear is the issue of whether finance spurs growth in the economy or growth is the necessary pre-requisite for the achievement of a stable financial sector (Adeniyi, Oyinlola, Omisakin and Egwaikhide, 2015).

The literature is filled with several studies that examined the finance-growth relationship, with mixed results produced, regardless of whether the study is country specific or panel. (seeAdeniyi *et al* 2015; Abu-Bader and Abu-Qarn,2008; Nicholas Odhiambo, 2004, 2008; Ghirmay, 2004; Agbetsiafa, 2004; Rousseau and Watchel, 2011; Ahmed, 2016; Benfiglioli, 2008; Arize, Ume and Nkwor, 2017, Dabo, 2012; Enowbi, Mlambo and Asongu (2017), Ibrahim and Alagidede, 2017). Agbetsiafa (2004), and Abu-Bader and Abu-Qarn (2008) in a study for Tunisia Egypt and Morocco found finance to be growth spurring in their studies while the Kenyan economy found growth as the pre-condition for a stable financial sector (see Odhiambo 2004 and 2008).

Theoretical and empirical arguments also exists among scholars as regards the precise nature of the relationship between financial development and economic growth, while some studies found that the direction of causality runs from financial sector development to growth (see Agbetsiafa, 2004; Abu-Bader and Abu-Khan, 2008; to mention a few), some others found the causality to be from growth to financial sector development (see Odhiambo, 2004; and Odhiambo, 2008). Studies such as Akinboade (1998) using Botswana as the focal point, found the existence of a bi-directional causality between finance and growth while Atindehou, Guyeie and Amenounve (2005) found no causal linkage between financial development and growth in Sub-Saharan Africa.

From the theoretical standpoint, as described by one Patrick (1966), the finance-growth relationship is said to be either supply-leading or demand-following. The demand-following relationship asserts that financial sector development drives and induces output in the economy while the supply-leading relationship posits that growth has to be achieved before financial sector development and stability can be attained. However, Lucas (1988) believes the finance-growth argument to

Author: *e-mail: olanirandotun@gmail.com*

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be overrated and he posited that financial sector performance insignificantly affects growth. Having established some of the key controversies that abound in the literature, this paper will examine the relationship between financial development and economic growth in Nigeria because of the following reasons, Firstly; previous studies have produced mixed and inconclusive results as regards the effect of financial sector development on economic growth and there is the need to investigate the effect of finance on economic growth in a developing country like Nigeria.

Secondly, country specific studies in Nigeria are still quite scanty compared to studies carried out in some other developed and developing countries of the world, thirdly; this paper will investigate which theory holds in Nigeria, whether it's the supply-leading or the demand-following theory, by examining the direction of causality between the variables. Finally, previous studies have used different ways to measure financial development ranging from the ratio of broad money supply to gross domestic product (M2/GDP), ratio of the credit to the private sector to gross domestic product (PSC/GDP), total banking sector assets (TBSA), interest rate spread (IRS), ratio of investment to GDP, stock market capitalization etc. As a departure from previous studies, this paper intends to generate a composite series for financial development using Principal Component Analysis (hereafter, PCA) as a way of generating a more precise series to measure financial development in Nigeria.

The rest of the paper is divided into five sections, section two presents the review of relevant literature on the finance-growth nexus, section three presents the methodology, section four showcases analysis and discussion of results while section five concludes the paper.

a) Brief Overview Of Financial Development And Economic Growth In Nigeria (Trend Analysis)

The financial sector in Nigeria is an integral part of the economy. The introduction of the Structural Adjustment Programme (SAP) in 1986(which championed the liberalization and deregulation of the financial sector among other things) was aimed at improving the performance of the financial sector in Nigeria. This was followed by the consolidation periods of the mid-2000s, the post consolidation era, bank mergers and acquisition and the recent cashless policy introduced by the Central Bank of Nigeria (hereafter, CBN) in recent years. These series of reforms brought about the introduction of Electronic banking (E-banking) that came along with the usage of Automated Teller Machines (ATM) and point of Sales (POS) as alternative sources of withdrawing cash in Nigeria. The introduction of these machines has helped in improving the performance and efficiency of banks and the stock market in Nigeria.

This paper therefore examines briefly the trend of financial development and economic growth in Nigeria using quarterly data between 1981 and 2014, in order to provide a deeper insight into the behavior of both variables in Nigeria. From figure 1, Nigeria witnessed a drag in financial development (proxied by PSC/GDP) between 1981 and 1991 and rose at a steady rate between 1992 and 2006. In 2007, the financial sector experienced a sudden increase with the stock market experiencing a growth of about 74.5%, making Nigeria one of the fastest growing markets around the time despite the occurrence of the global economic meltdown. The subsequent periods experienced slight increases and falls (fluctuations) and these has been the trend in recent years

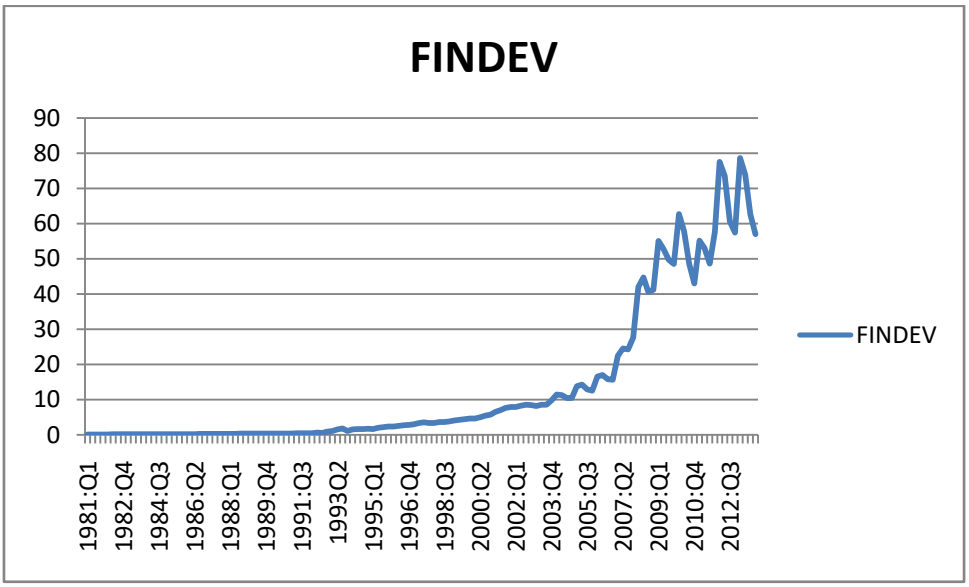


Figure 1: The graph of Financial Development

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On the other hand, GDP increased at a decreasing rate between the first quarter of 1981 and the third quarter of 1991and it was fairly stable between 1992 and 2004. It experienced fluctuations between 2004 and 2007 probably as a result of CBN's commercial banks consolidation policies around the time and the fluctuations in oil price (which is the major source of revenue to the government).Furthermore, GDP experienced sharp fluctuations between 2007 and 2014, probably as a result of the global economic meltdown that affected the performance of macroeconomic variables all over the world around the time and the economic recovery process of the subsequent periods. Specifically, GDP fell in 2009 and rose between 2010 and 2011; it further increased sharply between the first quarter of 2013 and the last quarter of 2014.

The foregoing clearly establishes and further strengthens the need to examine the finance-growth relationship in Nigeria, as both have been fluctuating over the years. This implies that the desired level of growth and financial sector performance have not been achieved despite several reforms and policies introduced over the years in Nigeria.

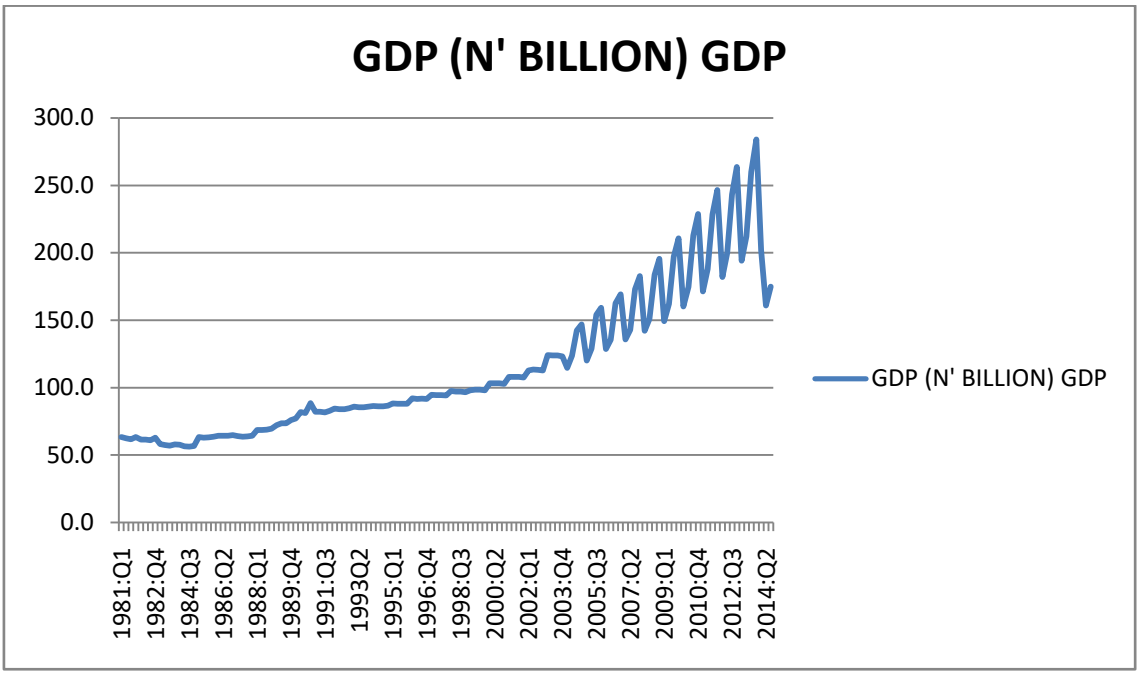


Figure 2: The graph of GDP

II. Review of Relevant Literature

There are different theoretical views and empirical findings on the finance-growth nexus in the literature. The study of Schumpeter (1911) was more or less the earliest study to examine the finance-growth relationship, and his findings supported the demand following hypothesis, which argued that financial sector performance significantly drives the achievement of economic growth in the economy (see Levine, 2005; for clarity on the roles of the financial sector in any economy). Contrastingly, Robinson (1952) posited that economic growth has to be achieved before a stable financial sector can be attained in any economy; this places his view to be in support of the supply-leading hypothesis. This establishes that the demand-following and supply-leading theories are the two (2) major theories in the literature on the finance-growth relationship. Some empirical studies on the strands of literature that supports both are discussed below.

In line with the demand-following theory, Ghirmay (2004) found finance to be the major driver of economic growth in two-thirds of his sample countries in SSA (specifically 8 out of the 13 countries sampled in his study. Similarly, Agbetsiafa (2004) and Abu-Bader and Abu-Khan (2008) who worked on the Middle-East and North African countries (MENA) found that finance causes growth in their study. Also, Adeniyi*et al* (2015) using annual data between 1960 and 2010 and an error correction model incorporated the role of thresholds in their study. They found finance to play a very trivial role in accelerating economic growth in Nigeria. This is because finance had a significantly weak but positive relationship with growth during the period of study. Furthermore, Ahmed (2015) that used seven indicators to measure financial development in forty-five (45) SSA countries between 1976 and 2010 supported the growth-spurring effect of financial development in his study.

Some studies have also established the existence of the supply-leading theory in their findings. Robinson (1952) was one of the pioneers of this view as earlier stated. Recent studies such as Odhiambo (2004), using data for South Africa, found out that growth spurs

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financial development in the economy. This implies that a sustained increase in economic performance in the economy is a necessary pre-requisite for a stable financial system. Also, in an attempt to further strengthen his argument, Odhiambo (2008) used the Kenyan economy as the focus between 1969 and 2005incorporatedsavings into his model as a key explanatory variable, he found the causal link between financial development and economic growth to be uni-directional; albeit, the causality runs from economic growth to financial development in Kenya.

In contrast to the uni-directional relationship stated above, a few other studies found the relationship between financial sector development and economic growth to be bi-directional. For example, Akinboade (1998) found out that private sector credit and bank deposit liabilities (which were used as proxy for financial development) granger caused economic growth and a reverse causation was statistically found to run from economic growth to financial development in Botswana. On a different note, Lucas (1988) posits that there is no relationship whatsoever between finance and growth, asserting that the presumption that finance influences growth is overrated. This view is supported by Atindehou*et al* (2005) who found the effect of finance on growth in SSA countries to be ambiguous and overrated as they found no significant relationship between them.
Based on the studies reviewed above, it is evident that the finance-growth debate is largely inconclusive. This study will therefore investigate the effect of financial development on economic growth in Nigeria, verify which theory (whether demand-following or supply-leading) holds in Nigeria by examining the direction of causality between financial development and economic growth in Nigeria while using PCA to generate a series to measure financial development in Nigeria.

III. Methodology

This study in an attempt to examine the relationship between financial development and economic growth in Nigeria adopts model used by Arize*et al* (2017) and Adeniyi (2015). Theoretically, the demand-following hypothesis presents financial development to be a function of economic growth while the supply-leading hypothesis refutes the assertion. Nonetheless, in line with the objectives and focus of this study, the relationship between financial development and economic growth is specified as follows:

$$RGDP = \beta_0 + \beta_1 FDIN + e_t \quad (1)$$

Where RGDP is real gross domestic product, FDIN is financial development index which will be measured by generating a series from different proxies for financial development in the literature such as the ratio of broad money supply to GDP (M2/GDP), ratio of private sector credit to GDP (CPS/GDP), ratio of total bank deposit to GDP (TBP/GDP), total stock market capitalization (TSMC) and total market turnover (TMT) using PCA. The reason for doing this are in two folds; firstly, modeling various indicators of financial development in the same equation may lead to serious problem of multicollinearity, furthermore, utilizing the aggregate effect of these indicators of financial development is preferably a better approach than modeling each indicator separately. Secondly, there is no general concensus as to which measure of financial development is most appropriate (Alimi, 2018). For the purpose of robustness and model stability, this study introduces two major macroeconomic explanatory variables commonly used in the finance-growth models in the literature. Thus, equation 1 is restated as:

$$RGDP = \beta_0 + \beta_1 FD + M2 + INFL + e_t \quad (2)$$

Where M2 is broad money supply, INFL is inflation which is used as a measure of economic instability in the model and e_t is the stochastic error term.

b) Estimation Technique

This paper employs the autoregressive distributed lag model (hereafter, ARDL)as the technique of analysis. This is because it is effective comparatively in determining the co integration of small and finite samples (Arize*et al*, 2017). The ARDL can be used for variables with different orders of integration, be it I(1) or I(0) or a mix of both (Pesaran and Smith, 1995; Pesaran*et al*., 1999), provided none of the variables are I(2). The augmented form of the ARDL model as specified by Pesaran and Shin (2001) is stated as:

$$\lambda\,(L, p)yt = \Sigma^{k}\,\beta i\,(L, p) + \delta' wt + \mu t \quad (3)$$

Where

$$\lambda\,(L, p) = 1 - \lambda\,1L - \lambda\,2L^2 - \cdots - \lambda\,pLp \text{ and}$$

$$\beta i\,(L, p) = \beta i1 + \beta i1L + \beta i2 + \cdots + {}^{\beta iqi}L^{q}_{i}$$
$$i = 1,2, \ldots, k$$

L is a lag operator such that $LYt = yt-1$, and wt is an $s \times 1$ vector of deterministic variables such as the intercept term, dummy variables, time trends or exogenous I(1) variables with fixed lags.

Before the ARDL model can be estimated, the ordinary least squares (OLS) estimates of equation (3) must be estimated first. All possible values p = 0, 1, 2, . . . , m; qi= 0, 1, 2, . . . , m; and i = 1, 2, . . . , k, that is, for a total of three$(m + 1)^{k+1}$ different ARDL models. The choice of one of the estimated models was made using the SBC information criteria. The error-correction model of the ARDL (, $q1$, $q2 \ldots qk$) model can be obtained by rewriting equation (1) in terms of the lagged levels and the first differences of y_t, x_{1t}, x_{2t}, … ,x_{kt} and wt. Substituting these lagged and differenced terms into equation (3) and rearranging gives:

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$$\Delta y_t = -\lambda(1-\rho)EC_{t-1} + \sum_{i=1}^{k} \beta_{i0}\Delta x_{it} + \sigma\Delta w_t^1 - \sum_{j=1}^{p-1} \lambda^* y_{t-j} - \sum_{t-1}^{k} \sum_{j=1}^{t-1} \beta_{ij}^* \Delta x_{i,t-j} + \mu_t \quad (4)$$

Where the error-correction term, EC_t is defined as:

$$ECj_t = y_t - \sum_{i=1}^{k} \theta_i x_{it} - \hat{\Psi} w_t \quad (5)$$

The response of y_t with respect to x_t for the long-run coefficients are estimated as:

$$\theta_i = \frac{\beta_i(1, q_t)}{\lambda_1(1, p)} = \frac{\hat{\beta}_{io} + \hat{\beta}_{i1} + \ldots\ldots + \hat{\beta}_{tqt}}{1 - \lambda_1 + \lambda_2 - \ldots\ldots - \hat{\lambda}_p} \quad (6)$$

where $\hat{p}$ *and* $\hat{q}i$, i = 1, 2, … , k are the selected estimated values of p *and* qi , i = 1, 2, … , k.

In line with the objectives of this study, the relationship between financial development and economic growth in Nigeria will be examined within the framework of the ARDL (provided the variables exhibits mixed order of integration). However, if all the variables in the model are found to be stationary at first difference and co integrated, the error correction mechanism will be adopted. The general form of the ARDL specification which is flexible with different orders of integration is stated as follows:

$$\Delta Y = \gamma_0 + \gamma_1 Y_{t-1} + \gamma_2 FDIN_{t-1} + \gamma_3 M2_{t-1} + \gamma_4 INFL_{t-1} + \sum_{i=1}^{n} \pi_{1i}\Delta Y_{t-i} + \sum_{i=0}^{m} \pi_{2i}\Delta FDIN_{t-i} + \sum_{i=0}^{p} \pi_{3i}\Delta M2_{t-i} + \sum_{i=0}^{p} \pi_{4i}\Delta INFL_{t-i} + \lambda_1 EC_{t-1} + e_t \quad (7)$$

Where the variables are the same as defined above, γ_i are the long run multipliers and π_i are the short run coefficients. After establishing the order of integration of the variables, the restricted version of the ARDL is stated as follows:

$$\Delta Y = \theta_0 + \sum_{i=1}^{n} \pi_{1i}\Delta Y_{t-i} + \sum_{i=0}^{m} \pi_{2i}\Delta FD_{t-i} + \sum_{i=0}^{p} \pi_{3i}\Delta M2_{t-i} + \sum_{i=0}^{p} \pi_{4i}\Delta INFL_{t-i} + \lambda_1 EC_{t-1} + e_t \quad (9)$$

Where λ_1 is the error correction term which shows the speed of adjustment of the short run towards the long run equilibrium. Put simply, the error correction term shows the speed at which errors committed in the short run are corrected in the long run.

a) Structural Breaks Unit Root Test

For robustness, this study will employ the Zivot and Andrews structural break unit root test.Checking for structural breaks in unit roots has become necessary in the study of time series over the years. This is because it allows us to test and ascertain the order of integration of the variables used in a model i.e. whether the variables are truly non-stationary or not in their level form. For this study, the Zivot-Andrews structural break unit root test will be used toascertain the order of integration of the variables and the structural break dates in the data.

b) Data Sources

The data used in this study were sourced from the Central Bank of Nigeria (CBN) statistical bulletin (2016). Data on real gross domestic product, broad money supply, inflation and financial development (proxied by generating a series from five financial development indicators namely; M2/GDP which is the ratio of broad money supply to gdp, CPS/GDP i.e. the ratio of credit to the private sector to gdp, ratio of total bank deposit i.e. TBD/GDP, total stock market capitalization i.e. TSMC and total stock market turnover i.e.TSMT, using PCA), are used for this study. As a way of avoiding spurious results and in line with standard research practice, this study adopts the Phillip-Perron unit root test and the Zivot and Andrews structural break unit root test to examine the order of integration of the variables after which the bounds test co-integration test will be used to test for long run relationship among the variables

IV. Empirical Results and Discussion

This section starts with the results of the unit root test carried out with intercept and trend.The Phillip-Peron unit root test showed that all the variables are non-stationary at level, but they became stationary at their first difference. However, the Zivot-Andrews unit root test for structural breaks showed that real gross domestic product (RGDP), financial development index(FDIN) and broad money supply (M2) became stationary at their first difference except for inflation (INFL) that was stationary at level.

The identified breakpoint for RGDP was in 2002, this may be as a result of the reforms and policies made as an economic recovery attempt to insulate the country from the aftermath effect of the previous military

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administration in Nigeria. In the case of financial development index, 2007 was its breakpoint; this is probably as a result of the global economic and financial crisis that affected all countries of the world. This crisis affected the performance of the financial sector in Nigeria due to the fall in stock prices and the value of the currency around the time. Money supply recorded its breakpoint in 2006; this may be as a result of the different bank consolidation policies, mergers and the unsatisfactory performance of the stock market around the time. Lastly, inflation has its breakpoint in 1996; this is likely to be as a result of the military administration at the time, which encouraged printing excessive loads of currency for the purpose of embezzlement and capital flight in Nigeria. The result of the Phillip-Peron unit root test and the Zivot-Andrews structural break unit root test are presented in table 1 and 2.

Since this study intends to ascertain the order of integration of the variables and the structural break dates of the variables using the Zivot-Andrews unit root test, the result of the Zivot-Andrews unit root test result will be followed. This implies that all the variables are stationary at their first difference except for inflation in Nigeria.

a) Bounds Test Co integration Result

The long run relationship among the variables is tested with the null hypothesis of the non- existence of a long run relationship. The Pesaran et al. (2001) F-table is compared with the calculated F-statistics at various critical levels and it is generally assumed thatco-integration exists if the calculated F test statistics exceeds upper bound limit. However, if the test statistic is below the lower bound value, the null hypothesis of no co-integration is accepted and if the test statistics lies between the lower and upper bounds limit, the test of co-integration is indecisive. . From Table 3, the calculated F-statistics value is 5.4434 and it exceeds the upper bounds critical value of the Pesaran et al. (2001) bounds testing table. This implies that we reject the null hypothesis of no co-integration and accept the alternative hypothesis that says co-integration exists. Thus, long run relationship exists among the variables.

b) Diagnostic TESTS

i. *Testing for Serial Correlation*

According to the Breusch-Pagan test for serial correlation, the null hypothesis of no serial correlation is tested against the alternative hypothesis of serial correlation. In order to verify the existence of serial correlation in the model, the observed R-squared (Obs*R-squared) and its corresponding probability value (Pro. Chi-squared) are observed. In Table 4, the Obs*R-squared has a value 1.3629, while its corresponding p-value has a value of 0.5059. Since the probability value is greater than 5%, we accept the null hypothesis that there is no evidence of serial correlation in the model.

ii. *The Test for Heteroskedasticity*

To test for the presence of homoscedasticity in the model, the study chooses the Arch Test. In the Arch test, the Observed R-squared value is examined along with its corresponding probability value. The null hypothesis here is that the model is homoscedastic, while the alternative hypothesis here is that the model is heteroskedastic. We reject the null hypothesis if this probability value is less than 5%. From Table 5, since the probability value of 0.2887is greater than 0.05, at the 5% significance level, we accept the null hypothesis of homoscedasticity and reject the alternative hypothesis of presence of heteroskedasticity. Hence, the model is homoscedastic and this means the model has goodness of fit and the results are desirable.

c) Ardl Short and Long Run Estimate

Focusing on table 5, financial development index has a negative and insignificant effect on economic growth in Nigeria both in the short and long run. This implies that financial sector development does not affect economic growth in Nigeria during the period of study. Money supply on the other hand, positively and significantly affects economic growth in Nigeria in the short run but not in the long run. Also, inflation (by summing up the coefficients using Wald test) has a negative and significant effect on economic growth in Nigeria in the short run but its effect was insignificant in the long run (this supports the position of economic theory that says some level of inflation is good for the economy).

The pairwise granger causality test carried out revealed that financial development index does not granger cause economic growth in Nigeria during the period of study, thereby supporting the findings of the ARDL. However, economic growth granger caused financial development in Nigeria at 5% significance level. This shows that direction of causation between financial development and economic growth in Nigeria is unidirectional and it runs from economic growth to financial development. This implies that the supply-leading theory holds in Nigeria. This is similar to the findings of Odhiambo (2004, 2008) for South Africa and Kenya respectively.

Inflation was found to significantly granger cause economic growth in Nigeria at 5% significance level while economic growth does not granger cause inflation during the period of study. The result also revealed that there exists a significant unidirectional causality running from money supply to economic growth in Nigeria during the period of study.

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V. Conclusion

The finance-growth relationship has been an issue of concern among researchers in the literature over the years. This gave birth to two theories (demand-following and supply-leading) in the theoretical literature as well as different empirical findings on the finance-growth nexus. The present study (after ascertaining the order of integration and the structural break dates of the variables, using the Zivot-Andrews unit root structural break test) investigated the effect of financial sector development (using the financial development index generated by PCA) on economic growth in Nigeria; using annual data between 1981 and 2016. It also examined the direction of causality between financial development and economic growth in Nigeria, in order to know which theory holds for Nigeria between the demand-following and the supply-leading theory.

By adopting the ARDL technique of analysis and the pairwise granger causality test, the study found out that financial development (measured by financial development index) has a negative but insignificant effect on economic growth in Nigeria, both in the short and long run. The pairwise granger causality test revealed that financial development does not granger cause economic growth in Nigeria, however, economic growth significantly granger caused financial development in Nigeria during the period of study. This implies that the supply-leading theory holds in Nigeria and supports the early view of Robinson (1952).

Based on the foregoing, the major policy implication is that the government and policymakers should focus more on growth driven policies and less on financial development policies. This is because the achievement of growth in Nigeria will bring about stability in the financial sector.

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List of Tables

Table 1: Phillip-Peron Unit root test

Variables	Level	1st Difference	Status
LRGDP	-2.9484	-3.6394**	I(1)
FDIN	0.384	-4.8478**	I(1)
LM2	2.923	-3.7129**	I(1)
INFL	-2.7348	-9.6225**	I(1)

*Note: ** represents 5% significance level*

Table 2: Zivot-Andrews Structural Break Unit Root Test

Variables	Level	1st Difference	Status
LRGDP	-3.3306	-4.5069**	I(1)
LM2	-3.9889	-5.6451**	I(1)
FDIN	-3.6771	-5.2866**	I(1)
INFL	-6.5294**	----------	I(0)

*Note: ** represents 5% significance level*

Table 3: Bound Test Cointegration Result

Table 3 Ardl Bounds Test		
Null Hypothesis:No Long Run Relationship		
Test Statistic	Value	K
F-Statistic	5.443365	3
Critical Value Bound		
Significance	I0 Bound	I1 Bound
10%	2.38	3.45
5%	2.69	3.83
2.50%	2.98	4.16

Table 4 and 5: Test for Serial Correlation and Heteroscedascity

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	0.467116	Prob. F(2,21)	0.6332
Obs*R-squared	1.362959	Prob. Chi-Square(2)	0.5059
Heteroskedasticity Test: ARCH			
F-statistic	1.092789	Prob. F(1,29)	0.3045
Obs*R-squared	1.125734	Prob. Chi-Square(1)	0.2887

Appendix

Zivot-Andrews Unit Root Test	
Date: 03/08/18 Time: 21:03	
Sample: 1981 2016	
Included observations: 36	
Null Hypothesis: FD has a unit root with a structural	
break in both the intercept and trend	
Chosen lag length: 3 (maximum lags: 4)	

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Chosen break point: 2004		
	t-Statistic	Prob. *
Zivot-Andrews test statistic	-3.677148	0.294520
1% critical value:	-5.57	
5% critical value:	-5.08	
10% critical value:	-4.82	
* Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process		

Zivot-Andrews Unit Root Test		
Date: 03/08/18 Time: 22:03		
Sample: 1981 2016		
Included observations: 36		
Null Hypothesis: DFD has a unit root with a structural break in both the intercept and trend		
Chosen lag length: 2 (maximum lags: 4)		
Chosen break point: 2007		
	t-Statistic	Prob.*
Zivot-Andrews test statistic	-5.286653	0.042604
1% critical value:	-5.57	
5% critical value:	-5.08	
10% critical value:	-4.82	
* Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process		

Zivot-Andrews Unit Root Test		
Date: 03/08/18 Time: 22:03		
Sample: 1981 2016		
Included observations: 36		
Null Hypothesis: INF has a unit root with a structural break in both the intercept and trend		
Chosen lag length: 1 (maximum lags: 4)		
Chosen break point: 1996		
	t-Statistic	Prob. *
Zivot-Andrews test statistic	-6.529420	4.00E-05
1% critical value:	-5.57	
5% critical value:	-5.08	
10% critical value:	-4.82	
* Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process		

Zivot-Andrews Unit Root Test		
Date: 03/08/18 Time: 22:03		
Sample: 1981 2016		
Included observations: 36		
Null Hypothesis: MS has a unit root with a structural break in both the intercept and trend		
Chosen lag length: 3 (maximum lags: 4)		
Chosen break point: 2004		
	t-Statistic	Prob. *
Zivot-Andrews test statistic	-3.988959	0.068074
1% critical value:	-5.57	
5% critical value:	-5.08	
10% critical value:	-4.82	
* Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process		

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Zivot-Andrews Unit Root Test			
Date: 03/08/18 Time: 22:03			
Sample: 1981 2016			
Included observations: 36			
Null Hypothesis: DMS has a unit root with a structural break in both the intercept and trend			
Chosen lag length: 2 (maximum lags: 4)			
Chosen break point: 2006			
		t-Statistic	Prob. *
Zivot-Andrews test statistic		-5.645096	0.000347
1% critical value:		-5.57	
5% critical value:		-5.08	
10% critical value:		-4.82	
* Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process			

Zivot-Andrews Unit Root Test			
Date: 03/08/18 Time: 22:03			
Sample: 1981 2016			
Included observations: 36			
Null Hypothesis: LRGDP has a unit root with a structural break in both the intercept and trend			
Chosen lag length: 1 (maximum lags: 4)			
Chosen break point: 1994			
		t-Statistic	Prob. *
Zivot-Andrews test statistic		-3.330606	0.406918
1% critical value:		-5.57	
5% critical value:		-5.08	
10% critical value:		-4.82	
* Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process			

Zivot-Andrews Unit Root Test			
Date: 03/08/18 Time: 22:03			
Sample: 1981 2016			
Included observations: 36			
Null Hypothesis: DLRGDP has a unit root with a structural break in both the intercept and trend			
Chosen lag length: 0 (maximum lags: 4)			
Chosen break point: 2002			
		t-Statistic	Prob. *
Zivot-Andrews test statistic		-4.506932	0.003953
1% critical value:		-5.57	
5% critical value:		-5.08	
10% critical value:		-4.82	
* Probability values are calculated from a standard t-distribution and do not take into account the breakpoint selection process			

ARDL Bounds Test
Date: 01/06/18 Time: 20:45
Sample: 1985 2016
Included observations: 32
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	5.443365	3

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Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.72	3.77
5%	3.23	4.35
2.5%	3.69	4.89
1%	4.29	5.61

ARDL Cointegrating And Long Run Form				
Dependent Variable: LRGDP				
Selected Model: ARDL(1, 0, 0, 4)				
Date: 01/06/18 Time: 20:44				
Sample: 1981 2016				
Included observations: 32				
Cointegrating Form				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(FDIN2)	-0.015791	0.010286	-1.535204	0.1384
D(LM2)	0.018162	0.009194	1.975481	0.0603
D(LNINFL)	-0.020985	0.009224	-2.275013	0.0325
D(LNINFL(-1))	0.015664	0.012426	1.260615	0.2201
D(LNINFL(-2))	0.016295	0.011365	1.433760	0.1651
D(LNINFL(-3))	0.015894	0.008709	1.825113	0.0810
CointEq(-1)	-0.036889	0.064107	-0.575433	0.0306
Cointeq = LRGDP - (-0.4281*FDIN2 + 0.4923*LM2 -1.3831*LNINFL + 12.0718)				
Long Run Coefficients				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
FDIN2	-0.428072	0.982702	-0.435607	0.6672
LM2	0.492332	0.652889	0.754082	0.4585
LNINFL	-1.383103	2.440306	-0.566774	0.5764
C	12.071807	4.845708	2.491237	0.0204

Pairwise Granger Causality Tests			
Date: 01/06/18 Time: 20:31			
Sample: 1981 2016			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Prob.
FDIN2 does not Granger Cause LRGDP	33	0.46301	0.6341
LRGDP does not Granger Cause FDIN2		3.76854	0.0355
LNINFL does not Granger Cause LRGDP	34	4.38954	0.0216
LRGDP does not Granger Cause LNINFL		1.31500	0.2840
LM2 does not Granger Cause LRGDP	34	4.04093	0.0283
LRGDP does not Granger Cause LM2		0.08534	0.9184
LNINFL does not Granger Cause FDIN2	33	3.22908	0.0547
FDIN2 does not Granger Cause LNINFL		0.49405	0.6154
LM2 does not Granger Cause FDIN2	33	1.64359	0.2114
FDIN2 does not Granger Cause LM2		2.45658	0.1040
LM2 does not Granger Cause LNINFL	34	2.19007	0.1301
LNINFL does not Granger Cause LM2		1.71102	0.1984

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