Effect of Foreign Exchange Fluctuations on the Economic Growth of Nigeria

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Abstract

Stable exchange rate is one of the various objectives meant to be attained by the government of a country. Therefore, this study looks at the effect exchange rate fluctuation has on Nigeria's economic growth. The study employs Autoregressive Distributed Lag (ARDL) model on selected variables from 1981–2020. Using Augmented Dickey Fuller (ADF) test, stationarity test was conducted and the result revealed that growth rate (GR), inflation rate (INFR) and gross capital formation (GCF) is stationary at levels while exchange rate (EXR) and trade openness (TO) are stationary at first difference. Results from ARDL model show that in the short run, EXR and INFR are both statistically significant and have negative effects on the economy, while TO and GCF are both statistically insignificant only GCF has a positive effect on the economy. In the long run EXR and GCF are statistically insignificant and both have a negative effect on the economy, while INFR is statistically significant and has a negative effect on the economy. TO is statistically insignificant and has a positive effect on the economy. The study, therefore, recommends that policy makers should ensure diversification of the economy in order to reduce the focus on oil sector and encourage domestic production which will aid export and make us less import dependent resulting in a more stable exchange rate.

Keywords: Autoregressive Distributed Lag (ARDL), Economic growth, Exchange rate, Inflation rate, Nigeria and Trade openness.

Introduction

Exchange rate is an essential macroeconomic policy instrument and changes in exchange rates have powerful effects on trade and non-trade of economies concerned through effects on relative prices of goods and services (Bobai, Ubangida & Umar, 2013). Exchange rates and its continual movement in Nigeria are significant to the economy because its fluctuation has an effect on the competence of the economy to attain optimal productive capacity. According to Jhingan (2013), exchange rate refers to the rate at which currency is exchanged for another, that is the price of a country's currency expressed in terms of another country's currency. It is also known as the ratio between a unit of one currency and the amount of another currency for which that unit can be exchanged at a time. However, exchange rate of currency is the link between domestic and foreign prices. Obi, Oniore and Nnad (2016) posit that exchange rate can either appreciate or depreciate, they explain that appreciation in the exchange rate occurs if less unit of domestic currency exchanges for a unit of foreign currency while depreciation in exchange rate occurs if more unit of domestic currency exchanges for a unit of foreign currency.

In most developed countries, an appropriate exchange rate has been one of the key important factors for economic growth. However, inappropriate exchange rate or constant fluctuations

has been a major hindrance to economic growth of many developing economies which includes Nigeria. Inflation can have a major effect on the value of a country's currency and its foreign exchange rates with other currencies. While it is just one factor among many, inflation is more likely to have a significant negative effect on a currency's value and foreign exchange rate. A very low rate of inflation does not guarantee a favourable exchange rate but an extremely high inflation rate is very likely to have a negative impact (Musa, Muhammad, Mohammed & Adamu, 2019).

According to Inam and Umobong (2015), since the Nigerian independence in 1960, Nigeria has employed many exchange rate policies in an effort to attain a realistic exchange rate that would allow for non-inflationary growth of the economy and ensure efficient allocation of foreign exchange. To achieve macroeconomic stability accurately, Nigeria's monetary authorities have adopted several exchange rate arrangements over the years. The fixed exchange rate system was scoped from 1960 to 1986. The system inability to achieve the major aims of exchange rate policy led to September 1986 policy reversal with the fluctuation of the Naira. The flexible exchange rate system was operated between the period from 1986-1993, a temporary halt to deregulation in 1994 with the "guided deregulation" of the foreign exchange market, through exchange rate liberalization and the institution of a dual exchange rate mechanism (Oladapo & Oloyede, 2014).

The need for foreign exchange rate stability arises only within the framework of countries engaged in international trade, in contrast to a closed economy, whose scope does not transcend its intra-country trade transactions. Thus, this makes economic issue relevant in a bid to ensuring a guaranteed growth for the country, owing the fact that majority of the country's raw materials for manufacturing purpose are imported coupled with the fact that Nigeria is one of the major exporters of crude oil and its produce (Oladapo & Oloyede, 2014).

Literature Review

There are various literatures in economics that have examined the influence of foreign exchange on Nigeria's economic growth. Many have focused on countries around the world and a good number on Nigeria. Karahan (2020) studied from 2002-Q1 to 2019-Q1, the effect exchange rate has on Turkey's economic growth; using Innovation Accounting Techniques, Johansen co-integration test and Granger causality test. The result reveals that between exchange rate and economic growth there is a negative effect. Ribeiro, McCombie and Lima (2020), also achieved a negative result after observing the connection real exchange rate has with the economic growth of fifty-four developing countries by focusing on the structural features from 1990-2010. Morina, Hysa, Ergün, Panait and Voica (2020) utilizing yearly data from 2002 to 2018 for 14 Central and Eastern European countries inspect real exchange rate volatility effect on economic growth. The result shows after the use of panel data that real economic growth is affected significantly and negatively by exchange rate volatility.

In Cambodia, Vorlak, Abasimi and Fan (2019) examined how exchange rate affect the country's economic growth utilizing ordinary least squares (OLS) model on data set spanning 1995 to 2017. The variables in the study consist of trade openness, rate of inflation, gross domestic product, foreign direct investment, exchange rate and money supply. The findings showed a contrast from the previous authors revealing a positive relationship between gross domestic and product exchange rate.

Hussaini, Aguda Niyi and Davies (2018) investigated how exchange rate volatility influences the economic growth of West African English-Speaking Countries. The outcome after employing ordinary least square and fixed and random analysis show that there is an inverse relationship between real exchange rate and economic growth. In Indonesia, using ARDL model on yearly data from 1990 to 2017, Agus, Ignatius and Long (2018) conducted an analysis of exchange rate disconnect puzzle. The analysis showed a relationship involving macroeconomic fundamentals and the rate of exchange. Utilizing GARCH models, Latief and Lefen (2018) examined the relationship international trade, Foreign Direct Investment (FDI) and the rate of exchange have on seven countries that are developing which include; Pakistan, India, Bangladesh, Sir Lanka, Bhutan, Maldives and Nepal. The study was from 1995-2016 and the outcome showed that the rate of exchange has a direct relationship with international trade for counties like Nepal, Bhutan and Maldives but an inverse relationship for Pakistan. For the relationship between the rate of exchange and FDI, India and Pakistan show a direct relationship while reverse is the case for Nepal and Bhutan.

Studying just Nepal, Koirala (2018) looked at how real exchange rate affects economic growth from 1975-2015, with the use of time series data on real exchange rate, money supply, real gross fixed capital formation, gross domestic product and level of trade openness. The outcome of ECM shows a positive relationship between real exchange rate and real GDP. Utilizing generalized differences and methods of moments on forty-five developing countries, Barguellil, Ben-Salha and Zmami (2018) looked at exchange rate variations and its effect on economic growth from 1985-2015. The outcome reveals an inverse relationship between exchange rate variations and economic growth. It also suggested that exchange rate variations rely on exchange rate regimes and the openness of finances.

In Bangladesh, Razzaque, Bidisha and Khondker (2017) investigated from 1980 to 2012 the impact exchange rate fluctuation has on the growth of the economy. The variables were all stationary at first difference according to ADF outcome. ECM result revealed that on an average in the long-run, a ten per cent fall in real exchange is connected to a three per cent rise in the growth of the economy. The reverse is the case in the short-run. Using ARDL technique, Peter and Isaac (2017) investigated real rate of exchange and economic growth relationship in Ghana from 1984-2014. The variables employed in the study include; trade openness, real gross domestic product growth, real effective rate of exchange, foreign direct investment, labour force, fixed capital formation and government spending. The result show that in the long run the rate of exchange has an adverse effect on economic growth while the reverse is the case in the short run.

In Nigeria, Musa *et al* (2019) studied from 1981 to 2017, the connection between the rate of foreign exchange and economic growth of Nigeria. Utilizing ARDL, the result showed that in the long run exchange rate has an inverse and significant relationship with economic growth while in the short run it is insignificant. Yakub, Sani, Obiezu and Aliyu (2019) utilizing ARDL technique, studied exchange rate fluctuations effect on the flow of trade in Nigeria from 1997 to 2016. GARCH model was employed to produce nominal rate of exchange fluctuations series. The result showed that in the long run there is a direct impact of the rate of exchange fluctuations on the flow of trade while the reverse is the case for the short run. The study also revealed that in the short run trade flows could be impacted negatively by the rate of exchange if neglected. Also using ARDL procedure, Idris, Ashemi and Musa (2019) looked at exchange

rate and GDP's relationship in Nigeria from 1981-2017. The outcome was that exchange rate variation had no significant impact on the gross domestic product of Nigeria.

Still in Nigeria but using ordinary least square method, Ufoeze, Okuma, Nwakoby and Alayekwu (2018) assess how the economy is affected by exchange rate movement. Money supply, oil revenue, gross domestic product, rate of inflation, and rate of exchange were the variables used in the study. The outcome showed that the rate of inflation and the rate of exchange have an inverse effect on economic growth while supply of money and oil revenue have a direct relationship on the economy. In Nigeria, Mohammed (2016) focused on the period during the Structural Adjustment Programmes (SAP) and after, to examine the decline in the rate of exchange and its resultant effect on economic growth spanning 1986- 2012. GDP, government spending, broad money supply, rate of exchange and net export were used as variables. Using ECM model, the outcome shows no significant impact on economic growth by the rate of exchange.

Kenneth, Jonathan and Kenneth (2016) and Obi *et al* (2016) both studied from 1970 to 2014, the impact exchange rate regime had on the economic growth of Nigeria. Employing generalized moment method (GMM), the result suggested that the lessening of the rate of exchange system will trigger economic growth. They observed that exchange rate regimes matter in the performance of Nigeria. Employing Augmented Dickey Fuller (ADF) test, standard deviation method, Error Correction Model (ECM), Multiple Regression Model and Johansen Co-integration test, Amassom and Odeniyi (2016) investigated the rate of exchange fluctuation impact on Nigeria's economic growth from 1970-2013. Rate of inflation, trade openness, rate of exchange fluctuation, oil price and real GDP are the variables used in the study. The outcome observed that in the long run and short run, the rate of exchange has a direct but not significant impact on economic growth. Utilizing Ordinary Least Square technique (OLS), Augmented Dickey Fuller test (ADF) and Granger Causality test, Inam and Umobong (2015) examined the connection between the rate of exchange fluctuations and Nigeria's economic growth from 1970 to 2011. The outcome of the analysis shows a direct and insignificant connection between the rate of exchange and economic growth.

Having reviewed a number of literatures, it is apparent that a conclusion regarding the effect of foreign exchange on the economic growth of Nigeria has not been reached. This has fundamentally shaped a route for this study to validate the types of relationship amongst variables chosen for this study.

Methodology

This study examines if the fluctuations in exchange rate are detrimental to the growth of Nigeria's economy from 1981-2020. The reason for the base year period is because exchange rate recorded one of its lowest rates following the rise in oil prices at the international market, while the current period shows the year at which annual data are available. The study comprises of other variables that also affect economic growth apart from exchange rate. The study made use of Autoregressive Distributed Lag (ARDL) and began by a unit root test of the variables.

Model specification

The study modifies the model in the work of Idris, Ashemi and Musa (2019), in an attempt to

investigate the effect exchange fluctuation has on Nigeria's economic growth. Therefore, the model for this study is written as;

GR = f (EXR, INF, TO, GCF) ……. (1)
Where:
GR = Growth rate
EXR = Exchange rate
TO = Trade openness
GCF = Gross capital formation
From equation (1), it can be stated more explicitly as:
$GR = f(\beta_0 + \beta_1 EXR + \beta_2 INF + \beta_3 TO + \beta_4 GCF)$ …… (2)

Estimation techniques
Unit root test

Unit root test is important because it helps the study in choosing the most appropriate estimation technique required for analysis. The trend and intercept of the unit root are shown in equations (3) and (4), respectively.
$\Delta Y_t = \beta_0 + \lambda Y_{t-1} + \beta_i \Delta\lambda Y_{t-1} + \mu_{ti}$ …… (3)
For intercept

$\Delta Y_t = \beta_0 + \lambda Y_{t-1} + \beta_{it} + \beta_i \Delta\lambda Y_{t-1} + \mu_{ti}$ …… (4)
For trend
where Δ is the first difference, Y_t is the tested variable for unit root, μ_{ti} denotes error term at period i, Y_{t-1} represents the one period lag of the tested variable for unit root.

Autoregressive Distributed Lag (ARDL)

The study investigates the short run and long run relationship among the variables, after the unit root test has been conducted. This is done with the use of ARDL also known as the bound test method of co-integration. Pesaran, Shin and Smith (1996) developed the ARDL model which was made popular by Pesaran, Shin and Smith (2001). It is more beneficial compared to other co-integration methods because it can be utilized when the variables under consideration are integrated of order zero I(0) and order one I(1). Similarly, because the error correction mechanism can be gotten through simple linear transformation it gives improved outcome. The method is preferred for a small sample size of 40 observations (1981–2020). The unrestricted error correction mechanism for testing co-integration among the variables utilized in this work is stated as follows:

$$\Delta GR_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta GR_{t-1} + \sum_{i=1}^{n} \beta_2 \Delta EXR_{t-1} + \sum_{i=1}^{n} \beta_3 \Delta INF_{t-1} + \sum_{i=1}^{n} \beta_4 \Delta TO_{t-1} + \sum_{i=1}^{n} \beta_5 \Delta GCF_{t-1} + \alpha_1 GR_{t-1} + \alpha_2 EXR_{t-1} + \alpha_3 INF_{t-1} + \alpha_4 TO_{t-1} + \alpha_5 GCF_{t-1} + \mu_t \quad ----------(5)$$

The ARDL long-run model is estimated if co-integration is found while the short-run model is estimated if otherwise.

$\Delta GR_t = \beta_0 + \beta_1 GR_{t-1} + \beta_2 EXR_{t-1} + \beta_3 INF_{t-1} + \beta_4 TO_{t-1} + \beta_5 GCF_{t-1} + \mu_t$ ..... (6)

$$\Delta GR_t = \alpha_0 + \sum_{i=1}^{n} \alpha_1 \Delta GR_{t-1} + \sum_{i=1}^{n} \alpha_2 \Delta EXR_{t-1} + \sum_{i=1}^{n} \alpha_3 \Delta INF_{t-1} + \sum_{i=1}^{n} \alpha_4 \Delta TO_{t-1} + \sum_{i=1}^{n} \alpha_5 \Delta GCF_{t-1} + \sum_{i=1}^{n} ECM_{t-1} + \mu_t ----(7)$$

where $\beta_0 - \beta_5$ are short-run elasticities, $\alpha_0 - \alpha_5$ are long-run elasticities, ECM_{t-1} is one lag of error correction term, Δ is first difference, $\mu_{t\ is}$ white noise, β_0 is constant term.

Sources of Data

Data used for the study were sourced from statistical bulletin of the Central Bank of Nigeria (CBN) 2020 and World Development Indicators 2021 (World Bank, 2021).

Result of the Findings

This section begins with descriptive statistics of the variables. This is followed by time series property using test statistics of Augmented Dickey Fuller (ADF) to provide the basis for the analysis considered.

Table 1: Descriptive statistics

Variables	GR	EXR	INFR	TO	GCF
Mean	3.027	99.79	15.03	32.12	36.24
Median	3.700	106.5	11.84	33.87	35.51
Std. Dev.	5.453	98.33	17.54	12.29	20.03
Skewness	-0.800	0.804	1.582	-0.330	0.851
Kurtosis	4.501	2.731	5.640	2.254	3.228
Jarque-Bera	8.034	4.427	28.23	1.655	4.924
Probability	0.018	0.109	0.000	0.437	0.085
Observations	40	40	40	40	40

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

From the Table 1, the result shows that all the variables, GR, EXR, INF, TO, and GCR have positive mean values with 40 observations. The highest standard deviation is recorded by EXR while the least standard deviation is recorded by GR. The skewness statistics from the table show that all the variables are positively skewed except GR. The probability values of the Jarque-Bera statistics show that some series are normally distributed while others are not.

Table 2: Augmented Dickey-Fuller (ADF) Unit Root Test

Variables	Critical values 5%	Level		1st difference		Order of integration
		t-statistics	p-value	t-statistics	p-value	
GR	-2.94	-3.020606	0.0419	-10.07275	0.0000	1(0)
EXR	-2.94	1.421671	0.9988	-4.347691	0.0014	1(1)
INFR	-2.94	-3.106230	0.0343	-8.025028	0.0000	1(0)
TO	-2.94	-2.328525	0.1685	-7.476411	0.0000	1(1)
GCF	-2.94	-4.206993	0.0020	-3.436914	0.0157	1(0)

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

From Table 2, the decision rule using Augmented Dickey-Fuller test statistic is that when the t-statistics is greater than the critical value 5% significance level and the probability value (P-value) is less than 0.05, it shows that the variables (except exchange rate and trade openness) are stationary at order level 1(0) but became stationary after taking the first difference 1(1). The t-statistics values are all greater than the critical value at the standard 5% significant level.

Table 3: Bound Test for Co-integration H_0: No Co-integration

Test statistics	**Value**	**K**
F-Statistic	4.67	4
Pesaran Critical values	***Lower bound***	***Upper bound***
(10%)	2.2	3.09
(5%)	2.56	3.49
(1%)	3.29	4.37

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

Table 3 reveals the outcome of the Bound test for co-integration. The test was done by utilizing long-run coefficient boundaries to compute the F-statistic for deciding the acceptance or rejection of the null hypothesis of no co-integration among the long-run variables in the ARDL model. The results in table 3 reveal the F-statistics value is 4.67 and it is higher than all the Pesaran lower and upper boundaries at 1%, 5% and 10% correspondingly. Consequently, the null hypothesis of no co-integration among the variables of the study is rejected whereas the alternative hypothesis is accepted. This proposes the presence of long-run relationship amongst the variables of the study.

Table 4: ARDL Long-run Relationship of the variables

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	24.57969	18.42308	1.334179	0.1997
EXR	-0.093690	0.055915	-1.675573	0.1121
INFR	-0.260448	0.072857	-3.574790	0.0023
TO	0.105130	0.154979	0.678351	0.5067
GCF	-0.309401	0.281237	-1.100145	0.2866

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

Table 4 reveals the estimated outcome for long run relationship of the variables. The coefficient of EXR, INFR and GCF is all negative but only INFR is statistically significant. TO is positive but not statistically significant. This implies that a 1 per cent rise in EXR, INFR and GCF will decrease GR by 9.37 per cent, 26 per cent, and 30.9 per cent respectively. While a 1 per cent increase in TO will also increase GR by 10.5 per cent.

Table 5: ARDL short-run Relationship with Error correction of the variables

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
D(EXR)	-0.059603	0.026257	-2.269969	0.0365
D(INFR)	-0.072753	0.032278	-2.253950	0.0377
D(TO)	-0.031155	0.059829	-0.520734	0.6093
D(GCF)	0.614368	0.326700	1.880525	0.0773
CointEq(-1)	-0.720878	0.119658	-6.024501	0.0000
R-squared	0.809787			
Adjusted R-squared	0.697388			
S.E. of regression	2.482774			
Sum squared resid	135.6117			

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

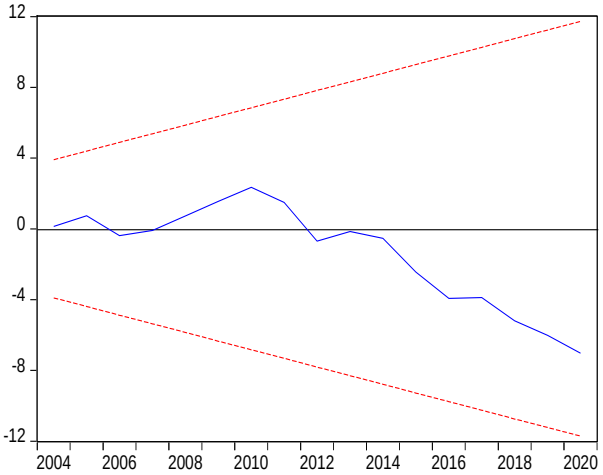
Table 5 reveals that in the short run, GCF is positive while INF, EXR, and TO are negative. Furthermore, EXR and INFR are statistically significant at 5% level of significance while GCF and TO are not**.** The outcome shows that the error correction term is negative as anticipated and is statistically significant. The negative sign suggests that there is modification from short-run to long-run equilibrium between the variables of the study. That is, the economy responds to deviations from equilibrium such that if the short run variables (EXR, INFR, TO and GCF) deviate from equilibrium, they tend to re-adjust back to equilibrium in the long run. The coefficient of the error term indicates an annual speed of adjustment from long-run disequilibrium of about 72 per cent per annum. This means that about 72 per cent of the disequilibrium errors, which happened the preceding years, are adjusted in the current year. The R-square of the model reveal that about 81 per cent of the disparity in dependent variable (GR) is explained by the model leaving about 19 per cent variation in GR to be explained by other factors not inputted in the model.

Table 6: Post-Estimation Statistics

Breusch-Godfrey Serial Correlation LM Test:			
F-statistic	1.704704	Prob. F(19,7)	0.2152
Obs*R-squared	6.667173	Prob. Chi-Square(19)	0.1042
Heteroskedasticity Test: ARCH			
F-statistic	0.866617	Prob. F(1,24)	0.4966
Obs*R-squared	3.640953	Prob. Chi-Square(1)	0.4568

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

Table 6 reveals the outcome of post-estimation statistics. The outcome of LM test of serial correlation in table 5 points out confirmation of no autocorrelation in the error residuals of the data set. This is because it's estimated probability of is 0.1042 (greater than 5%). Thus, the null hypothesis of no serial correlation is accepted and the alternative hypothesis is rejected. Also, the outcome of ARCH test proposes that the series data are homoscedastic. That is, the series data sets are not suffering the setback of heteroscedasticity.



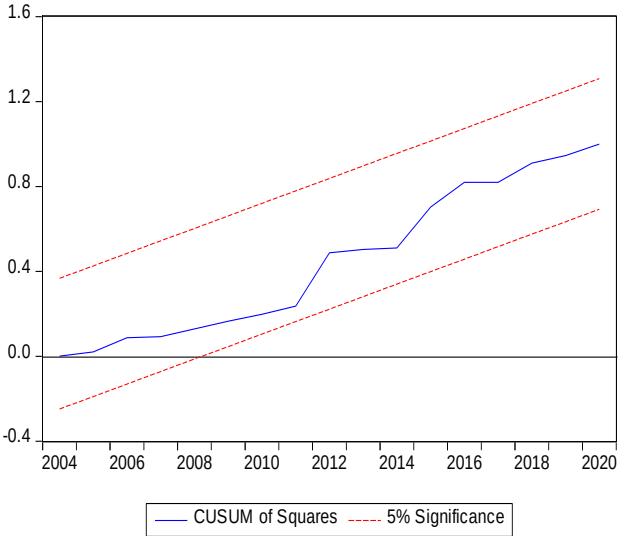


Fig. 1. Cumulative sum (CUSUM) test **Fig. 2. Cumulative sum (CUSUM) of Squares test**

To ensure a fit ARDL model, the study used cumulative sum (CUSUM) and CUSUM of squares test established by Durbin, Brown, and Evans (1975). In the test the coefficient estimates are only accepted when the plotted CUSUM statistics falls within 5% significance level. The figures above reveal that the CUSUM plot falls within the 5% level of significant (denoted by the two red lines). This shows that the model is stable and not spurious.

Conclusion

This study evaluates the effect of foreign exchange fluctuation on the economic growth of Nigeria from 1981-2020. The study adopts the ARDL model in a bid to investigate the short and long run relationship among the variables, after the Augmented Dickey Fuller (ADF) unit root test of the variables has been conducted. The study comprises of other variables that also affects economic growth apart from exchange rate such as growth rate, inflation rate, trade openness (inflow percentage rate of GDP) and gross capital formation. The result of the study

reveals that both in the short run and long run exchange rate fluctuation has a negative effect on the economic growth of Nigeria though it is insignificant in the long run it is statistically significant in the short run.

Recommendations

Based on the findings of the study, the following recommendations are made;

i. Policymakers and monetary authorities should evolve policies on foreign exchange to avoid speculation in the foreign exchange market, political influence and premium seekers taking advantage of the Nigerian economy.

ii. Nigerian government should endeavour to stabilize the exchange rate of Naira in order to increase economic growth.

iii. The government should encourage and increase money supply in a bid to finance domestic production of export commodities in order to reduce imports which leads to rise in the value of exchange rate.

iv. To maintain exchange rate and economic stability, more attention needs to be paid by the Nigerian government to other more relevant macroeconomic variables like oil price and inflation rate in Nigeria.

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