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Exchange Rate Volatility and Balance of Payments Problem in Nigeria, 1980-2016

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Abstract There is a growing agreement in the literature that prolonged and substantial exchange rate volatility can create severe macroeconomic disequilibria and the correction of external balance will require both exchange rate devaluation and demand management policies. The main intuition behind this is that an increase in exchange rate volatility leads to uncertainty which might have a negative impact on trade flows. Consequent upon the above, this study focused on the effect of exchange rate volatility on balance of payments in Nigeria, 1980 to 2016. Exchange rate volatility was measured using the GARCH approach. The empirical results confirmed that exchange rate is positively related to balance of payments; while real gross domestic, inflation rate and volatility of exchange rate are negatively related to balance of payments. Therefore government should not underplay exchange rate volatility in Nigeria. In addition, government should encourage export promotion strategies in order to maintain a surplus balance of trade which will help make the domestic currency strong and also prevent further depreciation of the Nigeria naira in the future.

Keywords: *exchange rate, volatility and balance, Garch approach*

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1. Introduction

Exchange rate is commonly known as a measure of international competitiveness. It is also known as index of competitiveness of currency of any country and an inverse relationship between this index and competitiveness exists. The lower the value of this index in any country, the higher the competitiveness of the currency of that country will be [1]. The general view of researchers about exchange rate is that if the exchange rate of a country is properly valued, it does not substantially affect the balance of payments and thus macro economic performance of that country. Volatility in exchange rate of a country can affect the investment in that country adversely. It creates an uncertain environment for investment and requires that resources in a country should be reallocated among various sectors of the economy of that country.

Nigeria has witnessed a number of attempts by successive governments since independence to influence the pace and thrust of development in order to bring about an improved quality of life for the people by the introduction of several exchange rates management policies. A glance at the evolution of the exchange rate policies in Nigeria reveals that exchange rate policy in Nigeria has undergone a good number of changes. It has developed from a fixed parity in 1960 when it was solely tied with the British Pound Sterling. By 1967, following the devaluation of the Pound Sterling the US dollar was included in the parity exchange. In 1972, the parity exchange with the British Pound was suspended as a result of the emergence of a stronger US dollar. In 1973, Nigeria reverted to a fixed parity with the British Pound following the devaluation of the US dollar. In 1974, in order to minimize the effect of devaluation of a single individual currency, Nigerian currency was tied to both the pound and dollar. In 1978, the naira was pegged to a basket of 12 currencies comprising Nigeria's major trading partners. However, the 1978 policy was jettisoned in 1985 in favour of quoting the naira against the dollar. However, since the move to floating exchange rate system in 1973, the effect of dramatic movement of exchange rate on trade flow has continued to generate series of responses [2]. Many analysts of international economics concur that the generalized floating of system in operation since the post Bretton wood period has engendered substantial volatility in both developed and developing economies. Since 1986, Nigeria appears to have shifted away from fixed and independent floating exchange rate regimes towards intermediate flexibility as the naira was deregulated in September 1986 under the Structural Adjustment Programme Package. Exchange rate policy in Nigeria has undergone a good number of changes but as observed by Sani [3], it has gone through many changes but spanning between two major regimes, namely, the fixed and flexible exchange rate regimes. The fixed exchange rate system was adopted between 1960 and 1985, while the flexible system has remained in use from 1986 to date albeit series of modification.

Despite various efforts by the government to maintain a stable exchange rate, the naira has depreciated throughout the 80's. It depreciated from ₦0.61 in 1981 to ₦2.02 in 1986 and further to ₦7.901 in 1990, against the US dollar.

The policy of guided or managed deregulation pegged the Naira at #21.886 against the US dollar in 1994. Further deregulation pushed the exchange rate to ₦86.322 to $1.00 in 1999. The exchange rate experienced slight appreciation from 2004 to reach a highest level of ₦132 to $1.00 in 2008. In addition, the exchange rate depreciated to ₦149.58 at the end of 2009 only to maintain relatively stable value from 2010 till early 2015 before the Central Bank of Nigeria on 15th June, 2016 announced a flexible foreign exchange regime thereby abolishing the dual exchange rate regime. Similarly, balance of payment (BOP) dropped by approximately 78.30% in 2011 approximately 485.49% in 2012. There is a growing agreement in the literature that prolonged and substantial exchange rate misalignment can create severe macroeconomic disequilibria and the correction of external balance will require both exchange rate devaluation and demand management policies. The main intuition behind this is that an increase in exchange rate volatility leads to uncertainty which might have a negative impact on trade flows [4]. The economic logic underpinning the negative link is the aversion of firms to engage in a risky activity, namely trade [5]. Consequent upon the above, this study focused on the effect of exchange rate volatility on balance of payments in Nigeria, 1980 to 2016.

2. Literature Review

2.1. Conceptual Clarification

2.1.1. Exchange Rate

Conceptually, an exchange rate implies the price of one currency in terms of another. Exchange rate is the ratio between a unit of one currency and the amount of another currency for which that unit can be exchanged at a particular time [6]. In other words, exchange rate is the price of one currency vis-à-vis another and is the number of units of a currency required to buy another currency [7]. Exchange rate is the link between domestic and foreign prices of goods and services. Also, exchange rate can either appreciate or depreciate.

2.1.2. Balance of Payments

The balance of payments is the record of all international financial transactions made by a country's residents. A country's balance of payments tells you whether it saves enough to pay for its imports. It also reveals whether the country produces enough economic output to pay for its growth. The BOP is reported for a quarter or a year.

A balance of payments deficit means the country imports more goods, services and capital than it exports. It must borrow from other countries to pay for its imports. In the short-term, that fuels the country's economic growth. In the long-term, the country becomes a net consumer, not a producer, of the world's economic output. It will have to go into debt to pay for consumption instead of investing in future growth. If the deficit continues long enough, the country may have to sell off its assets to pay its creditors. These assets include natural resources, land and commodities. A balance of payments surplus means the country exports more than it imports. Its government and residents are savers. They provide enough capital to pay for all domestic production. They might even lend outside the country. A surplus boosts economic growth in the short term. That's because it's lending money to countries that buy its products. That boosts its factories, allowing them to hire more people. In the long run, the country becomes too dependent on export-driven growth. It must encourage its residents to spend more. A larger domestic market will protect the country from exchange rate fluctuations. It also allows its companies to develop goods and services by using its own people as a test market.

The balance of payments has three components. They are the financial account, the capital account and the current account. The financial account describes the change in international ownership of assets. The capital account includes any financial transactions that don't affect economic output. The current account measures international trade, the net income on investments and direct payments.

2.2. Theoretical Literature

2.2.1. Structural Theory

This theory argued that balance of payments disequilibrium abates due to an inherently inefficient or imbalanced economy [8]. Two specifications of structural problems that affect the Nigerian economy are weakness in fiscal system and high external debt burden. Weakness in fiscal system leads to budget deficit, expenditure increases due to population increase and the need for development, while the revenue system and tax rate of the Nigerian economy are inadequate to obtain the needed growth in revenue. What is needed is restructuring and improvement of the country's revenue system and increase in taxes. The revenue system of the economy should be elastic relative to economic growth, that is, revenue should grow proportionately with higher gross domestic product. On the other hand, high external debt burden sustainability analysis of Nigeria by the international monetary fund (IMF) indicates that the country's debt burden has been increasing since1960. Determining whether or not the level of debt is sustainable in the country is one of the most fundamental issues, and there is no conclusive level of measure amongst economists to determine when an external debt is sustainable or not.

2.2.2. Balance of Payments Model

To express the balance of payments model in this study, we look at various approach used to analyze the effects of exchange rate volatility on the balance of payments. These approaches include: the elasticity approach; the absorption approach; and the monetary approach. Among these three approaches, the monetary approach describes the current state of art in the analysis of exchange rate fluctuations and effects on balance of payments. Considered below are the three approaches to formulating a balance of payments model where the objective is to assess the effect of exchange rate on it.

2.2.3. The Elasticity Approach

The elasticity approach focuses on the trade balances. It studies the responsiveness of the variables in the trade and

services account; constituting imports and exports of merchandise and services relative to price changes and induced by devaluation. The elasticity approach to balance of payments is built on the Marshall Learner condition [9], which states that the sum of elasticity of demand for a country's export and its demand for imports has to be greater than unity for a devaluation to have a positive effect on a country's balance of payments. If the sum of this elasticity is smaller than unity, then the country can instead improves its balance of trade by revaluation. This condition can be expressed mathematically as follows:

$$\Delta B = KX_f \left(e_{1m} + e_{2m-1}\right) \quad 2.1$$

Where:

ΔB = Change in the trade balance

K = The devaluation in percentage

X_f = Value of exports expressed in foreign currency

e_{1m} = First (devaluing) country's demand elasticity for imports.

e_{2m-1} = Second country's demand elasticity for exports from the devaluing country.

For Marshall Learner condition to be fulfilled, $e_{1m} + e_{2m-1} > 1$. This approach essentially detects the condition under which changes in exchange rate would restore balance of payments (BOP) equilibrium. It focuses on the current account of the balance of payments and requires that the demand elasticity be calculated, specifying the conditions under which a devaluation would improve the balance of payments. Crockett [10] sees the elasticity approach to balance of payments as the most efficient mechanism of balance of payments adjustments and suggests the computation of demand elasticity as the analytical tool by which policies in the exchange field can be chosen, so as to form the equilibrium.

2.2.3. The Absorption Approach

This approach summarily postulates that devaluation would only have positive effects on the balance of trade if the propensity to absorb is lower than the rate at which devaluation would induce increases in the national output of goods and services. It therefore advocates the need to achieve deliberate reduction of absorption capacity to accompany currency devaluation. The basic tenet of this approach is that a favorable computation of price elasticity may not be enough to produce a balance of payments effect resulting from devaluation, if devaluation does not succeed in reducing domestic expenditure. The approach dwells on the national income relationship developed be Keynes and it tries to find out its implication on balance of payments [11]. It begins with the national income identity as shown below.

$$Y = C + I + G + X - M \quad 2.2$$

Where

Y = National Income

C = Private consumption of goods and services

I = Total investment by firms and government

G = Government expenditure on goods and services

X = Export of goods and services

M = Import of goods and services.

We can represent domestic expenditure with expenditure terms such as:

$$C + I + G \quad 2.3$$

And, the net export as:

$$X - M = \beta. \quad 2.4$$

Putting the two expressions together gives the equation Y = A + β, which means that the trade balance equals national income minus total expenditure, i.e.

$$\beta = Y. \quad 2.5$$

2.2.4. The Monetary Approach

The monetary approach focuses on both the current and capital accounts of the balance of payments. This is quite different from the elasticity and absorption approaches, which focus on the current account only. As pointed out by Crockett [11], the general view of monetary approach makes it possible to examine the balance of payments not only in terms of the demand for goods and services, but also in terms of the demand for the supply of money. This approach also provides a simplistic explanation to the long run devaluation as a means of improving the balance of payments, since devaluation represents an unnecessary and potentially distorting intervention in the process of equilibrating financial flows.

Dhliwayo [12] emphasizes that the relationship between the foreign sector and the domestic sector of an economy through the working of the monetary sector can be traced to David Hume's price flow mechanism. The emphasis here is that balance of payments disequilibrium is associated with the disequilibrium between the demand for and supply of money, which are determined by variables such as income, interest rate, price level (both domestic and foreign) and exchange rate. The approach also sees balance of payments as regards international reserve to be associated with imbalances prevailing in the money market. This is because in a fixed exchange rate system, an increase in money supply would lead to an increase in expenditure in the forms of increased purchases of foreign goods and services by domestic residents. To finance such purchases, much of the foreign reserves would be used up, thereby worsening the balance of payments. As the foreign reserve flows out, money supply would continue to diminish until it equals money demand, at which point, monetary equilibrium is restored and outflow of foreign exchange reserve is stopped. Conversely, excess demand for money would cause foreign exchange reserve inflows, domestic monetary expansion and eventually balance of payments equilibrium position is restored.

The monetary approach is specifically geared towards an explanation of the overall settlement of a balance of payments deficit or surplus. If the supply of money increases through an expansion of domestic credit, it will cause a deficit in the balance of payments, an increase in the demand for goods and various assets and decrease in the aggregate in the economy.

2.3. Empirical Literature

Baxter and Stockman [13] investigated the time series behavior of a number of macroeconomic aggregates under alternative exchange rate systems during the postwar period. They used a sample of 49 countries, and found

little evidence of any differences in the behavior of trade flows under alternative exchange rate systems. Given that the flexible exchange rate periods studied in their paper were periods of high exchange rate volatility, the conclusion could be drawn that exchange rate volatility did not affect trade flow behavior in the large cross section of countries considered. Baxter and Stockman [13] removed the trends in the series under consideration by applying a linear trend, or by first differencing. They then examined the properties of the de-trended data, implicitly focusing on the high and medium frequencies when the linearly de-trended data is examined, while focusing on the higher frequency properties of the (quarterly) data when the differenced data are considered.

Onuchukwu and Kalu [14] in their study of exchange rate variations and Nigeria balance of payments evaluated the impact of exchange rate variation on Nigeria balance of payments. In the study, a Nigeria balance of payments model was designed and estimated and the result thereof suggests that about 81% of variation in the Nigeria balance of payments within the study period is explained by exchange rate. The study, which has balance of payments as the dependent variable and exchange rate as well as gross domestic product as explanatory variables, reveals a significant and positive relationship between them. And thereby argues that exchange rate and gross domestic product exert significant influence on the balance of payments in Nigeria during the period of study.

Broda and Romalis [15] looking at the effects of exchange rate volatility on disaggregated trade flows found that, volatility decreases trade in differentiated product relative to trade in commodities, although the effect is rather small. Eliminating all real exchange rate volatility would increase trade in manufacturing by less than 5 percent and total trade by less than 3 percent. In conclusion they note that, developing countries would experience a more pronounced increase in trade due to the fact that they are more prone to volatile exchange rate.

Bernardina [16] investigated the impacts of the real exchange rate, real non-oil gross domestic products, and the world income on Russian non-oil export by using an Error Correction (EC) model over the period 1994-2001. The author found that, there is a robust and negative long run co-integration relationship between the real exchange rate and Russian non-oil exports. Furthermore, the world income has positive effect on Russian non-oil export while a real non-oil gross domestic product causes a decline in non-oil export.

Saadet and Ayhan [17] examined the behavior of the macroeconomic variables in terms of volatility across exchange rate regimes in *de jure and de facto* classifications, using monthly data over the period 1980-2006. They found a strong GARCH effect for the real exchange rate, inflation and foreign exchange reserves. The findings of the T-test indicate that the variations in the mean of most of the macroeconomic variables are not statistically different from each other under *de facto* regimes The results of this study suggest the existence of *de facto* regime neutrality. Their findings are similar to the findings of Baxter and Stockman [13].

Ogbonna [18] examined the empirical relationship between the real exchange rate and aggregate trade balance in Nigeria. The study tested Marshall-Lerner conditions to see if it is satisfied for Nigeria. The result showed no co-integration for the trade balance model. The results further revealed that depreciation/devaluation improves balance of payment and Marshall-Lerner (ML) condition holds for Nigeria.

Polodoo et al. [19] investigated the impact of exchange rate volatility on the macroeconomic performance of Small Island Developing States (SIDS) taking a sample of 15 SIDS. Their findings based on Ordinary Least Squares (OLS) regression with robust Standard Errors (SE) revealed that exchange rate volatility has both an economically and a statistical significant effect on changes in current account balance. However, in a dynamic setting, Generalized Method of Moments (GMM) estimates showed that exchange rate volatility has no influence on changes in current account balance. The same is found for the growth equation. OLS estimates with robust SE showed that exchange rate volatility positively influences economic growth, in line with Rodrik [20] who avers that an undervaluation of exchange rate improves export competitiveness, encourages investment and hence promotes growth.

Rasaq [21], analysed the impact of exchange rate volatility on macroeconomic variables, using correlation matrix, Ordinary Least Squares (OLS) and Granger causality test, the findings of the study showed that exchange rate volatility has a positive influence on Gross Domestic Product, Foreign Direct Investment and Trade Openness, but with negative influence on the inflationary rate in the country.

Umoru and Odjegba [22], analysed the relationship between exchange rate misalignment and balance of payments (BOP) mal-adjustment in Nigeria over the sample period of 1973 to 2012 using the vector error correction econometric modeling technique and Granger Causality Tests. The study revealed that exchange rate misalignment exhibited a positive impact on the Nigeria‟s balance of payments position. The Granger pair-wise causality test result indicated a unidirectional causality running from exchange rate misalignment to balance of payments adjustment in Nigeria at the 1 percent level. The inconsistency in the research results of the various studies reviewed therefore motivated this study.

3. Empirical Model, Data and Estimation Technique

3.1. Model and Data

The main objective of this study is to examine the impact of exchange rate volatility on balance of payments in Nigeria, 1980 to 2016. For this purpose the model adapted for this study is predicated on the balance of payments model and a modified model of Adubi and Okunmadewa [23] and Clark et al. [24]. The preferred model is represented as:

$$BOP_t = f\left(EXR_t, RGDP_t, INFR_t, VEXR_t, E_t\right) \quad 3.1$$

Where

BOP_t =Balance of payments

EXR_t = Exchange rate (N/$)
$RGDP_t$ = Real gross domestic product
$INFR_t$ = Inflation rate (INFR)
$VEXR_t$ = Volatility in exchange rate
E_t = Disturbance terms that are normally distributed

To estimate the model above, volatility was measured using the Generalized Autoregressive Conditional Heteroscedesticity (GARCH). The GARCH (1,1) as introduced by Bollerslev [22] considered two distinct specifications, one for the conditional mean and one for the conditional variance. The GARCH model is specified thus:

$$EXR_t = \beta_0 + \beta_1 EXR_{t-1} + E_t; \quad E_t / \beta_{t-1} = N\left(O,\ VEXR^2{}_t\right) \tag{3.2}$$

Where
EXR_t; Present focus based on past information
EXR_{t-1}; Mean Exchange rate based on past information
E_t; Error term in the present period
β_0 and β_1; Constants to be estimated.

Equation 3.2 is the mean equation and written as a function of exogenous variables with an error term E_t.

$$VEXR^2{}_t = \eta_0 + \eta_1 E^2{}_{t-1} + \eta_2 VEXR^2{}_{t-1} \tag{3.3}$$

Where,
E^2_{t-1} = Error term based on past information
$VEXR^2_{t-1}$ = Variance based on past information.

$VEXR^2_t$ is the present forecasted variance based on past information and used to proxy volatility. It is called the conditional variance where η_1 and η_2 are the coefficient of the GARCH. The addition of η_1 and η_2 must be positive and less than one to ($\eta_1 + \eta_2 > 0$; but < 1) satisfy the necessary condition of equation 3.3. When it is very close to one, it indicates that volatility shocks are quite persistent. Equation 3.3 is the measure of volatility, which was use to verify the relationship between volatility and balance of payments.

The study used secondary data that were obtained from the Central Bank of Nigeria (CBN) Statistical Bulletin various issues, National Bureau of Statistics and World Development Indicators for Nigeria (WDI). It covered the period from 1980 to 2016.

3.2. Estimation Technique

In order to investigate the relationship that exists between the dependent variable and explanatory variables, this study adopted the following procedures.

First, volatility effect was measured using the Generalized Autoregressive Conditional Heteroscedesticity Model; GARCH (1, 1), which is the generalized version of ARCH model. Engle (1982) introduced the ARCH model to capture the time-varying risk, which allows us to estimate the time-varying conditional variance. GARCH (1, 1) model is the extension of ARCH models by including lagged values of the conditional variance. The (1, 1) in parentheses is a standard notation in which the first number refers to how many autoregressive lags appear in the equation and the second number refers to how many moving average lags are specified which here is often called the number of GARCH terms. The Generalized Autoregressive Conditional Heteroscedesticity method of measuring volatility is one of the best measures of exchange rate volatility. It is useful in capturing non-constant, clustered time varying variance in higher moments, which represents stochastic process by which risk terms are generated [25]. According to Clark et al. [24] when hedging instruments are available, the predicted part of exchange rate volatility can be hedged away and hence may not have much impact on trade. This suggests that the appropriate measure of risks should be related to deviations between actual and predicted exchange rates. And hence, GARCH (1,1) process is more appropriate because the underlying idea is that part of the volatility can be forecasted based on past values of the exchange rate and also allows both a long memory and a more flexible lag structure without having to impose a priori of any fixed lag pattern.

The technique as introduced by Bollerslev [25] considered two distinct specifications; one for the conditional mean, and one for the conditional variance. The model employed volatility clustering which helped to provide the magnitude but not the sign of the random shocks. The econometric challenge was on how to specify the information to be used in forecasting the mean and variance of the return, conditional on the past information.

The next step after the measure of volatility was to check the stationarity property of the time series data. The issue of stationarity and non-stationarity of time series data in econometric modeling has become a major concern beginning from the 1980's. Non-stationarity of time series data has often been regarded as a problem in empirical analysis. The use of non-stationary variables often leads to spurious regression results from which further inference are meaningless [26]. Thus, the variables were investigated for their stochastic properties, using unit root test with structural break by Perron [27] to determine the break points/dates as well as further investigate the properties of the time series employed since traditional tests for unit-roots (e.g. ADF and PP) are known to have low power in the presence of structural breaks, and have a tendency to "detect" non-stationarity which does not exist in the data.

4. Empirical Results

4.1. Time Series Properties of the Variables

Econometric studies have shown that most financial and macro-economic time series variables are non-stationary and using non-stationary variables leads to spurious regression [26]. Table 1 presents the results of Unit Root Tests with a Structural Break for the levels and first differences of the annual time series data for the period, 1980-2016.

From Table 1, the null hypothesis of a unit root is accepted for EXR and RGDP (in the innovational outlier model). The null hypothesis of a unit root is accepted for BOP and EXR (in the additive outlier model). In first difference however, all the series tend to be stationary.

Table 1. Unit Root Tests with a Structural Break

	Innovational Outlier Model			Additive Outlier Model		
Variable	t-statistics	Break date	Lag	t-statistics	Break date	Lag
BOP	-5.201119*	2003	1	-3.989424	2001	0
EXR	-0.144480	1998	0	-2.434462	1999	9
RGDP	-3.593924	2015	8	-5.515919*	1994	9
INFR	-5.268415*	1995	1	-5.043384*	1995	0
VEXR	-5.520218*	2015	0	-9.210636*	1997	9
ΔBOP	-7.030887*	2005	0	-6.548525*	2000	0
ΔEXR	-5.454040*	2015	0	-8.792266*	1997	9
ΔRGDP	-5.579577*	2003	8	-6.421851*	1996	9
ΔINFR	-6.007683*	2001	0	-6.766829*	1995	1
ΔVEXR	-9.700263*	2015	0	-12.81801*	1997	9

Note: *denote significant at the 1, 5 and 10 percent level.
Source: Researcher's Computation Using E-views 9.5.

The results confirm previous studies [28] that in the presence of structural break, the standard ADF test or PP tests are biased towards acceptance of the null hypothesis of unit root in the data. Both the IO and AO approach revealed that all the variables have quite diverse structural breaks that depend on key policy changes. The results revealed that majority of the variables have unit root at level but found to be stationary at 1st difference in the presence of various structural breaks. For majority of the variables the endogenously determined break date closely correspond to (i) the 1988-1994 tariff policy reforms, (ii) 1995-2001 policy shift towards measures to promote capacity utilization, increase manufacturing output and grant tax concessions to exporters (v) the creation in 2002 of an industrial development coordination committee to attract foreign direct investment, stimulate competition and diversify the export base. Other structural breaks can be attributed to the banking sector reform of 2005 and economic recession in Nigeria starting from early due primary to drop in price of crude oil at the international market.

Next, the study presents the parametric measure of exchange rate volatility. This measure estimates volatility in exchange rate using the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model. This is distinct from some past studies that employed the traditional measures of volatility as represented by variance or standard deviation that are unconditional and does not recognize that there are interesting patterns in volatility study; time-varying and clustering properties. This lends credence to the choice of Generalised Autoregressive Conditional Heteroscedasticity adopted for this paper. Table 2 presents the parameter estimates and their corresponding p-value of AR(1)-GARCH(1,1) model for the study.

The statistically significant negative coefficient of the exchange rate volatility is not surprising. This is because exchange rate is a price and therefore its movements affect resource allocation in the economy. Thus, when the exchange rate is highly volatile and uncertain, as was the case in Nigeria (especially with the adoption of a market determined exchange rate since September 1986), it hinders the flow of transactions and the movement of financial assets, goods and services. Evidently, this result points to the fact that exchange rate stability is central to the flow of foreign capital into Nigeria which impact on balance of payments. A note of warning is therefore signalled to the government of Nigeria to always take cognizance look at the exchange rate movement with a view to regulating it. Since exchange rate volatility is high in Nigeria, both local and foreign investors may be scared of investing in the economy. This therefore portrays adverse effect on the balance of payments.

The results of the GARCH model shown in Table 2 revealed that exchange rate is positively related to balance of payments which is the dependent variable; while real gross domestic, inflation rate and volatility of exchange rate are negatively related to balance of payments during the study period. A keen look at the coefficients of analysed variables revealed that RGDP, INFR and VEXR are not in conformity with the apriori expectations of the study. It is however noteworthy to state that all the variables in study with the exception of INFR are significant enough to explain the dynamics of balance of payments in Nigeria. The overall GARCH probability which indicates the level of significance of the whole empirical analysis of the impact of exchange rate volatility on balance of payments revealed that the whole model for analysis is highly significant in explaining the dynamics of exchange rate volatility on balance of payments. Looking critically at the numerical value of the coefficients and their corresponding signs a 1 percent increase in exchange rate volatility will cause BOP in Nigeria to increase by 0.402326 percent.

Table 2. Summary of the GARCH (1, 1) Analysis

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	-203427.2	210131.3	-0.968095	0.3330
EXR	26717.89	2365.388	11.29535	0.0000
RGDP	-0.039578	0.008956	-4.419258	0.0000
INFR	-4044.867	5518.856	-0.732918	0.4636
VEXR	-37674.77	4336.005	-8.688821	0.0000
GARCH(-1)	0.402326	0.155237	2.591688	0.0096
R-squared	0.836695			
Adjusted R-squared	0.790031			
S.E. of regression	1789586.			
Durbin-Watson stat	1.918453			

Source: Researcher's Computation (2018).

The R squared value of 0.836695 showed that the variables in the regression equation explain 84 percent of all the variation in balance of payments in Nigeria for the period 1980 to 2016. The Durbin-Watson (DW) test statistic (d*) showed the absence of first order serial correlation between the error terms. From the result d* is approximately 2, that is 1.918453 ~ 2 for Nigeria. We therefore accept the null hypothesis (H0), which says that there is no positive autocorrelation of the errors' terms; we reject the alternative hypothesis (H1), which says that there is positive weak autocorrelation of the errors' terms.

5. Conclusion and Recommendations

The paper examined the effect of exchange rate volatility on balance of payments and through that assesses the linkage between exchange rate volatility and balance of payments in Nigeria using the Generalised Autoregressive Conditional Heteroskedasticity (GARCH) model. The empirical estimates, using available time series data over a period of 37 years, 1980 to 2016 suggested that exchange rate volatility is high in Nigeria. Therefore, both local and foreign investors may be scared of investing in the economy. This therefore portrays adverse effect on the balance of payments. The study further revealed that exchange rate is positively related to balance of payments which is the dependent variable; while real gross domestic, inflation rate and volatility of exchange rate are negatively related to balance of payments. It is however noteworthy to state that all the variables in study with the exception of INFR are significant enough to explain the dynamics of balance of payments in Nigeria. The overall GARCH model for analysis is highly significant in explaining the dynamics of exchange rate volatility on balance of payments.

The findings point to some key policy recommendations for balance of payments in Nigeria as the empirical results confirmed that exchange rate volatility has a significant negative effect on balance of payments. This implies that policy that will enhance stability of the exchange rate will promote balance of payments performance. Therefore government should not underplay exchange rate volatility in Nigeria. Finally, it is the study position that government should encourage export promotion strategies in order to maintain a surplus balance of trade which will help make the domestic currency strong and also prevent further depreciation of the Nigeria naira in the future.

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