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TARABA STATE UNIVERSITY JALINGO

EST. 2008

HARNESSING NATURE'S GIFT

AFRICAN JOURNAL OF ECONOMICS AND SOCIAL RESEARCH

A JOURNAL OF DEPARTMENT OF ECONOMICS
TARABA STATE UNIVERSITY, JALINGO, TARABA STATE, NIGERIA
www.tsuniversity.edu.ng

Vol. 1. No. 1 September, 2013

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CONTENTS

AN EMPIRICAL INVESTIGATION OF OIL PRICES AND EXCHANGE RATE VOLATILITY: THE NIGERIAN EXPERIENCE

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Abstract

This study oil prices and exchange rate volatility the Nigerian experience, examines the impact of petroleum products prices on the exchange rate volatility in the Nigerian economy. The scope of this study covers a period of twenty four years, time series data on annual basis from 1986-2010 are employed for this work. The methodology employed in this study includes; ADF and PP test, Johansen co-integration, vector error correction model, impulse response function and Arch and Garch. A stationary test was carried out using the Augmented Dickey-Fuller (ADF) and Philip Perron (PP) test where the data were found not to be stationary at level but were stationary at first difference at 5% level of significance. The Johansen co-integration test indicated that trace and max-eigen statistic both showed a 2 co-integration at 5 percent and 1 co-integration at 1percent. The VECM result indicates a 1 percent increase in PPP leads to 0.24 percent fall in exchange rate, this was further supported by the impulse response function graphs. The summation of ARCH and GARCH = 0.942921 shows the presence of volatility and the volatility is persistent. The findings in this study is in line with the empirical studies of (Amano and Norden (1995);Jin 2008; Coudert, et al., 2008) which showed that oil price directly impact on exchange rate. It was concluded that exchange rate volatility is greatly influence by the fluctuation or volatility in oil prices in the country, that is the Nigerian economy is very vulnerable to oil price shocks.

Keywords: *oil prices, exchange rate, volatility, co-integration, Vector Error Correction Mechanism, Arch and Garch, and Nigeria economy.*

Introduction

Nigeria's petroleum industry has been described as the most dynamic sector in Nigeria in recent times; and the development of oil resources as the most significant event in recent years. There is no doubt about the fact that oil has been dominating the Nigerian export trade since the gradual decline of the agricu1tura1 sector (business in Africa, June 1998). With the increasing dependence on oil revenue therefore, and the virtual neglect of other important sectors such as agriculture, Nigeria has put all her eggs in one basket. The oil industry is very important to the Nigerian economy. It provides among other things the greatest part of the foreign exchange earnings and total revenue needed for socio-economic and political development of Nigeria (Arinze 2011). The volatility in oil prices have varying consequences for different countries; while oil-producing countries reap the benefit of high oil prices, oil-importing countries experience unfavorable terms-of-trade in their external sector that can transfer into their economies in the long run.

Theoretically, an oil-price increase leads to a transfer of income from importing to exporting countries through a shift in the terms of trade. The magnitude of the direct effect of a given price increase depends on the share of the cost of oil in national income, the degree of dependence on imported oil and the ability of end-users to reduce their consumption and switch away from oil. It also depends on the extent to which gas prices rise in response to an oil-price increase, the gas-intensity of the economy and the impact of higher prices on other forms of energy that compete with or, in the case of electricity, are generated from oil and gas (Majidi, 2006).

Nigeria is highly vulnerable to fluctuations in the international oil market despite being the 6th largest producer of oil in the world. However, during periods of favorable oil price shocks are triggered by conflicts in oil-producing areas of the world, the course in the demand for the commodity by consuming nations, seasonality factors, trading positions, etc; the country experiences favorable terms-of-trade quantified in terms of a robust current account surplus and exchange rate appreciation. On the converse, when crude oil prices are low, occasioned by factors such as low demand, seasonality factors, excess supply and exchange rate appreciation, the Nigerian economy experiences significant drop in the level of foreign exchange inflows that often result in budget deficit and or slower growth (Englama *et al.,* 2010)

A recent case was the dramatic drop in the price of crude oil in the wake of the global financial and economic crises. The price of oil fell by about two thirds from its peak of $147.0 per barrel in July 2008 to $41.4 at end-December 2008. Prior to the crises, oil price was high, exchange rate was stable but with the advent of the global financial crisis oil price crashed and the exchange rate caved-in, depreciating by more than 20 per cent. Since oil price directly affects the inflow of foreign exchange into the country, there is a need to examine if it has direct impact on the exchange rate in the Nigerian economy.

The main objective of this study is to examine the relationship between oil prices and exchange rate volatility in the Nigerian economy. Section1 consist of the introduction, Section 2 reviews of literatures. The methodology adopted for the empirical study is discussed in Section 3. The empirical findings are analyzed in Section 4. Section 5 concludes the paper.

Review of Related Literature

James Hamilton's (1983) study of the role of oil price shocks in United States business cycles has had considerable influence on research on the macroeconomics of oil price shocks. As Mork's (1994) review paper outlines, economists worked for nearly a decade on methods of incorporating oil price shocks into macroeconomic models before a synergy developed between real business cycle (RBC) models and oil price shocks. An oil price shock proved to be a believable mechanism which yielded the unanticipated, temporary supply shocks needed by the RBC models. The subsequent decline of the real oil price, despite the two shocks of the 1970s, appeared to put a new light on the origins and the probable future of oil price shocks. To the extent that the oil market had undergone a permanent change in the fall of 1973, that change seemed to be more one of moderately effective cartel power centered in a politically unstable part of the world than one of a permanent shift into escalating scarcity of minerals.

Subsequent research on OPEC supply behavior (Griffin, 1985; Jones 1991; Dahl and Yücel, 1991; Wirl, 1990) and on the predictive capability of the Hotelling exhaustible resource model in the oil market (Watkins 1992) has reinforced this unfolding interpretation of the events of oil market of the 1970s and 1980s. Hamilton (1983) shifted the macroeconomic analysis of oil shocks from demand-side phenomena to the supply side, a movement which Rasche and Tatom's supply oriented analyses had not entirely accomplished, and relied on the statistical concept of Granger causality to test for directions of effect in a business cycle setting of recurrent shocks.

Akram (2004) explore the possibility of a non-linear relationship between oil prices and the Norwegian exchange rates. The non-linearity of the model improved its predictive power when compared with other similar linear and random walk models. The result from the model indicated that oil price was negatively related to the value of the Norwegian exchange rate when oil price was below US$14.0, contrary to other findings from other studies. Also, from the existing literature, Koranchelian (2005) estimated a long-run equilibrium real exchange rate path for Algeria. The result showed that the Balassa-Samuelson effect and real oil prices explained the long-run evolution of the equilibrium real exchange rate in Algeria.

Rautava (2004) examined the relationship between oil prices and real exchange rate in Russia. The study employed vector autoregressive (VAR) modeling and cointegration techniques to examine the impact of international oil prices and the real exchange rate on the Russian economy and its fiscal policy. The findings from the study indicate that the Russian economy was influenced significantly by fluctuations in oil prices and the real exchange rate through both long-run equilibrium conditions and short-run direct impacts. However, because of growth trends in the Russian economy which improved in the recent times, the role of oil prices have greatly reduced.

Anshasy *et al.* (2005) assessed the effects of oil price shocks on Venezuela's economic performance over a longer period (1950 to 2001). The study adopted a general to specific modeling VAR and VECM technique to investigate the relationship between oil prices, governmental revenues, government consumption spending, GDP and investment. The results found two long-run relationships consistent with economic growth and fiscal balance. Furthermore, they found that this relationship is important not only for the long-run performance but also for short-term fluctuations.

Olomola (2006) in his empirical study on the oil price shock and aggregate economic activity in Nigeria, used a VAR model with quarterly data from 1970 to 2003. Volatility was measured as the conditional variance of the percentage change of the nominal oil price. The five variables used for the empirical study were gross domestic product (real GDP), proxied by industrial production index (y), domestic money supply, the real effective exchange rate (reer), the inflation rate (CPI), and real oil price (Poil). The specification used for the model is the scaled specification, a non-linear transformation of oil price that takes volatility into account. The findings showed that while oil prices significantly influence exchange rate, it does not have significant effect on output and inflation in Nigeria. He concluded that an increase in the price of oil results in wealth effects which appreciates the exchange rate and increases the demand for non tradable, a situation that would result in "Dutch disease".

Gounder *et al.,* (2007) used a multivariate framework to measure the shortrun impact of oil shocks on economic growth, inflation, real wages and exchange rate. Short-run impacts were examined using linear and non-linear oil price transformation. The Likelihood Ratios tests of Granger non-causality result indicated that linear price changer, asymmetric price increase and the net oil price variables impacted significantly on the economy unlike the asymmetric price decrease. The generalized impulse responses and error variance decomposition results confirm the direct link between net oil price shock and growth and its indirect linkages through inflation and the real exchange rate. The paper, thus, concluded that oil prices exhibit substantial effects on inflation and exchange rate in New Zealand.

Aliyu (2009), assessed the impact of oil price shock and real exchange rate volatility on the real gross domestic product in Nigeria using quarterly data that span the period 1986-2007. He used the Johansen VAR-based cointegration technique to examine the sensitivity of real GDP to change in oil prices and real exchange rate volatility in the long-run while the vector error correction model was used in the short-run. The result of the long-run analysis indicated that a 10.0 per cent permanent increase in crude oil prices increases the real GDP by 7.72 per cent, similarly a 10.0 per cent appreciation in exchange rate increases GDP by 0.35 per cent. The short-run dynamics was found to be influenced by the longrun equilibrium condition. He recommended the diversification of the economy and infrastructural diversification.

Apkan (2009) analyses the dynamic relationship between oil price shocks and major macroeconomic variables in Nigeria by applying a VAR approach. The study pointed out the asymmetric effects of oil price shocks; for instance, positive as well as negative oil price shocks significantly increase inflation and also directly increases real national income through higher export earnings, though part of this gain is seen to be offset by losses from lower demand for exports generally due to the economic recession suffered by trading partners. The findings of the study showed a strong positive relationship between positive oil price changes and real government expenditures. Unexpectedly, the result identified a marginal impact of oil price fluctuations on industrial output growth. Furthermore, the "Dutch Disease" syndrome is observed through significant real effective exchange rate appreciation.

Abwaku et al., (2010) in their study examined the effects of oil price volatility, demand for foreign exchange, and external reserves on exchange rate volatility in Nigeria using monthly data for the period 1999:1 to 2009:12. Drawing from the works of Jin (2008), the authors utilized cointegration technique and vector error correction model (VECM) for the long-run and the short-run analysis, respectively. The results showed that a 1.0 per cent permanent increase in oil price at the international market increases exchange rate volatility by 0.54 per cent in the long-run, while in the short-run by 0.02 per cent. Also a permanent 1.0 per cent increase in demand for foreign exchange increases exchange rate volatility by 14.8 per cent in the long-run. The study reaffirms the direct link of demand for foreign exchange and oil price volatility with exchange rate movements and, therefore, recommends that demand for foreign exchange should be closely monitored and exchange rate should move in tandem with the volatility in crude oil prices bearing in mind that Nigeria remains an oil-dependent economy.

Data and Methodology

The data for this analysis consist of annually observations from 1986-2010. The data is divided into two periods 1986-1995 is the deregulation period while 1996-2010 is considered as the regulation period. The variables considered in the models are petroleum product prices (PPP), inflation rate (INF), exchange rate (EX) and Net Foreign Asset (NFA). These data are extracted from Central Bank of Nigeria (CBN) Statistical Bulletin (2010), and Annual Report Journal gathered from NNPC, text books, and paper presentation on related issue.

To estimate the VAR, we need to first check the time series properties of the data in order to help us decide whether the VAR will be estimated in levels, first or second difference. Here we shall use a variant of the unit root tests such as the Augmented Dickey Fuller (ADF) or Phillip Perron (PP). Depending on the nature of the time series, a variant of this test that account for structural changes may be more appropriate.

Hence, the general framework of the model to be estimated can be specified as follows: For simplicity, assume a VAR (1) model of the form:

$$X_t = B + A_1 X_{t-1} + \varepsilon_t \quad \text{.......} (1)$$

where the vector X_t = (PPP, INF, EX, GFD)

The relationship can be represented as follows:

$$\underset{X_t}{\begin{pmatrix} PPP_t \\ INF_t \\ EX_t \\ NFA_t \end{pmatrix}} = \underset{B}{\begin{pmatrix} B_1 \\ B_2 \\ B_3 \\ B_4 \end{pmatrix}} + \underset{A}{\begin{pmatrix} \beta_{11} & \beta_{12} & \beta_{13} & \beta_{14} \\ \beta_{21} & \beta_{22} & \beta_{23} & \beta_{24} \\ \beta_{31} & \beta_{32} & \beta_{33} & \beta_{34} \\ \beta_{41} & \beta_{42} & \beta_{43} & \beta_{44} \end{pmatrix}} \underset{X_{t-1}}{\begin{pmatrix} PPP_{t-1} \\ INF_{t-1} \\ EX_{t-1} \\ NFA_{t-1} \end{pmatrix}} + \underset{\varepsilon_t}{\begin{pmatrix} \varepsilon_t \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \end{pmatrix}} \quad \dots\dots\dots\dots \quad 2$$

Thus, in all VARS, each variable is expressed as a linear combination of lagged values of itself and lagged values of all other variables in the group.

Since a majority of economic variables exhibit non-stationary properties, the presence of unit roots for each variable was checked before estimating the VAR model. If unit root exists in any variable, then the corresponding series exhibits non- stationary properties. Thus, estimations based on non-stationary series may lead to spurious regressions (see, Granger and Newbold, 1974). The variables in the models are tested for stationarity using the Augmented Dicky-Fuller *(ADF)* and Philips-Perron *(PP)* tests. The ADF test is conducted using regression (5) which includes intercept and time trend:

$$\Delta X_t = a + bt + \rho X_{t-1} + \sum_{i=1}^{k} \Delta X_{t-i} + \mu_t \qquad (3)$$

Where ΔX_t is the first difference of the series *X*, *k* is the lag order, *t* is the time. The *PP* test is computed using the following regression (7):

$$\Delta X_t = a + bX_{t-1} + c(t + \frac{T}{2}) + \mu_t \qquad (4)$$

Where *a*, *b*, and *c* are the coefficients and *T* is the total number of observations.

Therefore, the *ADF* and *PP* unit root tests posits a null hypothesis $\beta = 0$ versus an alternative hypothesis $\beta < 0$, where the *ADF* and *PP* statistics is compared with the observed Mackinnon critical values.

Co-integration may be necessary if all the series have unit roots. The Johansen procedure establishes a VAR model which can be defined by the following Error-Correction Model:

$$\Delta Y_t = \sum_{i=1}^{p} \tau_i \Delta Y_{t-i} + \pi Y_{t-1} + \alpha Z_t + \varepsilon_t \qquad (5)$$

Where $\pi = \sum_{i=1}^{p}(A_i - I)$ and $\tau_i = -\sum_{j=i+1}^{p} A_j$, Δ is the first difference operator, is a $p \times 1$ vector of non-stationary variables (in levels), 0 τ_i is the deterministic element of the VAR model, Z_t is a dummy variable that takes the value 1 if there is stability and 0 otherwise, which allows a structural break of the independent variables to impact on the dependent variable, and ε_t is the vector of random errors that are normally distributed with mean zero and constant variance. The coefficient matrixπ embodies the error correction terms (ECT) and provides information about the long-run properties of the VAR. model.

Arch and Garch model

Petroleum product prices and exchange rate are volatile just like most financial data. Leslie (2011) noted that financial data suffer from heteroscedasticity in which the error terms and variances are expected to be larger or smaller for some points than the others. It may not be appropriate to model it with ordinary least square; OLS which is the commonest modeling technique because the basic assumptions concerning the means and variance of stochastic term. (The white noise assumption) for which the estimates of this technique will be accepted as robust may not hold. Besides, this problem may also make one to cast doubt on the inferential procedure because it may cause incorrect rejection of the null hypothesis i.e. type 1 error. As a result of this, this study consider two different but unique models that take into consideration the volatile nature of financial data like exchange rate and inflation into consideration.

The path of shock was traced to have started from oil prices to inflation, net foreign asset and then finally exchange rate. The past and current values of oil prices tend to be highly correlated. The oil price is directed influence by exchange rate:

$$\mathrm{EX}_t = \beta_0 + \beta_1\,\mathrm{PPP}_t + \beta_2\,\mathrm{INF}_t + \beta_3 \log(\mathrm{NFA})_t + \beta_4\mathrm{AR}(1) + \mu_t \;\dots(6)$$

$$\mathrm{PPP}_t = \beta_0 + \beta_1\,\mathrm{EX}_t + \beta_2\,\mathrm{INF}_t + \beta_3 \log(\mathrm{NFA})_t + \beta_4\mathrm{AR}(1) + \mu_t \;\dots(7)$$

$$\mathrm{INF}_t = \beta_0 + \beta_1\,\mathrm{PPP}_t + \beta_2\,\mathrm{EX}_t + \beta_3 \log(\mathrm{NFA})_t + \beta_4\mathrm{AR}(1) + \mu_t \;\dots(8)$$

$$\log(\mathrm{NFA})_t = \beta_0 + \beta_1\,\mathrm{PPP}_t + \beta_2\,\mathrm{INF}_t + \beta_3\,\mathrm{EX}_t + \beta_4\mathrm{AR}(1) + \mu_t \;\dots(9)$$

Engle (1982) advanced an Autoregressive Conditional Heteroscedasticity (ARCH) model which treats heteroscedasticity as a variance to be modeled and also test for the presence of volatility with the test hypothesis as follows:

$$Y_t = \beta X_t + \varepsilon_t \qquad (10)$$

$$\varepsilon_t / \Omega_{t-1} \sim N(0, \delta_t^2)$$

$$\varepsilon^2{}_t = \alpha_0 + \textstyle\sum_{i=1}^{q} \alpha_i\, \varepsilon^2{}_{t-i} + e_i \qquad (11)$$

Whereas Y_t is the endogenous variable X_t exogenous and ε_t is the white noise residual.

The LM test statistic indicates that $TR^2 \sim \chi^2(q)$. If $TR^2 > \chi^2(q)$ then the model rejects H_0 and considers the presence of an ARCH effect. Whereas T is sample size and R^2 is the regression's coefficient.

Generalize Autoregressive Conditional Heteroskedasticity Model (GARCH)

Bollerslev (1986) considered the conditional variance as a significant measure of information, thus extending the ARCH model to the GARCH model. The conditional variance suggests that, the error variance is a function of past squared error and past error variance i.e. the influence of the past p period of the residual error term and past q period of conditional variance. According to Wang (2009), the significance of the GARCH effect shows the presence of a spillover effect.

A univariate regression with GARCH (*p*,*q*) effects in a polynomial form with a lag operator is represent as:

$$Y_t = \alpha_0 + \alpha(L)Y_t + \beta X_t + \varepsilon_t \qquad (12)$$

$$\varepsilon_t / \Omega_{t-1} \sim N(0, \delta_t^2)$$

$$\delta_t^2 = \beta_0 + \gamma(L)\varepsilon_t^2 + \varphi(L)\delta_t^2 \qquad (13)$$

$$\alpha(L) = \sum_{i=1}^{k} \alpha_i L^i \; ; \; \gamma(L) = \sum_{i=1}^{q} \gamma_i L^i \; ; \; \varphi(L) = \sum_{i=1}^{p} \varphi_i L^i$$

Whereas Y_t is the endogenous variable and X_t exogenous, Ω_{t-1} is all collected messages up to t-1 period, and δ_t^2 is conditional variance which depends linearly on past squared-error terms and past variances. $\beta_0 > 0$, $\gamma_i \geq 0, \varphi_i \geq 0$. $\beta_0, \gamma_i, \varphi_i$, are parameters to be estimated. The Akaike Information Criterion (AIC) and Schwartz Criterion (SC) are employed to select the optimal ARMA (*p*,*q*) process. The mean equation in equation (12) thus follows an AR(1) process. $\gamma(1) + \varphi(L) \leq 1$ signifies the persistence of volatility.

Lastly, the z-test was used to test for the significance of the individual variables, the F-test to test for the joint significance, DW to test for serial correlation and R^2 to test for the general fitness of the model.

The Estimation of Vector Autoregressive Model Unit Root Test

A necessary but not sufficient condition for cointegration and VECM is that all series should share the same integrational properties in a univariate sense. Prior to testing for cointegration, we investigated the integrational properties of each of the variables by applying unit-root testing procedure. This study makes use of Augmented Dickey Fuller and Philips-Perron (PP) tests. The result shows that all variables are not stationary in levels. After first difference, the ADF and PP test of unit root indicates that all variables employed are stationary at five percent level and their use would not lead to spurious regression. Therefore, all the series are stationary or integrated of the same order one, that is, *I*(1) as expected.

Table 3: Error Correction Result of ΔPPP

Regressor	Coefficient	T-value
Intercept	5.362555	1.55472
D(PPP(-1))	0.639246	1.30519
D(PPP(-2))	-0.315203	-0.58347
D(INF(-1))	0.196807	1.21758
D(INF(-2))	0.145272	1.44248
D(EX(-1))	-0.240494	-1.53479
D(EX(-2))	-0.038613	-0.30843
D(NFA(-1))	0.515229	0.09666
D(NFA(-2))	-4.651186	0.89832
ECM(-1)	-0.387760	-2.15082

The results of the VECM produced some salient features that are worth explaining. The error correction term in column two in the table above have the expected negative sign between zero and one and is statistically significant. It shows a low speed adjustment towards equilibrium. In the base line (table 3) the estimation suggests that the speed of adjustment (the error correction mechanism) to the long run is negative but is statistically significant because only about 39 percent of the disequilibrium error which occurred in the previous period is corrected in the current period. While negative relationship exist between PPP and EX and insignificant. A one percent increase in the prices of petroleum product will lead to a decline in exchange rate by about 0.24 percent.

Fig (1) represents the plots of the accumulated impulse response functions for the estimated variables. As represented below, a shock petroleum product price gradually decline from the 1st quarter that is the short run into the long run the 10th quarter (response of PPP to EX). The accumulated response EX to PPP indicated a slight positive relationship existed from the 1st quarter to the 2nd quarter and then in the 3rd quarter decline and become negative remain steady to the 5th quarter and continued to decline and maintain negative path in the long-run.

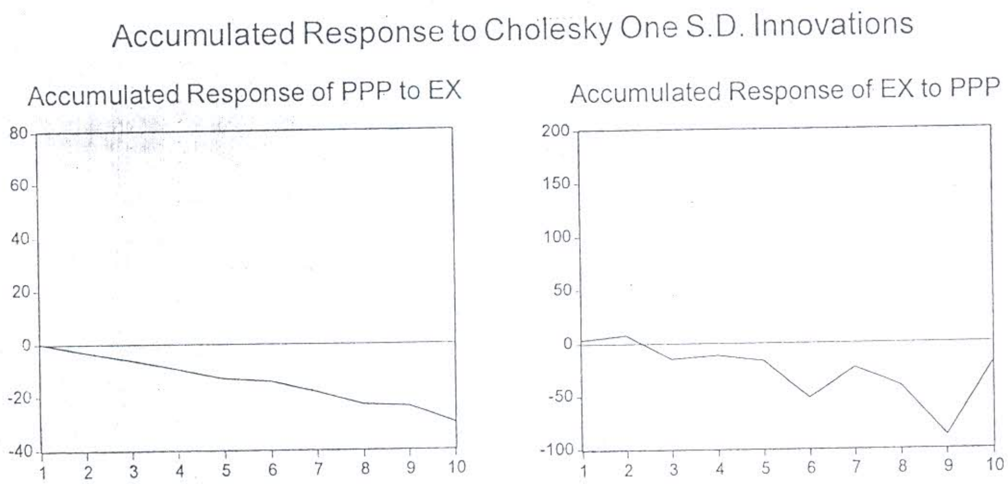

Figure: 1 accumulated impulse response

The result on table (4) shows that the overall model is good based on the different statistics obtained. The Durbin-Watson value is 1.58, R^2 is 94%....It is established from the result below that negative relationship exist between petroleum product prices and exchange rate this implies that one percent increase in the (PPP) will lead to the reduction of exchange rate by 0.68 percent. The negative relationship observed between exchange rate (EX) and inflation rate (INF) suggests that one percent increase on inflation rate (INF) lead to the depreciation of exchange rate (EX) by 0.72 percent. Finally, net foreign asset responds positively and significantly to exchange rate because it show that one percent raise in (NFA) brings about 31 percent rises to exchange rate (EX) in the Nigerian economy.

Table (1): Results of Unit Root Tests: Using Augment Dickey Fuller and Philip Perron (PP) Tests (with intercept and drift)

Variable	Level, 1st difference	Conclusion
PPP	Level -0.532601 (-0.753745) 1st difference -4.354374** (-6.203374) **	I(1)
INF	Level -2.131751 (-3.131288) 1st difference -3.238725 ** (-4.324877) **	I(1)
EX	Level -2.243776 (-2.14900) 1st difference -3.805226** (-4.544586) **	I(1)
LOG(NFA)	Level -2.541126 (-2.115872) 1st difference -3.725918** (-4.987751) **	I(1)

Critical value: 1%=-4.4691(-4.4167), 5%=-3.6454 (-3.6219), 10%= -3.2662 (-3.2474)

* 1% significance level

**5% significance level

***10% significance level

Source: Author's Estimation using E-views 4.0.

Cointegration Test

Having established that the variables are integrated of the same order, we proceed to testing for cointegration. The Johansen-Juselius maximum likelihood procedure was applied in determining the cointegrating rank of the system and the number of common stochastic trends driving the entire system. We reported the trace and maximum eigen-value statistics and its critical values at both one per cent (1%) and five per cent (5%) in the table below. The result of multivariate cointegration test based on Johansen and Juselius cointegration technique reveal that there is three cointegrating equations at 5% and two cointegration equation at 1% level of significant as indicated by the trace statistic while the max-eigien statistic only indicated three cointegrating equation at 5% significant level. These results suggest that the appropriate model to use is the VECM specification with more than one cointegrating vector in the model.

Table 2: Unrestricted Cointegration Rank Test Trace Statistic and Max- Eigen Statistic

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Max-Eigen Statistic	5 Percent Critical Value	1 Percent Critical Value
None** (**)	0.856889	73.93745	42.77089	47.21 (27.07)	54.46 (32.24)
At most1*(*)	0.641336	31.16656	22.55811	29.68 (20.97)	35.65 (25.52)
At most 2	0.311805	8.608449	8.221020	15.41 (14.07)	20.04 (18.63)
At most 3	0.017456	0.387429	0.387429	3.76 (3.76)	(6.65) 6.65

*(**) denotes rejection of the hypothesis at the 5%(1%) level

Trace and Max-eigenvalue test both indicated 2 cointegrating equations at 5% level and 1 cointegrating equations at 1% level

The parenthesis ( ) represent the max-eigen values

Source: Author's Estimation using E-views 4.0.

Vector Error Correction Model

We proceed to estimate the VECM that is designed for use with non-stationary series that are known to be cointegrated. The VECM has cointegration relations built into the specification so that it restricts the long run behaviour of the endogenous variables to converge to their cointegrating relationship while allowing for short-run adjustment dynamics. The cointegration term is known as the *error correction* term (ECT) since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. The results are presented in the table (3) below. It shows that only some macroeconomic variables are crucial in influencing the performance of the exchange rate as only few of the test statistics are significant. The results were evaluated using the conventional diagnostic tests. The estimated VECM satisfy the stability condition, that is, the vector error correction term in each of the models should have the required negative sign and lie within the accepted region of less than unity.

Conclusion

The study examines the relationship between oil prices and exchange rate volatility in the Nigeria economy using the Arch and Garch model to know if volatility really exists. The empirical results showed that exchange rate volatility is greatly influence by the fluctuation or volatility in oil prices in the country; this shows that the Nigerian economy is very vulnerable to oil price shocks.

From the results obtained, exchange rate running policies should focal point on foreign exchange demand strategies and in addition, incorporating the movement of international oil prices into exchange rate management, as Nigeria remains an oil dependent economy.

The consequences of oil price shocks on the economy are real since oil remains the major foreign exchange earner for the country. The implication of this finding is that there is likelihood for potential currency crisis after a shock occur especially negative shock in the international oil market.

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