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MODELING OF RETURNS AND VOLATILITY TRANSMISSION BETWEEN OIL PRICE AND EXCHANGE RATE MOVEMENTS IN NIGERIA

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Abstract

This study attempts to investigate the existence and nature of relationship between oil price and exchange rate in Nigeria using daily time series data spanning July 01, 2016 to July 02, 2018. The relationship was modelled within a generalized autoregressive conditional hetero skedasti city (GARCH) and extended GARCH (EGARCH) frameworks. The results from both models show an inverse relationship between oil price and exchange rate in Nigeria. That is an increase in crude oil prices leads to a decrease (appreciation of the Naira) in the Naira/US$ exchange rate and vice versa.

Keywords: Modeling, Returns, Volatility transmission, Movements, Oil price, Exchange rate

JEL Classification: A10, C22, C40, C51

INTRODUCTION

Empirical research into the relationship between oil price and exchange rate for Nigeria, is a very recent development and a detailed survey of relevant literature can be found in Adeniyi *et al*. (2012) (Salisu and Mobolaji, 2013).

The relationship between the price of oil and other macroeconomic fundamentals was introduced into the literature in the pioneering work of Hamilton (1983), who was able to show that there was a link between increases in oil prices and the US business cycle. Since thisnovel work, a lot of authors have undertaken studies into the relationships between oil prices and different macroeconomic variables for different countries including Nigeria (see, *Inter alia* Narayan *et al.*, 2008; Englama *et al.* 2012; Hussin *et al.* 2012; Kin and Courage, 2014; Abed *et al.*, 2016).

The situation in Nigeria is unique and paradoxical. Both oil price and oil output are exogenous determined because Nigeria is a member of OPEC. Oil is about 15 per cent of GDP but contributes over 80 per cent of revenue. In terms of employment, the sector contributes less because it is capital intensive. However, changes in oil prices affect virtually every segment of society because the annual budget is benchmarked against oil price. The situation would have been different if the annual budget is predicated on some other sources like taxes.

Second in the paradox is the exchange rate and the import-dependent nature of the economy and the eventual transmission to domestic prices. Current rates in the markets are indicative that Nigeria relies so much on foreign goods and services.

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Third in the paradox that further compounds the argument is the ugly fact that Nigeria is a net oil exporter; she exports crude oil and imports refined petroleum products. This has implications for the exchange rate against the background of 30 to 40 million liter daily consumption of petroleum products. This study however, is more concerned about the impact from demand side shocks. Specifically, we seek to find out if there is a positive/negative and statistically significant impact of oil price on exchange rate for net oil exporting country like Nigeria.

According to Bode stein *et al*. (2012), from a theoretical point of view, a shock in oil price may be transmitted to exchange rate through two main channels; Terms of trade and Wealth effects. While economic theory dictates that the currency of an oil exporter should experience depreciation in the event of negative shocks to oil price and appreciate in the face of positive shocks to the price of oil in the international crude market, what obtains in reality is sometimes not so. There may be auxiliary forces at play that counter-balances the exchange rate. For instance, a monetary authority may not be comfortable with large fluctuations in the nominal exchange rate, and may act to counter the pressures on exchange rate by building up or drawing down the foreign exchange reserves. Also, there is the international risk-sharing channel that may act as an automatic stabilizer through currency exposure. Since oil exporters must have accrued a large pool of foreign exchange in their reserves during the good days, a decline in the oil price complemented by depreciation in foreign exchange, could produce a positive valuation effect – a net gain for them relative to domestic GDP – therefore playing a stabilising role. That is to say, the exchange rate does not need to depreciate quite as much to safeguard external sustainability (Buetzer *et al*., 2012).

As pointed out in Salisu and Mobolaji (2013), "there are several convincing reasons justifying the need for empirical analysis of oil-price–US/Nigeria exchange rate nexus. First, Nigeria is ranked among the top ten oil producers and net oil exporters and therefore, fluctuations in oil price are expected to affect its USD reserves and by implication the purchasing power of its local currency relative to USD. Second, oil revenue accounts for over 80per cent of the total revenue of Nigeria annually and therefore; changes in oil price are expected to have serious implications on the Nigerian economy, which have to be dealt with by the relevant authority. Thus, an empirical investigation into the nexus between oil price and US–Nigeria exchange rate will provide useful insights into effective policy formulation by policy makers. Similarly, information about the probable return and spill over transmission between oil and exchange rate will offer plausible ideas to investors on how to diversify their portfolios or hedge their risks."

Nigeria is a major oil exporter therefore the role oil prices play is a very crucial one. To this end, lot of studies have been done on the nature of the oil prices - exchange rates nexus in Nigeria but to the best of our knowledge, only Salisu and Mobolaji (2013) had used daily data but their study preceded the great slump in oil prices. The average price of Brent during the study period was US$70.00. As such, this is the first time such a study would be carried out using daily data that includes the period of the great slump.Oil prices, which plummeted roughly by half since June 2014, continued through 2015 and 2016 posing economic challenges for many oil-exporting countries including Nigeria. The oil industry, with its history of booms and busts, is currently, in

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its deepest downturn since the 1990s, if not earlier, owing to supply glut and weak global demand. Earnings are down for countries that have made record earnings from taxes and royalties in recent years, leading to sharp cut in investments in exploration and production. Several thousands of oil workers have lost their jobs, and manufacturing of drilling and production equipment has fallen sharply. The poor revenue inflows from both the oil and non-oil sectors have constituted major drawbacks on government fiscal operations and exchange rate management.

Evidences from past decade show that oil price per barrel of Brent moved from an average of US$74.63 in 2005 to an average of US$81.15 in 2007 and a whooping US$107.18 in 2008, it then declined sharply to an average of US$52.53 by 2009. By 2013 the price of Brent recovered significantly averaging US$117.58 then dropping sharply again by 2015, averaging US$59.79 and by mid July 2016 it averaged US$42.20. Persistent oil shocks such as these could have extensive effects on key macroeconomic fundamentals like exchange rates, thus stirring up challenges for both fiscal and monetary policy makers. In line with

The aim of this paper is to contribute to existing knowledge by adopting the approach of Narayan *et al*. (2008), to test the relationship between oil prices and exchange rate empirically for Nigeria. The issue of both returns and volatility transmission between exchange rate and oil price will be investigated. More specifically, the objective of this paper is to examine the relationship between oil prices and Nigeria's exchange rate vis-à-vis the US dollar, by using daily data for the period July 01, 2016 to July 02, 2018.

To the best of our knowledge, apart from Salisu and Mobolaji (2013), no other study has investigated the oil price-exchange nexus for Nigeria using daily data.

The rest of this paper is organized as follows: the next section presents an overview of some related literature as well as the conceptual framework. In section three the methodology used as well as the data are presented. In section four analyses are carried out, results are presented and section five presents conclusion and proffers possible policy implications.

LITERATURE REVIEW

Theoretical framework

The theoretical basis in Narayan *et al.* (2008) was based on the argument of Darby (1982) to the effect that imported oil (or energy) impacts the aggregate production function. This study considers the inverse scenario because Nigeria is an oil exporting country. That is, a slump in the price of oil in the international market would lead to an adverse swing in the aggregate supply curve, which would then lead to a rise in aggregate prices and a drop in output[1]. With a northward move by inflation, the monetary authority would likely increase domestic interest rate

[1]Even though Nigeria also benefit with a slump in oil prices because we also import refined products, this study only considers Nigeria as an oil exporter.

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to act as a cushion. This hike in interest rate is likely to lead to increased capital importation, as foreign investors seek to take advantage of the favorable rates which would then lead to an appreciation of the domestic currency.

Empirical Literature

There exists a myriad of studies that have investigated the relationship between oil prices and exchange rates and the results have been mixed (see Salisu and Mobolaji, 2013 for a survey of literature on this).

Olomola and Adejumo (2006) examined the relationship between real oil price shock and real effective exchange rate alongside other macroeconomic variables for Nigeria using quarterly data from 1970 to 2003. By applying the variance decomposition technique based on vector auto regression (VAR), they established that a rise in real oil prices induced an appreciation of the real exchange rate.

Narayan *et al. (2008)* examined the relationship between oil price and the Fiji-US exchange rate using daily data for the period 2000 – 2006. They used GARCH and EGARCH models to estimate the impact of oil price on the nominal exchange rate and found that a rise in oil prices leads to an appreciation of the Fijian dollar relative to the US dollar. Though counter intuitive, since Fiji is an oil importer, the result was not surprising. In response to the increases in oil price, the Reserve Bank of Fiji (RBF) increased interest rates. Specifically, It raised the official interest rate in October 2005, and in less than 6 months, on 24 February 2006, the RBF raised official interest rates from 2.25% to 4.25% (RBF, 2006). Over the same period, inflation increased from about 3% to 6% and the current account deficit, partly as a result of the impact of higher oil prices, has increased to around 13% of GDP.

Englama *et al.* (2012) examined the possible effects of oil price volatility, demand for foreign exchange, and external reserves on exchange rate volatility in Nigeria using monthly data for January 1999 to December 2009. From their results they established that a 1.0 per cent permanent increase in oil price at the international market caused 0.54 per cent increase in exchange rate volatility in the long-run, while in the short-run exchange rate volatility increased by 0.02 per cent. Also their results showed that 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.

Adeoye and Atanda (2012) examined the consistency, persistency, and severity of volatility in exchange rate of the Nigerian Naira vis-a-vis the US dollar using monthly data from 1986 to 2008. The results showed the presence of overshooting volatility shocks. Further analysis revealed that the nominal and real exchange rates of naira vis-a-viz the U.S dollar are not with the traditional long run PPP model. All the incorporated measures of volatility indicated presence and persistency of volatility in the nominal and real exchange rate for naira vis-à-vis U.S dollar in Nigeria.

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Salisu and Fasanya (2012) compared the performance of volatility models for oil price using daily returns of WTI. The study analysed the oil price across three sub samples namely period before, during and after the global financial crisis and also analysed the comparative performance of both symmetric and asymmetric volatility models for the oil price. Results from the study showed that oil price was most volatile during the global financial crises compared to other sub samples. Also based on the appropriate model selection criteria, it was discovered that the asymmetric GARCH models was superior to the symmetric ones in dealing with oil price volatility. The finding indicated evidence of leverage effects in the oil market and ignoring these effects in oil price modelling will most likely lead to serious biases and misleading results.

Salisu and Mobolaji (2013) in their highly innovative study, modelled returns and volatility transmission between oil price (OP) and US–Nigeria exchange rate (EXR). The study found robust structural breaks that coincided with the period of global financial crisis as well as period of Forex crisis in Nigeria. It also established a bidirectional returns and spillover transmission between oil and EXR markets. Finally, its findings revealed evidence of hedging effectiveness involving oil and FX markets in Nigeria which implied that the inclusion of oil into a diversified portfolio of FX will improve its risk-adjusted return performance.

Bala and Asemota (2013) examined exchange rate volatility with GARCH models using monthly exchange rate return series from 1985:1 to 2011:7 for Naira/US dollar return and from 2004:1 to 2011:7 for Naira/British Pounds and Naira/Euro returns. The study compared estimates of variants of GARCH models with break in respect of the US dollar rates with exogenously determined break points. The study revealed the presence of volatility in the three currencies and showed that most of the asymmetric models rejected the existence of a leverage effect except for models with volatility break. Evaluating the models through standard information criteria, volatility persistence and the log likelihood statistic, showed there is an improvement in the results with estimation of volatility models with breaks as against those of GARCH models without volatility breaks and also, the introduction of volatility breaks reduces the level of persistence in most of the models.

Kin and Courage (2014) investigated the impact of oil prices on the exchange rate of South Africa using monthly time series data covering the period between 1994 and 2012 and employing GARCH model. Results showed a significant influence of oil prices exchange rates. In addition, the findings reveal the existence that an increase in oil prices leads to a depreciation of the rand exchange rate.

Abed *et al* (2016) investigated the consequence of oil price volatility on exchange rate across some MENA (Middle Eastern Economic Association) countries (importers and exporters) as well as examine the dynamic relationships between these shocks using GJR-GARCH. The study made use of time series data for the period 2001 – 2015. Their results show that the foreign exchange market and oil price exhibits asymmetry but the return series had no asymmetry. Further findings demonstrated asymmetric response of volatilities to positive and negative shocks as well a dynamic relationship between oil price shocks and exchange rate volatility.

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Emenike (2016) estimated and compared volatilities of Naira/US$ exchange rates in the official, interbank, and bureaux de change markets for the period January 1995 – December 2014 using GARCH (1,1) and GJR-GARCH (1,1) models. The results obtained showed that the volatilities of interbank and bureaux de change exchange rates in the previous periods influence current volatility of exchange rates. Also, there was evidence of volatility clustering in the interbank market and bureaux de change. There was also evidence of volatility persistence in the exchange rates returns series. Comparative analysis showed that the magnitude of impact of volatility shocks on current volatility as well as volatility clustering were greater in bureaux de change than in other exchange rates in Nigeria. The asymmetric parameter indicated that exchange rates depreciation tends to produce higher volatility in the immediate future than appreciation of the same magnitude in both the interbank and bureaux de change markets in Nigeria.

METHODOLOGY AND DATA

Methodology

The Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Exponential GARCH (EGARCH) models will be employed to investigate the relationship between recent oil price changes and exchange rates in Nigeria. Bollerslev (1986) put forward the GARCH model as an extension to Engle's (1982) framework and it has been popular since the early 1990s. On the other hand, Exponential General Autoregressive Conditional Heteroskedastic modeled was developed by Nelson (1991).

The Daily returns were computed as follows:

$$EXR_t = 100 * (exch_t / exch_{t-1})$$

$$OPR_t = 100 * (brent_t / brent_{t-1})$$

where EXR_t is the daily returns on exchange rate, $exch_t$ is naira-dollar exchange rate for period t while $exch_{t-1}$ is taking one lag of naira-dollar exchange rate. Opr_t, stands for the daily returns on oil price, $brent_t$ is the daily spot price for brent crude for period t while $brent_{t-1}$ is taking one period lag of the daily spot price for brent crude oil.

Following the approach in Narayan *et.al*. (2008),wego on to describe the relationship between oil prices and exchange rate with the aid of GARCH (*p*,*q*) and EGARCH (*p*,*q*)

The mean equation is given by:

$$Exr_t = c + \beta OPR_t + \varepsilon_t \quad (1)$$

where$\varepsilon_t$is the white noise residuals N(0,σ^2).

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The variance equation for the GARCH (p, q) is expressed as

$$\sigma_t^2 = \omega + \alpha\varepsilon_{t-1}^2 + \beta\sigma_{t-1}^2 \quad (2)$$

where ω is constant, ε_{t-1}^2 is the ARCH term and σ_{t-1}^2 is the GARCH term. From equation 2, present volatility is a function of immediate past volatility and immediate past squared error.

In the similar way, EGARCH model can be expressed:

$$\sigma_t^2 = \omega + \alpha\left[\frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}}\right] + \beta\frac{\varepsilon_{t-1}}{\sqrt{\sigma_{t-1}^2}} + \gamma\sigma_{t-1}^2 \quad (3)$$

Or

$$\log(\sigma_t^2) = \omega + \gamma\log(\sigma_{t-1}^2) + \beta\frac{u_{t-1}}{\sqrt{\sigma_{t-1}}} + \alpha\left[\frac{|u_{t-1}|}{\sqrt{\sigma_{t-1}}} - \sqrt{\frac{2}{\pi}}\right] \quad (4)$$

The EGARCH model has the added advantage of the model being expressed in terms of log of h_t, so that even if the parameters are less than zero, the conditional variance will always be positive. There is therefore no need to artificially impose non-negativity constraints.

Data

This study uses daily data from CBN statistical database and Bloomberg for the period July 01, 2016 to July 02, 2018.

RESULTS

Preliminary Analysis

This section provides some preliminary analysis which involves; graphical analysis, descriptive statistics, unit root test.

Graphical Analysis

Figure 1 below shows that both series display volatility and volatility clustering but it appears to be more in oil price series.

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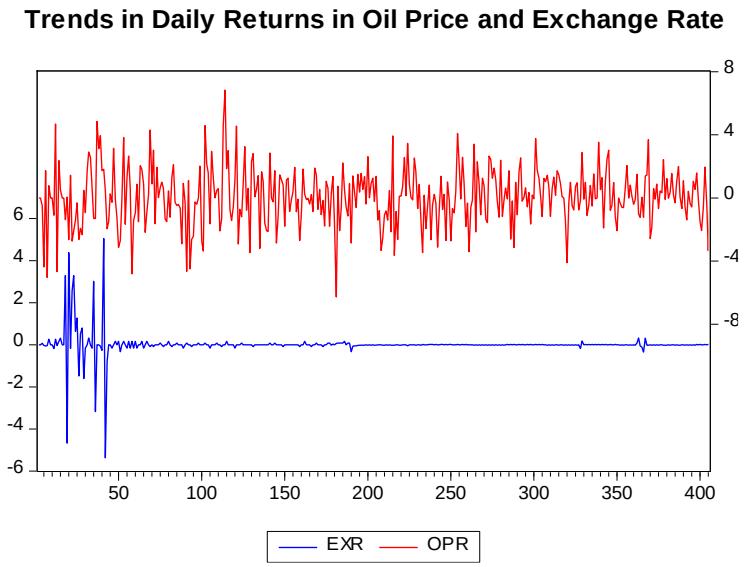

Figure1: Daily Returns in Oil Price and Exchange Rate Returns

Table 1 shows the descriptive statistics, results of the normality for the daily returns of the oil price and Naira/US$ exchange rate.

Table 1: Descriptive Statistics

Statistics	Variables	
	EXR	**OPR**
Mean	0.0199	0.0729
Maximum	5.0483	6.8306
Minimum	-5.3725	-6.2645
Std. Deviation	0.615	1.8126
Skewness	0.2646	-0.0290
Kurtosis	48.5262	3.7327
Jarque-Bera	34980.55*	9.11753**

*& ** represent 1% and 5% level of significance

Under assumptions of normality, skewness and kurtosis have asymptotic distribution of N (0) and N (3) respectively (Gujarati, 2003). Empirical distribution of the exchange rates returns differ significantly from the normal distribution.

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Table 1 show positive skewness in exchange rate returns and negative skewness in oil price returns. Kurtosis are positive with a value for the return series of the exchange rates and oil price as 48.526 and 3.7327 respectively, thus to the fact that the returns distribution are leptokurtic. Therefore, the mean equation should be subjected to autoregressive conditional heteroscedasticity (ARCH) test (Adeniyi et al, 2012). For normality, skewness should be zero and kurtosis should be three. Jarque and Bera (1987) statistics, indicate that the null hypothesis of normal distribution in both exchange rates series and oil price is rejected

Also, unit root test is carried out to determine the order of integration (i.e. number of times they are to be differenced to achieve stationarity) of the variables. In standard econometric analysis of the data used in research, a stationary test is to be carried out; this is due to the fact that most time series data are non-stationary. There exist various types of stationary test but this study employed Augmented Dickey Fuller test (ADF) test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test. The test was carried out on the return series and it shows that the variables are stationary at level at 1 percent level of significance as shown in the table 2.

Table 2: ADF and KPSS Test

	ADF			**KPSS**			**Order of Integration**
Variables	**None**	**Constant**	**Constant and Trend**	**None**	**Constant**	**Constant and Trend**	
EXR	**-31.1718***	**-31.1891***	**-31.2941***	**0**	**0.224***	**0.08***	**I(0)**
OPR	**-18.9116***	**-18.9172***	**-18.9315***	**0**	**0.123***	**0.04***	**I(0)**

* sgnifiest 1% level of significance

Test for ARCH Effects

We went further to run an OLS regression of the mean equation stated. The major reason is to see the possibility of using OLS model as the preferred model for estimation. This is done by testing for ARCH effect in the estimated OLS regression model. From table 3 below it was found that the obtained p-values is either zero of very close to zero implying that we are to reject the null hypothesis of no ARCH effect. This basically means that the OLS regression model suffers from ARCH effects and hence cannot be the preferred model of estimation. This was remedied using the GARCH/EGARCH model.

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Table 3: Test for ARCH Effects

Diagnostics	OLS
ARCH-LM(5)	81.335 (0.000)
ARCH-LM(10)	40.197 (0.000)
ARCH-LM(15)	28.565 (0.000)
ARCH-LM(20)	19.132 (0.000)

() represent probability levels

Model Results and Diagnostics

Preliminary analyses of lag selection using SIC indicate that the Naira/US$ exchange rates returns and oil price returns can be modeled with an AR (1) component for the mean equation, and GARCH (1, 1) as well as E-GARCH (1, 1) were selected for the variance equation. The result of the GARCH model and E-GARCH model is presented in Table 4. In a volatility model, they are different versions of the model but the choice of model is determined using SIC/AIC value. The model with least SICS/AIC value should be used as the model to be estimated. (Afees, 2017). Based on the result presented in table 4 below, the EGARCH (1, 1) model has the lowest SIC/AIC, hence interpretation of the result would focus on the E-GARCH model.

Nonetheless, in the result of the GARCH (1, 1) model reported in column 2, the mean equation shows that an increase in oil price will appreciate pressure on the exchange rate as the oil price was found to be negative and statistically insignificant. Secondly, the variance part of the model is also statistically insignificant.

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Table 4; GARCH (1, 1) model and EGARCH (1, 1) model

	GARCH(1,1)	EGARCH(1,1)
Mean Equation		
c	-0.000647 (0.7557)	-0.00074 (0.3803)
β	-0.000292 (0.6635)	-0.000232 (0.5794)
Variance Equation		
c	0.2706 (0.9977)	-0.3317 (0.000)
α	334.781 (0.9977)	0.6638 (0.020)
Θ	0.7632 (0.000)	0.3402 (0.039)
ϒ		0.9598 (0.000)
Diagnostics		
Q-Stat(5)	5.7484 (0.331)	4.3188 (0.504)
Q-Stat(10)	15.191 (0.125)	14.012 (0.172)
Q-Stat(15)	17.570 (0.286)	15.588 (0.410)
Q-Stat(20)	24.735 (0.212)	23.759 (0.253)
ARCH-LM(5)	0.0201 (0.999)	0.0251 (0.999)
ARCH-LM(10)	0.0552 (1.0000)	0.0585 (1.000)

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ARCH-LM(15)	0.0398 (1.000)	0.0492 (1.000)
ARCH-LM(20)	0.8474 (0.6547)	1.3019 (0.1737)
AIC	-3.571	-3.594
SIC	-3.511	-3.566

Figures in parentheses represent probability levels

The result of the EGARCH model is reported in column 3. From the mean equation, an increase in oil price will impact negatively on exchange rate. That is an increase in oil price will appreciates exchange rate. Specifically a 100% increase in oil price will lead to an appreciation of the Naira –US dollar by around 0.02% while a plunge in oil price by 100% will depreciate exchange rate by 0.02%. This finding is in line with the theory that exchange rate appreciates in response to rising oil price and depreciates in response to falling oil price in oil exporting countries (Krugman 1983) and other relevant empirical literature Akram (2004) and Bergv all (2004), Olomola and Adejumo (2006). This transmission channel is referred to as the Wealth channel that was introduced by Krugman, 1983 and Golub (1981) as discussed in chapter 2.The basic idea is that oil-exporting countries in this case Nigeria experiences a wealth transfer when the price of oil rises. (Bénassy- Quéré et al., 2007). When oil prices rise, wealth is transferred to oil exporting countries. For this reason, the currencies of oil-exporting countries to appreciate and currencies of oil-importers to depreciates (Beckmann and Czudaj, 2013b). Furthermore, the elasticity channel argues that the transmission of changes in oil price to exchange rate depends on the elasticity of oil import demand of a nation (Nkomo, 2006; Abed et al, 2016). If the import demand of oil of a nation is elastic and oil price increases, it can cut down its oil demand which has the tendency of appreciating its exchange rate or at least neutralize the effect of increase in oil price. On the other hand, if the import demand is inelastic, oil price increase leads to depreciation of the exchange rate of the oil importing economy. Invariably, for an oil exporting country, oil price increase will lead to appreciation of the exchange rate if the export demand (Abed et al, 2016, Kin and Courage, 2014**).** From this, it could be said that for an oil exporting county, if export supply of oil is elastic and oil price decreases, it would lead to depreciation of the exchange rate of the oil exporting country, in this case Nigeria. This further explains the result gotten in our analysis. This was the case in Nigeria when oil price dropped in 2014, it led to depreciation of our exchange rate.

Looking at the variance equation, the parameter Θ captures asymmetry. This parameter is statistically significant at 5% which implies asymmetry effects of exchange rate volatility. The positive sign implies that, a positive (depreciation) shock will give rise to higher volatility than negative (appreciation) shock. The volatility persistent parameter (ϒ) is statistically significant and the coefficient is relatively large (close to 1) implying that a shock to exchange rate volatility

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has persistent effect. It also implies that news about volatility from the previous periods has an explanatory power on current volatility in other words exchange rate volatility has effect on exchange rate itself.

The residual diagnostics results are reported in the final panel of the Table 4 above. The Ljung-Box Q-statistics and ARCH-LM test computed at various lags suggest that the null of no auto correlation and no ARCH effect cannot be rejected hence the residuals are free from auto correlation and ARCH effects. This implies that the models are well behaved.

Conclusion and Policy Recommendations

This paper examines the relationship between oil price and Naira/Dollar exchange rate using daily data for the period July 01 2016 to February 07 2018. This study uses the GARCH and EGARCH models to estimate the impact of oil price on exchange rate. The results from both models show an inverse relationship between oil price and exchange rate in Nigeria. That is an increase in crude oil prices leads to a decrease (appreciation of the Naira) in the Naira/US$ exchange rate and vice versa. Specifically, in the EGARCH model, a 100% increase in oil price will lead to a 0.02% appreciation in exchange rate of Naira with respect to US dollar. This result is in line with findings in literature especially for a net oil exporting country like Nigeria (Koranchelian et al., 2005, Zalduendo, 2006, Aziz, 2009, Korhonen and Juurikkala, 2009, Ogundipe et al., 2014).

There are several policy implications of the empirical results presented in this paper. First the appreciation of the exchange rate weakens the competitiveness of exports of non-oil goods and services in these countries hence there is the need for the Nigerian economy to be diversify into other sectors like agriculture and manufacturing to encourage exports. To this end, as Hasanov (2011) states, there is a need for a policy mix were monetary policy focuses on price stability and fiscal policy focuses on achieving full employment and efficient allocation of economic resources. These policy have to be implemented jointly with efficient coordination to eliminate the negative effects of oil prices and, thus, to curb high prices, which lead to the appreciation of the exchange rate.

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