

IMPACT OF EXCHANGE RATE VOLATILITY ON ECONOMIC GROWTH IN NIGERIA (1980-2016)

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Abstract – In the light of the fact that the government of Nigeria adopted various exchange rate measures and regimes in order to improve the output and stimulate economic growth, yet the output performance in the country is below expected desire. Therefore, this study is set out specifically to examine the impact of exchange rate volatility on economic growth in Nigeria. The study made use of ARDL co integration and Error Correction Model to capture the stated objective. The results revealed that there is existence of co integration among the variables. The findings also exhibited significant impact of export on Gross Domestic Product while import is insignificant both in the short and the long run. The study established insignificant positive relationship between exchange rate volatility and economic growth in Nigeria. Based on these findings, government of the country should diversify the economy so as to improve on export and to mitigate over dependence on oil and gas sector of the economy as well as reducing import. Also monetary authorities should embark on policies that would ensure stability of the exchange rate for a sustainable economic growth in Nigeria.

Keywords: Exchange Rate Volatility, Export, Import, Economic growth and Error Correction Model.

INTRODUCTION

Exchange rate plays an increasingly significant role in any economy as it directly affects domestic price level, profitability of traded goods and services, allocation of resources and investment decision. Exchange rate is one of the actor players of macroeconomic variables used to determine the international competitiveness and it is considered as a measure of how competitive the currency of a country is (Rasaq, 2013). Exchange rate indicates the values of two currencies in terms of another. It is the price of one currency in terms of another currency. Traditionally, exchange rate is defined as the price of one unit of the foreign currency in terms of the domestic currency (Mejekomi, 2000). It is a determinant of relative prices of domestic and foreign goods and also determines the strength of external sector participation in the international trade. Exchange rate remains a veritable tool in the growth of an economy as its stability is very germane in stimulating export and private investment. Evan and Lyons (2005) described exchange rate is an important economic indicator that has a strategic role in an economy and say that exchange rate movements widely influence various aspects of the economy, including inflation, import-export performance which in turn affects the output of economy. He concludes that in the market, there are two main forces that interact with each other, namely supply and demand and they form an equilibrium which is reflected in the price and quantity levels where supply and demand curves meet.

In view of the above, the issues of exchange rate and its management are of serious concern to economic agents, especially in developing countries. Amongst others, this concern stems from the fact that exchange rate policies determine the ability of countries to take full advantage of international trade. A successful exchange rate policy is expected to facilitate the achievement of external and internal balances in the economy, in which case the exchange rate is said to be in equilibrium. However, a currency is termed misaligned when its exchange rate departs from its long run equilibrium path. Thus, an exchange rate is said to be “undervalued” when it depreciates more than its equilibrium, and “overvalued” when it appreciates more than its equilibrium value. An overvalued exchange rate implies that a country’s currency is too high for the state of the economy. In other word, it indicates that country’s exports will be relatively expensive and its imports become cheaper. This results to the slowing down the domestic demand in international market and stimulate spending on imports while undervaluation of exchange rate is when the value of country’s currency in the exchange market is lower than its believed sustainable value. This may be due to a pegged or managed rate that is below the market-clearing rate or floating rate. It may be as a result of speculation of capital inflow.

Exchange rate volatility is the risk associated with unexpected movements in the exchange rate. Economic

fundamentals such as the inflation rate, interest rate and the balance of payments, which have become more volatile in the 1980s and early 1990s, by themselves, are sources of exchange rate. Volatility of exchange rate induces uncertainty and risk in investment decision with destabilizing impact on the macroeconomic performance (Mahmood and Ali, 2011). In view of this, it has been recognized in previous studies that maintaining a relatively stable exchange rate is important in boosting economic growth. The world Bank Report(2010) concluded that most countries of sub-Saharan Africa including Nigeria implemented fixed exchange rate regime prior to the structural Adjustment Programme(SAP) era. Following the adoption of Structural Adjustment Policy (SAP) in 1986, the country has moved from a peg regime to a flexible exchange rate regime in practice, no exchange rate is clean or pure float, that is, a situation where it 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). Thus, the government of Nigeria has adopted this strategy in order to improve the output and stimulate economic growth, yet the output performance in the country leaves much to be desired. The government of Nigeria has been continuously manipulating the exchange rate of the country over the years by changing from one regime of exchange to another order to ensure economic stability and stimulate growth. Despite these various exchange rate policies put in place by successive government in the country to enhance economic growth are yet to achieve the desired result in term of growth. It is against this background, that the study seeks to examine the effect of volatility of exchange rate on economic growth in Nigeria as the major objective of the study.

The rest of the paper is organized in five sections. Section two is devoted to the review of related literature, while section three deals with research methods. Section four presents the results and discussions, while conclusion and recommendations are presented in the last section.

Literature Review

Conceptual Issues

Exchange Rate

Mejekomi (2000) defined exchange rate as the price of one unit of the foreign currency in terms of the domestic currency. Mordi, (2006) also defined exchange rate as a price of one currency in terms of another. This exchange rate, which is a price of the domestic currency in terms of other currencies, is usually determined in principle by the interplay of supply and demand in a free market environment. In practice, however, no currency is allowed to float freely by the monetary authorities. Between the fixed and floating systems exchange rate management and other regimes such as the managed and dual exchange rate regimes. while exchange rate volatility is defined as the risk associated with unexpected movements in the exchange rate. Economic fundamentals such as the inflation rate, interest rate and. the balance of payments, which have become more volatile in the 1980s and early 1990s, by themselves, are sources of exchange rate.

Theories of Foreign Exchange Rate

Some of the theories on determinants of foreign exchange rate are mint parity theory and purchasing power parity theory. These theories are discussed below.

The Mint Parity Theory: Determination of Exchange Rate under Gold Standard

This theory is associated with the working of the international gold standard. Under this system, the currency in use was made of gold or was convertible into gold at a fixed rate. The value of the currency unit was defined in term of certain weight gold, that is, so many grains of gold or the naira, dollar, pounds and so on. The apex bank of the country was always ready to buy and sell gold at the specified price. The rate at which the standard money of the country was convertible into gold was called the “mint price” of gold. If the official British price of gold was £6 per ounce and US price gold \$36 per ounce. These will be the mint price of gold in their respective countries. The exchange rate between the dollar and pound would be fixed at \$36/£6=\$6. This rate was called the mint parity or mint price of gold. Thus under the gold standard, the normal or basic rate of exchange was equal to the ratio of their mint per values.

$$R = \frac{\$}{\pounds} \dots\dots\dots 2.1$$

However the actual rate of exchange could vary above or below the mint parity by the cost of transporting gold from one country to other. The mint parity theory has certain assumption.

Assumption of Mint Parity Theory

The mint parity theory is based on the following assumptions.

1. The price of gold is fixed by a country in terms of its own currency.
2. It buys and sells gold in any amount at that price
3. Its supply of money consists gold or paper currency which is backed by gold
4. Its price level varies directly with money supply
5. There is movement of gold between countries
6. Capital is mobile within countries
7. The adjustment mechanism is automate

Theory of Purchasing Power Parity

The Purchasing Power Parity/Theory {PPP} was developed by Gustav Cassel in 1920 to determine the exchange rate between countries on inconvertible paper currencies. The theory states that equilibrium exchange rate between two inconvertible papers currencies is determined by the equality of relative change in price in the two countries. In other words, the rate of exchange between two countries is determined by their relative price levels. There are two versions of the Purchasing Power Parity (PPP) theory, namely the absolute and relative versions.

Empirical Literature

Danson et al (2012) carried out study on the impact of real exchange rate volatility on economic growth in Kenya. The study employed the Generalized Autoregressive Condition of Heteroscedasticity (GARCH) and computation of the unconditional standard deviation of the changes to measure volatility and Generalized Method Moments (GMM) to assess the impact of the real exchange rate volatility on economic growth for the period January 1993 to December 2009. The study found that RER was very volatility for the entire study period. Kenya's RER generally exhibited a appreciating and volatility trend, implying that in general, the country's international competitiveness deteriorated over the study period. The RER Volatility reflected a negative impact on economic growth of Kenya. Sequel to the foregoing study are Ugochuchukwu, (2015) and Okoh,(2015).

Ugochuchukwu, (2015) in his study on exchange rate volatility and economic growth (1980-2012) adopted the general autoregressive conditional heteroscedasticity (GARCH) technique to estimate the relationship between the two variables. The results showed a negative response of economic growth to exchange rate volatility. This finding was contrary to Izilein and Okoh,(2015) who also employed the GARCH technique for the period 1980-2013, but rather found a positive relationship between exchange rate and economic growth in Nigeria. They recommended greater diversification of the productive and export base of the economy to bring about a stable exchange rate. A similar study was conducted by Jugu and Soeding, (2015) using multiple regression analysis, and covering 1981-2013. This study also confirmed the existence of a significant positive relationship between exchange rate and economic growth in Nigeria.

In another related study, Odilli(2015) used vector error correction model on time series annual data from 1971 to 2012 to examine real exchange rate volatility, economic growth and international trade in an Emerging Market Economy. The results revealed that in both short-run and long-run, exports and imports were chiefly influenced by real exchange rate, real exchange rate volatility, foreign income, gross domestic product, terms of trade and changes in exchange rate policies. The findings further revealed that exchange rate volatility depressed exports and imports in the long-run. The result from pair wise Granger causality test revealed unidirectional causality running from export to exchange rate volatility and from exchange rate volatility to import and a unidirectional causality flow from RGDP to imports and exports. Achouak, Ousama and Mourad(2018) explored exchange rate volatility and economic growth. This paper examines the impact of exchange rate volatility on economic growth with similar result and with the same methodology of Danson et al(2012). The study investigation based on a sample of 45 developing and emerging countries over the period of 1985~2015 is conducted using the difference and system generalized method of moments estimators. Findings suggest that the generalized autoregressive conditional heteroskedasticity-based measure of nominal and real exchange rate volatility has a 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.

Iyeli and Utting (2017) study the effect of exchange rate volatility on Economic Growth in Nigeria from 1970 to 2011. We employ the Johansen Co-integration estimation techniques to test for the short and long runs effect of the variables used. The ADF test reveals that all the variables are stationary. From the parsimonious model, the results show that OREV and EXR are positively related to GDP. Further findings reveal that there exist two equations at 5% level in both trace and Max – Eigen statistic. This implies that exchange rate volatility and oil revenue contributes positively to GDP in the long run.

Ndu- Okreke and Nwachukwu (2017) employed the use of vector auto regression (VARs) models on the time series data, the result reveal that supply of foreign exchange has a positive and significant relationship with output level of Gross Domestic Product while the demand for foreign exchange has a negative relationship with gross demand product The study in question is the effect of exchange rate fluctuations on the Nigerian economy. The justification for the use of these models was based on the volatility of exchange rate in impacting on macro-economic variables using a 14- year period. The hypotheses stated will be tested using the two-stage least square (2LS). The statistical properties of the 2LS are contained in the popular Gauss- Markov theorem which sees the least squares estimators as unbiased linear estimator, having minimum variance.

Basirat, Nasirpour and Jorjorzadeh (2014) investigated the effect of exchange rate fluctuations on economic growth considering the rate of development of financial markets in developing countries over the period 1986-2010. The effects of variables such as trading volume, inflation, and production of the previous period on economic growth have been studied as well. The results obtained by analyzing panel data of 18 countries show that the effect of financial development on economic growth as well as the effect of exchange rate fluctuation on economic growth are negative and significant. On the other hand, the mutual effect of exchange rate fluctuations and financial development on economic growth is positive, but the effect in the studied countries is so small that is not statistically significant.

Alagidede and Ibrahim (2016) delved into the causes and effects of exchange rate volatility on economic growth: Evidence from Ghana. What drives exchange rate volatility, and what are the effects of excessive fluctuations in the exchange rate on economic growth in Ghana? These questions are the subject matter of this article. The results showed that while shocks to the exchange rate are mean reverting, misalignments tend to correct very sluggishly, with painful consequences in the short run as economic agents recalibrate their consumption and investment choices. About three quarters of shocks to the real exchange rate are self-driven, and the remaining one quarter or so is attributed to factors such as government expenditure and money supply growth, terms of trade and output shocks. Excessive volatility is found to be detrimental to economic growth; however, this is only up to a point as growth-enhancing effect can also emanate from innovation, and more efficient resource allocation.

Eneji et al(2018) examined the effect of exchange rate policy and its volatility on economic growth in Nigeria. The primary focus of monetary policy is to determine the exchange rate that stabilizes prices, resulting to sustained growth in the economy. The problem of study is exchange rate volatility and the continued depreciation of the naira, surrounded by negative or sluggish growth indices. The model adopted is time series model; a dynamic distributed-lag model. It is a causal dynamic economic model that shows the long-run and short-run relationship as the parameters are restrictedly estimated, using secondary data. The results show negative relationship between exchange rate volatility and economic growth.

Sunday, Stephen and Babatunde(2017) investigated the dynamics of naira real exchange rate (RER) during the period 2000Q1 – 2016Q1 as well as the extent to which it deviated from its long run equilibrium path. To achieve this, we adopt the Behavioural Equilibrium Exchange Rate (BEER) model approach and incorporate the effects of an endogenously determined breakpoint in the co-integrating vector of the RER model. We found empirical support for the existence of a long-run relationship between RER and its determinants that is subject to a structural break in 2011Q1. Also, model results showed that exchange rate policy, productivity and interest rate differentials are significant determinants of real exchange rate movements.

Research Methods

This study employed Vector Error Correction Model and Pair Wise Granger Causality to investigate the relationship between exchange rate volatility and the economic growth in Nigeria.. ARCH and GARCH were used to test for the exchange rate volatility. The study employed the most effective empirical method of single equation model, treating economic growth as dependent variable while exchange rate, export, import, inflation and money supply. The model specification mirrors the work of Ndu- Okrereke and Nwachukwu (2017) with modifications which took its root from purchasing power parity theory. Therefore, the model is specified below:

$$GDP = f(EXR, EMPR, IMPR, INF, MS_2) \text{-----} 3.1$$

Explicitly,

$$RGDP = \beta_0 + \beta_1 EXR + \beta_2 EMPR + \beta_3 IMPR + \beta_4 INF + \beta_5 MS_2 + U_t \text{-----} 3.2$$

β_0 = Intercept or Constant

$\beta_1 -- \beta_4$ = parameters or coefficients

U_t = Error term or Random or Disturbance term

Scope and Sources of Data

The study covers the period between 1980 and 2016. Data for the variables were secondary data and variables such as Gross Domestic Product, export rate, import rate, inflation and money supply were sourced from central bank of Nigeria (CBN) while exchange rate was sourced from World Bank Statistical Bulletin.

Results and Discussion

4.1 Unit root test

Table1: Phillip-Perron Unit root test table

		Phillip-Perron @ level				
		GDP	IMPT	EXPT	EXR	INF
C	t-stat	0.0630	-2.4843	-2.2653	-0.0158	8.6433
	Prob.	0.9623	0.1204	0.1841	0.9555	1.0000
C&T	t-stat	-2.6996	-6.6029	-3.5616	-1.4334	3.7676
	Prob.	0.2377	0.0000***	0.0351**	0.8492	1.0000
No C&T	t-stat	2.6929	2.0244	1.5173	2.1765	15.1445
	Prob.	0.9984	0.9900	0.9683	0.9932	1.0000
		Phillip-Perron @ First difference				
		GDP	IMPORT	EXPORT	EXR	INF
C	t-stat	-4.3766	-33.3718	-24.7611	-11.8403	-9.7615
	Prob.	0.0004***	0.0000***	0.0000***	0.0000***	0.0000***
C&T	t-stat	-4.3416	-34.9577	-24.8066	-11.9200	-10.9596
	Prob.	0.0031***	0.0000***	0.0000***	0.0000***	0.0000***
No C&T	t-stat	-4.2556	-29.9908	-24.3764	-11.7252	-7.2475
	Prob.	0.0000***	0.0000***	0.0000***	0.0000***	0.0000***
Remark		I(1)	I(0)	I(0)	I(1)	I(1)

Source: Author’s computation.

Note * (**) (***) denotes null hypothesis at 10%, 5% and 1% respectively

Where made used, C represents Constant while T represents Trend. All variables are in log form.

The result of the Philip Perron(pp test) revealed that at series; import and export rate were stationary while all other variables were not series but attained stationarity at first difference. The order of integration at which stationarity is attained determines the estimation of technique suitable for each model. Based on above scenario, the study employed ARDL model towards achieving the aim of this paper.

4.2 Exchange rate volatility modeling and filtering

Table 4.2: ARIMA (3, 1, 1) – GARCH (1, 1) model of exchange rate return

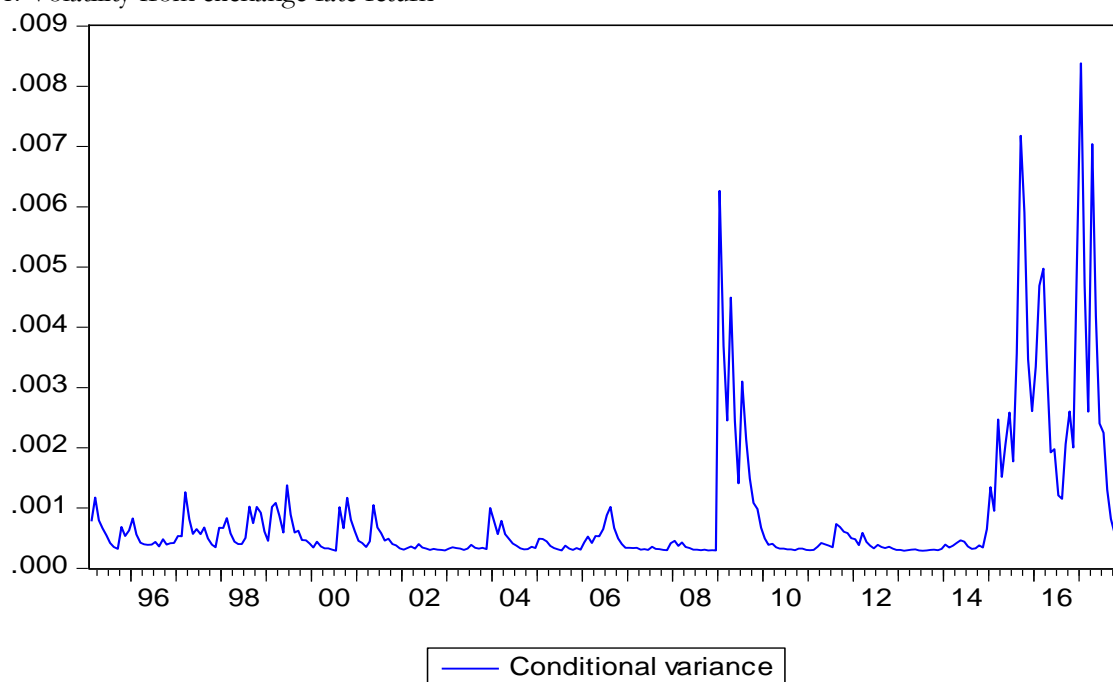
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002822	0.002209	1.277009	0.2016
AR(1)	-0.614910	0.087324	-7.041726	0.0000***
AR(2)	0.174663	0.080007	2.183109	0.0290**
AR(3)	-0.147059	0.076926	-1.911689	0.0559*
MA(1)	0.999987	8.78E-05	11385.31	0.0000***
Variance Equation				
C	0.000135	3.32E-05	4.054653	0.0001***
RESID(-1)^2	0.316851	0.108766	2.913141	0.0036***
GARCH(-1)	0.514779	0.113697	4.527627	0.0000***
Companion roots				
Inverted AR Roots	.17+.35i	.17-.35i	-96	
Inverted MA Roots	-1.00			

Source: Authors' computation(2018).

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1%

The Table 4.2 above shows the estimated ARIMA (3, 1, 1) – GARCH (1, 1) model for exchange rate return. It can be seen from the table that most of the estimated parameters are significant. The variance equation confirmed the existence of non-persisted volatility in exchange rate return, and the extracted volatility is depicted below in figure 1. The series generated for the volatility is included in the short-run and long-run models below.

Figure 1: Volatility from exchange rate return



4.3 Short-run and error correction model

Table 4.3: Estimated short-run parameters from ARDL (3, 0, 0, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(GDP(-1))	1.154134	0.047291	24.404950	0.0000***
DLOG(GDP(-2))	-0.519364	0.052096	-9.969408	0.0000***
DLOG(IMPT)	0.004131	0.003407	1.212611	0.2264
DLOG(EXPT)	0.006573	0.003479	1.889179	0.0600*

DLOG(VOL)	-0.006789	0.003852	-1.762490	0.0792*
D(INF)	0.000171	0.000066	2.587168	0.0102**
CointEq(-1)	-0.054517	0.012211	-4.464693	0.0000***

Source: Authors' computation(2018).

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1%

From the above **Table 4.3**, all the variables except import impacted significantly of real GDP in the short run. On the average, a percentage increase in export and inflation would bring about 0.007% and 0.017% rise in real GDP in the short run respectively. However, rising exchange rate volatility on average would bring about reduction in real GDP in the short run. The speed of adjustment is correctly signed and highly significant with a practically zero probability and the practical implication of its estimated coefficient is that about 5.5% of disequilibrium in real GDP due to shock is corrected within a year.

4.4 Long-run model

Before the study proceeds to the long run modeling, the study first conducts wald test and the generated output is presented in the table 4.4 below.

Table 4.4:

Null Hypothesis: No long-run relationships exist

Test Statistic	Value	K
F-statistic	4.090451	4

Critical Value Bounds

Significance	I(0) Bound	I(1) Bound
10%	2.45	3.52
5%	2.86	4.01
2.5%	3.25	4.49
1%	3.74	5.06

From the table 4.4, the study concludes that there is long run relationship between the dependent variable and the regressors because the computed F-statistics exceed the upper bound value I(1) at 5% level of significance, then the null hypothesis(no integration) is rejected and there is a prove of long run cointegration. Hence, we proceed to the long-run modeling as below.

Table 4.5: Estimated long-run parameters from ARDL (3, 0, 0, 1, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOG(IMPT)	0.075780	0.060115	1.260578	0.2086
LOG(EXPT)	0.120574	0.058737	2.052773	0.0411**
LOG(VOL)	0.054437	0.041997	1.296210	0.1960
INF	0.003142	0.000981	3.202531	0.0015***
C	9.497270	0.444930	21.345513	0.0000***

Source: Authors' computation(2018).

Note: * (**) (***) denotes the rejection of null hypothesis at 10%, 5% and 1%

From the Table 4.5, only export and inflation rate impacted significantly of real GDP in the long run. On the average, a percentage increase in export and inflation rate would bring about 0.12% and 0.31% increase in real GDP in the long run respectively. The implication is that export is capable of generating significant relationship with gross domestic product while import has insignificant impact on gross domestic product both in the short and the long run. The exchange rate volatility has insignificant positive relationship with economic growth in the long run. This finding is in line with the studies of Danson et al (2012) and Iyeli and Utting (2017)

Conclusion and Recommendations

The study examined the impact of exchange rate volatility on economic growth in Nigeria between 1980 and 2016. The study concludes that there is existence of exchange rate volatility right from 1996 till 2018 and it was very high in 2008-2010 as well as 2014 -2016. The findings of the study revealed that there is presence of cointegration among the variables. The results also showed that export has significant impact on Gross Domestic Product both in the short and the long run while import is insignificant. Therefore, the study concludes that export is significantly contributing to economic growth while import is detrimental to growth in Nigeria. The result also confirmed that mild inflation is good for growth and development in the long run as suggested by the neo-classical economists. Based on these findings, the study therefore, recommends that government of Nigeria should make sure that central Bank focuses primarily on inflation control to ensure price stability. Also monetary authorities should embark on policies that would ensure stability of the exchange rate for a sustainable economic growth in Nigeria. There is need for the government of the country to diversify the economy so as to improve on export and to mitigate over dependence on oil and gas sector of the economy.

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