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Nexus between Exchange Rate and Foreign Reserves on Economic Growth in Nigeria (1980-2020)

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ABSTRACT: Numerous research in Nigeria on the interaction effect between the exchange rate and foreign reserves have been marginalized; this has therefore informed this study to investigate the nexus between exchange rate and foreign reserves, with focus on the Nigerian economy. External reserve was used as the dependent variable, exchange rate, inflation, non-oil export, oil export, and real interest rate, were used as the independent variables. Time series data spanning 1980 to 2020 was used. The study employed the Bound Auto Regressive Distributed Lag (ARDL) co-integrating test approach for evaluation. The results showed that exchange rate have a positive and significant impact on foreign reserves. The granger causality test revealed a unidirectional causality running from exchange rate to foreign reserves. This study recommends that the government should diversify the economy to increase the productivity of other sectors of the economy; this would by implication boost the export of the country thereby leading to accumulation of huge foreign reserves.

KEYWORDS: Exchange rate, Foreign reserves, Economy, Government, Productivity.

INTRODUCTION

Exchange rate and foreign reserves have grown significantly in every economy; developed and developing as economic globalization and financial integration have increased. The stock of foreign reserves in a country serves as an indicator in the global financial market regarding the credibility of its monetary policy and creditworthiness (Andriyani 2020). The advent of world financial crisis in the 1990s reawaken interest of countries in foreign reserves, as it was clearly revealed that countries with large foreign reserves were the least affected during the crisis (Lane and Burke 2001). This emphasizes the importance of foreign reserves as a buffer against external shock, financial imbalances, and maintaining stability in the country's exchange rate. As an import dependent country, the value Nigerian naira continued to depreciate, therefore, the interplay between reduced foreign exchange supply and rising foreign exchange demand continued to result in substantial reductions in the foreign exchange reserves.

However, evidence has shown that none of the primary objectives of exchange rate policy in Nigeria; preserving the value of the domestic currency, maintaining favorable external reserves position, and ensuring external balance without compromising macroeconomic stability has been achieved in the country (Nathaniel & Emeka, 2018). For instance, foreign reserves have declined to 37490 USD millions in October from 38320 USD millions in September 2022.

Consequently, the above problem has become a major concern to scholars and policy makers, therefore different studies have been carried out by scholars on the relationship between exchange rate and foreign reserves. Different assertions have been made by various researchers on the nexus between exchange rates and foreign reserves. Some scholars like Nwachukwu (2016), Adhikari, (2018), Kalu (2019) found a positive relationship between exchange rate and foreign reserves, while (Yu 2011), Chinweobo, 2013), (Osigwe 2015) asserted that there is a negative relationship between exchange rate and foreign reserves, However, (Gokhale & Raju, 2013), and Ivana & Milan, (2019) found that there is no correlation between exchange rate and foreign reserves. In the overall the nexus between exchange rate and foreign reserves remains inconclusive.

In view of the above, the broad objective of this study is to examine the short and long run relationship between exchange rate and foreign reserves in Nigeria. Specifically, the direction of causality between exchange rate and foreign reserves would be determined. The paper is further structured as follows: Section 2 provides a literature review on exchange rate theories, and it

effect on foreign reserves. Section 3 describes the methodology used; Section 4 describes the results and discussion. Section 5 summarizes and concludes the paper.

LITERATURE REVIEW

Theoretically, Foreign exchange reserves will raise when there is a high demand of home currency in an international market, and conversely Foreign exchange reserves will decrease when in an international market the supply of home currency increased, thus according to this approach foreign exchange reserves are a residual holding by country (Prabheesh 2007).

According to the traditional flow model (1982), the exchange rate is simply set by the market flow of foreign exchange demand and supply. When the supply of foreign exchange meets the demand for foreign exchange, there is equilibrium. The model proposes that the exchange rate is determined by the interaction of two basic factors. The variables are relative income and the differential in interest rates. This is because foreign demand for domestic commodities is a function of foreign income, and asset demand is influenced by the differential between domestic and foreign interest rates (Udoye, 2009). According to the Mercantilist model, many governments amass foreign reserves as a tool for successful exchange rate management and to keep exchange rates low n order to encourage commerce and international competitiveness.

Using the financial fragility theory, Kalu et al., (2019), explore the correlation between foreign reserves and exchange rate parameters in Nigeria. The Auto Regressive Distributed Lag Model (ARDL) and Correlation Matrix Methods were employed. Time series data spanning from 1996 to 2016 were used. Their results establish that the real exchange rate has a positive significant correlation with foreign reserves, whereas the nominal exchange rate has a positive but non-significant correlation with foreign reserves. This implies that a rise in the real exchange rate will facilitate foreign reserves to rise. On the contrary, a study by Chinaemerem, (2012), examines the relationship between external reserves and exchange rate in Nigeria. The study employed VAR with the use of time series data covering the period 1980 to 2009. The empirical findings provide evidence of a negative relationship between external reserves and exchange rate in Nigeria. However, the period covered in the study did not capture the aftermath of the global financial crisis.

Osigwe (2015) examine the factors affecting Nigeria's foreign reserves. The study's model hypothesised that Nigeria's foreign reserve (RESV) is a function of the exchange rate (EXCH), oil exports (OILEXP), Foreign Direct Investment (FDI), real GDP (RGDP), lending rate (LR), non-oil exports (NOILEXP), and inflation rate (INFL). The Johansen cointegration results showed evidence of a long-term relationship between the variables. Also, EXCH was observed to be a significant but negative determinant of RESV. As a result, a rise in exchange rate (interpreted here as a depreciation of the Nigerian Naira) will cause foreign reserves to fall. Like the study above Akims (2019), evaluate the effect of exchange rate fluctuations on external reserves in Nigeria with the use of a cointegration approach. The study was based on time series data spanning from 1981 to 2014. The study concludes that exchange rate fluctuations significantly affect external reserves in Nigeria. The findings of the study suggested that monetary policies, particularly exchange rates, have been volatile. This volatility implies that the conservative monetary management policies put in place in Nigeria for stabilizing the exchange rate of a unit U.S dollar to naira over the years has been ineffective.

Andriyani et al., (2020), carry out research to identify and analyze the variables that influence Indonesia's foreign exchange reserves. They considered foreign debt, exchange rate, inflation, and exports as explanatory variables. The Autoregressive Distributed Lag Model was adopted in their investigation to explain long-term correlations using modified coefficients as well as a co-integration test employing time-series data from 2016 to 2018. Their findings reveal that foreign debt, currency rates, inflation, and exports all have a significant effect on the simultaneous volatility of Indonesia's foreign exchange reserves. Foreign debt, in part, has a significant and favorable impact on foreign exchange reserves. The exchange rate has a significant and negative impact on Indonesia's foreign exchange reserves.

Using the double log regression model Suman & Aman, (2021), examine determinant of foreign reserves in India, in order to find out the relevant and significant determinants of foreign exchange reserves in India. The results of their study show that inflow of FDI, exchange rate, exports, short term debt and time are statistically significant factors that affects the value of foreign exchange reserves in India. Their results show a negative relationship between exchange rate and foreign reserves in India.

Contrary to findings above, Izekor &Aigbovo (2018), examines exchange rate instability and the Nigerian foreign exchange reserves. The study ascertains the short run and long run analyses of exchange rate instability on the Nigerian foreign exchange reserves. Data were obtained from the Central Bank of Nigeria Statistical Bulletin and World Bank database for a period of 24 years: 1993 to 2016. The model was estimated using the descriptive statistics, Augmented Dickey-Fuller (ADF) unit root test, Johansen co-integration test, Error Correction Mechanism (ECM) and the Ordinary Least-Squares (OLS). The study established that exchange rate instability has inconsequential influence on the Nigerian foreign exchange reserves at the short-run and long-run which has not been the main depleting factor of the foreign reserves. Thus, the significant depletion in the Nigerian foreign exchange reserves was induced by other factors. A similar study by Gokhale & Raju, (2013), explores the relationship between

exchange rate and foreign exchange reserves in the Indian Context. The study employs the Johansson Co-integration test, Unit Root test, and Vector Auto Regression (VAR). Time series data was used covering the period 1980 to 2010, the empirical findings of the study concludes that no significant long and short run relationship between exchange rate and foreign exchange reserves in India.

Owing from the above literature review, various researchers have carried out studies on foreign reserves and exchange rate. It is observed that studies conducted under this area have shown an inconclusive result on the relationship between exchange rate and foreign reserves. This study will therefore fill the existing gap by examining the nexus between exchange rate and foreign reserves, and therefore include real interest rate, oil export and non-oil export among the explanatory variables covering the span of 1980-2020.

METHODOLOGY

The main methodological framework adopted for this study is the financial fragility hypothesis as adopted by Kalu et al. (2019). The hypothesis encapsulates the developing economies' vulnerability to the fluctuation and instability of the foreign exchange market. It also demonstrates how vulnerable these developing countries' markets are to exchange rate fluctuations, which has a significant impact on their foreign reserves. This study adopted and modified the model used by Kalu et al. (2019). Thus, the function of the model is stated thus:

EXTR = F (EXCH, INF, NONOIL, OILEXP, RIR) ……. (1)

Where,

EXTR= External Reserves

EXCH = Exchange rate

INF = Inflation

NONOIL = Non-oil export

OILEXP = Oil export

RIR = Real interest rate

In order to establish a linear relationship between the dependent variable and other control variables, an econometrics model is therefore specified as follows:

$$\text{EXTR} = \alpha_0 + \alpha_1 \text{EXCH} + \alpha_2 \text{INF} + \alpha_3 \text{NONOIL} + \alpha_4 \text{OILEXP} + \alpha_5 \text{RIR} + \mu_t \quad \text{..... (2)}$$

Where,

μ_t = Error term

α_0 = the constant term

α 's = the parameters to be estimated

However, the dependent and some of the independent variables were not in the same unit, hence, they were logged to bring the data to the same level. Thus, the above equation can be re-specified as,

$$LOG(\text{EXTR})_t = \alpha_0 + \alpha_1 LOG(\text{EXCH})_t + \alpha_2 \text{INF}_t + \alpha_3 LOG(\text{NONOIL})_t + \alpha_4 LOG(\text{OILEXP})_t + \alpha_5 \text{RIR}_t + \mu_t \quad \text{..... (3)}$$

A priori Expectation

$$\frac{\Delta EXCH}{\Delta EXTR} > 0 \ (\beta_1 < 0)$$
$$\frac{\Delta INF}{\Delta EXTR} > 0 \ (\beta_2 < 0)$$
$$\frac{\Delta NONOIL}{\Delta EXTR} > 0 \ (\beta_3 > 0)$$
$$\frac{\Delta OILEXP}{\Delta EXTR} > 0 \ (\beta_4 > 0)$$
$$\frac{\Delta RIR}{\Delta EXTR} > 0 \ (\beta_5 < 0)$$

Techniques of Estimation

To achieve the objectives of this study will adopt the Autoregressive Distributed Lag (ARDL) technique for estimation. The ARDL models are powerful time saving econometrics tools used for different variable estimation. Greene (2008) noted that the ARDL models which include lags of both the independent and dependent variable as explanatory variables, are standardized least square regression. The Autoregressive Distributed Lag (ARDL) models are known as powerful time saving tools for estimating different

variables. The ARDL models are standardized least squares regression which includes lags of both the dependent and explanation variables as regressors. The main characteristic of ARDL is to examine long run and co-integration relationships between variables, hence it has become famous in econometric in recent years. In its basic form, an ARDL regression model looks like this:

$$\Delta EXTR_t = \beta_0 + \sum_{i=1}^{n} \beta_{1i}\Delta EXTR_{t-1} + \sum_{i=0}^{n} \beta_{2i}\Delta \mathrm{EXCH}_{1t-1} + \sum_{i=0}^{n} \beta_{3i}\Delta \mathrm{INF}_{2t-1} + \sum_{i=0}^{n} \beta_{4i}\Delta \mathrm{NONOIL}_{3t-1} + \sum_{i=0}^{n} \beta_{5i}\Delta \mathrm{OILEXP}_{4t-1} + \sum_{i=0}^{n} \beta_{6i}\Delta \mathrm{RIR}_{5t-1}$$
$$+ \sum_{i=0}^{n} \beta_{7i}\mathrm{EXTR}_{t-1} + \beta_8\mathrm{EXCH}_{t-1} + \beta_9\mathrm{INF}_{t-1} + \beta_{10}\mathrm{NONOIL}_{t-1} + \beta_{11}\mathrm{OILEXP}_{t-1} + \beta_{12}\mathrm{RIR}_{t-1} + \varepsilon_t \quad \text{.........(4)}$$

Where,

Δ = Difference operator

εt = Stochastic term

Conducting ARDL bound test, an Ordinary Least Square (OLS) is estimated firstly in order to establish if there exists a long run relationship between the variable under consideration. The test is based on an F-Statistic for the joint statistical significance of the lagged variables. The null hypothesis of no cointegration is evaluated using Pesaran et.al. (2001) procedure. The underlying assumption is therefore stated as follows: if the F-statistic is > upper critical bound, H0 is rejected and concludes that the variables under consideration are cointegrated, otherwise it is not accepted. However, if F-statistic? lower critical bound? upper critical bound, then decision becomes inclusive. If the null hypothesis of no cointegration is rejected, a vector error-correction model (VECM) is therefore estimated. The VECM model is therefore specified as follows:

$$\Delta LOG(\mathrm{EXTR})_t = \alpha_0 + \sum_{i=1}^{n} \alpha_{1i}\Delta LOG(\mathrm{EXTR})_{tt-1} + \sum_{i=0}^{n} \alpha_{2i}\Delta LOG(\mathrm{EXCH})_{1t-1} + \sum_{i=0}^{n} \alpha_{3i}\Delta \mathrm{INF}_{2t-1} + \sum_{i=0}^{n} \alpha_{4i}\Delta LOG(\mathrm{NONOIL})_{3t-1} +$$
$$\sum_{i=0}^{n} \alpha_{5i}\Delta LOG(\mathrm{OILEXP})_{4t-1} + \sum_{i=0}^{n} \alpha_{6i}\Delta \mathrm{RIR}_{5t-1} + \lambda \mathrm{ECM}(-1) + \mu_t \quad \text{............(5)}$$

Where,

ECM (-1) = The error correction term

λ = the error coefficient

Granger Causality Test

A Ganger causality test will be employed to determine the direction of causality between exchange rate and foreign reserves in Nigeria, to examine these causal relationships among the variables, we use the estimated model in the previous section and F-Statistics as a testing criterion. Granger considers a system of the general form stated thus:

$$I_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i I_{t-1} + \sum_{i=1}^{m} \beta_i X_{t-1} + \sum t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..(6)$$

$$X_t = \gamma_0 + \sum_{i=1}^{n} \gamma_i I_{t-1} + \sum_{i=1}^{m} \delta_i X_{t-1} + \varphi_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.(7)$$

Where,

X = an indicator of exchange rate

I = external reserves

t = current value external reserves

t-1 = lagged value of external reserves

Data Source

The study employed secondary data, sourced from the Central bank of Nigeria Statistical Bulletin. Annual Time Series data spanning 1980 and 2020.

RESULTS AND DISCUSSION

This section presents the econometrics analysis of the nexus between exchange rate and foreign reserves in Nigeria. Pre-econometric tests were carried out using descriptive statistics and stationarity tests, followed by the ARDL long-run and short-run dynamics. While the last part of this section considered the post diagnostic test.

Descriptive Statistics

This section presents the descriptive statistics of the variables, which is the summary of the variables of the study. Descriptive statistics was used to describe the basic features of the data in a study. They provide simple summaries about the samples and measures.

Table 4.1 Descriptive statistics results

	EXTR	EXCH	INF	NONOIL	OILEXP	RIR
Mean	17553.90	100.7142	18.89225	1196.046	25378.14	0.211257
Median	7592.844	101.0392	12.15500	322.0500	8560.080	3.666917
Maximum	53000.36	307.0000	72.84000	10466.44	213778.8	18.18000
Minimum	224.4000	0.636900	5.380000	5.349000	200.7102	-65.85715
Std. Dev.	0.659604	92.41250	16.91599	2015.897	49223.29	14.43095
Skewness	0.659604	0.817587	1.823960	2.899455	2.882956	-2.640212
Kurtosis	1.833311	3.037856	5.151077	12.57195	10.47904	12.44914
Jarque-Bera	5.169121	4.458712	29.89076	208.7493	148.6363	195.2818
Probability	0.005429	0.107598	0.000000	0.000000	0.000000	0.000000
Sum	702156.1	4028.567	755.6900	47841.84	1015126	8.450279
Sum Sq. Dev.	1.19E+10	333062.7	11159.88	1.58E+08	9.45E+10	8121.836
Observations	41	41	41	41	41	41

Source: Author's computation from the E-views 9.0 result (2021)

The descriptive statistics in Table 4.1 above shows that this analysis indicates a high level of consistency as their mean and median values fall within their minimum and maximum values. The study further estimates the kurtosis that measures the flatness of curve and skewness that measures asymmetry of the series, whether their values are very close to 3 and 0 respectively. The standard deviation that measures the volatility of data indicted a very low value for all the series except the exchange rate the exhibit volatility within the scope of the study. A formal test of normality was conducted using Jargue-Bera statistics, the results rejected the alternative hypothesis of non-normality of the series and concluded that all the series used for this study are normally distributed except that of the exchange rate.

Unit Root Test

This study employed the Augmented Dickey-Fuller tests of stationarity to examine the nature of the series. The study was conducted using equation intercept and no trend to determine the true behaviour of each series.The assumption is stated as follows: If the absolute value of the Augmented Dickey Fuller (ADF) test is greater than the critical value either at 1%, 5%, or 10% level of significance at order zero, one or two, it shows that the variable under consideration is stationary otherwise it is not. The results of the Augmented Dickey Fuller (ADF) test obtained are as follow:

Table 4.2: The Unit root test (Augmented Dickey –Fuller Test) Results

Variable	Level difference	Probability	Order of integration	First difference	Probability	Order of integration
EXTR	-0.950948	0.7603		-5.544739	0.0000	**I(1)**
EXCHR	0.803770	0.9929		-5.544739	0.0000	**I(1)**
INF	-3.001260	0.0435	**I(0)**			
OILEXP	-2.582579	0.1051		-5.827557	0.0000	**I(1)**
NONOIL	-0.821838	0.8017		-3.244995	0.0250	**I(1)**
RIR	-4.569301	0.0007	**I(0)**			

Source: Author's computation from the E-views result 9.0

From the table above, only two variables are stationary at level difference (INF and RIR, integrated of order zero), and the other four variables are stationary at first difference (EXTR, EXCHR, OILEXP, NONOIL, integrated of order one). Since there are mixed orders of stationarity, a Bound co-integration test procedure will therefore be conducted.

ARDL Bound Test for Co-integration.

Having established that all series are integrated of a different order, that is a mixture of I(1) and I(0), we proceeded to bounds testing for co-integration approach. The decision is made by comparing the value of F-statistic from the finding and the upper

bound value, if the F-stat. value is greater than I (1), reject the null hypothesis of no long-run relationship among the variables. The results of the ARDL Bound tests are shown in Table 3.

Table 4.3: Bound Test for Co integration

Test Statistic	**Value**	**K**
F- Statistics	9.011287	5
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	2.26	3.35
5%	2.62	3.79
2.5%	2.96	4.18
1%	3.41	4.68

The bounds testing for co-integration results are presented in Table 4.3. The above analysis shows that the F-statistic value computed of 9.011287 is greater than the upper bound critical values of 3.79 at a 5 % level of significance. The null hypothesis of no long-run relationship between foreign reserves and other independent variables in Nigeria was rejected. This implies that there exists evidence of a strong long-run relationship between EXTR, EXCH, INF, OILEXP, NONOIL, and RIR in Nigeria. The conclusion of co-integration among the series gives justification to estimate both the long run and the short- run coefficients using ARDL and error correction model (ECM) to examine the significant effect of the EXCH, INF, OILEXP, NONOIL, and RIR on EXTR. The results of the long-run significant impact of independent variables on foreign reserves in Nigeria are presented in table 4.4 below.

Long-run relationship between Exchange rate and External reserves

Having established the existence of co-integrating equation from the ARDL bounds test, we proceed to examine the long-run impact of exchange rate on the foreign reserves using ARDL level equation. The results are presented in Table 4.4

Table 4.4: The Long run coefficient

Long run coefficients				
Variable	Coefficient	Std. Error	t-Statistics	Prob.
LOG(EXCH)	0.876321	0.150456	5.824418	0.0004
INF	-0.202707	0.046546	-4.354964	0.0024
LOG(NONOIL)	-0.902563	0.352419	-2.561052	0.0336
LOG(OILEXP)	1.764231	0.526636	3.349999	0.0101
RIR	-0.136521	0.062865	-2.171647	0.0617
C	-1.360384	2.628686	-0.517515	0.6188

From the result table above, the intercept value is -1.360384. this implies that when the independent variables are held constant, then the value of foreign reserves will be equal to -1.360384. The coefficient of the exchange rate indicates a positive sign, and it is statistically significant at 5% level. This shows that exchange rate positively impacted on foreign reserves during the period under consideration. It also implies that a unit increase in the value of exchange rate will increase the country's foreign reserves by 0.876321. This result conforms to the findings of Kalu et al. (2019) on the correlation between exchange rate and foreign reserves in Nigeria, that exchange rate has a positive and significance correlation with foreign reserves. Equally, Ivana and Milan (2019) on the relationship between exchange rate and foreign reserves, find that that there is a long run relationship between nominal exchange rate and foreign reserves. Furthermore, Akims et al (2019), on the effect of exchange rate fluctuations on foreign reserves in Nigeria find that exchange rate fluctuations significantly affect foreign reserves in Nigeria in the long run. The results negate the findings of Suman & Aman, (2021), their result revealed a negative relationship between exchange rate and foreign reserves.

The coefficient of oil export is positive and statistically significant; this implies that oil export positively impacted on foreign reserves in Nigeria during the period under review. Thus, a unit increase in the value of oil export in Nigeria will increase the country's foreign reserves by 1. 764231. The result conforms to the findings of Ozigbu (2019), that oil export impact positively on foreign reserves in Nigeria.

On the other hand, the coefficients of Inflation, non-oil export and real interest rates indicates negative signs and are statistically significant at 5% level. These indicate that these variables impacted on foreign reserves negatively during the period under study.

Thus, a unit increase in the value of inflation, non-oil export and real interest rate will decrease external reserves by -20%, -90%, and -14% respectively.

Error Correction Model Showing Short Run Dynamic

The Error Correction Mechanism (ECM) is used to eliminate the discrepancy that occurs in the short run. The assumption of the ECM states that if two variables are cointegrated, then, there is error correction mechanism to revise instability in short term (Engle and Granger, 1987). ECM is used to see the speed of adjustments of the variables to deviations from their common stochastic trend. ECM corrects the deviations from the long run equilibrium by short-run adjustments. The result ECM result is therefore presented in the table 4.5 below:

Table 5: The short run error correction coefficients

ARDL Cointegrating And Long Run Form				
Dependent Variable: LOG(EXTR)				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(EXTR(-1))	0.228081	0.165704	1.376434	0.2060
DLOG(EXCHR)	0.126369	0.346431	0.364774	0.7247
DLOG(EXCHR(-1))	0.256424	0.311040	0.824410	0.4336
DLOG(EXCHR(-2))	-1.354425	0.587704	-2.304604	0.0501
D(INF)	-0.065870	0.010018	-6.575264	0.0002
D(INF)	0.042313	0.009099	4.650279	0.0016
DLOG(NONOIL)	-0.396492	0.170765	-2.321863	0.0488
DLOG(NONOIL(-1))	0.016903	0.111760	0.151248	0.8835
DLOG(OILEXP)	0.331976	0.215983	1.537045	0.1628
DLOG(OILEXP(-1))	-0.214742	0.153704	-1.397113	0.1999
D(RIR)	-0.028054	0.006518	-4.304022	0.0026
D(RIR(-1))	0.036010	0.008510	4.231552	0.0029
ECM(-1)	-0.516418	0.140965	-3.663445	0.0064
R-squared	0.953528	Mean dependent var		0.142621
Adjusted R-squared	0.852134	S.D. dependent var		0.624452
S.E. of regression	0.240123	Akaike info criterion		0.187933
Sum squared resid	0.634249	Schwarz criterion		1.287599
Log likelihood	21.61721	Hannan-Quinn criter.		0.571746
F-statistic	9.404174	Durbin-Watson stat		1.821037
Prob(F-statistic)	0.000224			

Source: Author's computation from the E-views 9.0 result

The results of error correction model shown in Table 4.5 shows that the second year lagged of exchange rate has a negative and significant effect on foreign reserves in the short run, suggesting that a unit increase in exchange rate reduce external reserves by -1.35, which implies an increase in exchange rate would deplete foreign reserves in the short run. The coefficient of the current inflation has a negative and significant effect on foreign reserves at 5% level, implying that a unit increase in inflation rate would dampen foreign reserves by -0.066. The current coefficient of non oil export has a negative and significant impact on foreign reserves, which implies that a unit increase in non oil export, foreign reserves would decrease by -0.40. while the lagged value depict a positive but no significant impact on foreign reserves in the short run, a unit increase in non oil export, would increase foreign reserves by 0.015. The oil export coefficient depict a positive and insignificant impact on foreign reserves in the short run, that is a unit increase in oil export would bring 0.33 increase in foreign reserves. The real interest rate depicts a negative and significant impact on foreign reserves in the short run, showing that a unit increase in real interest will bring about -0.028 decrease in foreign reserves. The equilibrium error-correction coefficient ECM (−1) is -0.516418 which has the expected negative sign and statistically significant. . We can therefore state that 51 percent gap between long run equilibrium value and the actual value of the dependent variable (EXTR) has been corrected. It can be also said that the speed of adjustment towards long run equilibrium is 51 percent annually. The coefficient of determination (Adj.R^2) indicates that 85% variation in industrial growth is explained by the independent variables. It can also be concluded that the adjustment is quite meaningful in the short-run ARDL relations.

Diagnostic Tests results

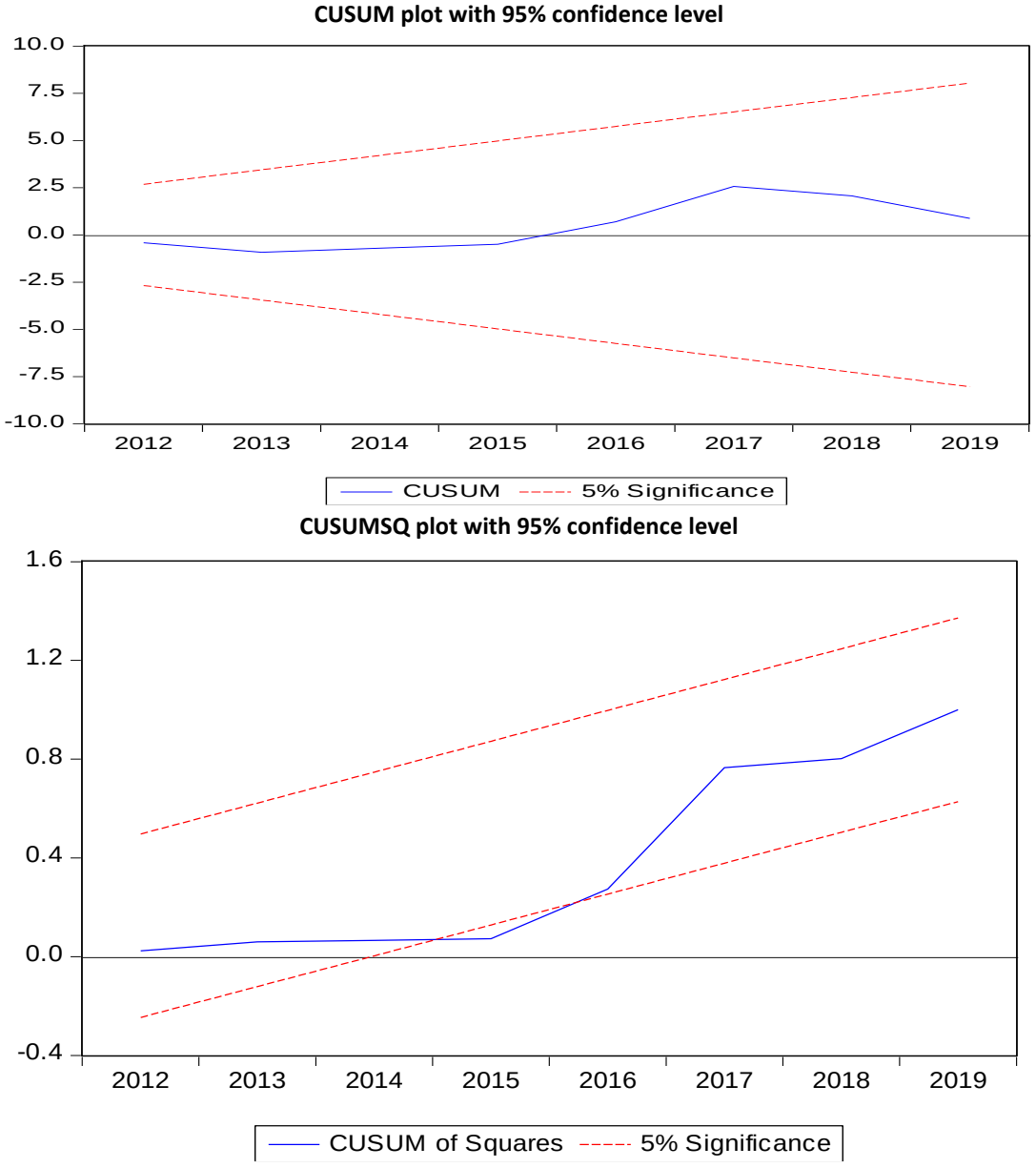
The study carried out post estimation tests on the error correction model to test the validity and reliability of the short-run coefficients. The study employed a normality test using the Jarque-Bera test, the Heteroscedasticity test with Breusch-Pagan-Godfrey, and, the LM test for serial correlation. The results are presented in Table 4.6 respectively.

Table 4.6: Summary of Diagnostic Tests

	Breusch-Pagan-Godfrey	Jarque-Bera	LM Test:
F-Statistics	0.513194	**14.17934**	**0.545700**
Probability	0.9067	**0.000834**	**0.6057**

The results of diagnostic tests shown in Table 4.6 indicate that there is no problem of heteroscedasticity, normality, and serial correlation. This further confirms the robustness and validity of the results for long term decisions. The Cumulative Sum (CUSUM) and the Cumulative Sum of Squares (CUSUMSQ) stability tests also indicate that the plot of CUSUM and CUSUMSQ are within the lower and upper bounds at 5%level. This implies that the coefficients of the error correction model are stable within the scope of the study.

Figure 4.1: CUSUM and CUSUMSQ Stability Tests



CONCLUSION AND RECOMMENDATIONS

Using the ARDL model, to examine the nexus between exchange rate and foreign reserves in Nigeria from 1980 to 2020.The findings revealed that exchange rate contributes positively to accumulation of foreign reserves in Nigeria. This result supports the conclusion of Kalu et al. (2019), an increase in exchange rate (depreciation of naira) which would increase our competitiveness at the international market, there increasing the stock of foreign reserves.

As a matter of policy, the relationship between exchange rate and foreign reserves is direct so the government should diversify the economy to increase the productivity of other sectors of the economy, this would by implication boost the export of the country thereby leading to accumulation of huge foreign reserves. Also, this study recommend that government should ensure that all refinery is working and to the full capacity in addition more should refinery be built so that the country would import little or no oil by this the country external reserve would be preserve and use for more productive purpose.

As a concluding remark, this call for a redirection in a manner that will ensure the evolution of appropriate exchange rate policies and regimes that will enable the economy to build its reserves. This is made necessary by the fact that reserves provide confidence and buffer in times of economic difficulties especially for developing economies like Nigeria.

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