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Impact of Financial Sector Development on Economic Growth in Nigeria: Evidence from Nonlinear ARDL Model

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Abstract
This study examines the impact of financial sector development on economic growth in Nigeria using annual data from 1986 to 2018. To estimate the dynamic and asymmetric relationship among the variables in the study, a Non-linear Autoregressive Distributed Lag (NARDL) model was employed. The results suggest a positive asymmetric impact of financial deepening (in its one-period lag) on economic growth in the long run, but a negative impact in the short-run. More explicitly, the positive (negative) partial sum of changes of M2/GDP has a negative (negative) impact on GDPGR, while the positive (negative) partial sum of changes of M2/GDP(-1) has a positive (negative) impact on GDPGR, in the long-run. In the short-run, the partial sum of the policy variable suggests an inverse relationship with the dependent variable i.e. the positive (negative) partial sum of changes of M2/GDP has a negative (positive) impact on GDPGR. Furthermore, the control variable appears to be insignificant in examining its asymmetric relationship with the target variable. The results imply that M2/GDP hampers economic growth in the short-run, while it positively impacts growth in the long run. The researchers concluded that to achieve a steady economic growth, the financial deepening should be strengthened through expansion in the money supply, while attention should be given to the complimentary and coordinated development of financial reforms and changes in the real sector of the economy.
Keywords: Economic Growth, Financial Development, Nonlinear ARDL, Asymmetric

1.0 Introduction

In every economy of the world, the role of the financial sector in ensuring growth and development is very central and cannot be overrated. This also connotes that the development of the financial sector itself is very key for economic growth. The structure of the financial sector and its development dictates how its role of funds mobilization from the surplus sector to the deficit sector can be efficaciously and efficiently discharged in the economy. This sector has helped in facilitating business transactions and economic development (Aderibigbe, 2004). Also, a well-structured and development-oriented financial sector plays several vital roles in improving the effectiveness of the intermediation by reducing information, transaction, and monitoring costs. A well-developed financial system enhances investment by identifying and funding good business opportunities, mobilizes savings, enables trading, hedging, and diversification of risk, and

facilitates the exchange of goods and services. All these results in a more efficient allocation of resources, rapid accumulation of physical and human capital, and faster technological progress, which in turn results in economic growth.

Economic growth is a gradual and steady change in the long-run, which comes about by a general increase in the rate of savings and population (Jhingan, 2005). It has also been described as a positive change in the level of production of goods and services by a country over a certain period. Economic growth is measured by the increase in the number of goods and services produced in a country. An economy is said to be growing when it increases its productive capacity, which later yields more in the production of more goods and services (Jhingan, 2003). Economic growth is usually brought about by technological innovation and positive external forces. It is the yardstick for raising the standard of living of the people. It is a measure for the improvement of the standard of living of the people.

In Nigeria, the need to build an efficient financial sector started in the pre-colonial era. The post-independence experience with financial sector development was characterized by weak institutions that operated under the ambit of direct control policies, which negatively affected financial intermediation. Consequently, the introduction of SAP in 1986 witnessed a turning point in financial sector development in Nigeria. The development resulted in financial sector deregulation and liberalization. In the event, the number of merchant and commercial banks rose from less than 40 to 120 (Eboreime, Elisha & Ude-Abosi 2016). However, the systemic distress of the Nigerian financial system showed up when the number of banks declined to 89 as a result of the liquidation of 33 terminally distressed banks. Aside from the liberal licensing of banks by the CBN, the imperative for a financial system that is supportive of growth brought about further reforms such as universal banking in 2000, banking system consolidation, and pension fund in 2004, several other policies of the CBN aimed at regulatory over-hauling between 2005 and 2008, quantitative easing during the period of the global financial crisis in 2008/2009 and the "Alpha project Initiative" that resulted in a new banking model. Setbacks continued to plague the development in the country's financial sector after the introduction of SAP in 1986. The banking industry in Nigeria is the most predominant among the financial sub-sectors such as the capital market, insurance, finance companies, mortgage institutions, foreign exchange markets, other specialized financial institutions, and development banks.

Thus, financial sector vulnerabilities could lead to a financial crisis with adverse consequences on economic growth and development. The fluctuating experiences or rather, the successive acceleration and deceleration in the trend of financial sector performance in Nigeria call for further study. In this regard, several Nigerian studies produced conflicting results with either finance promoting growth Osuji (2015) and Ubaje and Ubaje (2014) or impeding growth. Furthermore, divergent opinions on this issue have existed among economists since the time of Bagehot (1973), Schumpeter (1911, 1934), Patrick (1966), Goldsmith (1969), McKinnon (1973), and Shaw (1973), and this makes the finance-growth controversy a subject of further empirical investigation.

Therefore, the general objective of this study is to examine the impact of financial sector development on economic growth in Nigeria, while the specific objectives are to examine the dynamic impact of financial deepening (M2/GDP) on economic growth rate in Nigeria, and economic growth response to the dynamism in government total expenditure in Nigeria. As it is revealed from the reviewed literature that ordinary M2 (demand for

money) may not tell the entire story of how financial development can contribute to economic growth, this study used the ratio of M2 to GDP. Also, this study differs markedly from previous ones by employing not just a linear dynamic model for the analysis, rather, a Nonlinear Autoregressive Distributive Lag (ARDL) Model that has not been applied in this area of study is used to establish perhaps economic growth rate responds asymmetrically to the proxy for financial sector development in Nigeria. Furthermore, the study would apply the recently rebased GDPGR for the entire scope of the study 1986-2018. Hence, following the introduction above, the remaining part of this paper is structured as follows; Section 2 reviews related literature, section 3 present material, and method, section 4 analysis, interpret and discuss results and section 5 presents the conclusion and recommendations

2.0 Literature Review

A sound financial system is critical to economic growth. The role of finance in economic development has not always been unanimous. Developing countries attach great importance to financial sector development and deepening in the pursuit of their poverty reduction goal. By mobilizing savings, facilitating payments and trade of goods and services, and promoting efficient allocation of resources, the financial sector is seen as playing a critical role in facilitating economic growth and, directly, through broadening access to finance and indirectly through growth, contributing to poverty reduction. The Nigeria financial sector is one of the largest in sub- Sahara Africa, consisting of a fairly diverse array of banking and non-banking financial institutions. Many empirical studies have been investigated on the impact of financial sector development and economic growth, and these include; (Puatwoe & Piabuo, 2017; Oriavwote & Eshenake, 2014; Madichie, Maduka, Oguanobi & Ekesiobi, 2014; Agbo & Nwankwo 2018; Mwang' onda, Mwaseba & Ngwilizi 2018; Pelesai & Pearce 2013; Olusegun, Ganiyu & Oluseyi 2013), discovered that financial development affects economic growth negatively in the long run. However, the short-run impact of financial development on economic growth is positive.

Furthermore, Agbo and Nwankwo (2018), investigate the effect of financial sector development on the economic growth of Nigeria with secondary data covering the period 1981 to 2013. This study is anchored on the need to fill the gap occasioned by the shortage of literature on this subject matter, especially as it concerns Nigeria. They employ the Dickey-Fuller unit root test to confirm the stationarity of the variables involved and the ordinary least squares technique to determine the extent to which other variables impact economic growth. The multiple regression results show that the money supply, minimum rediscount rate, and exchange rate have a positive and insignificant effect on economic growth. On the other hand, banking sector credit, credit to the private sector, market capitalization, and foreign direct investment discovered to be having a negative and insignificant effect on economic growth.

The financial sector has always been a potential ingredient in bringing growth to an economy. Accordingly, Mwang' onda, Mwaseba, and Ngwilizi (2018) examine the indirect impact of financial markets and institutions through saving mobilization, and credit expansion are of extraordinary importance in Tanzania. By employing the Autoregressive Distributed Lags (ARDL) approach. The results show that, in both the long-run and short-run, financial development exerts a significant but negative effect on economic growth, contrary to our expectations. The study employs the ratio of broad money to GDP (financial depth) as a proxy measure of financial development, along with

inflation rate, real interest rate, real exchange rate, the share of investment to GDP, the proportion of development expenditure to total expenditure and dummy for structural reforms as control variables during our estimations. Results also suggest the non-existence of causality between financial development and economic growth.

Puatwoe and Piabuo (2017), investigates the impact of financial development on Economic growth using time series data in Cameroon covering the period 1980-2014 (34 years). This investigation was carried out using three common indicators of financial development (broad money, deposit/GDP, and domestic credit to the private sector). Using the Auto Regressive Distributive Lag (ARDL) technique of estimation, they found out that there exists a short-run positive relationship between monetary mass (M2), government expenditure, and economic growth, a short-run negative relationship between bank deposits, private investment, and economic growth equally exists. However, in the long run, all indicators of financial development show a positive and significant impact on economic growth. Similarly, Oriavwote and Eshenake (2014) empirically examine the implications of financial development for economic growth in Nigeria. Time series data cover the period between 1990 to 2011. The cointegration technique, with its implied Error Correction Mechanism (ECM), was applied. They find that financial sector development has not significantly improved private sector development. The minimum capital base and liquidity ratio have improved the level of economic growth in Nigeria. The Johansen cointegration test suggests a long-run relationship among the variables, and the significant ECM, which is negatively signed, supports the long-run relationship among the variables and indicates a satisfactory speed of adjustment.

In the same vein, using the Modern time series econometric procedures, Agyei and Kwarteng (2015) examines the causal relationship between financial development and economic growth in Ghana from 1961 to 2010. The empirical results show a uni-directional relationship between financial development and economic growth and that the direction of causality is sensitive to the choice of proxy of financial development. It was discovered that the issue as to whether finance follows in the direction of economic growth or lead to economic growth depends on the proxy of financial development.

A related empirical study by Madichie, Maduka, Oguanobi and Ekesiobi (2014) investigated the impact of financial development on economic growth in Nigeria during the period 1986 – 2012. To achieve the purpose of this research, they estimated the real GDP as a function of the gross fixed capital formation, financial development (the ratio of private sector credits to GDP), liquidity ratio, and the interest rate. The methods used are: The Ordinary Least Squares (OLS) techniques, Augmented Dickey-Fuller unit root test, Johansen cointegration test, error correction technique, and the Granger causality test. The empirical results revealed that: all the variables used are integrated of the same order, I(1); there is evidence of the existence of a long-run relationship among the variables used; the normalized cointegration coefficients revealed that financial development affects economic growth negatively in the long run. However, the short-run impact of financial development on economic growth is positive. This goes to show that the finance-led growth hypothesis is valid in Nigeria only in the short run. There is also evidence of the stability of both long-run and short-run relationships between the real GDP and financial development in Nigeria, and the adjustment process to restore equilibrium after disturbance is effectively slow (6.50 percent of discrepancies are corrected in each period). Also, causality runs from economic growth to financial development, and there is no bi-directional causality between growth and finance, which lends support to the demand-leading hypothesis.

Pelesai and Pearce (2013), the study empirically evaluates the impact of financial development on economic growth in Nigeria. The paper employed annual times series data spanning over 43 years (1970 to 2012). The finding of our study suggests that the theoretical modeling requirements for all the variables used in the regression satisfy the statistical requirements which determine the choice of our model. The result of the cointegration estimates in the study revealed that the selected independent variable used in this study explains the long-run relationship between financial development and economic growth between the periods under consideration. The result from the estimated long-run Parsimonious Error Correction Model (ECM) shows that all the variables used in the study were statistically significant. The study also reveals that the lending rate did not conform to our theoretical expectation but impacts significantly on gross domestic product.

Olusegun, Ganiyu and Oluseyi (2013) investigate the impact of financial sector development and economic growth in Nigeria, to seek the sectoral impact in the economy and whether the sector has been able to achieve its main objective of intermediation as a result of the inability of the sector to assist the real sector despite the huge profits declared yearly. The study covers a period of 1992 to 2009; the Ordinary least square (OLS) method was employed. The result of the study shows that the Findings show that only the real interest rate is negatively related. All the explanatory variables are statistically insignificant.

On the other hand, the nexus between the operation of the financial system and economic growth has been one of the most heavily researched topics in development economics. Many empirical studies have investigated the long-run and short-run relationship between financial sector development and sustainable economic growth. These are (Adelakun 2010; Nkoro & Uko 2013; Sofia, Ghulam & Zakir 2011; Odeniran & Udeaja, 2010; Agyei, 2015). They employed the OLS techniques alongside they did the granger causality test, to know the long-run and short-run relationship between financial development and economic growth.

Sofia, Ghulam and Zakir (2011) analyze the long-run relationship between financial sector development and sustainable economic development along with the direction of causality between both the financial sector development and sustainable economic development. The study covers a period of 1973 to 2007 using the autoregressive distributed lag (ARDL) model; a stable long-run relationship was found between financial sector indicators and sustainable economic development. Error Correction coefficient was statistically significant. It was concluded that the financial sector had a positive impact on sustainable economic development in the short-run as well as in the long run. The causality test revealed that financial sector development was the basis for economic development.

Using the ordinary least square estimation method, Adelakun (2010) examines the relationship between financial development and economic growth. The study covers a period of 1980 to 2008. The study finds out that there is a substantial positive effect of financial development on economic growth in Nigeria. The Granger causality test showed that financial development promotes economic growth, but there is evidence of causality from economic growth to the development of financial intermediaries. Similarly, Nkoro and Uko (2013) examine the financial sector development growth nexus in Nigeria from 1980 to 2009. The methodology employed is a cointegration/ Error correction mechanism, and the result shows that there is a positive effect of financial sector development on economic growth in Nigeria.

Odeniran and Udeaja (2010) examine the relationship between financial sector development and economic growth in Nigeria, data collected covers the period 1960 to 2009. They employed the granger causality test in a Vector Autoregression framework, and the result shows that there is an exception of the ratio of broad money to GDP with various measures of financial development of granger cause output at 1percent level of significance. Additionally, the findings also show that net domestic credit is equally driven by growth in output, thus indicating bidirectional causality. The variance decomposition shows that the share of deposit liability in the total variations of net domestic credit is negligible, indicating that shock to deposit does not significantly affect net domestic credit.

Lastly, another research study shows the relationship or link between the financial sector development and economic growth indicators, and this includes the banking sector, industrial sectors, etc. The empirical studies consistent with this view include **(**Abubakar & Gani, 2013; Akpansung & Babalola, 2011; Ho & Odhiambo, 2013; Udoh & Ogbuagu, 2012).

Despite the implementation of several banking sector reforms, the real sector in Nigeria is still finding it difficult to access financial resources, especially from the commercial banks that hold about 90% of the total financial sector assets. The myriad financing challenges facing the real sector call for the reassessment of the finance-growth nexus in Nigeria. In this regard, Abubakar, and Gani, (2013), re-examined the long-run relationship between financial development indicators and economic growth in Nigeria over the period 1970-2010. They utilized the Vector Error Correction Modeling (VECM). The findings of the study revealed that in the long-run, liquid liabilities of commercial banks and trade openness exert a significant positive influence on economic growth.

Conversely, credit to the private sector, interest rate spread, and government expenditure exert a significant negative influence. Also, Akpansung and Babalola (2011), examines the relationship between banking sector credit and economic growth in Nigeria over the period 1970-2008. The causal links between the pairs of variables of interest were established using the Granger causality test, while a Two-Stage Least Squares (TSLS) estimation technique was used for the regression models. The results of the Granger causality test show evidence of a uni-directional causal relationship from GDP to private sector credit (PSC) and from the industrial production index (IND) to GDP. Estimated regression models indicate that private sector credit impacts positively on economic growth.

In a similar vein, Ho and Odhiambo (2013), examine the dynamic relationship between bank-based financial development and economic growth in Hong Kong. They attempt to answer one critical question: Does the relationship between bank-based financial development and economic growth in Hong Kong follow a supply-leading or a demand-following response? In other words, which sector drives economic development in Hong Kong- the real sector or the formal sector? Unlike the majority of previous studies, this study uses the newly developed ARDL-bounds testing approach to examine this linkage. The ARDL-bounds testing approach has numerous advantages over other cointegration techniques, especially when a short time-series dataset is used. To test the robustness of the empirical results, two proxies of bank-based financial development have been used; these are first, the domestic credit provided by the banking sector as a ratio of GDP, and secondly, the banks' deposit as a ratio of GDP. From the study, empirical results show that the relationship between bank-based financial development and economic

growth in Hong Kong is sensitive to the proxy used to measure the banking sector development.

In a corroborated view using an aggregate production framework and Autoregressive Distributed Lag (ARDL) cointegration technique for Nigerian time series data covering the period 1970 to 2009, Udoh and Ogbuagu (2012) examined the link between financial development and industrial growth in Nigeria. They find a cointegration relationship between financial sector development and industrial production. Both the long-run and short-run dynamic coefficients of financial sector development variables have a negative and statistically significant impact on industrial production.

The financial system includes all financial intermediaries that operate in the financial sector in the economy. It is an anchor on the belief that economic agents are categorized into the surplus spending unit operating within the economy and the deficit spending units that engage in borrowing to fund their operations. The financial sector provides an enabling environment for economic growth and development, productive activity, financial intermediation, capital formation, and management of the payment system. From the empirical evidence above, it can be noticed that the results differ in the direction of causality between financial sector development and economic growth, also the divergence in the effect of financial development on economic growth in the short-run and the long-run.

3.0 Methodology

3.1 Nature and Sources of Data

This study relies on annual data for the period of 1986 to 2018. The data; M2/GDP, GEXP, and GDP were obtained from the Central Bank of Nigeria (CBN) statistical bulletin. However, GDPGR was computed by the authors using the following formula; $[(GDP_t - GDP_{t-1})/GDP_{t-1}]$ 100. Where; GDP_t= Gross Domestic Product in the current period, and GDP_{t-1} = One period lag of Gross Domestic Product.

3.2 Model Specification

To empirically analyze the impact of financial sector development on economic growth in Nigeria, this study is adapting; the multiple regression model of Olusegun et al., (2013) on the impact of financial sector development on Nigeria economic growth which is specified as GDPGR= f (DCPS, BD, M2, PI, GEXP, μ), where; GDPGR = GDP growth rate, DCPS = domestic credit to the private sector, BS = bank deposits, M2 = ratio of liquidity liabilities to GDP, PI = private investment, GEXP = government expenditure and μ= stochastic variable or error term incorporating other factors that are not considered in the model.

The model is, therefore, modified to suit the objectives of this study and to capture other variables relevant to the impact of financial sector development on economic growth in Nigeria. The model is re-specified as follows by considering the economic growth rate as the target variable, the ratio of the money supply to GDP, and ;

$$GDPGR_t = \beta_0 + \beta_1 M2/GDP_t + \beta_2 \text{GEXP}_t + \epsilon_t \quad (1)$$

Where:

GDPGR = Gross Domestic Product Growth Rate (Proxy for Economic Growth)

M2/GDP = Financial Deepening

GEXP = Government Expenditure

β_0 = Intercept Term

β_1, β_2= Slopes
ϵ_t = Error Term over time t period.

However, Financial sector development indicator considered in this study is in ratio form and computed using the rebased nominal GDP as the denominator, also the control variable, government expenditure is expressed in its natural log form, therefore, the model is stated as thus;

$$GDPGR_t = \beta_0 + \beta_1 M2/GDP_t + \beta_2 \text{LnGEXP}_t + \epsilon_t \quad (2)$$

3.3 Estimation Techniques

3.3.1 Nonlinear Autoregressive distributive lag model (NARDL)

Most research works in this area have been analyzed using linear models, which presuppose that changes in a particular variable (endogeneous) will lead to a corresponding change in another variable (exogenous). However, a peep into reality will convince us of the practicality of that assumption. It then means that most relationships in economics produce a nonlinear result in which a unit change in one variable (endogeneous) will not bring about the same change in the other variable (exogenous). Therefore, a Nonlinear Autoregressive Distributed Lags (NARDL) Model is adopted for this study.

A simple technique for modeling both long-run and short-run asymmetries in a logical appearance was advanced by Shin, Yu and Greenwood-Nimmo (2014). The method employs positive and negative partial sum decompositions for discovering the asymmetric effects both in the long and in the short-run, in the standard model of Pesaran, Shin and Smith (2001). It can be applied to variables that are stationary at level [I(0)], at first difference [I(1)], or mutually cointegrated except for variables that are stationary at the second difference (I(2)). Specifically, the asymmetric NARDL framework of Shin et al. (2013) is appropriate for this study because of its ability to reveal the short- and long-run asymmetries. In addition to its ability to estimate the rising and falling effects of the regressors on the regressand simultaneously, it still spots concealed cointegration.

Based on equation 3.2, the general form of the asymmetric ARDL model is presented as thus:

$$GDPGR_t = \delta_0 + \delta_1 M2/GDP_t^+ + \delta_2 M2/GDP_t^- + \delta_3 LnGEXP_t^+ + \delta_4 LnGEXP_t^- + \mu_t \ldots. \quad (3)$$

Where the variables are as previously defined and $\delta = \delta_1, \delta_2, \delta_3, \delta_4$ is a vector of long-term parameters to be estimated. However, the negative and positive signs attached to the explanatory variables indicate the falling and rising effects respectively on the target variable, $GDPGR_t$.

From the ratio of the money supply to GDP variable in equation 3 $M2/GDP_t^+ \; and \; M2/GDP_t^-$ create, correspondingly, the partial sums of positive and negative changes in the ratio of money supply to GDP. These can be estimated as thus;

$$M2/GDP_t^+ = \sum_{i=1}^{t} \Delta M2/GDP_t^+ = \sum_{i=1}^{t} \max(\Delta M2/GDP_i, 0) \quad (4)$$

and;

$$M2/GDP_t^- = \sum_{i=1}^{t} \Delta M2/GDP_t^- = \sum_{i=1}^{t} \min\left(\frac{\Delta M2}{GDP_i}, 0\right) \quad (5)$$

Also, from the government expenditure variable in equation (3), $LnGEXP_t^+ \; and \; LnGEXP_t^-$ create, correspondingly, the partial sums of positive and negative changes in the sum

capital and recurrent spendings as the components of government expenditure. These can be estimated as thus;

$$LnGEXP_t^+ = \sum_{i=1}^{t} \Delta LnGEXP_t^+ = \sum_{i=1}^{t} \max(\Delta LnGEXP_i, 0) \quad (6)$$

and;

$$LnGEXP_t^- = \sum_{i=1}^{t} \Delta LnGEXP_t^- = \sum_{i=1}^{t} \min(\Delta LnGEXP_i, 0) \quad (7)$$

Equation (3) depicts the long-term relationship between economic growth and financial development variables. The long-term relationship between economic growth and the positive changes in M2/GDP is δ_1 which is expected to be positive. In the meantime, δ_2 capture the long-term relationship between economic growth and the negative changes in M2/GDP. Since they are projected to move in the same direction with δ_1, δ_2 is expected to be positive. Similarly, δ_3 and δ_4 capture the long-term relationship between economic growth and positive and negative changes in GEXP, respectively, and they are expected to be positive.

However, in the process of examining the asymmetric effects of the exogenous variables on the endogenous variable through the Non-linear autoregressive distributed lag (NARDL) technique, estimating the model with the traditional ARDL technique is a necessity. The ARDL model is therefore stated as follows;

$$\Delta GDPGR_t = \beta_0 + \sum_{i=1}^{a} \Delta\beta_1 GDPGR_{t-i} + \sum_{i=0}^{b} \Delta\beta_2 M2/GDP_{t-i} + \sum_{i=0}^{c} \Delta\beta_2 LnGEXP_{t-i} + \alpha_1 GDPGR_{t-i} + \alpha_2 M2/GDP_{t-i} + \alpha_3 LnGEXP_{t-i} + \mu_t \quad (8)$$

Where; Δ is the first-difference operator, and β's shows the long-run coefficients and short-run coefficients of the regressors in the model, and a, b, c are the lag orders.

Furthermore, the equation (3) can be incorporated in a NARDL form as thus:

$$\Delta GDPGR_t = \delta + \delta_0 GDPGR_t + \delta_1 M2GDP_{t-1}^+ + \delta_2 M2GDP_{t-1}^- + \delta_3 LnGEXP_{t-1}^+ + \delta_4 LnGEXP_{t-1}^- + \sum_{i-1}^{a} \alpha GDPGR_{t-1} + \sum_{i=0}^{b} (\beta_i^+ \Delta M2GDP_{t-1}^+ + \beta_i^- \Delta M2GDP_{t-1}^-) + \sum_{i=0}^{c} (\gamma_i^+ \Delta LnGEXP_{t-1}^+ + \gamma_i^- \Delta LnGEXP_{t-1}^-) + \varepsilon_t \quad (9)$$

Where, all variables are as previously defined a, b and c, are lag orders and $\delta_1 = \frac{-\delta_1}{\delta_0}, \delta_2 = \frac{-\delta_2}{\delta_0}$ Those mentioned above are the long-run impacts of M2GDP increase and M2GDP reduction on economic growth, respectively. Also, $\delta_3 = \frac{-\delta_3}{\delta_0}, \delta_4 = \frac{-\delta_4}{\delta_0}$ are the long-run impacts of LnGEXP increase and LnGEXP decrease on economic growth respectively. $\sum_{i=1}^{b} \beta_i^+$ measures the short-run impacts of the increase in the M2/GDP, while $\sum_{i=1}^{b} \beta_i^-$ Measures the short-run impacts of the decrease in the M2GDP. Also, $\sum_{i=1}^{c} \delta_i^+$ measures the short-run impacts of the increase in the LnGEXP and $\sum_{i=1}^{c} \delta_i^-$ Measures the short-run impacts of the decrease in the LnGEXP. Therefore, as provided above, both the asymmetric long-run relation and the asymmetric short-run influences of financial development variables on the economic growth are captured.

3.3.2 Empirical Procedures

The stationarity properties of variables used in the model were examined and in furtherance to equation (9) and its explanation, the NARDL is an asymmetric extension of ARDL, and as such, it is possible to build an asymmetric cointegration model using the positive and negative partial sum decompositions to explore the asymmetric effects in the short run and long run. As stated by Shin et al., (2014), the nonlinear cointegrating regression model is shown as;

$$Y_t = \delta^+ X_t^+ + \delta^- X_t^- + \pi_t \quad (10)$$

Such that, δ^+ and δ^- represents the associated long-run parameters and X_t is a $k \times 1$ vector of regressors, and it is decomposed as follows;

$$X_t = X_0 + X_t^+ + X_t^- \quad (11)$$

Such that, X_t^+ and X_t^- denote the partial sums of positive and negative changes in X_t as;

$$X_t^+ = \Sigma_{i=1}^{t} \Delta X_i^+ = \Sigma_{i=1}^{t} \max(\Delta X_i, 0) \quad (12)$$

$$X_t^- = \Sigma_{i=1}^{t} \Delta X_i^- = \Sigma_{i=1}^{t} \min(\Delta X_i, 0) \quad (13)$$

In line with Shin *et al.*, (2014), equations (11) and (13) reveals that the linear ARDL model in equation (9) can be modified to show the following nonlinear ARDL model:

$$\Delta Y_t = \delta_0 + \delta_1 Y_{t-1} + \delta_2^+ X_{t-1}^+ + \delta_2^- X_{t-1}^- + \sum_{i=1}^{p} \gamma_I \Delta Y_{t-i} + \sum_{j=0}^{q} \vartheta_j^+ \Delta X_{t-1}^+ + \vartheta_j^- \Delta X_{t-1}^- + \varepsilon_t \quad (14)$$

Such that; ε_t is the error term and Δ is the first difference operator, $\vartheta_j^+ = -\varphi\omega_j^+ \; and \; \vartheta_j^- = -\varphi\omega_j^-$.

In the NARDL framework, the short-run ($\vartheta_j^+ = \vartheta_j^-$) and long-run (($\delta_1 = \delta_2^+ = \delta_2^-$) asymmetries are examined using the standard Wald test, unlike in the ARDL framework in which the long-run co-movement between the variables is examined by testing the null hypothesis of no cointegration i.e $\delta_1 = \delta_2^+ = \delta_2^-$. However, the asymmetric cumulative dynamic multiplier effect of a unit change in the decomposed version of the variable X_t i.e X_t^+ and X_t^- on the target variable Y_t is examined as;

$$Z_t^+ = \frac{\sum_{i=0}^{\tau} \beta Y_{t-i}}{\beta X_t^+}, Z_t^- = \frac{\sum_{i=0}^{\tau} \beta Y_{t-i}}{\beta X_t^+}, h = 0, 1, 2 \quad (15)$$

Such that $\tau \longrightarrow \infty$, $Z_\tau^+ = \delta^+$ and $Z_\tau^- = \delta^-$. However, it is worthy of note that δ^+ and δ^- are the asymmetric related long-run parameters which can be measured as $\frac{\alpha_2^+}{\alpha_1}$, and $\frac{\alpha_2^-}{\alpha_1}$ respectively.

4.0 Results and Discussion of Findings

4.1 Descriptive Statistics

Table 1: Summary Statistics

	GDPGR	M2/GDP	GEXP
Mean	4.445796	14.70506	3.960548
Median	4.631193	13.13181	2.123442
Maximum	15.32916	21.30726	9.448340
Minimum	-2.035119	9.151674	0.911235
Std. Dev.	3.919613	3.976365	3.007093
Skewness	0.447568	0.388422	0.600279
Kurtosis	3.312141	1.630362	1.821735
Jarque-Bera	1.235714	3.409166	3.890767

Probability	0.539099	0.181848	0.142932
Sum	146.7113	485.2670	130.6981
Sum Sq. Dev.	491.6276	505.9673	289.3634
Observations	33	33	33

Source: Author's Computation, 2020.

Table 1 presents the descriptive analysis of the variables under study which include; GDPGR, M2/GDP, and GEXP. Where GDPGR is the Gross domestic product growth rate, M2/GDP depicts the financial deepening or the financial depth, and GEXP is total government expenditure. GEXP has the minimum mean value, follows by GDPGR and the ratio of M2 to GDP respectively. The result of the standard deviation shows that GEXP would contribute more to the target variable as the standard deviation value of GEXP is greater than that of M2/GDP. Furthermore, the Kurtosis values reveal that only GDPGR is mesokurtic given that its value is greater than three (3) and it also implies that the variable follows a normal distribution pattern, while the other variables are Platikurtic because their kurtosis values are less than three (3), and it also implies that the variables are less peaked or flatter compared to the normal distribution. However, considering the probability values of the Jarque-Bera results, it's conspicuous that the three variables are normally distributed given that their probability values, individually, are greater than a 5% level of significance. This also suggests that the variables pass the normality test. These tests are premised on the statistical belief that most psychological and educational variables are expected to be normally distributed.

4.2 Unit Root Test

One of the challenges of time-series analysis is the problem of unit root or non-stationarity of the data, and to have a robust result that is void of spuriousness, the data has to be stationary. Therefore, one of the goals of researchers is to avoid the problem of a unit root in estimating time-series data. Hence, in every time-series analysis, the stationarity of the data is expected to be examined or explored to avoid a misleading or supposititious regression result. Also, the output of the unit root test will present the order of integration of each variable under study, and that will also give a clear indication of the appropriate technique of econometrics analysis.

In this study, Augmented Dickey-Fuller and Phillip Perron methods of unit root tests are employed and their outputs are presented in table 2. The stationarity properties of the variables as presented in table 1 depict a mix of I(0) and I(1). The unit root properties of the variables are binding for the application of NARDL model as none of the variables is I(2). As such, we can proceed by estimating the long and short-term with the Non-linear Autoregressive Distributed Lag (NARDL) Model.

Table 2 Unit Root Test

Variable	**Augmented Dickey-Fuller (ADF) Test**			**Phillip-Perron (PP) Test**		
	@ Level	@ 1st Diff.	Status	@ Level	@ 1st Diff.	Status
GDPGR	-3.842281***	-10.00234***	I(0)	-3.842281***	-13.45982***	I(0)
M2/GDP	-3.160022	-5.151718***	I(1)	-2.651385	-5.653780***	I(1)
GEXP	-1.096326	-5.207478***	I(1)	-1.235306	-	I(1)

					5.241940***	
Asymptotic Critical Values						
1%	-3.484198	-3.484198		-3.484198	-3.484198	
5%	-2.885051	-2.885051		-2.885051	-2.885051	
10%	-2.579386	-2.579386		-2.579386	-2.579386	

*** implies significant at 1% level and **implies significant at 5% level**
Source: Author's Computation, 2020.

4.3 ARDL Bounds Test for Cointegration

Table 3: F-Bounds Test

	90%		95%		97.5%		99%	
F-stats	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)	I(0)	I(1)
5.431015***	2.2	3.09	2.56	3.49	2.88	3.87	3.29	4.37

Source: Author's Computation, 2020.

Table 3 reveals the F statistic result of the bounds test and the critical values for upper and lower bounds. The F-stat (5.431015) is greater than the upper bound critical value (3.49) at 5% significance level, and even the upper bound (4.37) at 1% level of significance, which is an indication of cointegration i.e existence of a long-run relationship between the target variable and the explicative variables. Also, for lag selection, AIC suggests we apply NARDL (1, 2, 0, 0, 4).

4.2.2 Estimated Long Run and Short Run Asymmetric ARDL Model

Here, the model on the impact of financial sector development on economic growth in Nigeria is estimated using NARDL model and the result is presented in Table 4;

Table 4 Estimated Long Run Coefficients Using the NARDL Approach

Estimated Long Run Coefficients Using the NARDL Approach NARDL (1, 2, 0, 0, 4) Selected based on Akaike info criterion (AIC)				
The dependent variable is GDPGR				
Regressor	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
$GDPGR_{t-1}$	0.684934	0.141313	4.846935	0.0002***
$M2/GDP_t^+$	-1.677422	0.523752	-3.202702	0.0055***
$M2/GDP_{t-1}^+$	2.544346	0.645414	3.942193	0.0012***
$M2/GDP_{t-2}^+$	-2.171045	0.488103	-4.447920	0.0004***
$M2/GDP_t^-$	-2.911398	1.274868	-2.283685	0.0364**
$LnGEXP_t^+$	-1.087244	1.662831	-0.653851	0.5225

$LnGEXP_t^-$	5.633430	6.558812	0.858910	0.4031
$LnGEXP_{t-1}^-$	3.386646	8.566593	0.395332	0.6978
$LnGEXP_{t-2}^-$	-0.574606	9.588289	-0.059928	0.9530
$LnGEXP_{t-3}^-$	8.696447	8.464407	1.027414	0.3195
$LnGEXP_{t-4}^-$	-15.55489	5.779364	-2.691453	0.0161**
C	-4.683060	2.540656	-1.843248	0.0839
Estimated Short-Run Coefficients Using the NARDL Approach NARDL (1, 2, 0, 0, 4) Selected based on Akaike info criterion (AIC)				
$D(M2/GDP_t^+)$	-1.677422	0.298904	-5.611910	0.0000***
$D(M2/GDP_{t-1}^-)$	2.171045	0.324906	6.682072	0.0000***
$D(LnGEXP_t^-)$	5.633430	3.748892	1.502692	0.1524
$D(LnGEXP_{t-1}^-)$	7.433047	4.607902	1.613109	0.1263
$D(LnGEXP_{t-2}^-)$	6.858442	4.367101	1.570479	0.1359
$CointEq(-1)*$	-0.315066	0.048177	-6.539820	0.0000***
R Squared = 0.782562 Adjusted R-Squared = 0.633073 S.E. of Regression = 2.337997 F-statistic (Prob.) = 5.234920 (0.001550)				
Diagnostic Tests				
Test Statistics			**LM Version**	
A. Serial Correlation X^2_{auto} = 1.077528 (0.3671)				
B. Functional Form (Ramsey Reset) X^2_{RESET} = 0.102018 (0.7538)				
C. Normality X^2_{Norm} = 178.6982 (0.000000)				
D. Heteroscedasticity X^2_{Het} = 1.850445 (0.1277)				

Source: Author's Computation, 2020.

Note: ** and * indicate significance at 1% and 5% level of significances. Figures in parenthesis are probability values. A is Breusch-Godfrey Serial Correlation LM Test, B is Ramsey's RESET test, C is Normality Test, D is Heteroscedasticity test.

The result presented in table 4 depicts the output of the estimated long-run coefficients NARDL model on the impact of financial sector development on economic growth in Nigeria. One period lag of the target variable, economic growth appears to be positively significant in influencing the behavior of the variable in the current period given that a unit increase in $GDPGR_{t-1}$ leads to a 0.684934 unit increase in $GDPGR$. The

coefficients of the partial sums of $M2/GDP$ in current value and estimated lags also reveal the presence of an asymmetric relationship between the policy variable, $M2/GDP$ and the target variable, $GDPGR$ i.e increase (decrease) in financial deepening exert significant positive (negative) impact on economic growth rate. Although, the rise in $M2/GDP$ only in its one-period lag leads to a rise in $GDPGR$. In a more explicit form, a unit rise (decline) in partial sums of financial deepening, $M2/GDP_t^+$ and ($M2/GDP_t^-$) leads to 1.677422 and 2.911398 decline (decline) respectively in $GDPGR$. But a unit rise increase in $M2/GDP_{t-1}^+$ brings about 2.544346 unit increase in the regressand, $GDPGR$, which is an indication that the financial deepening in its contemporaneous positive value is inversely and asymmetrically related to the $GDPGR$, while the former, financial deepening, in its positive and one period lag exerts positive asymmetric influence on the later, $GDPGR$. Furthermore, the coefficients of the rise and decline in total government expenditure appear to be insignificant in explaining the target variable, economic growth rate. The value of R-squared and the adjusted R-squared show that 78% and 63% of the variation in GDPGR is explained by the independent variables. Also, the F-statistic (Prob.) = 5.234920 (0.001550) and illustrate the overall significance and fitness of the model.

Similarly, in the short-run, rise and decline in financial deepening, the ratio of M2 to GDP exhibit an asymmetric inverse relationship with the regressand, GDPGR, and the estimates also reveals that M2/GDP$^+$ and M2/GDP$^-$ are not similar in their values and lag lengths which also indicates asymmetric adjustments of the economic growth rate in the short-run. Specifically, a unit change in $D(M2/GDP_t^+)$ and $D(M2/GDP_{t-1}^-)$ lead to -1.677422 and 2.171045 respectively, while the coefficients of partial sum of LnGEXP show it's asymmetrically and statistically insignificant in explaining the target variable. Also, the value of ECT(-1) being negative and less than one (1) shows the speed of adjustment of the variables from departure to equilibrium is approximately 32%.

However, the result of the diagnostic tests of Breusch-Godfrey Serial Correlation LM Test, Ramsey's RESET test, Normality Test and Heteroscedasticity test revealed that the model passed all the diagnostic checks, and Ramsey's RESET test indicates a good and correctly specified Nonlinear ARDL model, and the skewness and kurtosis of residuals based on normality test shows that the residuals are normally distributed.

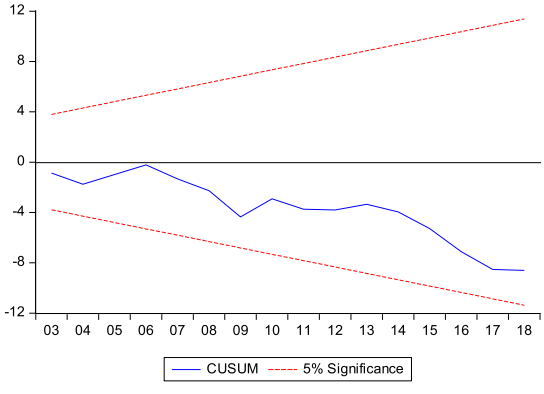

Figure 1: CUSUM

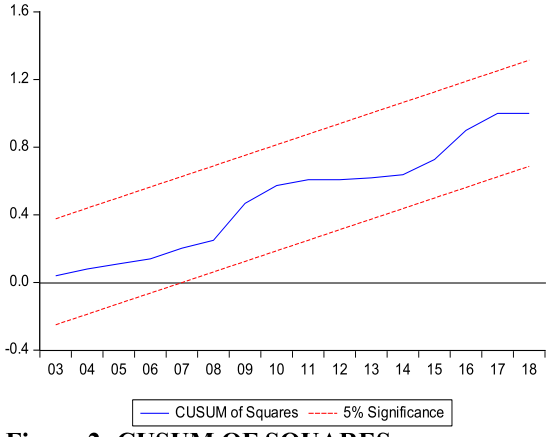

Figure 2: CUSUM OF SQUARES

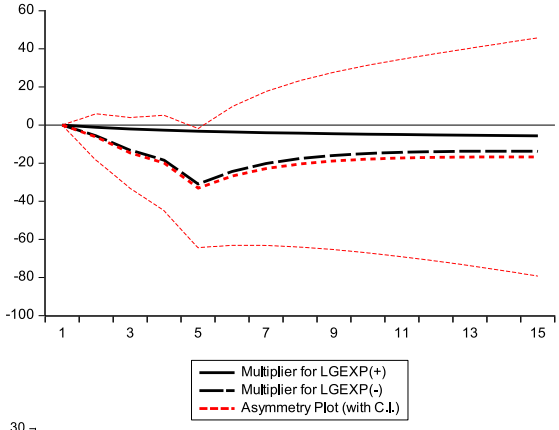

Figure 3: Dynamic Multiplier for LGEXP

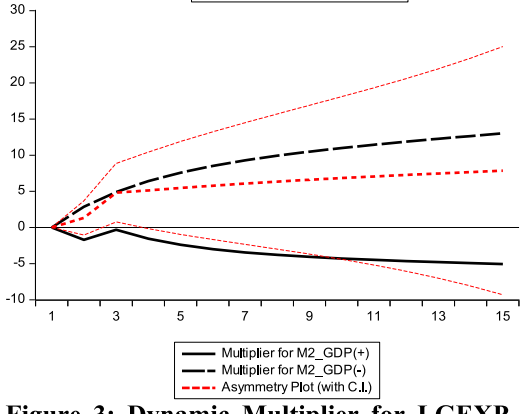

Figure 4: Dynamic Multiplier for M2/GDP

In line with Pesaran et al. (2001), we examine and report the CUSUM and CUSUM of Squares to verify and ensure the stability of the long-run and short-run

estimates. The CUSUM and CUSUM of Squares in figure 1 and 2 are within the critical bounds, hence, the stability of the model is assured at a 5% level of significance.

Figures 3 and 4 shows the asymmetric cumulative dynamic impact of the lagged financial sector development variables on the economic growth rate in Nigeria. The black lines indicate the positive impact of the explicative variable on the target variable, while the black dotted line shows the inverse impact. Also, the red dotted and the thick line represents the asymmetry in the short-run, while the two red dotted and thin lines are the upper and lower bounds of the asymmetry. Simply put, in the short-run, there exists an asymmetric impact relationship between the target variable and each of the independent variables.

5.0 Conclusion

This study investigates the dynamic relationship between financial sector development and the economic growth rate in Nigeria using annual data. The ratio of demand for money to GDP i.e M2/GDP stands as a proxy for financial deepening or financial depth, which is the policy variable in this paper, while Government total expenditure serves as the control variable in our model. The major contribution of this study is that a non-linear cointegration method known as asymmetric ARDL was adopted in the estimation, and this allows exploring the possibility of an asymmetric relationship between the dependent variable and each of the explanatory variables in both the short-run and the long-run. The rising and falling effects of the policy variable on the dependent variable are established in the long run. This study shows the existence of a long-term asymmetric effect or relationship between the policy variable, while the control variable remains asymmetrically insignificant in determining the behavior of the target variable, GDPGR.

In the short-term, the economic growth rate is also significantly impacted but, an increase in the policy variable's effect is inversely related to the economic growth, while a decrease in financial deepening again also leads to an increase in the target variable. All the diagnostic checks also indicate a well-specified model as they all passed the necessary post-estimation tests. These results imply that in the short run, an increase in the ratio of the money supply to GDP is potent but affects the growth rate inversely, while the expected positive effect of it can only be realized in the long-run. Also, the speed of adjustment and time spent by the variables in question to reach an agreement or equilibrium point is 32% annually. The researchers concluded that to achieve a steady economic growth, the financial deepening should be strengthened through expansion in the money supply, while attention should be given to the complimentary and coordinated development of financial reforms and changes in the real sector of the economy.

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