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Article

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International Journal of Energy Economics and Policy

Provided in Cooperation with:
International Journal of Energy Economics and Policy (IJEEP)

Reference: Manasseh, Charles O./Ogbuabor, Janathan E. et. al. (2019). Analysis of oil price oscillations, exchange rate dynamics and economic performance. In: International Journal of Energy Economics and Policy 9 (1), S. 95 - 106.
doi:10.32479/ijeep.5944.

International Journal of Energy Economics and Policy

ISSN: 2146-4553

available at http: www.econjournals.com

International Journal of Energy Economics and Policy, 2019, 9(1), 95-106.

Analysis of Oil Price Oscillations, Exchange Rate Dynamics and Economic Performance

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Received: 23 December 2017 **Accepted:** 03 October 2018 **DOI:** https://doi.org/10.32479/ijeep.5944

ABSTRACT

This study examined the influence of oil price oscillation and exchange rate dynamics on economic performance. While multiple regression models was adopted to examine the effect of oil price and exchange rate dynamics on economic performance, we employed exponential generalized autoregressive conditional heteroschedasticity (EGARCH) to investigate the effect of oil price oscillation on exchange rate dynamic using annual time series data that covers the period 1970–2013. However, the results of the study suggested that real exchange rate (REXR) exhibits volatility of about 16%. The result also shows that 10% increase in oil price leads to 19% increase in REXR in the long run. Nonetheless, there is no evidence of fluctuation in the foreign exchange rate market, caused by changes in oil prices in Nigeria as at the time of the study since the shock effect between oil price and exchange rate dynamics is relatively not significant in the long run and hence, in explaining the reasons for volatility in exchange rate as represented in EGARCH result. Also, we observed a positive relationship between oil price, exchange rate dynamic and economic performance (proxy; real gross domestic product). From the empirical findings, this study therefore recommends that government should reduce the pressure on exchange rate by diversifying the economy so as to reduce the pressure on oil. This will help to stabilize oil price and promote growth.

Keywords: Oil price oscillation, Exchange Rate Dynamic, Economic performance
JEL CLASSIFICATIONS: F30, F31, P331

1. INTRODUCTION

The interplay of oil price and exchange rate in Nigeria has enormous implications in Nigerian economy. As the main stay of the Nigerian economy, oil sub-sector dominates the volume of the country's export and foreign exchange earning of the country. Consequently, oil price and exchange rate dynamics in Nigeria has been a much debated issues in the economy considering its volatility and subsequent influence on range of other sectors of the economy. It has been acknowledged that exchange rate depreciation persuade the expansion of exports and reduce imports, whereas its appreciation could cause a fall in exports, vis-à-vis promoting importation. Hence, the depreciation in exchange rate could lead to an amazing transfer of income from import dependent countries to exporting countries via a swing in the terms of trade (Aliyu, 2009), affecting the economic performance of both countries. Be that as it may, the understanding that oil price hike according to Aliyu (2009) and Hamilton (1983) have enormous negative influence on the performance of an economy is largely based on the relationship between the timing of oil price hike and economic downturn. While recognizing that oil price shock in the level of exchange rate and appreciation exert positive impact on economic growth in Nigeria, McKillop (2004) findings was contrary to their view. From his study, he argued that

higher oil prices reduce economic growth, generate stock exchange panics and produce inflation, believing that higher oil price could lead to monetary and financial instability. In like manner, Jin (2008) added that the increase in the international oil prices and violent fluctuation of the exchange rate may be regarded as disincentive to economic performance. Contrary to these opinion, Greenspan (2004) shows that oil prices alone in modern market-based economies is difficult to infer in a way in which policy is automatically obvious factor for economic performance.

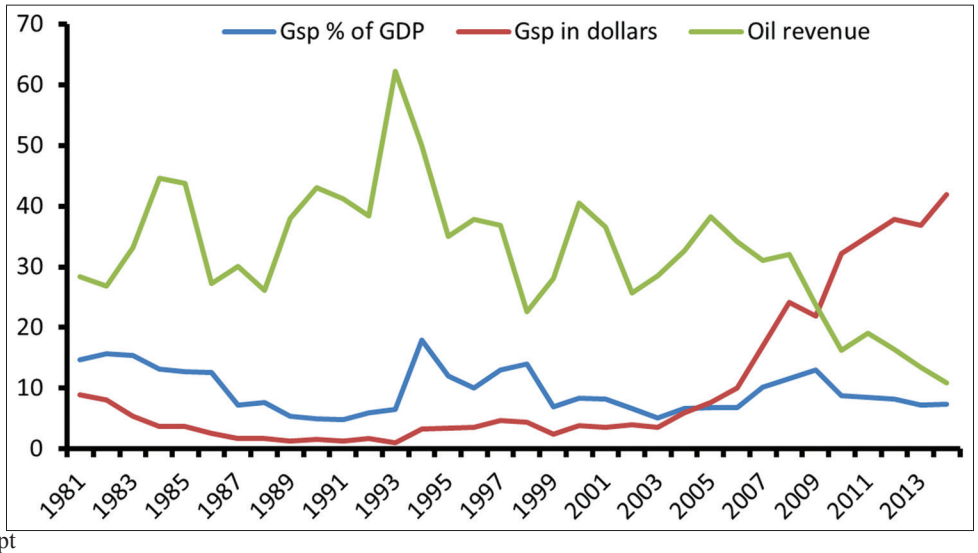
In the past, the international oil prices have risen significantly resulting to a boom in many oil reach nations particularly Nigeria while the present crash in oil price has been argued to have pushed the country's economy into stagnation that metamorphose into recession. An increase or decrease in petroleum prices tends to have a contradictory or expansionary impact on world demand and growth in the short term. Therefore, as the price of oil goes up, Naira tends to appreciate against other major currencies in sub-Sahara Africa and the world at large. This is due to the fact that Nigeria is a net oil exporter; when oil prices are high, Nigeria tends to reap greater revenues from its oil exports, strengthening the domestic currency (e.g., Naira) in the foreign exchange market. In addition, evidence from post-Breton woods era pointed the significant role of oil price fluctuations in the determination of the path of the exchange rate. Following Krugman (1983) findings, the appreciation or depreciation of exchange rate respond to rising or fall in oil prices of exporting countries, while the reverse becomes the case in oil importing countries. Accordingly, Englama et al. (2010) maintained that a dynamic exchange rate exhibits many challenges in international trade, thus making investments more difficult due to the danger that may emanate from exchange rate increases. However, this interaction has the tendency of increasing the business risk and the uncertainty of external transactions, which in most cases disposes a country to a related shock from exchange rate fluctuations (Jin, 2008). In addition, hikes in crude oil prices could also raise inflation, though the magnitude of this inflation partly depends on the degree of labour market flexibility and the producer's capacity to transfer the increases in cost to the consumers.

Over time, the impact of rising or decreasing oil prices on economic activities and inflation depends also on policy responses and supply side effects (IMF, 2000). Thus, it has been argued that periods of increase in price of crude oil result to huge inflow of oil revenues in Nigeria which led to expansion in the level of government spending while the periods of decrease in oil price deplete oil revenues with its consequence on budget deficits. However, Nigeria relies heavily on revenue from crude export with special interest in massive importation of refined petroleum and other related products (Aliyu, 2009). Evidence has shown that government spending before 1999 was below N0.5 trillion, but surge to N1.02 trillion and N1.5 trillion in 2001 and 2004 respectively while the figures for 2006 and 2007 stood at N2.04 and N2.45 trillion respectively (Figure 1). Furthermore, total imports by the oil sub-sector, accounts for an average of 22.4% between 2000 and 2007 in the Nigeria's total visible trade. Precisely, the sub sector accounts for 17.5% in 2001 and rose to 28.5% in 2005 which stood at 27.3% and 21.2% in 2006 and 2007 respectively (Aliyu, 2009).

As the 6th largest producer of oil in the world, Nigeria seems to be vulnerable to fluctuations in the international oil market and this has affected the performance of the economy through its effect on the foreign exchange reserve. Hence, given the fact that Nigeria heavily depends on crude oil proceeds; a deep fall in international oil price has been argued to be the major cause of the current economic downturn to the current economic meltdown and hence, has fragile macroeconomic implication (Aliyu, 2009).

Generally, a rise in price of crude oil increases real national income through higher export earnings. Although part of this earnings may be offset by losses from lower demand for exports. Moreover, in net oil-importing countries, higher oil prices lead to increase in revenue and inflation together with increase in input costs, causing a fall in non-oil demand with a corresponding fall in level of investment (Wakeford, 2006). Consequently, this results to a fall in tax revenues and increase in budget deficit due to rigidities in government expenditure, which in turn drives interest rates up because of resistance to real declines in wages. In addition, this

Figure 1: Graph of government spending (gross state product % of gross domestic product) and oil revenue



Source: Authors concept

increase in oil price could also leads to upward pressure on nominal wage levels and wage pressures in conjunction with reduced demand, resulting to increase unemployment in the short term. Therefore, as this effect becomes more severe, the more sudden and pronounced the prices increase with a magnified impact on consumer and business confidence (Majidi, 2006).

Nonetheless, the Nigeria crude oil output has been severely affected by increasing theft, persistent insurgent attack such as the Niger-Delta, worsened by a continuous decline in crude oil price in the world market. This continues decline may cause a fall in foreign exchange earnings of the country especially in the case of mono-product economy and consequently resulting to a fall in the capacity of the Central Bank of Nigeria (CBN) to fund foreign exchange market. The low level of foreign exchange reserve has induced free movement of exchange rate and as a result, has implication on the demand side. The demand for foreign exchange has been on increase in present time due to high demand for imported finish products, dependence of the industrial sector on imported raw materials and other input, capital flow reversals by portfolio investments and high speculative demand has caused uncertainty in the foreign exchange market (CBN, 2013). Consequently, the increased foreign exchange demand in the face of unstable supply caused exchange rate volatility. Be that as it may, the oscillation in oil price can benefit or hurt an economy (Oriakhi and Osaze, 2013). The higher the oscillation, the more volatile the output of oil rich countries and government revenue becomes. Inversely, the current fall in oil price in Nigeria has affected the index and continuous depreciation of the local currency Oluwatomisin, Ogundipe, Ojeaga and Ogundipe (2014). To this point, many analysts tag the current macroeconomic instability in Nigeria to the recent fall in crude oil revenue owing to the fall in oil prices and the volatile nature of real exchange rate (REXR) experienced during the first quarter. Also, Nigeria's reliance on oil production for income generation has serious implications in managing her economic policies. Consequently, the short fall on oil revenue occasioned by oscillation in international oil prices had often led to deficit in the country's budget. These deficits normally have been managed by external or internal borrowings and most likely, through downward adjustment in budgetary allocation. However, this short fall in oil receipt owing to oscillation in international oil price has negative effect on economy performance best explained by dutch disease. This syndrome explains the possibility of decline in the productivity of manufacturing sector regardless of any increase in the exploitation of natural resources. This affects the development of many emerging economies due to over dependent in oil revenue. Thus, making fiscal planning uneasy and in that case the quality of public spending will be lessen, which in most cases causes financial disaster.

Considering the recent green alternative policy by federal government of Nigeria to diversify the economy with emphasis on agriculture, mining and manufacturing and as well, the world preached inclusive growth, there is need for urgent protection of the economy from exchange rate dynamics and oil price oscillation since it is now a well established fact that dependency on oil revenue alone, makes the Nigerian economy vulnerable. However for these reasons the study analysis the relationship between oil price oscillations, exchange rate dynamics and economic performance. Also, the study extended its investigation on the effect of oil price oscillation on exchange rate dynamic. While previous studies in this discussion in Nigeria adopted VAR-based cointegration and vector error correction technique (Aliyu, 2009 and; Ogundipe et al., 2014) on the basis of quarterly data from 1986Q1 to 2007Q4, we employ multiple regression model and exponential generalized autoregressive conditional heteroscedastic method with annual data that span the periods 1970–2013 for the analysis. Thus, this paper differs from the works of Aliyu (2009) in terms of the methodology and scope. Hence, the paper further assesses the exhibition of volatility clustering from 1970 to 2013. This study was extended with further inquire in the long run relationship between in the series; and the direction of causality between them using granger causality tests. exponential generalized autoregressive conditional heteroschedasticity (EGARCH) is considered most appropriate for this study because it has the ability of predicting volatility even over horizons as long as one year and more. Also, it is a multifactor volatility models. The rest of the paper is organized in the following way. Section two dwell on review of related literature, section three presents the research methodology and data source, while section four contains empirical results and discussion and section five finally discussed the summary and recommendations.

2. REVIEW OF RELATED THEORETICAL AND EMPIRICAL LITERATURE

Oil price oscillations and exchange rate dynamics have received significant attention in the past and the present time for a distinguished role it play in economic performance (Ogundipe et al., 2014). The relation between cause and effect of enormous increases in oil price on economic performances through its influence on some macroeconomic variables have been of great worry among researchers, economists, analysts and as well, the general public since the ugly experience from two major international oil price shocks in the 70s (Sill, 2009). Many studies have argued that oil price have a significant influence on exchange rate, maintaining that oil price may be sufficient to explain all the long-run movements in exchange rate (e.g., Al-Ezzee, 2011). Like other low income and emerging economies, Nigeria adopted two major exchange rate regimes for the sole aim of attaining internal and external balance; and to maintain stable exchange rate in the economy (Umar and Soliu, 2009). Moreso, it has been stipulated that unstable REXR arising from volatile oil prices are detrimental to capital formation, non-oil sector performance and per-capita income of the households and their saving (Serven and Solimano, 1993 and Bagella et al., 2006). This is why Isard (2007) argued that the consequences of extensive misalignments of exchange rate can lead to shortage in output and vast economic mishap. In addition, in a study by Trung and Vinh (2011) on the impact of oil shock, they pointed two reasons in which macroeconomic performance indicators may be affected by oil shocks. First, oil increase could deplete aggregate demand given that income is reallocated between net oil import and export countries. Also, increase in oil price alters economic performance because, in low income countries like Nigeria, energy consumption takes the largest chunk of household income, and the amount of crude

oil purchased by firms are reduced, resulting to underutilization of some factors of production like labor and capital (Ogundipe et al., 2014). Second, since crude oil is considered the basic input to production process, a rise in oil price causes a decline in the supply of oil owing to a rise in the cost of crude oil production (i.e., supply side effect) which in turn leads to degeneration of possible output and slowdown economic performance.

Considering the relevance of stable exchange rate in an economic performance, many researchers around the world have been on their quest to establish the benefits and the consequences of volatile exchange rate in developed, emerging and less developed countries. Be that as it may, Schnabl (2007) argued that theoretically, flexible exchange rates allow an easier adjustment in response to asymmetric country specific real shocks. Under fixed exchange rate system, trade and investments between two currencies are easy and predictable. It is mostly useful for small economies that ordinarily borrow for foreign currency and as well as benefiting economies that borrow for the sole purpose of the economic expansion. Therefore, the effects of low exchange rate volatility are sometimes associated with lower transaction costs for international trade and capital flows thereby contributing to higher growth. Among other benefits is that it promotions transparency in international prices, through the ease of prices comparison in different countries. The elimination of exchange rate volatility could enhance the efficiency of international arbitrage, productivity and welfare. Mundell (1961) opined that monetary and exchange rate policies are the chief source of uncertainty and volatility in small open economies and economic growth is enhanced when exchange rate fluctuations are smoothed. Schnabl (2007) argued that even in a large and comparatively closed economies are responsive to greater exchange rate swings particularly in the case of exchange rate appreciation.

The transmission mechanisms, according to Jin (2008) through which oil prices affect real economic activity include both supply and demand channels. The supply side effects are related to the fact that crude oil is a basic input to production, and an increase in oil price leads to a rise in production costs that induces firms' lower output. The demand side effect is derived from the fact that oil prices changes affect both consumption and investment decisions. Consumption is adversely affected because increase in oil price affects disposable income and the domestic price of tradable. Investment is adversely affected because such increase in oil price also affects firms' input prices and thereby increasing their costs.

In view of Aliyu (2009), academic, analysts and policy makers around the globe have raised concerns over the effect of asymmetric shocks on economic performance owing to high exchange rate and oil price variability. But according to the study conducted by Amano and Norden (1998), oil fluctuations has been a major issue in most of the third world nations whose sources of revenue is largely dependent on crude oil, and this has had a significant consequence on the economic activities of these countries. Though, they argued that the severity and the effects of oil price shocks may differ from one country to the other. They also reiterated that the effect on oil exporting countries may be difference from oil importing countries, pointing that high volatility in oil prices tend to benefits oil exporting countries more but poses problems for oil importing countries - that's when the international oil price have a consistent upward swing. This idea was supported by the postulate Plante (2008), which believed that the immediate effect of positive oil price shocks is the increase in the cost of product for oil importing countries, this is likely to reduce output and the magnitude of this will depends on the demand curve for oil. Higher oil prices lower disposable income which then leads to a decrease in consumption. Once the increase in oil price is believed to be permanent, private investments will decrease, but perceiving the shocks are as transitory could lead to less use of oil less in production, resulting to a decline in the productivity of labor and capital and potential output. This is likely to have a greater influence on the economy than a decrease in oil price (Patti and Ratti, 2007). But Rickne (2009) takes a divergent view in his argument. He strongly believed that legal institutions influences the degree to which the REXR in oil exporting countries is affected by international oil price shocks, stressing that strong institutions protect REXR from oil price volatility by generating a smooth pattern of fiscal spending over the price cycle. This is further explained by a study on 33 oil exporting countries by (Mordi and Adebiyi, 2010). The findings shows that countries with high bureaucratic quality with strong and impartial legal system have REXR that are affected less by oil price volatility. Further inquiry also shows that the asymmetric effect of oil price changes on economic activities is different for both oil price increase and oil price decrease. However, argument that oil price serves as a major determinant of REXR mystifies the results for oil exporting countries (Rickne, 2009).

In addition, there have counter argument on oil price, exchange rates and economic performance relationship across the globe but up to this moment there is no consensus on the link. On this note, Korhonen and Juurikkala (2007) opine that oil prices increase cause a REXR appreciation mostly in oil exporting countries. But looking at the relationship between oil prices and REXRs for oil importing countries, studies by Camarero, Ordóñez and Tamarit (2002), and Spatafora and Stavrev (2003) confirm the response of REXR to long run oil prices change. Also in a study on Euro against Russia currency, Suseeva (2010) found a long run and positive relationship between the real oil price and the real bilateral exchange rate. In a similar study, Lizardo and Mollick (2010) proof that from 1970s to 2008s, movements in U.S dollar against major currencies was significantly explained by oil prices volatility. They concluded that when oil prices increases, currencies of oil importers suffer depreciation. On the other hand, in net-oil exporters such as Canada, Mexico and Russia increase in oil prices leads to a noteworthy depreciation of the US dollar. Even in the presence of research findings, Akram (2004) strongly argued that there no linear relationship between oil prices and the exchange rates in a study in the Norway.

Using quarterly data from 1974 to 1992 and comparing the United States of America to four different countries such as Germany, United Kingdom, Japan and Canada, Clarida et al. (1999) estimate the share of exchange rate fluctuations that is due to the different shocks in oil and found that more than 50% of the variance of REXR changes over all the horizons was

caused by real oil shocks. In a similar study, Amano and Norden (1998) using real effective exchange rates for Germany, Japan and United States observed real oil price as the most important determinant REXRs in the long run. They further argued that when the productivity of tradable goods relative to non-tradable goods is larger in other countries, there will be REXR appreciation which somewhat supported Balassa-Samuelson hypothesis as formulated by Balassa (1964). Coudert and Dubert (2004) sees Balassa-Samuelson effect as the mechanism by which an appreciation of REXR occurs owing to changes in relative productivity. The survey shows that the appreciation in REXR observed in central and Eastern Europe in early 2000 stemmed from the Balassa effect. In an experiment for further investigation, Sossounov and Ushakov (2009) examined the influence of oil price fluctuations and productivity differentials on REXR, assuming that oil price is the main export good driving the terms of trade in oil exporting countries, using real oil price as a measure of term of trade. Their findings suggests that price of the main exported good is an indicator of the terms of trade. Also, Choudhri et al.(2004) stipulated strong evidence of the workings of the Balassa Samuelson effects using a panel of 16 developing countries. However, Balassa-Samuelson hypothesis was further examined by Kutan and Wyzan (2005). The evidence shows that changes in oil prices had a significant effect on the REXR during 1996–2003. In like manner, investigating over fifty commodities in oil exporting developing countries, Cashin et al. (2004) found a long-run relationship between exchange rate and the exported commodity's price in one third of their sample. In a recent study, Ozsoz and Akinkunmi (2011) also demonstrated the positive effects of international oil prices on Nigeria's exchange rate. In a study by Chen and Chen (2007) using monthly panel of G7 countries, a long run relationship between real oil price and REXRs was investigated and they found that real oil prices is a dominant cause of REXR dynamic.

Furthermore, from the review of other studies, it is obvious that oil price shocks affect economic performance. But study by Olomola (2006) take a different dimension going by their findings on the impact of oil price shocks on aggregate economic activity in Nigeria using quarterly data from 1970 to 2003. In contrary to some empirical works, his study shows that oil price shocks do not affect output and inflation in Nigeria but were found to have a significant influence on exchange rate. In Bahrain Johansen co-integration test is used to examine the co-integrating relationship among the real gross domestic product (GDP), real effect exchange rate and real oil price of a country. Real GDP of Bahrain is more elastic to changes in international oil prices than REXR (Al-Ezzee, 2011). Research conducted on Vietnam from the period of 1995–2009 using the vector autoregressive model (VAR) produce results that suggest that both oil prices and the real effective exchange rates have strong significant impact on economic activity. In a sample of Norway, Saudi Arabia and Russia, Habib and Kalamova (2007) studied the effect of oil price on the REXR. In case of Russia, a positive long run relationship was found between oil price and exchange rate. But there was no evidence of oil price impact on exchange rate for Norway and Saudi Arabia. In all the discussions of the interactions of oil price oscillation, exchange rate dynamic and their influence on economic growth, Aliyu (2009) and Rickne (2009) pointed that lack of strong institutions and total dependency on oil exports is the major causes of underperformance some economies especially mono-product economies. In view of this, Aliyu (2009) recommends the divergence of the economy through the investment in other sectors other than oil to reduce the adverse effect of oil price shocks and the exchange rate.

In Oluwatoyin and Adegboye (2014) investigation on the effect of oil price shock and exchange rate instability on economic growth shows that real economic growth is sensitive to changes in oil prices and REXR volatility in long run. The result of granger causality tests provides evidence of unidirectional causality from oil prices to real GDP. The finding showed that oil price shock appreciation in level of exchange rate exerts positive impact on real economic growth in Nigeria. Englama, Duke, Ogunleye and Isma (2010) examined the relationship between oil prices and exchange rate volatility in Nigeria using monthly data from 1999 to 2009. Co integration technique and vector error correlation model (VECM) for long run and short run analyses respectively were adopted. The results showed that 1.0% permanent increase in oil price at international level increases exchange rate volatility by 0.54% in long run while in short run by 0.25%. Therefore, they concluded that since Nigeria is an oil dependence country the demand for foreign exchange should be closely monitored and exchange rate should move in tandem with the volatility in clued oil prices.

Suleman (2012), examine oil price-exchange rate nexus for Nigeria economy using periodic data 2007–2011. GARCH and exponential (GARCH) models were utilized to examine the impact of price changes on the nominal exchange rate. The outcome indicated that a rise in oil price leads to deprecation of Nigeria naira vis-à-vis the US dollar over the study period. In another vein, Trung and Vinh (2011) studied the impact of oil prices REXR and inflation on economic activities in Vietnam using VAR model and co integration techniques. Monthly data for the period of 1995–2009 was used. The result suggested that both oil prices and real effective exchange rate have a strong significant impact on economic activity. The study concluded that Vietnamese economic activity is influenced more by changes of the value of Vietnamese currency than the fluctuations of oil prices.

Adeniran et al. (2014) also studied the impact of exchange rate fluctuation on Nigeria economic growth using the OLS technique and the chi-square. The study revealed that REXR has a positive effect on the GDP. Akpan and Atan (2012), investigated the effect of exchange rate movements on real output growth in Nigeria using quarterly data series for the period 1986 to 2010. A generalized method of moments technique was adopted. The estimation results suggested that no evidence of strong direct relationship between changes in exchange rate and output growth. In a related study, Aliyu et al. (2009**)** examined exchange rate pass-through in Nigeria for the period 1986 to 2007. Quarterly data was employed and a vector error correction model estimation was used in the estimation process. The study revealed that exchange rate pass-through in Nigeria during the period under consideration was low and declined along the price chain, which partly overturns the conventional wisdom in the literature that exchange rate pass-through is always considerably higher in developing countries than

developed countries. The study concluded that in the long run, pass through would likely increase and monetary policy should be designed to accommodate the effect.

To determine the channel of exchange rate pass-through in Nigeria, Adelowokan (2012) employed a distributed lag model that incorporated the first order lag of exchange rate inclusive of current output level. This approach yielded two-variants in the adapted model. The findings indicated that previous exchange rate (Naira against US dollar) pass-through interest rate between 1970 and 2010. In a similar study by Obi et al. (2016), interest rate differential is shown to be statistically and economically significant in explaining the exchange rate volatility. However, Varela (2007) reported a negative non-negligible effect of exchange rate volatility on output. This effect is independent of the level effect of the real effective exchange rate on output. Similarly, the findings of Varga (2012) indicated a strong negative exposure of Taiwanese firms from an appreciation of the domestic currency. Empirical result indicated that the exposure is non-linear. Oyeyemi (2010) also looked at the growth implications of crude oil price shock in Nigeria, adopting multiple regression techniques. The investigations show that little oil price shock in the international market produces a long term effect on economic growth. To this fact, he suggested for policy makers and the government authorities to think of policies to diversify the productive base of the economy to open up a wider opportunity for inflow of income to the economy. In a related study, Olomola and Adejumo (2006) posit that REXR is sensitive to oil price shocks in Nigeria using variance decomposition approach. Also further inquiry shows that oil price shock affects the government monetary policy significantly through the exchange rate. But the effect was insignificant in the 4th period, while 8th and 10th contributed about 10% and 17% respectively to change in the domestic money supply.

Considering the relevance of oil price and its implications in Nigeria, Oriakhi and Osaze (2010) took to examining the relation between cause and effect of oil price volatility and growth. With the help of VAR estimation techniques, they inferred that changes in oil price determine the level of government expenditure. This result seems to reflect the situation in Nigeria, considering the current and the destabilizing effects of oil price falls and government spending. However, Aliyu (2009), empirically assess the effects of oil price shocks on the real macro economic activity in Nigeria using Granger causality tests and multivariate VAR analysis to carry out both linear and non-linear specifications. Inter alia, the latter category included two approaches employed in the literature, namely, the asymmetric and net oil price specifications. The study found evidence of both linear and non-linear impact of oil price shocks on real GDP. In particular, asymmetric oil price increases in the non-linear models were found to have positive impact on real GDP growth of a larger magnitude than asymmetric oil price decreases and adversely affect real GDP. The non-linear estimation recorded significant improvement over the linear estimation but the earlier study by Aliyu (2009) indicated that linear price change and all the other oil price transformations were significant for the system as a whole. The results showed that the interaction between oil prices and macroeconomic variables in Nigeria is generally significant with the causality going in at least one direction across all the oil price specifications. Nigeria's REXR appreciates when oil price hike facilitates higher inflow of foreign exchange into the economy. Although this may sound good for the economy, it, however, has serious implications on real economic activities and the foreign scene due to the heavy reliance of the economy on foreign inputs.

Relating foreign exchange reforms to the performance of private domestic investment in Nigeria, Bakare (2011) show a significant but negative relationship between floating foreign exchange rate and private domestic investment in Nigeria. Olanipekuo (2010) examined the impact of exchange rate volatility on economic activities of firms in Nigeria focusing on the effect of exchange rate volatility on output, export and investment. Unlike the previous studies that were done at aggregate level, the study employed more disaggregated firm-level quarterly data from 1990 to 2012. The IM-Pesaran-Shin panel unit root test was used and in order to measure the volatility of exchange rate, the study utilized generalized conditional heteroskedasticity (GARCH) approach was utilized. The findings reveal that exchange rate volatility significantly influences output, export and investment of firms in Nigeria. Therefore, emphasis has to be laid on mechanism to reduce exchange rate volatility such as expenditure switching and export diversification policies.

With the help of structural VAR model, Mordi and Adabiyi (2010) examined asymmetric impact of oil shocks on output and price using monthly data for the periods 1999–2008. The empirical results showed that oil price shocks impact on output and prices is asymmetric in nature. Comparing, the weight of the influence, they observed that the impact of oil price decrease is significant but greater than oil price increase. Drawing inference from the findings, they argued that policies aimed at moving the economy forward must focus on price stability because oil price changes play a significant role. In addition, Patti and Ratti (2007) also observed the influence of oil price increase and oil price decrease in economic growth not to be the same and thus, harmonizing the works of Mordi and Adabiyi (2010). In the same vein, Hooker (1996) shows that monetary policy responds to oil price increases and not to oil price decreases in the attempt to examine the asymmetric effects of oil price shocks on GNP looking at the response of interest rates to oil price shocks. Hence, analyzing the relationship between exchange rates and macroeconomic performance, Dada and Oyeranti (2010) found evidence of no strong and direct relationship between changes in the exchange rate and GDP growth.

3. RESEARCH METHODOLOGY AND DATA SOURCE

The data for the study are secondary data sourced from the CBN statistical bulletin and national bureau of statistics. The work covers the period of 1970–2013.The framework of the study is built on GARCH and EGARCH model and granger causality test. According to Brooks (2008), the standard GARCH model allows the conditional variance to be dependent upon previous own lags. The basic structure of the symmetric normal GARCH model is GARCH (1, 1) given by Brooks (2008). The GARCH

model is used to measure conditional variance in oil price and exchange rate dynamic as shown in equation (1) below, while Pair Wise Granger Causality Tests is employed to examine the causal relationship between oil price fluctuation and exchange rate dynamic in Nigeria. Following the approach in Narayan et al. (2008) and Ghosh (2011), the study characterize the linkage between oil prices and exchange rate dynamic with the aid of GARCH (p,q) and EGARCH (p,q) models. The mean equation is given by:

$$OPR_t = a + \beta Rexr_t + v_t \quad (1)$$

Where v_t is the white noise residual $N(0, \sigma_t^2)$

In terms of the second moment, the variance equation for the GARCH (p,q) is of the form:

$$\sigma_t^2 = \theta + \sum_{i=1}^{p} \phi_i v_{t-i}^2 + \sum_{i=1}^{q} \varphi_i \sigma_{t-j}^2 \quad (2)$$

where the conditions $\theta>0, |\varphi_1|<1$ and $(1-\varnothing_1-\varphi_1)>1$ hold in the case of a GARCH (1, 1) model. Equation (2) expresses the conditional variance as a linear function of p lagged squared disturbances and q lagged conditional variances. In other words, volatility today depends upon the volatilities for the previous q periods and upon the squared residual for the previous p periods. Often GARCH models with small values of p and q do a very good estimate of volatility with the p = q = 1 case sometimes being adequate (Narayan et al., 2008; Ghosh, 2011). However, considering the fact that GARCH model cannot account for size effects and does not allow for any direct feedback between the conditional variance and the conditional mean, exponential GARCH model suggested by Nelson (1991), is introduced to establishment the size effect of oil price fluctuation on exchange rate dynamic in Nigeria.

Similarly, the EGARCH model which allow for oscillation in the conditional variance can be written as:

$$\log(\sigma_t^2) = \omega + \sum_{i=1}^{p} \alpha_i \left| \frac{u_{t-i}}{\sigma_{t-i}} \right| + \sum_{k=1}^{r} \lambda_k \frac{u_{t-k}}{\sigma_{t-k}} + \sum_{j=1}^{q} \beta_j \log(\sigma_{t-j}^2) \quad (3)$$

The parameters of equation (3) include the mean of the volatility equation, the size effect (α) which is suggestive of the magnitude of the increase in volatility regardless of the direction of shock. The estimate of β captures the persistence of shocks and λ is the sign effect. In addition, to trace the impact of oil price fluctuation and exchange rate dynamic on economic growth, the model in equation (4) below is adopted.

$$Rgdp_t = \beta_0 + \beta_1 Opr_t + \beta_2 Rexr_t + \beta_3 \sum \psi_t + \varepsilon_t \quad (4)$$

Where: $Rgdp_t$, is the real GDP which measures the market value of goods and services produced in a country within a period of time. Opr_t, is the oil price which measures the price of oil in the international market. $Rexr_t$ is the REXR. This measures the rate at which a country's currency exchanged for another. Hence, this study looks at the rate at which naira exchange for US Dollar. However, Σψt is the vector of control variables such as foreign direct investment (*Fdi*), external debt (*Exdt*), inflation (*Inf*) and real interest rate (*Rintr*). β_1 and β_2 are the coefficients of the explanatory variables and β_3 is the coefficients of the control variables while β_0 and ε_t are constant and the error term respectively. Considering the specification of equation (4) above, the model is transformed to incorporate both the core variables and the control variables as suggested in equation (5) below:

$$Rgdp_t = \beta_0 + \beta_1 Opr_t + \beta_2 Rexr_t + \varphi_1 Fdi_t + \varphi_2 Inf_t + \varphi_3 Intr_t + \varphi_4 Exd_t + v_t \quad (5)$$

φ_1, φ_2, φ_3 and φ_4 are coefficients of foreign direct investment, inflation, interest rate and external debt respectively and is the error term while others remain as defined above. To establish the long run relationship between oil price and exchange rate dynamic, equation (5) is transformed into;

$$\log Rgdp_t = \beta_0 + \beta_1 \log Opr_t + \beta_2 \log Rexr_t + \varphi_1 \log Fdi_t + \varphi_2 \log Inf_t + \varphi_3 \log Intr_t + \varphi_4 \log Exd_t + v_t \quad (6)$$

4. EMPİRİCAL RESULTS AND DİSCUSSİON

In this section, we present and discussed pre and post estimation results as well as the EGARCH results. The Augmented Dickey-Fuller (ADF) test of Unit Root is employed in this research work to ascertain the stationarity of the variables. A variable is stationary if the absolute ADF value (|T|) is greater than any of the absolute Mackinnon critical values. The results of the unit root ttest as shown in the ADF test result below shows that all the variables are stationary but at different orders of integration. This can be summarized in Table 1. Invariably this could mean that the selected variables for the study drift together in the long-run. Due to the outcome of the unit root results, we conducted additional test as shown on Table 1 for further inquiry.

4.1. Cointegration Test

Since results from Table 1 shows that almost all the variables are stationary at first difference - that is almost all the variables are integrated of the same order. Hence, we suspect the problem

Table 1: Unit root results

Variables	ADF test statistic	1% critical values	5% critical values	10% critical value	Order of integration	Decision
RGDP	−5.157	−3.641	−2.955	−2.611	1st difference	Stationary
REXR	−7.257	−3.641	−2.955	−2.611	1st difference	Stationary
OPR	−9.418	−3.641	−2.955	−2.611	1st difference	Stationary
FDI	−4.597	−4.224	−3.532	−3.119	Level form	Stationary
INF	−3.235	−3.634	−2.952	−2.6I0	Level form	Stationary
INTR	−7.167	−3.641	−2.955	−2.611	1st difference	Stationary
EXDT	−4.109	−3.641	−2.955	−2.611	1st difference	Stationary

NB: The null hypothesis of non-stationary is rejected. ADF: Augmented Dickey-Fuller, RGDP: Real gross domestic product, REXR: Real exchange rate

of cointegration, which suggest that the variables could move together in the long run. To confirm if actually the variables drift together in the long-run, we subjected the residual to cointegration tests using the ADF as presented in Table 2 which is based on the following assumptions.

Ho: α=0 (no cointegration),

H_1: α≠0 (cointegration).

4.1.1. Decision rule

Reject Ho if the absolute value of the ADF test statistics is greater than the absolute critical value at the chosen level of significance for the generated series; otherwise, do not reject Ho. The result is shown in the Table 2**.**

From the results given in Table 2, it can be observed that the t-stat is less than the critical value at 5% level of significance. Therefore, this implies that there is no cointegration between OPR and REXR and economic growth in Nigeria's case, which suggest that the variables do not drift together in the long run. Therefore, we accept the null hypothesis of no cointegration. From the result of cointegration tests, we inferred that there is no long-run relationship between oil price oscillation, exchange rate dynamics and Economic performance. To further the inquiry on examining if oil price fluctuation has no significant influence on REXR, the EGARCH model was estimated as indicated in Table 3. But before that, we established the influence of oil price oscillation, exchange rate dynamic on economic performance. In doing this, to correct the problem of heteroscedasticity and autocorrelation which is inherent in high frequency data, we use Newey-west standard errors in the regression. The results is presented in Table 4.

From the results, about 90% of variations in the explanatory variables could explain the variations in the dependent variable. In addition, the expected apriori expectations of most of the variables were not met. This may be due to the nature of data generated. Be that as it may, we observed a positive and significant relationship between REXR and real GDP. The relationship between oil price and real GDP according to the result is positive and significant. This result is consistent with the works of Trung and Vinh (2011), Plante (2008), Jin (2008) and Olanipekuo (2010) on a study on oil price, exchange rate and economic activities. According to Trung and Vinh (2011) this is mostly experienced in most of middle/less income and oil exporting countries, while Jin (2008) shows that the oscillation in oil prices affect the economic performance through the supply side, pointing that oil price increase result to an increase in production costs that can cause fall in firms' lower output. Also, the study's findings supported the work of Olanipekuo (2010) in a study on the influence of exchange rate volatility on economic activities in Nigeria. Therefore, giving the results, we conclude that increase in oil price and exchange rate promotes economic performance in Nigeria. Hence, increase in crude oil prices may lead to increase in government revenue and the level of investment in the economy. But the increase in exchange rate which may have resulted from an increase in demand for money or speculation for further depreciation in Nigerian currency, is expected to cause a decrease in economic activates, instead we observed an increase. This may likely be as a result of shadow economic activities which may is be accounted for. Other control variable such as inflation (INF) and foreign direct investment (FDI) were found to be insignificant and negatively associated to real GDP, while interest rate and external debt (EXDT impact positively and negatively to real GDP respectively.

Table 2: Cointegration results

Variable	ADF statistics	Critical values		
		1%	5%	10%
Residual	0.104	−3.634	−2.952	−2.610

ADF: Augmented Dickey-Fuller

Table 3: Summary of EGARCH estimated results

EXER variables	Coefficient	Standard error	z	P-value
POIL	1.962503	0.2054933	9.55	0.000
C	15.76312	10.89247	−1.45	0.148
EGARCH	−0.1683983	1.0821	−0.16	0.876
ARCH	0.0005386	0.0003057	1.76	0.098
GARCH	−0.0000784	0.0004458	−0.18	0.860
C	7.363254	6.62657	1.11	0.266

4.2. Autoregressive Conditional Heteroskedasticity (ARCH)

Before EGARCH estimation, we first estimated the ARCH model which assumes that the variance of current error term is associated to the size of the preceding error terms (Table 5). In some situation, it gives rise to volatility clustering. Therefore, ARCH test shows the condition in which one or more data points in a sequence is a function of the actual sizes of the previous time periods' error terms. Thus, in most cases the variance is associated to the squares of the preceding innovations.

The results of the ARCH above shows the average oil price (16.7) is relative to current oil price. This shows the extent of price rise in the oil commodity market. Also the ARCH terms *t*-ratio is statistically significant (2.33). It means that the variance is autoregressive conditional heteroscedastic in behavior. Hence, the oil price (OPR) and REXR exhibit a collective volatility of about 1.15% during this period which is relatively low. In addition, to

Table 4: Presentation of regression result

Dependent variable: RGDP				
Variable	Coefficient	Standard error	t-statistics	P-value
C	−58444.98	25104.99	−2.33	0.026
REXR	3126.434	817.1166	3.83	0.000
OPR	4519.071	1188.509	3.80	0.001
FDI	−0.0509426	0.0532302	−0.96	0.345
INF	−180.466	926.3843	−0.19	0.847
INTR	8019.702	1670.269	4.80	0.000
EXDT	−0.0442773	0.0207587	−2.13	0.040

R-squared=0.9087 and DW=1.7684129. REXR: Real exchange rate

Table 5: Summary of ARCH results

OPR variable	Coefficient	Standard error	z	P-value
REXR	0.475754	020.8849	2.28	0.023
C	16.71041	1.24406	13.43	0.000
ARCH	1.154317	0.4952137	2.33	0.026
C	14.92244	8.508498	1.75	0.079

REXR: Real exchange rate

check if there is ARCH effect in the series, we carry out the LM test for ARCH.

From the results given in Table 6, it can be seen that there is no ARCH effect since the P > 0.05. Hence, the null hypothesis is accepted. This therefore implies that oil price does not exhibit volatility clustering between the periods of 1970 and 2013 using annual figures in Nigeria. This result is coherent with the finding of Akram (2004) in a study on oil prices and the exchange rates in Norway. Further investigation shows that this result could be as a result of the fact that oil prices exhibits a stand-alone value for each year. Hence, we also observed the occurrence of high volatility towards the end of the series as indicated in the ARCH conditional variance in Figure 2.

From the Table 3 results, exchange rate exhibit a volatile shock of 16% in its behavior while a 10% increase in oil price leads to a 19% increase in exchange rate from 1970 to 2013 in Nigeria. This finding contradict studies by Serven and Solimano (1993) and Bagella et al. (2006) which stipulated that unstable REXR arises from oil prices shocks. The outcome of our findings shows that the shock effect is relatively not significant in explaining reasons for volatility in exchange rate since the probability value of the "E-GARCH term" is 0.876, hence, only the E-GARCH amidst the whole ARCH and GARCH family was able to explain shock in exchange rate.

From the Figure 3, we see that the conditional variance is stochastic in its behavior where one big volatility from year 1995 leads to another big volatility which eventually peaks at the 2000's which represents periods of improvement in oil prices and a rise in Nigeria's exchange rate.

Figure 4 indicates that both the GARCH and EGARCH support the continuous rise in prices of the series over the period of 1970–2013 in Nigeria. Hence, high fluctuation began in the 1990s in Nigeria.

The results as presented in Table 7 shows no causality between the variables because, from the result, we observed p-value to be insignificant. Therefore, we can conclude with strong inference that there is no casual relationship between oil price and REXR. Hence, there is no direction of causality between them in any form. Contrary to this findings, Korhonen and Juurikkala (2007) study in selected oil and non-oil exporting countries, shows that oil prices granger causes exchange rate mostly in oil exporting countries, while studies by Camarero, Ordóñez and Tamarit (2002), and Spatafora and Stavrev (2003) in non-oil exporting countries also shows that oil price causes REXR in the long run. The dissimilarities in our findings may result from the differences in methods of analyses and data set or due heterogeneity in the countries of study.

4.3. Evaluation of Research Hypotheses

Basically, the study focused on oil price fluctuation, exchange rate dynamics and Economic growth in Nigeria. The hypothesis was evaluated based on the empirical results of the study. The null hypothesis of no long-run relationship was accepted based on our result on cointegration tests presented in Table 2. From the estimated result, we observed that there is no long-run relationship between oil price and REXR in Nigeria within the time period under study. This largely due to the floating exchange

Table 6: Summary results of the LM test for ARCH

Lags (p)	χ^2	df	Prob.>χ^2
3	2.295	3	0.5135

Table 7: Granger-causality test results

Variables	F-stat	Lag	P-value
OPR does not cause REXR	4.5927	2	0.101
REXR does not cause OPR	0.66958	2	0.715

REXR: Real exchange rate

Figure 2: ARCH (1) Conditional variance

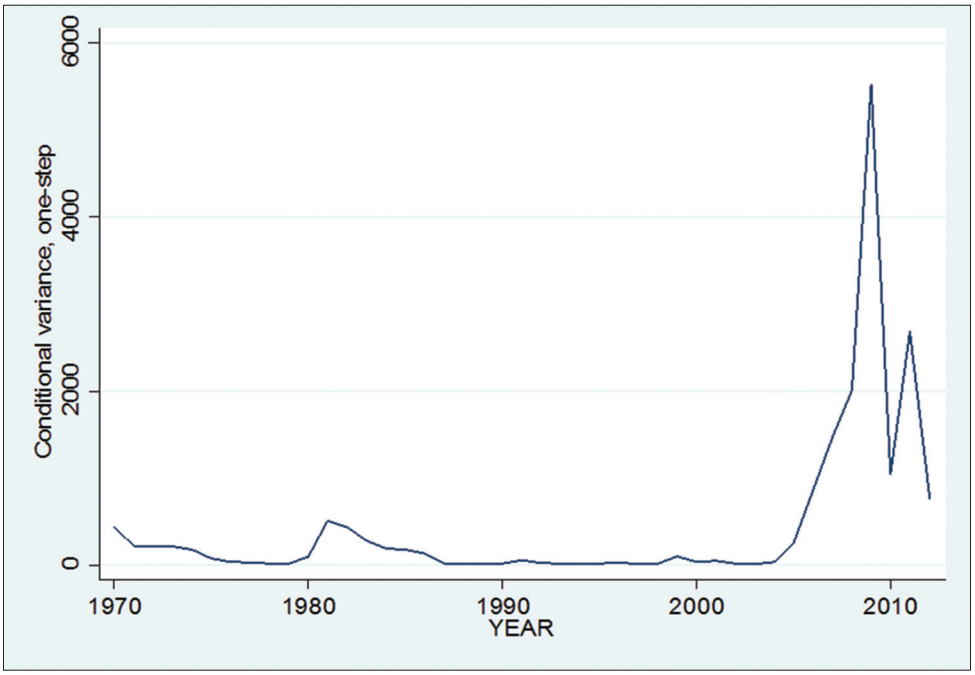


Figure 3: ARCH conditional variance graph of oil price

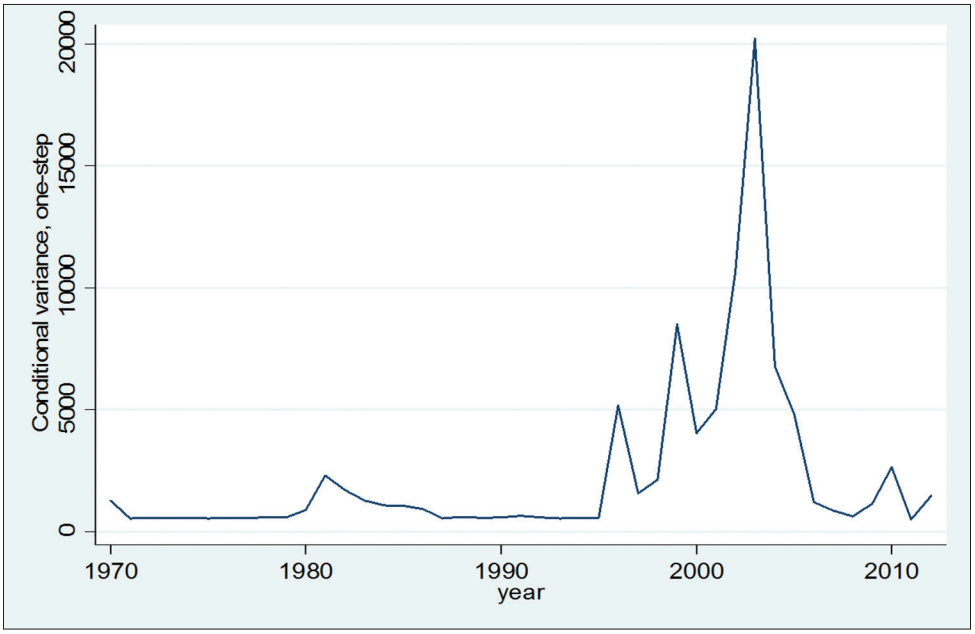
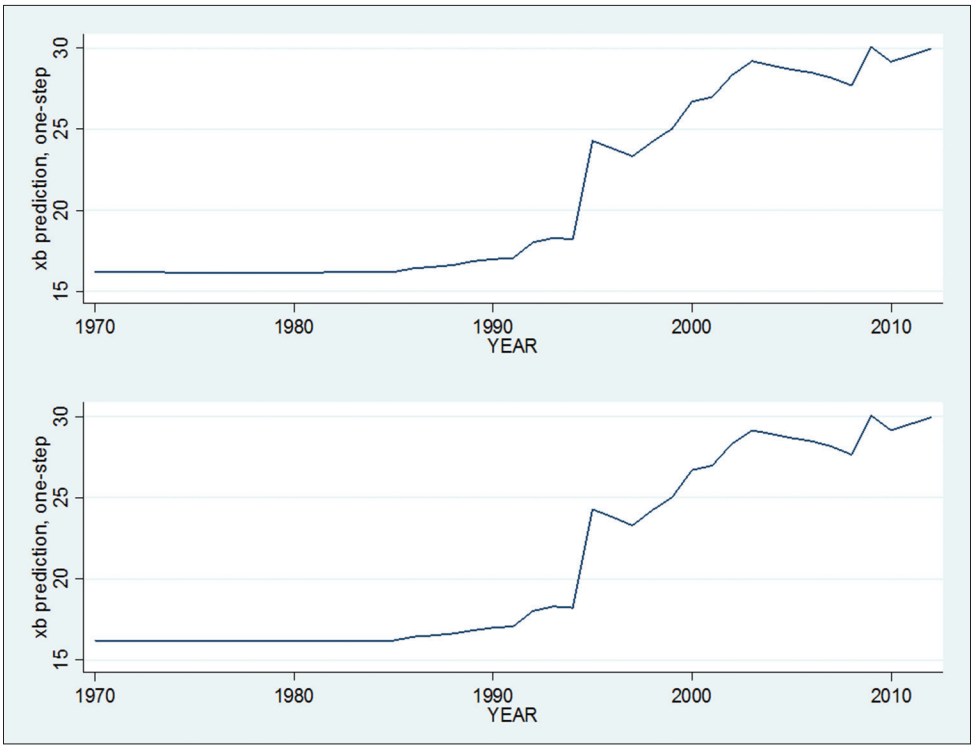


Figure 4: Predictions of GARCH and EGARCH variance



rate system run by the central monetary authority in Nigeria because exchange rate influences the prices of commodities at a particular time (which is usually short) but eventually balances off because oil is not the only commodity Nigeria exports. Hence, no long-run relationship exists between oil price and exchange rate. In addition, we equally observed that oil price oscillation and exchange rate dynamics have positive and significant impact on economic performances proxied with real GDP. Further inquiry showed that the oil price (OPR) and REXR (REXR) exhibit a collective volatility of about 1.15% during this period, which is relatively low. Hence there is no ARCH effect since the oil price does not exhibit volatility clustering between the periods of 1970-2012 (using annual figures in Nigeria). However, the result from EGARCH shows that REXR exhibits a volatility shock of 16%. Therefore, a 10% increase in OPR leads to a 19% increase in REXR at this period. The shock effect is relatively not significant in explaining reason for volatility in REXR since the probability value of EGARCH is 0.876.

Furthermore, the null hypothesis of no casual relationship between OPR and REXR was accepted based on our findings. Thus, this implies that oil price oscillation and exchange rate dynamics, do

not granger cause each other, indicating that there is no causal relationship between the variables. This can be justified by the fact that there is no long run relation between oil price and exchange rate.

5. CONCLUSİON AND RECOMMENDATİON

The study examined the long run relationship between oil price oscillation, exchange rate dynamics and economic performance. We extended our investigation on the influence of oil price oscillation on exchange rate and the causal relationship between oil price oscillation and exchange rate dynamic in Nigeria for the periods 1970 - 2013 using yearly time series data gotten from the CBN statistical bulletin.

To achieve these objectives, we adopted EGARCH model but before the estimation we evaluated the impact of oil price oscillation, exchange rate dynamics and economic performance. It was observed that changes in the oil prices and exchange rate have significant and positive impact on real GDP. Finally, the result further shows that oil price dynamic however, contributed to the high volatility in the exchange rate.

Given the findings, the study argued that the shock effect between oil price and exchange rate is relatively not significant in the long run, in explaining the reasons for volatility in exchange rate as represented in the EGARCH results. Also, we found no causal relationship between exchange rate dynamics and oil price oscillation from the causality test carried out.

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