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Exchange rate fluctuations and economic growth nexus: An empirical evidence from Nigeria

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Abstract
This research study examined the effect of exchange rate on economic growth from 1986 to 2019 using secondary data sourced from Central Bank of Nigeria Statistical Bulletin of various issues. From 1986 being the year the monetary authority shifted from fixed exchange rate regime to flexible exchange rate regime to 2019. The regression analysis using ordinary least square was used to analyze the data. The result revealed that exchange rate has insignificant positive effect on economic growth while interest rate and inflation rate have significant negative effect on economic growth. Therefore, in order to maintain a surplus balance of trade, it is recommended that government should encourage export promotion strategies and also provision of conducive environment, adequate security, effective fiscal and monetary, as well as infrastructural facilities should be available in order to attract foreign investors to invest in Nigeria.

Keywords: exchange rate, interest rate, inflation rate, economic growth and Nigeria

1. Introduction
Exchange rate is the price of one country's currency expressed in terms of some other currency. It determines the relative prices of domestic and foreign goods, as well as the strength of external sector participation in the international trade. Exchange rate regime and interest rate remain important issues of discourse in the international finance as well as in developing nations, with more economies embracing trade liberalization as a requisite for economic growth (Obansa *et al*., 2013) [17]. In Nigeria, exchange rate has changed within the time frame from regulated to deregulated regimes. Ewa, (2011) [8] agreed that the exchange rate of the naira was relatively stable between 1973 and 1979 during the oil boom era and when agricultural products accounted for more than 70 percent of the nation's gross domestic products (GDP).

In year 1986, Federal government adopted Structural Adjustment Policy (SAP) the country moved from a peg regime to a flexible exchange rate regime where exchange rate is left completely to be determined by market forces but rather the prevailing system is the managed float whereby monetary authorities intervene periodically in the foreign exchange market in order to attain some strategic objectives (Mordi, 2006) [14]. This inconsistency in policies and lack of continuity in exchange rate policies aggregated unstable nature of the naira rate (Gbosi, 2005) [9]. According to Benson and Victor (2012) [5] and Aliyu (2011) [11], opined that despite various efforts by the government to maintain a stable exchange rate, the naira has depreciated throughout the 1980's to date. Against this background, this study intends to investigate the effect of exchange rate fluctuations on economic growth in Nigeria over a period of 33 years (1986-2019).

2 Literature Review
The review of literature section is divided into two sections which include the review of theoretical literature section and the empirical literature review section

2.1 Theoretical Literature Review
There is no agreement on choosing the most suitable exchange rate to maintain macroeconomic stability. The choice of an appropriate exchange rate system must depend on the particular features of each country. Free floating exchange rate regimes adopted by developed countries might not suit developing countries whose insurance markets are not so

well developed and whose economy is not stable enough to absorb the risks from exchange rate volatility. Therefore, in theory, if the right regime is adopted, it could facilitate better business climate and potentially enhance economic growth in the long-run. Economic theory does not clearly articulate how exchange rate regimes can affect economic growth, and there are a limited number of studies which investigate this relationship (Musa *et al*., 2019) [15, 16].

i). The portfolio Balance theory: this theory developed by Branson *et al*., (1975) assumes that residents distribute their wealth among three forms of assets- monetary base, domestic bonds, and foreign bonds. Exchange rate is in equilibrium when the holding of these assets are in their desired proportion. In portfolio analysis, the current account balance becomes the reflection of the government budgetary imbalance when the private sector is satisfied with the holding of financial assets. The inability of government to sell bonds to foreigners without an excessive fall in their prices reflected in the overall balance of payment deficit Musa *et al*. (2019) [15, 16].

ii). The Purchasing Power Parity theory: according to Jhingan (2013) [12], this theory states that equilibrium exchange rate between two inconvertible paper currencies is determined by the equality of the relative change in the price levels in the two countries. International competitiveness is measured in a common currency. The purchasing power parity this theory, countries with higher domestic inflation than their competitors would face their appreciating exchange rate Musa *et al*. (2019) [15, 16].

iii). The Balance of Payment theory: as demonstrated by Jhingan (2013) [12], under a free exchange rate regime, a country's exchange rate depends upon its Balance of payments. A favorable balance of payments raises the exchange rates, with an unfavorable balance of payments reduces the exchange rate. By implication, exchange rate is determined by the demand and supply of foreign exchange. According to this theory, adjustments in the balance of payments can be made through devaluations and revaluations of some currencies in the case of deficits and surpluses respectively in the balance of payments Musa *et al*. (2019) [15, 16].

2.2 Empirical Literature Review

Exchange rate is the price of one country's currency in relation to another country(s) country. It is the required amount of units of a currency that can buy another amount of units of another currency. Therefore, the review of empirical related literature on the effect of exchange rate fluctuations on economic growth Nigeria is given as follows:

Aliyu (2011) [11] asserted that appreciation of exchange rate results in increased imports and reduced export while depreciation would expand export and discourage import. Also, depreciation of exchange rate tends to cause a shift from foreign goods to domestic goods. Hence, it leads to diversion of income from importing countries to countries exporting through a shift in terms of trade, and this tends to have impact on the exporting and importing countries' economic growth.

Adeniran *et al*. (2014) examined the impact of exchange rate fluctuation on economic growth from 1986 to 2015

using secondary date on gross domestic product, exchange rate, interest rate and inflation rate in Nigeria. The data were analyze using correlation and Ordinary Least Squares (OLS). The result revealed that exchange rate has positive and insignificant impact while interest rate and inflation rate show negative and insignificant impact on economic growth. The study recommends that government should encourage the export promotion strategies in order to maintain a surplus balance of trade and also conducive environment, adequate security, effective fiscal and monetary, as well as infrastructural facilities should be provided so that foreign investor will be attracted to invest in Nigeria.

Eze and Okpala (2014) tested the impact of the two basic exchange rates policies, namely, the fixed and flexible regimes, using the Chow test procedures to determine the structural stability of the relationship between exchange rate and output of goods and services during the two regimes. The time series date on government expenditure, exchange rate, money supply for the period of 1970-2011. The long-run estimates revealed that, apart from government expenditure, both exchange rate and money supply are highly significant in the determination of Nigeria's economic growth performance. The Chow test showed that the relationship between exchange rate and economic growth performance in Nigeria have not undergone any significant structural changes. The study conclude that Nigeria can substantially improve on its economic growth performance through improvement in the overall management of its exchange rate policy.

Oiro (2015) investigated how real exchange rate volatility affected exports of key Kenyan commodities namely; tea, coffee and horticulture for the period of 2005-2012 to the European Union and United Kingdom using GARCH model. The ADRL Bound test established a presence of long-run relationship between exchange rate volatility and key commodity exports. The result revealed that foreign income played an important role in explaining tea and coffee exports to the UK and EU. He recommended that greater value addition be done to tea and coffee to ensure that their demand increases with increase in foreign income.

Inam and Umobong (2015) [10] analyses the relationship between exchange rate movements and economic growth in Nigeria using annual data spanning 1970 to 2011. The study employed Ordinary Least Squares (OLS) and Granger Causality test. The OLS result revealed that positive and insignificant relationship exist between exchange rate and economic growth in Nigeria. The causality test indicates that there is no causality between exchange rate and economic growth in Nigeria. The study recommends that government should adopt appropriate monetary and fiscal policies that will not only ensure a realistic and stable exchange rate but will also serve to faster economic growth in Nigeria.

Aslam (2016) [3] tested the impact of exchange rate on the economic growth in Sri lank. The study makes use of the annual time series data from 1970 to 2015 on the gross domestic product, exchange rate, inflation rate and interest rate were considered. Using Ordinary Least Squares (OLS) method, the result shows that exchange rate positively and significantly influenced economic growth whereas inflation and interest rates show negative and significant impact on economic growth in Sri Lanka.

Jakob (2016) examined the impact of exchange rate regimes on economic growth for the year 2012. Secondary data on

gross domestic formation, government expenditure and index of per capita per person for 74 countries for 2012. The data were analyzed using Ordinary Least Squares (OLS) method and Correlation analysis. The results found that there is a positive and significant correlation between pegged exchange rate, index of government spending and growth in GDP. The index of human capital and inflation have negative and significant correlation with GDP.

Razzaque *et al*. (2017) [19] study the effects of exchange rate movements on economic growth of Bangladesh for the period 1980-2012 using error correction model. The result of ECM suggests that in the long-run, a depreciation of real exchange rate is associated with, on average, a 3.2% rise in aggregate output whereas a contractionary effect is observed in the short-run. While the long-run expansionary effect of real depreciations may be appealing for considering exchange rate policy as a development strategy, the like hood of rising inflationary pressures need to be kept in mind while pursuing this policy option.

Koirala (2018) [13] assess the impact of real effective exchange rate on economic growth of Nepal. The study uses time series data on GDP, money supply, level of trade openness, real gross fixed capital formation and real effective exchange rate for the period of 1975-2015. The result of ECM revealed that real effective exchange rate has a positive impact on the real GDP of Nepal. The researcher recommended that broad money supply continues be relevant monetary policy for Nepal. Moreover, Nepal must use the real exchange rate as one of the macroeconomic policies.

Barguellil *et al*. (2018) [4] examines the impact of exchange rate volatility on economic growth. Using a sample of 45 developing and emerging countries over the period of 1985 to 2015. Using the difference and system generalized methods of moments, the results suggest that the generalized autoregressive conditional heteroscedasticity-based measure of nominal and real exchange rate volatility has negative impact on economic growth. Also, the effect of exchange rate volatility depends on the exchange rate regimes and financial openness, that is, volatility is more harmful when countries adopt flexible exchange rate regimes and financial openness.

Musa *et al*. (2019) [15, 16] estimates the impact of foreign exchange rate on economic growth of Nigeria. The study makes used of Autoregressive Distributed Lag model (ARDL) on time series Data, for the period 1981-2017. The data set on real effective exchange rate, inflation rate, money supply, lending interest rate, real GDP and foreign direct investment, oil revenue and trade openness. The results reveal that real effective exchange rate is negative and significant in explaining GDP in Nigeria in the long-run. In the short-run, the lag value of real effective exchange rate is insignificant in explaining the changes in GDP. in the same period, the lag value of money supply is negative and significant in explaining GDP. But in the long run it is positive and significant. The rate of inflation both in the short run and long run is negatively and significant in explaining GDP. Therefore, the study concludes that the impact of foreign exchange rate on the economic growth of Nigeria is negative and significant and that the monetary authorities should adopt flexible exchange rate.

Evidence from around the work and evidence from Nigeria shows that the relationship between the foreign exchange rate and economic growth is documented and got mixed findings (positive and negative results) which were confirmed in the empirical literature reviewed. In this circumstance, a research gap about the effect of exchange rate fluctuations and economic growth in Nigerian context is formulated. Therefore, this study adds to the existing literature on exchange rate fluctuations and economic growth nexus in Nigeria from 1986-2019.

3. Research Methodology

Data used are sourced from the Central Bank of Nigeria (CBN) Bulletin of various issues. The main type of data used in this study is secondary; sourced from CBN Statistical Bulletin of various issues. From 1986 being the year the monetary authority shifted from fixed exchange rate regime to flexible exchange rate regime to 2019. The models used in this study are estimated using annual Nigeria data on some selected macroeconomic indicators, which includes: Gross Domestic Products (GDP) measured using GDP growth rate; exchange rate (EXR); inflation rate (INF) measured using percentage and interest rate (INR) measured using percentage for the same period of 1986 to 2019.

3.1 Model Specification

Model which specifies that economic growth (GDP) is significantly influenced by the exchange rate, inflation rate and interest rate was adapted from the work of Adeniran *et al*. (2014) and the model is given as follows;

$$GDP = f(EXR, INF, INR) \qquad [1]$$

The econometric form of the functional equation 1 is given in the model 2 which contains the coefficients of the intercept and the slope parameters as well as the error term.

$$GDP_t = \varphi_0 + \varphi_1 EXR_t + \varphi_2 INF_t + \varphi_3 INR_t + \sigma_{1t} \qquad [2]$$

Where GDP_t represents economic growth at time t, EXR_t stands for the exchange rate at time t, INF_t is inflation rate, INR_t represents interest rate at time t, φ_0 is the intercept parameter, $\varphi_1 - -\varphi_3$ are the slope parameters to be estimated and σ_1 is the stochastic error term.

According to Musa *et al*. (2019a) [15, 16], transforming variables into their natural logarithmic form is associated with some benefits such as interpreting the estimated coefficients in terms of elasticity coefficients and possible tackling the problem of serial correlation among others. Therefore, in line with this, the current study takes the natural logarithmic form of all the variables in equation 2. The natural logarithmic form of the model is given in equation 3.

$$\ln GDP_t = \varphi_0 + \varphi_1 \ln EXR_t + \varphi_2 \ln INF_t + \varphi_3 \ln INR_t + \sigma_{2t} \qquad [3]$$

Where lnGDP represents the log of economic growth at time t, lnEXR stands for the log of exchange rate at time t, lnINF is the log of inflation rate at time t, lnINR represents the log of interest rate at time t, φ_0 is the intercept parameter, $\varphi_1 - -\varphi_3$ are the slope parameters to be estimated and σ_1 is the stochastic error term.

4. Data Analysis and Discussion of Result

This section presents the results of the estimation and discusses the findings of the study. The presentation of the result started with the unit root test for stationarity of the variables and the result is presented in Table 1.

4.1 Unit Root Tests Result

The study used Augmented Dickey-Fuller (ADF) unit root test to ascertain the time series properties of the variables and the results from the ADF test is presented in Table 1.

Table 1: Unit Root Test Results

Augmented Dickey Fuller Unit Root					
	Level		1st Difference		
Variables	Constant	Trend	Constant	Trend	Interpretation
lnGDP	-3.672 (0.04)**	3.750 (0.00)***	0.142 (0.96)	-1.488 (0.81)	I(0)
lnEXR	-4.521 (0.00)***	-4.509 (0.00)***	-2.128 (0.24)	-1.998 (0.58)	I(0)
lnINF	-3.299 (0.02)**	-4.265 (0.00)***	-0.926 (0.77)	-2.194 (0.48)	I(0)
lnINR	6.046 (0.00)***	-5.873 (0.00)***	-2.402 (0.15)	-2.023 (0.57)	I(0)

Notes: ***, ** & * represents 1%, 5% & 10% levels and numbers in parentheses are the p-values.

The outcome from Table 1, indicated that the all the variables were stationary at level form under both constant and trend. Therefore, all the variables are said to be integrated of order zero or more popularly reported as I(0) series. Since all the variables were stationary at level, the study proceeds by testing the cointegration relationship among the variables using the Engle and Granger test for cointegration relationship.

4.2 Cointegration Test Result

The study tested for the existence of cointegration relationship among the variables using Engel and Granger test for cointegration test as reported in Table 2.

Table 2: Cointegration Test Result

Model	Test Statistics	Significance level	Critical Values
GDP = f (EXR, INF, INR)	-4.52***	1%	-4.42
		5%	-3.25
K = 3 & n =33		10%	-2.77

Notes: *** represents 1% level

From Table 2, the estimated test statistic value of -4.52 is greater than the critical value of -4.42 in absolute terms which confirm the rejection of the null hypothesis for no cointegration relationship among the variables and the acceptance of alternative hypothesis for cointegration relationship among the variables under study. Therefore, the study concludes that gross domestic product, exchange rate, inflation rate and interest rate are moving together in the long run.

4.3 Regression Test Result

The existence of I(0) variables gave this study a strong econometric background for the application of ordinary least squares (OLS) and the estimated OLS model result is reported in Table 3.

Table 3: Regression Result

Variables	Coefficients	t-Statistics	P-values
lnEXR	0.363***	7.965	0.000
lnINF	-0.172**	-2.923	0.007
lnINR	-0.286**	-2.2711	0.051
Constant	28.887***	17.965	0.000
R-square	0.801		
DW-stat.	1.729		
F-stat:	667.595*** (0.000).		

From Table 3, the value of the intercept value of 28.887 implies that the Nigerian economy will experience a 28.887 percent increase when all other variables are held constant. The estimate coefficient of exchange rate is positive and significance at 1 percent level which shows that a unit change in exchange rate will cause a 0.363 percent increase in gross domestic product in the long run period. The finding corroborates the result of Musa *et al*. (2019b) [15, 16] which shows that positive relationship exists between exchange rate and economic growth while contradict the result of Adeniran *et al*. (2014) who report negative relationship between exchange rate and economic growth in Nigeria.

Moreover, the estimated inflation rate coefficient revealed significant negative relationship between inflation rate and gross domestic product which means that a unit change in inflation rate will cause a 0.172 decrease in gross domestic product in the long run period. The result shows that inflation rate has negative impact on economic growth and this result is consistent with previous studies such as Asher (2012) and Musa *et al*. (2019b) [15, 16] which shows that positive relationship exists between inflation rate and economic growth.

Furthermore, interest rate coefficient shows significant negative sign at 1 percent level which implies that a unit change in interest rate will cause a 0.286 percent decrease in gross domestic product in the long run period. The result supported the finding of Adeniran *et al*. (2014) who reported negative relationship between interest rate and economic growth in Nigeria but contradict the result of Asher (2012) that exchange rate has positive impact on gross domestic product. In addition, the R-squared value of 0.801 indicates that 80% variation in the dependent variable (Gross Domestic Product) can be jointly explained by the independent variables (exchange rate, inflation rate and interest rate) and the remaining 20% variation is capture by the stochastic error term. The test of the overall significant of the model is shown by the F-statistic value of 667.595 and its probability value of 0.000 meaning that the overall regression model is statistically significant at 1% level which is more stringent. The Durbin-Watson statistic value of 1.729 is within the benchmark of 1.5 to 2.5 which entails the absence of first order serial autocorrelation problem.

4.4 Diagnostic Tests

Table 4 reported the estimated diagnostic tests results using serial correlation, heteroscedasticity, normality and Ramsey RESET test.

Table 4: OLS Diagnostic Tests Results.

Test	Serial correlation
F-stat	0.283 (0.756)
Observed R^2	0.867 (0.648)
Test	Heteroscedasticity
F-stat	0.477 (0.494)
Observed R^2	0.499 (0.480)
Test	Normality test
Jarque-Bera	0.164 (0.921)
Test	Ramsey RESET
F-stat	5.941 (0.023)

Note; Numbers in brackets are the p-values.

From the Table 4, the estimation was done to give unbiased and consistent estimates even in the face of heteroscedasticity, while the result of the Breusch Pagan test reveals that the null hypothesis of no serial autocorrelation is not rejected at 5% level of significance.

The Jarque-Bera test normality of the model also affirms that the model is well specified and in the right functional form, thus conforming that the model is a well-behaved model. The Ramsey RESET test shows that the null hypothesis of model misspecification cannot be reject at 5% level.
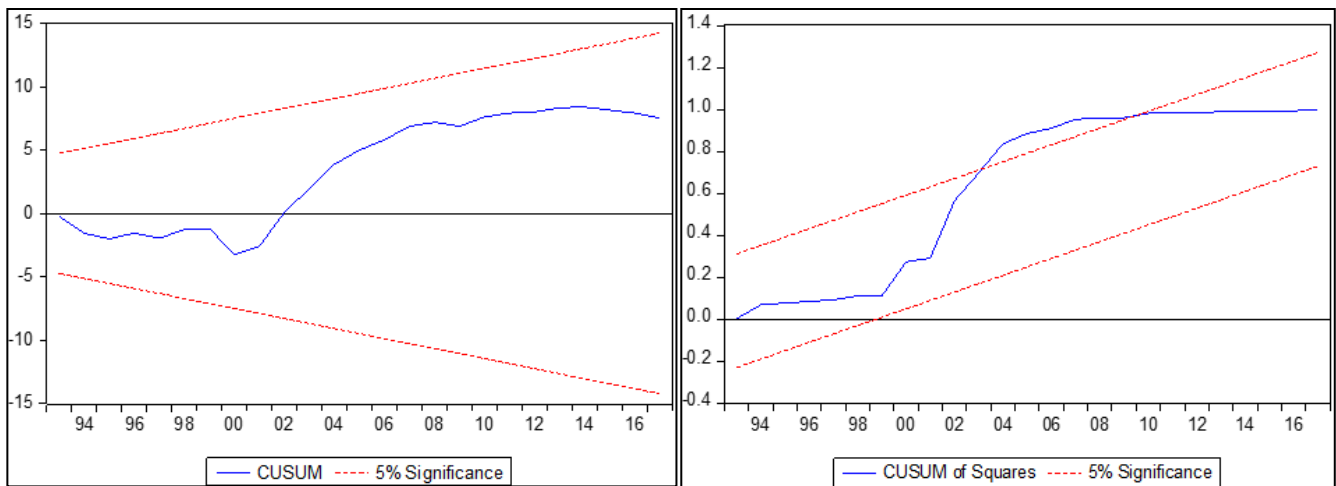

Fig 1: Time Plots of CUSUM and CUSUMSQ

Figure 1 presents the stability sketch of the estimated model, the CUSUM shows that the blue line is within the 5% upper and lower ridges lines meaning that the model is dynamically stable. While using CUSUM of Squares there is a slight deviation from the 5 per cent upper and lower ridges lines which means that the model is not dynamically stable.

5. Conclusion and Recommendation

This study examined the effect of exchange rate fluctuations on economic growth from 1986 to 2019 using ordinary least squares. The result revealed that exchange rate has positive impact and significant on economic growth which is in line with the previous studies that developing countries are relatively better off in the choice of flexible exchange rate regimes. The result also indicated that rate of inflation and interest rate have significant negative effect on economic growth. From the empirical reviewed work, some authors argued that exchange rate is positively related to economic growth, while some authors argued that it is negatively related. However, from empirical analysis of the current study, it was found that exchange rate is positively related to economic growth. Therefore, this study recommended that government should encourage the export promotion strategies in order to maintain a surplus balance of trade and also conducive environment, adequate security, effective fiscal and monetary, as well as infrastructural facilities should be provided so that foreign investors will be attracted to invest in Nigeria.

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