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RESEARCH PAPER

The Asymmetric Influence of Exchange Rate and Inflation on Financial Development in Nigeria: Evidence from NARDL

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Abstract

This paper examined the asymmetric effects of exchange rate, and inflation on financial development growth using a model enhanced with oil prices asymmetry to apprise model specification. The research question that has been used implies, do the changes in their asymmetry significantly influence financial development? We employed nonlinear auto-regressive distributive lag (NARDL). In addition, we used the monthly data from 1980M01 to 2018M12. We found a long-term negative shock in exchange rate, both short run positive shock and negative shocks, respectively, declining the financial development. Additionally, the long run negative oil price shock and its long-term positive shocks stimulate and decline financial development, respectively. Regarding inflation, its positive and negative shocks in long run, respectively, reduce financial development. While in the short run the negative and positive shock in inflation increase and decline the financial development respectively. Accordingly, the results demonstrate a stable and sustainable inflation and exchange rate environment that would negatively cause financial development to stabilize the oil price and enhance the robust financial system. Therefore, successful policies that promote low inflation and exchange rates, overhaul of reliably improved financial institutions, capital accumulation, and efficient resources mobilization should be put in place for positive financial development to occur.

Keywords: Asymmetries, Exchange Rate, Financial Development, Inflation, NARDL, Oil Prices.
JEL Classification: C58, F31, E51, E31, C58, Q49.

Introduction

Variations in the degree of financial development across countries may be attributed to several factors, including variables in macroeconomic stability. The determinants of financial development have been investigated by several empirical studies. For example, the amount of income, the openness of current and capital accounts and financial openness have been described as basic variables affecting financial development (Ashraf, 2018). But the effect of macroeconomic stability variables (inflation rate, exchange rate, and oil prices) has not been extensively examined on the development of the financial system. Research into the relationship between variables of macroeconomic stability and financial development is

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fundamental. Theoretical evidence indicates that poor macroeconomic performance has some negative effects on the growth of the financial sector. Low and stable inflation, for example, is a prerequisite for achieving an active and well-developed financial sector, whereas high and volatile inflation has a negative impact on financial development (Sanusi et al., 2017). In theoretical literature, the complex relationship between the real exchange rate and financial growth has also been stressed (Ahmad, et al., 2015a; Jehan and Hamid, 2017; Ehigiamusoe and Lean, 2019).

Macroeconomic fluctuations have an impact on stock prices, based on the principle of arbitrage pricing. The purpose of this research paper is to clarify the short-run and long-run asymmetric effects on financial development of macroeconomic variability. This research adds to current literature by analysing the asymmetrical impact on financial development of the exchange rate, inflation and oil prices, which is believed to be symmetrical in existing literature. This research article explores the asymmetric effect of macroeconomic volatility on financial development in Nigeria due to its highly volatile property.

For national economies, oil prices are recognised as a significant predictor. The primary explanation for this dilemma is that, regardless of possessing their own capital or not, nations have to import oil. The rise or decrease in oil prices is therefore an influential factor in the economies of the world (Kayalar et al., 2017; Ahmad et al., 2018). For countries that import oil, this is extremely relevant. Since these countries do not have their own capital, they must purchase oil from abroad. As a general rule, imported oil is bought in various currencies, such as dollars and euros. Thus, the price of oil would rise in foreign currencies and this circumstance would affect the macroeconomic policies of the nation. The key point in this context is understanding the main oil price measures. It is possible to talk about a variety of different problems that can influence the price of oil. Political and economic issues between countries, for example, can have a positive or negative effect on the oil prices (Charfeddine and Barkat, 2020). There has been a severe increase in oil prices in the oil crises of previous years. On the other hand, another factor influencing the price is the fact that the volume of oil supplied is more or less. The price of oil will decline as the oil supply rises (Jakada et al., 2020a). Because of this situation, in order to reduce their energy costs, both nations seek to have new oil supplies (Dabachi et al., 2020).

In addition to these factors, oil prices are influenced by developments in foreign markets. As an example, as the US dollar appreciates against other currencies, oil prices are expected to rise. The key explanation for this problem is that the world's six currency, oil is sold in dollars. The more precious the dollar becomes, thus, costlier to oil (Naeem et al., 2020). Moreover, the policies put in place by OPEC, known as the Union of Petroleum Exporting Countries, are likely to trigger shifts in oil prices. Although the nations contributing to this union can hold a large portion of the world's oil reserves, their policies can result in oil prices rising or dropping. Furthermore, the cost of oil production can also have a major impact on the countries' oil prices (Chen et al., 2016; Al-Khazali and Mirzaei, 2017). On the other hand, it's also clear that oil prices tend to have an effect on several variables. The rise in oil prices, for example, could have a negative effect on countries' current account balances. The rise in oil prices means an increase in import figures particularly for energy-dependent countries. This situation leads companies to have a problem with the current account deficit (Bayraktar et al. (2016). The higher current account deficit is known as one of the main measures of financial crisis. Therefore, in countries with a high current account deficit crisis, investors are concerned. As a result, nine national investments are negatively affected by this issue (Gazdar et al., 2019). In summary, oil price volatility can have a negative effect on both the country's economic and financial development.

Nevertheless, in recent decades, many developing countries have faced significant macroeconomic uncertainty due to a combination of volatility in production, inflation variability, and uncertainty in exchange rates. In essence, Önder and Özyıldırım, (2019)

asserted that there is a theoretical association between financial development and macroeconomic volatility, while, Łasak and van der Linden (2019) stressed that fostering financial deepening, economic development and macroeconomic stability in developed countries is a major priority of the International Monetary Fund (IMF). Subsequently, with a view to maintaining macroeconomic stability, a substantial number of developing countries have implemented such macroeconomic policies. It is therefore important to analyse the effect of variables relating to macroeconomic stability on various aspects of the economy, including the development of the financial system (Vo et al., 2019; Brychko et al., 2020). The study's findings could be helpful in establishing effective government policies that would improve financial sector performance and macroeconomic stability, especially in developing countries such as Nigeria. This is an important theoretical contribution to current literature since it describes the asymmetric impact of macroeconomic volatility on financial development that most researchers are studying as symmetrical. This paper is grouped into three parts below. The first section covers an introduction in which authors describe the theoretical relation that needs to be explored between macroeconomic uncertainty and financial development. Data sets, variables used in the model, and methodology of study that has been followed in Section 2. Sections 3 and 4 reflect results and conclusion, respectively.

Methodology

Researchers have analysed the symmetrical effect of macroeconomic fluctuations on financial development in current literature, which means that increasing currency prices have a negative impact on financial development and the decline of the currency has an opposite effect. According to Xiao et al. (2018) this may not be the case; the possibility exists that investors may respond differently to the increase or decrease in the price of the dollar. The weakening of the US dollar, for example, causes rates to shift downwards and raises the profit margin and stock indices for many companies. In the case of dollar appreciation, industries will bear the rising cost of producer prices by giving up their profit margin in order to retain market share. Thus, stock prices respond to both positive and negative shocks differently. In the case of negative exchange rate shocks (US dollars) with a positive impact and a positive exchange rate shock, stock prices did not respond to exchange rate appreciation. This relation is given the name of exchange rate asymmetric impact on stock prices. This thesis examined the asymmetrical impact of macroeconomic volatility on financial growth, as several studies on stock prices have been carried out in current literature.

Data

The paper utilizes the NARDL to examine the asymmetric effect of macroeconomic fluctuation on financial development in Nigeria. The study employed monthly secondary times series data spanning from 1980M1 to 2018M12. The data were mainly sourced from the United Nations Statistical Bulletin, Central Bank of Nigeria (CBN) Statistical Bulletin, and World Development Indicators.

Model Specification

Following the previous studies, the association between macroeconomic variables fluctuations and financial development is studied by applying the conventional time series approach of Auto Regressive Distributive Lag techniques of cointegration analysis that modelled the Error Correction as well as granger causality. However, the conventional methods of econometrics permit the examination of the of long run relationship as well as short run association while

taking into account the symmetric relationship among the variable of study. For this reason, prior studies failed to take into account the asymmetric features that is bound to exist among the macroeconomic variable's fluctuations. The current research then intends to look at the short run asymmetric relationship and also the long run asymmetric form of relationship between the macroeconomic variables fluctuations and financial development by applying the NARDL techniques of analysis that was introduced via Shin et al. (2014), the method contained the negative as well as positive disintegration partial sum of the dependent variables. At the same time the techniques possessed the advantage of discerning the independent variables of concern between the state of short-run period as well as the state of the long-run asymmetric reactions to changes in the financial development. The variation in the analyzed variables is characterized by changing the initial variable into a logarithmic form. The asymmetric form of cointegration association can be articulated as follows:

$$FD_t = f(EXR_t, INF_t, OP_t) \quad (1)$$

All the series of concern are converted for the purpose of transforming them into a logarithm form. The functional form of the log-linear of this empirical equation is presented as follows:

$$lnFD_t = \beta_1 + \beta_2^+ lnEXR_t^+ + \beta_3^- lnEXR_t^- + \beta_4^+ lnINF_t^+ + \beta_5^- lnINF_t^- + \beta_6^+ lnOP_t^+ + \beta_7^- lnOP_t^- + \mu_t \quad (2)$$

Where $\beta = (\beta_1, \beta_2^+, \beta_3^-, \beta_4^+, \beta_5^-, \beta_6^+, \beta_7^-)$ is an unknown vector of the parameters. Correspondingly, $EXR_t = EXR_0 + EXR_t^+ + EXR_t^-$, $INF_t = INF_0 + INF_t^+ + INF_t^-$, $OP_t = OP_0 + OP_t^+ + OP_t^-$ where EXR_t^+ and EXR_t^- , INF_t^+ and INF_t^-, OP_t^+ and OP_t^- are partial sum procedures of positive as well as negative variation in FD_t, EXR_t , INF_t, OP_t

$$EXR_t^+ = \sum_{j=1}^{t} \Delta EXR_J^+ = \sum_{j=1}^{t} max\emptyset\left(\Delta EXR_j, 0\right), EXR_t^- = \sum_{j=1}^{t} \Delta EXR_j^- = \sum_{j=1}^{t} max\emptyset(EXR, 0) \quad (3)$$

$$INF_t^+ = \sum_{j=1}^{t} \Delta INF_J^+ = \sum_{j=1}^{t} max\emptyset\left(\Delta INF_j, 0\right), FDI_t^- = \sum_{j=1}^{t} \Delta INF_j^- = \sum_{j=1}^{t} max\emptyset(\Delta INF_j, 0) \quad (4)$$

$$OP_t^+ = \sum_{j=1}^{t} \Delta OP_J^+ = \sum_{j=1}^{t} max\emptyset\left(\Delta OP_j, 0\right), OP_t^- = \sum_{j=1}^{t} \Delta OP_j^- = \sum_{j=1}^{t} max\emptyset(\Delta OP_j, 0) \quad (5)$$

As fragment of the relationship that is non-linear, the equation stated on the above is made base on the partial disintegration that take into account the asymmetric form of cointegration. The ARDL model can be used to accommodate equation (1) following (Pesaran et al., 1999; 2001) as:

$$\Delta FD_t = \rho_0 + \omega_1 FD_{t-i} + \emptyset_2^+ EXR_{t-i}^+ + \cap_3^- EXR_{t-i}^- + \emptyset_4^+ INF_{t-i}^+ + \cap_5^- INF_{t-i}^- + \emptyset_6^+ OP_{t-i}^+ + \cap_7^- OP_{t-i}^- + \sum_{i=1}^{d} \cap \Delta FD_{t-i} + \sum_{i=0}^{e} (\vartheta_i^+ \Delta EXR_{t-i}^+ + \gamma_i^- \Delta EXR_{t-i}^-) + \sum_{i=0}^{f} (\vartheta_i^+ \Delta INF_{t-i}^+ + \gamma_i^- \Delta INF_{t-i}^-) + \sum_{i=0}^{g} (\vartheta_i^+ \Delta OP_{t-i}^+ + \gamma_i^- \Delta OP_{t-i}^-) + \emptyset_t \quad (6)$$

where d, e, f, and g represent the lags of the orders. The unknown problem of cointegration may come up in Equation (1) when estimated, as a result it would be difficult to provide reliable interpretation concerning the outcome of the asymmetric results, as such a constrained is imposed into the coefficient of Equation (1) such as:

$\beta_2^+ = -\frac{\emptyset_2^+}{\omega_1}$ and $\beta_3^- = \frac{p_3^-}{\omega_1}$, $\beta_4^+ = -\frac{\emptyset_4^+}{\omega_1}$ and $\beta_5^- = \frac{p_5^-}{\omega_1}$, $\beta_6^+ = -\frac{\emptyset_6^+}{\omega_1}$ and $\beta_7^- = \frac{p_7^-}{\omega_1}$

The equation $\sum_{i=0} \vartheta_i^+$ examines the conceivable influence of macroeconomic variables fluctuations upsurge the emissions of financial development whereas $\sum_{i=0} \gamma_i^-$ processes the short-run influence of macroeconomic variables fluctuations reduction on and financial development. Consequently, the asymmetric short-run effect variations of macroeconomic variables fluctuations on financial development is taken also in this arrangement along with long-run relationship asymmetric. The (ECM) Error Correction Model of the preceding equation is portrayed as:

$$\Delta FD_t = \sum_{i=1}^{a} \sigma_i \Delta FD_{t-i} + \sum_{i=1}^{b} (n_i^+ \Delta EXR_{t-i}^+ + n_i^- \Delta EXR_{t-i}^-) + \sum_{i=1}^{c} (n_i^+ \Delta INF_{t-i}^+ + n_i^- \Delta INF_{t-i}^-) + \sum_{i=1}^{d} (n_i^+ \Delta OP_{t-i}^+ + n_i^- \Delta OP_{t-i}^-) + \beth_i ect_{t-i} \emptyset_t \quad (7)$$

where σ_i, p_i, and z_i signify the coefficient of short-run as well p_i^+, p_i^- are the symmetric modification of the short-run, while $\beth_i$ specifies the coefficient concerning the error term. The techniques of NARDL estimation contains the ensuing steps: Firstly, the method of ARDL is appropriate regardless of whether all the concern variables are collectively contained order zero or order one or revealed results that is mixed. It is very significant to apply the test of unit root to certify that none of the concern variables that is stationary at the second difference or is in order that is two, ever since the occurrence of a series that have an order up to two I(2) turn the predictable F-statistics to be void and null while determining cointegration. To avoid the occurrence of this problem, the study applied the techniques of ADF (Augmented Dickey-Fuller) as well as the techniques of Phillips-Perron (PP) test of unit root that are applied while determining the integration order of the variables. Subsequently, by applying the procedure of standard OLS (Ordinary Least Squares), Equation (3) is enumerated. The approach of general as well as specific is applied to improve the model that characterizes NARDL last condition through depressing the lags that are insignificant. Afterward, the NARDL estimation, a test is executed to confirm if long-run association among the comprised variables is present in the concerned model through the use of bound test procedure (Pesaran et al., 2001). This involves the null hypothesis of the Wald F test, H_0: $\omega_1 = \emptyset_2^+ = p_3^- = \emptyset_4^+ = p_5^- = \emptyset_6^+ = p_7^- = 0$ contrary to the null hypothesis, H1: $\omega_1 \neq \emptyset_2^+ \neq p_3^- \neq \emptyset_4^+ \neq p_5^- \neq \emptyset_6^+ \neq p_7^- \neq 0$. In due course, with the presence of cointegration, in the associations between financial development, FDI, economic growth and the quality of environment, an examination of the long-run as well as short-term form of asymmetries is shepherded; as well interpretations are certain to be completed. Additionally, the dynamic asymmetric aggregated multiplier impact of 1% disparity in ΔFD_{t-i}^+ and ΔFD_{t-i}^- ΔFDI_{t-i}^+ and ΔFDI_{t-i}^- ΔGDP_{t-i}^+ and ΔGDP_{t-i}^- respectively were computed as:

$$G_h^+ = \sum_{j=0}^{h} \frac{\partial CO_{2t+j}}{\partial FD_{t-1}^+}, G_h^- = \sum_{j=0}^{h} \frac{\partial CO_{2t+j}}{\partial FD_{t-1}^-} \quad , \text{h} = 1,2,3,\ldots$$

It should be noted that as h$\emptyset\infty$ $G_h^+ \emptyset$ β_2^+ and $G_h^- \emptyset$ β_3^-, h$\emptyset\infty$ $G_h^+ \emptyset$ β_4^+ and $G_h^- \emptyset$ β_5^-, h$\emptyset\infty$ $G_h^+ \emptyset$ β_6^+ and $G_h^- \emptyset$ β_7^-.

This research employed the Autoregressive Distributive Lags (ARDL) method that was established by Pesaran and Pesaran (1997), Pesaran and Shin (1999), and Pesaran et al. (2001), in order to test the robustness of the model. This technique is more proficient than other techniques. Thusly, the ARDL model in this study is determined as follows.

$$\Delta lnFD_t = \theta_1 + \sum_{i=1}^{n} \vartheta_1 \Delta lnFD_{t-i} + \sum_{i=0}^{n} \vartheta_2 \Delta lnEXR_{t-i} + \sum_{i=0}^{n} \vartheta_3 \Delta lnINF_{t-i} + \sum_{i=o}^{n} \vartheta_4 \Delta lnOP_{t-i} + \delta_1 lnFD_{t-1} + \delta_2 lnEXR_{t-1} + \delta_3 lnINF_{t-1} + \delta_4 lnOP_{t-1} + ECT(-1)_{t-1} + \varepsilon_{1t} \quad (8)$$

where Δ is a first-difference operator, and *n* is the ideal slack length. Investigating the existence of the long-run relationship among the indicators in the above equations and is finished utilizing limits testing strategy, which is the primary stage in the ARDL co integration technique and depends on the F-test measurement. Every equation consolidated both the long run and short run parameters. The Joint noteworthiness test, which suggests no co integration, is given by the null hypothesis $H_0: \vartheta_1 = \vartheta_2 = \vartheta_3 = \vartheta_4 = 0$. Therefore, rejecting the null hypothesis, i.e. $H_1: \vartheta_1 \neq \vartheta_2 \neq \vartheta_3 \neq \vartheta_4 \neq 0$ implies that cointegration exist amongst the variables. Two limits of basic esteems are registered by Pesaran et al. (2001) for choice run the show. The lower bound acknowledges that every one of the indicators are $I(0)$ and upper bound accept they are all $I(1)$. On the off chance that the figured F-measurement is more noteworthy than the upper basic esteem, there is co integration. But when the F-statistic is between the two bounds of

critical values, the analyses becomes inconclusive. In conclusion, when the F - statistic is less than the lower critical value, it suggests no cointegration.

Results and Discussion

Through the use of the NARDL model by Shin et al. (2014), this study examines the asymmetrical relationship of exchange rate, inflation, oil prices and financial growth. The asymmetric macroeconomic fluctuation in financial growth in Nigeria from 1980M1 to 2018M12 is explained using NARDL models. The functional objective of the NARDL model is to analyse the nonlinear financial development effects of macroeconomic uncertainty, while ARDL does not demonstrate the asymmetrical effect of macroeconomic fluctuations on financial development by decomposing independent variables into positive and negative shocks. The nonlinear ARDL model has the ability to decompose independent variables into positive and negative shocks to understand how investors react differently to both positive and negative shocks. Empirical analysis is based on the following parts, such as the BDS nonlinearity test for detecting time series serial dependence, descriptive statistics, correlation matrix, time series unit root detection, and the NARDL model for decomposing macroeconomic variables into negative and positive signs. Researchers conduct augmented Dickey Fuller test and KSS test to examine the effect of variability in the results. The null hypothesis for the ADF test is that, in the case of KSS, the data has an origin, but is inverted. According to Shin et al. (2014), the null hypothesis will not be dismissed if the value of F-statistics is lower than the upper and lower bound values, i.e. there is no long-term cointegration. In addition, ECM is carried out to confirm long-term co-integration between macroeconomic fluctuation and financial development. The ECM value should be negative and important, indicating that the device returns to long-run equilibrium at unique frequencies.

Brock-Dechert-Scheinkman (BDS) Independence Test

The BDS test was firstly introduced by Brock et al. (1987). BDS is one of the effective methods in time series to recognise serial dependence. The BDS test is used to test for the existence of nonlinear dependence in the residual series calculated after the fitness of the ARIMA model is defined (Ahmad et al., 2020). The test statistics are asymptotically accompanied by the normal distribution. The BDS test's null hypothesis states that the residuals are distributed independently and similarly against the alternative hypothesis that the iterations assume many deviations which render their degree of dependence nonlinear. The fundamental principle of the BDS test is built on the concept of the integral correlation which measures the frequency at which the series repeats the spatial pattern. The BDS test relies only on the signs of the consecutive return, with no interest in their dimensions, and does not require any assumptions regarding the distribution of returns. A series of too many or too few runs indicates the sample is also not random.

Brock et al. (1996) initially developed the BDS test and extensively applied it in Brock et al. (1991). Intuitively the integral correlation estimates the likelihood of any two m-dimensional points being within a distance from one another. The BDS test's implicit premise is that x_t should be a random series of data such that $x_t = x_1, x_2 \ldots\ldots\ldots\ldots x_3$ Also x_t is assumed to be a univariate series which is assumed to be iid. The BDS test is based on the following assumption:

$$H_O: p_m = p_1^m$$
$$H_1: p_m \neq p_1^m$$

the null hypothesis of iid is usually rejected at the 5% significance whenever the $p_m > 1.96$.

$$I_t = 1\ if\ |x - y| < \in \tag{8}$$

Likewise, the BDS test also relies on the value of the correlation integral as follows:

$$\mathrm{C}(m, \in, T) = \frac{I[(t,s):\|X_t^m - X_s^m\| < \in]}{T^2} \tag{9}$$

Where $X_t^m = (x(t).....,x(t-m+1)), \|.\|$ Is the l_∞ norm on R^m, and $I[.]$ indicates the number of elements subject to only modest regularity conditions as $T \to \infty, \mathrm{C}(m, \in, T)$ has limit $\mathrm{C}(m, \in)$ such that if $\{x(t)\}$ is iid, it then follows:

$$\mathrm{C}(m, \in) = \mathrm{C}(1, \in)^{\,m} \tag{10}$$

The reasoning motivates for the BDS test statistics are:

$$W(m, \in, T) = \sqrt{N}\,\frac{[\mathrm{C}(m, \in, T) - \mathrm{C}(1, \in, T)^m]}{\breve{\sigma}(m, \in, T)} \tag{11}$$

In particular, under the null hypothesis of whiteness the BDS test statistic is the established asymptotic distribution. The test offers a simple randomness statistical test against specific dependency, which involves both non-white linear and non-white nonlinear dependency. To detect the nonlinearity in the time series results, the BDS test is used. In particular, the test is applied to the data series of residuals made from ARIMA models (Dorina and Simina, 2007). The test was named after Brock, Dechert, and Schneinkman, the prominent econometricians. The test is based on the assumption that the series within the model show randomness or whiteness between the series against the alternative hypothesis that the series is asymmetric. Table 1 below shows the outcome of the BDS test. From the table, it is shown that the null hypothesis is rejected at a 1 percent level of significance in all dimensions. This demonstrates the nonparametric existence of the model.

Table 1. BDS Non-Linearity Test

Dimension	BDS Statistic	Std. Error	z-Statistic	Prob.
2	0.200653	0.002561	78.35297	0.0000
3	0.339237	0.004051	83.74688	0.0000
4	0.433849	0.004799	90.40698	0.0000
5	0.497509	0.004975	100.0017	0.0000
6	0.539365	0.004771	113.0396	0.0000

Source: Research finding.

Descriptive Statistics and Correlation Matrix

The bulk of the economic time series data is highly categorised as (non-normal) skewed. The key reason for this is the existence of many outliers along with the pattern. The Jarque-Bera test from Table 1 below is added to test the normality of the series. In order to test the normality of variables within our model, the study uses skewness and kurtosis coefficients based on the mean. Skewness refers to the tilt in the distribution, and it should be within the range of 0 and + 3 for the series to be normally distributed (Ahmad et al., 2015b). On the other hand, Kurtosis refers to the peak of the distribution for the sequence to be normally distributed and is thus assumed to lie within the range of 0 and + 3. In the normality test, the null hypothesis used shows that the sequence is usually distributed against the alternative hypothesis of non-normality. If the probability value is below the Jarque-Bera normality test's 5 percent significance point, then the sequence is not normally distributed. It can be seen from table 1 below that the sequence is far from average. The mean coefficients of Jarque-Bera show that

the series is not normally distributed. On the other hand, the standard deviation in the frequency distributions stressed that the variables were far from normal. The standard deviation values in Table1 below suggested that, relative to interest rates, FD, EXR, INF, and OP are highly volatile. Furthermore, the results of the Pearson sequence correlation matrix are further depicted in Table 2.

Table 2. Descriptive Statistics

	FD	**INF**	**EX**	**OP**
Mean	2.184008	54.58928	4.815086	0.841350
Median	2.094468	27.67336	4.612092	-0.001773
Maximum	0.774289	250.7103	6.325099	4.678307
Minimum	-0.715068	0.352762	3.877047	-1.487145
Std. Dev.	0.364910	64.56736	0.625739	1.753445
Skewness	-0.236739	1.285448	0.895609	0.761853
Kurtosis	2.529223	3.752516	2.720643	2.246427

Source: Research finding.

Table 3. Correlation Maxtrix

lnFD	**1.000**			
lnINF	0.207*	**1.000**		
	(0.000)			
lnEXR	-0.208*	-0.214*	**1.000**	
	(0.000)	(0.000)		
lnOP	-0.564*	-0.202*	0.514*	**1.000**
	(0.000)	(0.000)	(0.000)	

Source: Research finding.

Unit Root Test

Several economists have criticized the use and application of traditional unit root tests of stationarity, such as the Augmented Dickey-Fuller and Phillips-Perron (Ahmad et al., 2015c; Kamalu et al., 2019; Alkhawaldeh et al., 2020). This because of their inability to "differentiate between the unit root and near unit root" tests. For this reason, this study used the unit root test popularly known as Breitung (2002) unit root test of stationarity and newly advanced ESTAR unit root tests advanced by Kapetanios et al. (2003). Breitung (2002) came up with a method of conducting unit root test popularly known as Breitung unit root test of stationarity. The technique can be described using Equation (7) below:

$$\hat{\rho}N = \frac{N^{-4}\sum_{t=1}^{N}\hat{\mu}_t^2}{N^{-2}\sum_{t=1}^{N}\hat{\varepsilon}_t^2} \tag{12}$$

where $\hat{\varepsilon}_t$ is the ordinary Least Squares (OLS) residuals from Equation (8) below?

$$y_t = x_t - \hat{\gamma}' d_t + x_t \tag{13}$$

Where d_t stands for the deterministic function of the constant and trend, x_t are the stochastic terms, respectively.

$\hat{\mu}_t$ is the partial sum such that $\hat{\mu}_t = \hat{\varepsilon}_1 + \cdots + \hat{\varepsilon}_t$. In the event, if x_t is integrated at the level I(0).

The nonlinear unit root trial of KSS is fixated on a unit root's invalid speculation against the elective theory of the nonlinear yet by and large fixed period of exponential STAR (ESTAR). Consider the accompanying procedure of ESTAR:

$$\Delta f_t = \rho f_{t-1} + \sigma f_{t-1}\{1 - \exp\{-\varphi(\sigma f_{t-1} - r)^2\} + \omega_t \quad (14)$$

$$\Delta f_t = \pi + \delta f_{t-1}^3 + \sum_{i=1}^{k} a\Delta f_{t-1} + \omega_t, \qquad t = 1,2, \ldots\ldots\ldots T \quad (15)$$

The table below displays the results of traditional unit root checks, ADF, showing that the unit root null cannot be rejected at a sense point of 5 percent for all variables tested. Therefore we conclude that this study uses type series I(1). It is very well-founded that traditional linear unit root tests have lower power if structural breaks and nonlinear effects portray the series data generating process. Because of the higher degree of heterogeneity and breaks in these data series, conventional unit root testing may result in spurious outcomes. In this study, we will also conduct the new generation of root unit tests that incorporate the nonlinearities into the model to determine the series' nonlinear stationary properties. Additionally, the results of the KSS unit root tests are summarized in Table 3. The results for both ADF and KSS at level indicated that lnFD, lnINF, lnEXR and lnOP were not stationary at 1% level of significance. That all the variables were not stationary at I(0). Moreover, all the variables were found to be stationary at first difference that is I(1) at 1% level of significance for both ADF and KSS. Hence, the results of the unit root test show that for all variables, the ADF and KSS test fails to reject the null unit root hypothesis. Consequently, our series get to be nonlinearly stationary with an ESTAR process.

Table 4. Unit Root Test of Stationarity

Variables	ADF			KSS		
	T-statistics	**Critical Value (1%)**	**P-value**	**T-statistics**	**Critical Value (1%)**	**P-value**
lnFD	-1.947	-3.977	0.638	-2.179	-3.928	0.234
lnINF	-0.750	-3.977	0.968	-1.187	-3.928	0.474
lnEXR	-1.636	-3.977	0.740	-1.591	-3.928	0.812
lnOP	-2.507	-3.977	0.069	-1.473	-3.928	0.847
ΔlnFD	-8.287*	-3.977	0.000	-7.816*	-3.928	0.000
ΔlnINF	-7.339*	-3.977	0.000	-5.144*	-3.928	0.000
ΔlnEXR	-9.596*	-3.977	0.000	-6.628*	-3.928	0.000
ΔlnOP	-8.873*	-3.977	0.000	-8.164*	-3.928	0.000

Source: Research finding.

Symmetric Bound Test

The Equation regression (5) is performed on the basis of an ARDL (1,1,1,1,1) model automatically selected from a baseline system of four lags selected based on the Schwarz and Hannan – Quinn knowledge criterion. The results of the symmetric bound tests carried out are presented in Table 3 and have a significant F-statistics (F = 28,874) of 1 percent, indicating that there is an asymmetric long-run cointegrating relationship. Also, the variables pooled in the regression are stationary by substantial cointegration, partially supporting findings in Table 5.

Table 5. Symmetric Bound Test

			Critical bounds	
Statistics		**Sig**	**I(0)**	**I(1)**
F-statistics	28.874*	1%	3.600	4.900
T-statistics	7.4499			

Source: Research finding.

The null hypothesis that the variables in the runs are symmetric is rejected in Table 6,

indicating that the positive and negative partial sum of squares are substantially different from each other both in the short and long run, and support asymmetric behaviour. Thus, macroeconomic factors affect financial development differently in both runs and with varying degrees of positive and negative impacts. This induced their additional analysis to find their impact on financial development.

Table 6. Test for Symmetries

	Wald statistic
W_{SR}	10.614 (0.000)
W_{LR}	40.340 (0.000)

Source: Research finding.

In addition, Table 7 shows the non-linear influences of exchange rates, inflation and oil prices on financial development. Beginning with long-run asymmetric impacts and exchange rates, we read that, unlike the negative one, its positive partial amount is negligible, meaning that shifts in exchange rates asymmetrically affect financial development in the long term. Therefore, the important long-term negative exchange rate shock coefficient of 0.094 indicates that the state 's declining exchange rate raises financial development by -0.094 percent. This is connected with the fact that the policy formulation of the Central Bank Management Board should be free of any political pressures. This would enable the board of directors to have trained workers who will establish and execute successful policies to restore and maintain a sustainable and stable Naira. Sterilization of all quantities of currency used during intervention operations will be ensured by the Central Bank of Nigeria. It is well known that the rise in the circulating amount of money is correlated with non-sterilized steps. Literature has experiments with equivalent outcomes. The negative effect of growing exchange rate on promoting financial growth. Both the negative and the positive partial sum of inflation are important and continue to affirm the asymmetric effects of inflation on financial development. Therefore, in the long run, partial positive and negative squares are -0.072 and 1.46, respectively, and both are important. This implies that increasing inflation decreases financial development by 0.072%, while the decline correspondingly increases financial development by 1.46%.

Inferentially, long-term unstable inflation, through reduced efficiency, unsustainable tax systems, increased long-term unemployment, and strained government spending, will seriously induce long-term detrimental effects on financial growth to offset the unpalatable effects of these detractors of financial development. The estimates indicate that the effect of positive inflation shocks on the magnitude of inflation shocks is substantially detrimental relative to negative inflation shocks, suggesting that financial development is responding to inflationary pressures through a large slump. In an interactive world, the trade-off means that high and uncertain inflation, which lowers financial returns, indirectly discourages investment and the availability of credit in order to degrade financial developments. In a related case, Odhiambo (2009a) findings conversely indicate that growing inflation increases economic growth by stimulating financial developments. This suggested that high inflation is correlated with work prospects that raise household incomes. With increased income and improved living standards, they are saving and spending more creating demand for financial services, intermediaries, and institutions whose growth through inputs from technology and inwardness. The negative impacts of high inflation on finance through its negative externalities with inflation-stricken nations on financial deepening.

Oil prices still have large partial square sums which also showed the value of their asymmetric financial growth contributions as in studies. Therefore, with the coefficient at 0.083 and -0.341 respectively, both positive and negative partial shocks are important in the long run. It is noted that financial growth will increase elastically and decrease by 0.083 per cent and

0.341. The findings are consistent with the results of Hou et al. (2015) and Nwani et al. (2016), which argued that if oil prices were to fall, this would instigate fear of uncertainty in the minds of these economies, leading to macroeconomic distortions that could lead firms to cut their investments, thereby affecting the pace at which economic activity promotes opportunities Since Nigeria is an oil-producing state, it is the dominant position of the public sector in its financial system that makes it so promising. Second, the reasoning behind the positive effect of financial globalisation instability on their financial growth may be their increased diversification in terms of other profitable activities that have a direct impact on the real sector and, in exchange, contribute to increased financial activities in different countries.

On average, and if exchange rates, inflation, and oil prices are kept stable, the underlying rate of financial development in 2019 is 1.190 percent and below the expected 5.6 percent to 8 percent. The financial development rate, however, trends favourably at 0.035 percent, which still requires stringent financial development policies. The long-term financial development coefficient is also important. This implies that current financial development rates are significantly anticipated by previous financial development knowledge that works to minimise current financial development by 0.06 percent. From the back of the table, diagnostic tests show that the ARDL (1,1,1,1,1) model describes 40 per cent variations comfortably, qualifying the model as the best fit. Furthermore, $\forall_H, and\ \forall_N$ negligible chi-square statistics indicate that the residuals have a constant variance and are normally distributed, respectively. Conversely, $\forall_S$, a statistically significant serial correlation test, denotes that the residuals do not suffer from autocorrelation, while the estimates are still unbiased and accurate. In addition, the Figures 1 and 2 display stability tests conducted by plotting the recursive CUSUM and CUSUMSQ statistics against the breakpoints and checking based on the null hypothesis that parameters are unstable. This is the stability test of CUSUM and CUSUMSQ statistics (Brown et al., 1975) designed to assess the significance of trajectory at the confidence bounds of 95 percent. Figures 1 and 2 indicate dismissal of null hypothesis in this faith. Therefore, in Figure 2, we concluded that parameters in this regression are all stable. While, figure 1 showed that the parameters are not stable in the model. This model instability is due to a 1986 reform of the financial system, in particular the monetary management, risk management and the holding capacity of banks, which led to a transition from direct regulation to a financial system cantered on the market. Furthermore, a series of other initiatives, including banking restructuring in 2005 and insurance in 2007, have been pursued. The economic reform was more apparent in light of the economic problems which have confronted the country since the beginning of the 1980s, including sluggish growth, increasing inflation, rising exchange rates, unemployment, food shortages and rising external debt (Jakada et al., 2020b). The sharp fall in crude oil prices caused government finances and foreign exchange income deterioration. The initial policy response was the introduction in 1982 of strict austerity measures as the country stepped into economic recession. In the following years the economic condition was worsening. Stricter measures were enforced. Stabilization securities were introduced in 1990 for liquidity management and interest-rate caps were reintroduced in 1991 when interest-rate controls were removed in 1992, i.e. the credit market liberalization for banks (Jakada, et al. 2020c; 2020d).

In addition, the banking and capital market reforms were introduced as part of the categorization of reforms, with legalization of banking licenses in 1987, and banking portfolio limits relieved in 1988. Similarly, in 1990 a study of banks' criteria for capital adequacy was established in 1989. The reform of the accounting system for banks in 1991, the banking license embargo Strengthening banking regulations and supervision in 1991, and the start of bank privatization began in 1993. Restructuring of banks in crisis in 1994, winding up of 48 banks in 1995, capital flow liberalization in 1996 and capital market liberalization in 1997 and restructuring of the capital market (partly in 1993). International banks are reinstated as fully-owned in 2000 and foreign-currency deposits are institutionalized in 2001. Universal banking

introduction in 2005 and consolidation in 2006.

We eventually explore the dynamic multiplier to show the end of temporal growth dynamics when adapting to a backdrop invented by both initial disequilibrium and short-term dynamics due to unprecedented exchange rate, inflation, and oil price shocks. In comparison, the approximate ect_{t-1} coefficients are -0.059 (at 1 percent significant) suggesting that, in the absence of changes in the independent variables, the model's deviation from the long-run direction is corrected by 6 percent per year which is very quick. The implication is that; if there is a shock to the variables it will take a little time to return enviously to the long-run equilibrium. The rejection of null by Table 3 supports the presence of this initial equilibrium, thus providing an insight into the validity of the asymmetries provided in Table 6 in the investigation of Figures 3, 4, and 5. As far as Figure 3 is concerned, thus, positive exchange rate shocks and negative exchange rate shocks are negligible and negligible and most powerful, respectively. Short-run dynamics, however, are characterised by all financial development shocks, with the exception of the exchange rate, where optimistic shocks thrill financial development, but in all cases, the imbalance is reversed after approximately 4 cycles (years). Similar cases are noted in Figure 4 and, but with positive inflation shocks like most dominant ones. From below, we infer that, first, financial development is gradually responding to an increase in oil prices and a decrease in the exchange rate, but with a sharp boom in short-term inflation growth, as long-term correction is associated. Second, approximately four cycles ahead of the dynamics and disequilibrium are corrected with an answer to new equilibrium reached after a typically prolonged time. Third, the most severe shocks are those of rising oil prices, declining exchange rates and promoting sustainable inflation. We conclude that it is important to introduce specific policies that enhance the development of the financial system but encourage its prudent investment and preserve adequate inflation levels in the long run. In general, important findings on the effects of macroeconomic variables on financial development have been put forward. Long-term economic growth and development would be powered by sustainable inflation, increased financial patterns, and decreased government spending responsibly. Inflation that enhances growth in the short term through short-run vibrant economic activities and increased efficiency and job creation with increased citizen welfare partially attracts innovations in the financial system and prudent government spending to maintain efficient growth in the long run. This needs for fiscal policy adjustments that combine with other production-oriented policies such as effective tax incentive mechanisms, efficiency of public administration, and prudence and transparency of public resources that counter rent-seeking activities and long-term corruption; Therefore, the supportive climate generates the need for productive financial reforms through enhanced integration and growth of financial systems and institutions, which in turn enhances the independence, liquidity and transparency of stock market developments. This environment also draws international investors and investments who prefer integrated and stable financial structures, and their spill over effects further improve prospective financial growth with their inflow of technical skills and resources, which in turn generates job opportunities. In turn, the improved efficiency of financial structures partly condenses some of the inflationary pressures due to poorly formulated long-run monetary policies and continuously leaving relatively high yet manageable inflation to fuel economic growth. This claim is supported by the results shown in Figures 3, 4, and 5, which raise oil prices but decrease the exchange rate to offset the inflationary gap (high inflation) in order to have a positive impact on financial growth. This is due to the fact that financial growth is responding sharply to high inflation with a significant slump relative to the increase in oil prices.

Table 7. Asymmetric Coefficient Estimates

Dependent Variable $lnFD_t$		
	Coefficients	**t-statistics**
$lnFD_{t-1}$	-0.059346	-8.700694(0.000)
$lnEXR^{-}_{t-1}$	-0.180349	-2.025454(0.043)
$lnEXR^{+}_{t-1}$	-0.076712	-0.803883(0.422)
$lnINF^{-}_{t-1}$	-1.236816	-7.815971(0.000)
$lnINF^{+}_{t-1}$	-0.016324	-7.830448(0.000)
$lnOP^{-}_{t-1}$	0.990299	5.595841(0.000)
$lnOP^{+}_{t-1}$	-2.517693	-5.276803(0.000)
Constant	1.190476	10.407258(0.000)
Trend	0.034667	6.273477(0.000)
$\Delta lnEXR^{-}_{t-1}$	-0.093760	-2.541076(0.011)
$\Delta lnEXR^{+}_{t-1}$	-0.004553	-0.797565(0.426)
$\Delta lnINF^{-}_{t-1}$	0.014564	2.795589 (0.005)
$\Delta lnINF^{+}_{t-1}$	-0.145833	-5.497936(0.000)
$\Delta lnOP^{-}_{t-1}$	-0.092572	-2.204008(0.028)
$\Delta lnOP^{+}_{t-1}$	-0.340838	-5.120892(0.000)
ec_{t-1}	-0.059	8.700(0.000)
Asymmetric long-run coefficients		
$lnEXR^{-}_{t-1}$	-0.094	-2.541(0.011)
$lnEXR^{+}_{t-1}$	0.005	-0.798(0.426)
$lnINF^{-}_{t-1}$	0.072	2.650(0.008)
$lnINF^{+}_{t-1}$	0.146	-5.498(0.000)
$lnOP^{-}_{t-1}$	-0.341	-5.121(0.000)
$lnOP^{+}_{t-1}$	0.083	2.226(0.027)
Long run and Short-run Asymmetry		
	F-Statistics	**P-Value**
$lnEXR_{t-1}$	17.097	0.000
$lnINF_{t-1}$	5.651	0.018
$lnOP_{t-1}$	23.209	0.000
$\Delta lnEXR_{t-1}$	15.655	0.000
$\Delta lnINF_{t-1}$	12.469	0.000
$\Delta lnOP_{t-1}$	23.886	0.000
Diagnostic Test		
$\forall_S$	0.962 (0.465)	
$\forall_H$	1.465 (0.367)	
$\forall_N$	1.798 (0.278)	
R^2	0.396	

Source: Research finding.

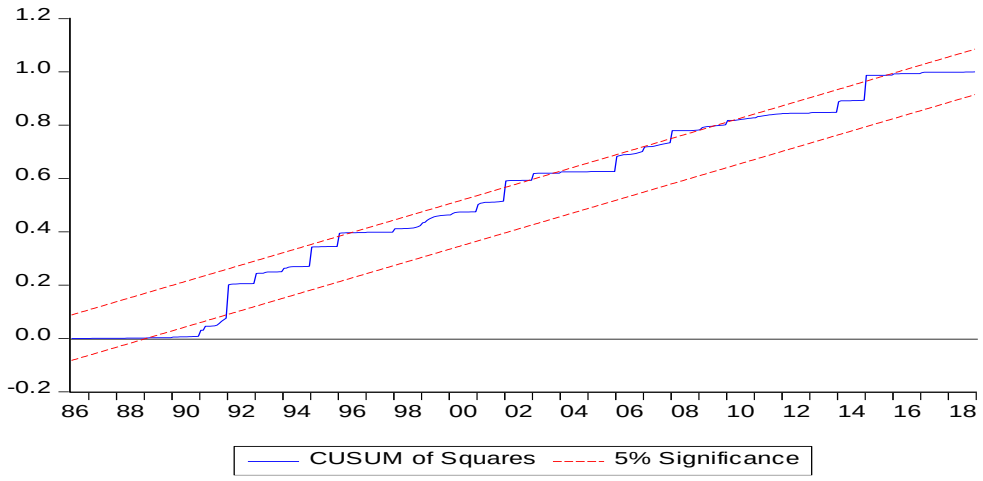

Figure 1. Cumulative Sum Test of Stability
Source: Research finding.

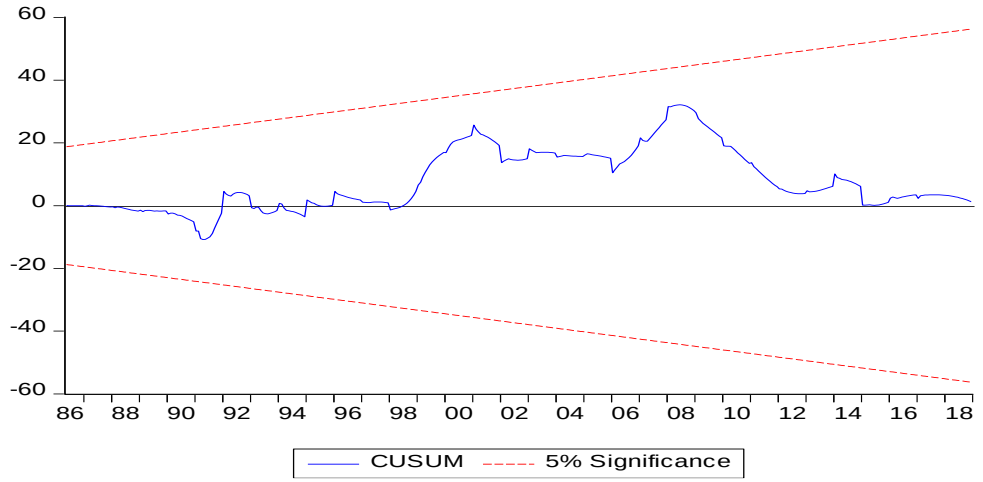

Figure 2. CUSUM Sum of Squares Stability Test
Source: Research finding.

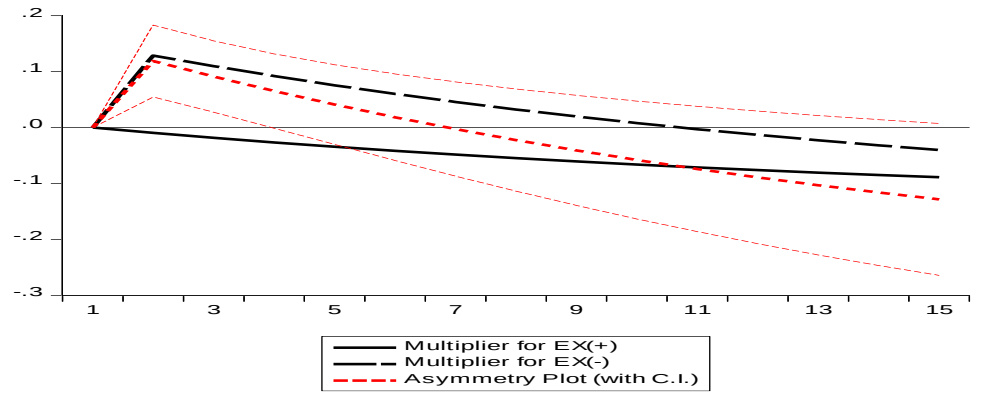

Figure 3. Dynamic Multiplier; Exchange Rate on Financial Development
Source: Research finding.

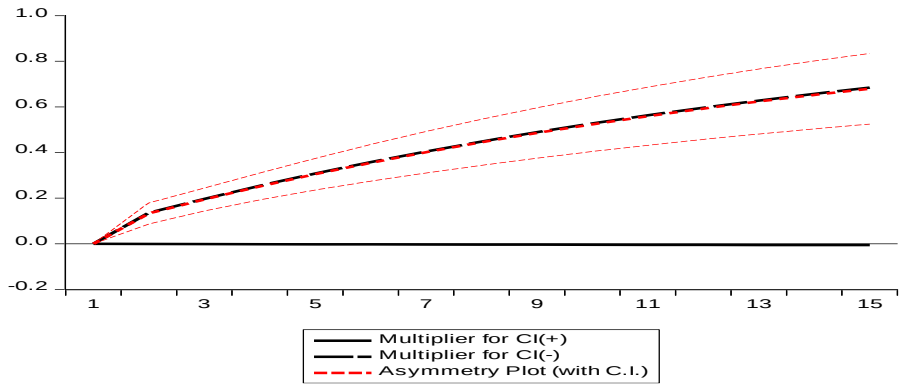

Figure 4. Dynamic Multiplier; Inflation on Financial Development
Source: Research finding.

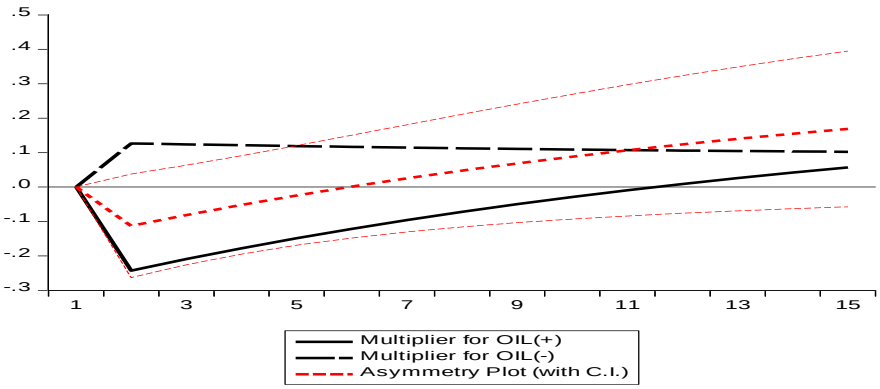

Figure 5. Dynamic Multiplier; Oil Prices on Financial Development
Source: Research finding.

This study employed the ARDL method in order to test the robustness of the model. The empirical results from table 8 indicated that, the F-statistics for the model exceeded both lower bound and the upper bound. Therefore, the null hypothesis suggesting absence of long-run relationship is rejected at 1% significance level. The results revealed that the long run relationship exist among the variables at 1% level of significance. Table 9 reported the results of the long and short-run analysis. The p-values is given in square brackets. In both short run and long run, the coefficients for lnEXR, and lnINF, are negative and statistically significant, while, lnOP is positive and statistically significant. The constant term is also positive. In general, the signs of all variables are in line with theoretical predictions. Moreover, Table 10 presented the results of diagnostic test. The results of diagnostic test showed that, the chi-square values indicated the absence of serial correlation and heteroscedasticity. It also reveals that the model is correctly specified and the series are normally distributed. Therefore, the results do not reject the null hypothesis for the diagnostic test. Furthermore, Figure 6 and Figure 7 showed that the consistency of the parameters since the plot of the tests is within the acceptable boundaries at 5% level of significant, i.e., the regression coefficients are stable overtime.

Table 8. ARDL Bounds Testing to Cointegration

Bounds Testing to Cointegration (*k=3*)		
Estimated Models	**Optimal Lag Structure**	***F*-statistics**
$FD_t = f(INF_t, EXR_t, OP_t)$	(1,1,1,1)	8.563*
Level of significant	Lower Bounds	Upper Bounds
1% level	3.65	4.66
5% level	2.79	3.67
10% level	2.37	3.20

Source: Research finding.

Table 9. Longrun and Shortrun Estimates

Dependent Variable: lnFD				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(lnEXR)	-0.231*	0.045827	-5.031019	[0.000]
D(lnINF)	-0.173*	0.045473	-3.795915	[0.000]
D(lnOP)	0.474*	0.175255	2.704986	[0.007]
ECM(-1)	-0.531*	0.102709	-5.168847	[0.000]
Long Run Coefficients				
lnEXR	-0.139*	0.044707	-3.107475	[0.000]
lnINF	-0.536*	0.134063	-4.000635	[0.000]
lnOP	0.284*	0.094565	3.005848	[0.003]
C	0.730*	0.260809	2.799198	[0.009]

Source: Research finding.

Table 10. Diagnostic Tests

	χ^2_{SERIAL}	χ^2_{RESET}	χ^2_{NORMAL}	χ^2_{ARCH}
$FD_t = f(INF_t, EXR_t, OP_t)$	0.411 (0.667)	0.014 (0.989)	0.669 (0.716)	1.208 (0.266)

Source: Research finding.

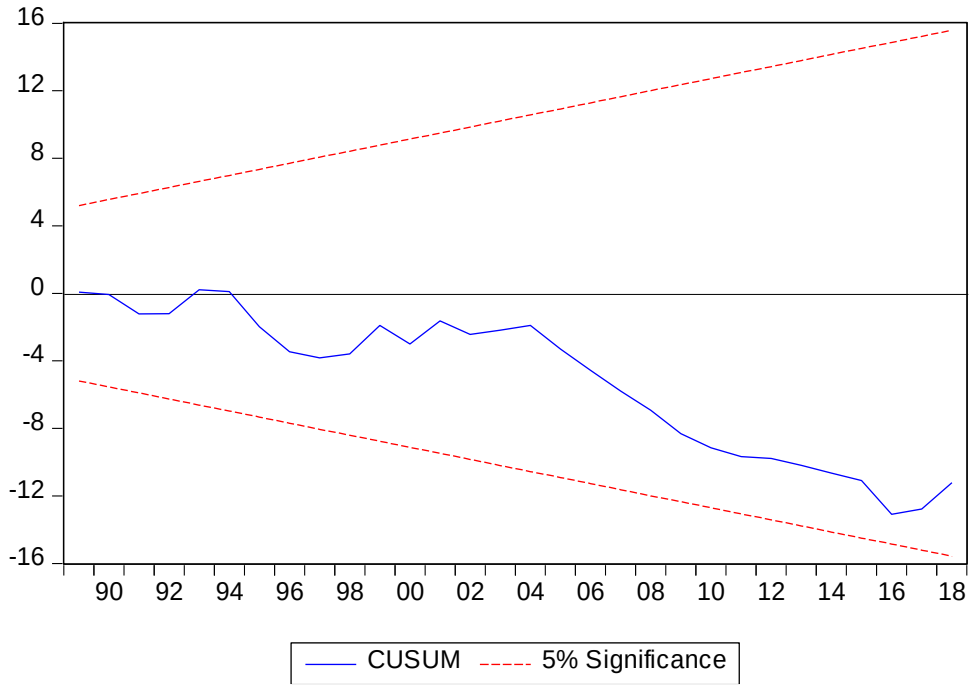

Figure 6. Cumulative Sum Test of Stability
Source: Research finding.

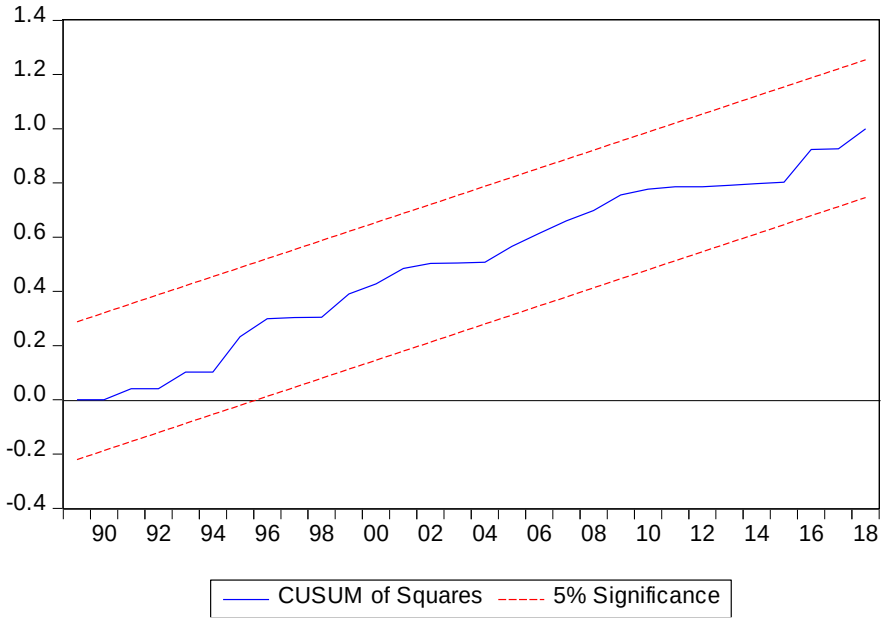

Figure 7. CUSUM Sum of Squares Stability Test
Source: Research finding.

Conclusion

This paper analysed the asymmetric impacts on financial development in Nigeria based on a nonlinear ARDL of the exchange rate, inflation and oil price. The most important results disclose rising oil prices, lowering exchange rates. And sustainable inflation if implored will elevate prospective long-term targets and financial growth. Confirming the supply-led hypothesis implies that it is important to reinforce short-run financial reforms that attract sound financial development projects in the long run. Likewise, policies that promote relatively rising inflation in the short-term to fuel booming but sustainable economic activity in the long-term would be fruitful in economic growth. Since the reduced exchange rate eventually increases financial growth, long-term policies should be placed in place that curb needless government waste but cautious public transparency and administration, and incarcerate dissipation of rent and corruption proceeds. The negativities of high exchange rates and inflation to growth are possibly what needs to be minimised as convergence of the financial system should be increased. In addition to general infrastructural development and import shocks (such as the oil crisis), the Nigerian government has introduced several economic development reforms affecting the financial sector since previous times, which we believe have complemented the temporary asymmetrical behaviours in the financial development process and altered the role of inflationary pressure on growth. This implies that much has happened to alter the stability of such macroeconomic systems and to create a study point that this article neglected to address. Future studies are needed to compare the outcomes of emerging countries such as Egypt, South Africa, Kenya and Morocco by implementing NARDL with a view to gaining a more diversified perspective on the positive and negative effect of macroeconomic variables fluctuations on developed countries ' financial growth. We also advocate re-examination of the impacts reviewed herein, but in view of structural breaks.

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