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Original Research Article

OIL PRICE VOLATILITY AND MACROECONOMIC PERFORMANCE IN NIGERIA: THE PRINCIPAL COMPONENT-GARCH APPROACH

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Abstract: - The Nigerian economy is largely oil-dependent as it accounts for a significant proportion of the Gross Domestic Product. Also the structure of exports in Nigeria shows the acute dominance of this natural resource. This dominance is further revealed especially with regards to revenue generation by the government. Budgetary allocations are many a time made based on projections about the expected path of oil prices thus making the economy susceptible to volatility emanating from the international oil market. This research work examined oil price shocks and macroeconomic performance in Nigeria using quarterly data 1980Q1-2014Q4. The study tested for the time series properties of the variables and adopted the principal component-generalized autoregressive conditional heteroskedasticy (PCA-GARCH) model to estimate the models. Our results showed that oil price shocks do not have substantial effects on government spending, output, interest rate and inflation rate in Nigeria over the period covered by the study. However, the findings demonstrated that fluctuations in oil prices do substantially affect the real exchange rates in Nigeria. The study also revealed that it is not the oil price itself but rather its manifestation in real exchange rates that affects the fluctuations of aggregate economic activity proxy, the GDP. Thus, we conclude that oil price shock is an important determinant of real exchange rates and in the long run real output, while real output and government expenditure granger cause inflation ratein Nigeria rather than oil price.

Introduction: Issues in oil price volatility and how it impacts on economic growth have continued to generate controversies among economic researchers and policy makers. While some (such as Akpan, 2009; Aliyu, 2009; Olomola, 2006; etc) argue that it can promote growth or has the potential of doing so, others (such as Darby, 1982; Cerralo, 2005; etc) are of the view that it can inhibit growth. The former argue that for net-oil exporting countries, a price increase directly increases real national income through higher export earnings, whereas, the latter cite the case of net-oil importing countries (which experience inflation, increased input costs, reduce non-oil demand, lower investment,

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fall in tax revenues and ultimately an increase in budget deficit which will further reduce welfare level) in advancing their argument. Thus the impact (positive or negative) which oil price volatility could have on any economy, depends on what part of the divide such economy falls into and of course the nature of such price change (rise or fall). However, the Nigerian economy uniquely qualifies as both an oil exporting and importing economy, by reason of the fact that she exports crude oil, but imports refined petroleum products.

The Nigeria economy is exposed to oil price shocks since oil contributes over 90% of the total revenue. This shock is so severe that the budget is even tied to a particular price of crude oil and the budget was adjusted in some occasions when there is a sudden change in crude oil price such as the reduction of budget due to a fall in oil prices during the last global financial crisis. Even a small fall in prices may lead to a substantial increase in financing needs, as their exports are not diversified and oil revenue accounts large portion of their total revenue. Consequently, a lack of medium to long-term fiscal framework forces governments to react to oil price volatility by conducting procyclical fiscal policies. A large number of studies show that procyclical fiscal policies have harmful implications in developing countries (Tornell and Lane (1999), Villafuerte and Lopez-Murphy (2010) and Arezki and Ismail (2010).

The transmission mechanisms through which oil prices have impact on real economic activity includes both the supply and demand channels. The most basic is the classic supply-side effect in which rising oil prices are indicative of the reduced availability of a basic input to production. The supply side effects are related to the fact that crude oil is a basic input to production, and consequently an increase in oil price leads to a rise in production costs that induces firms to lower output. Oil prices changes also entail demand-side effects on consumption and investment. Consumption is affected indirectly through its positive relation with disposable income. Oil price rises reduces the consumers spending power. Investment may also be affected if the oil price shock encourages producers to substitute less energy intensive capital for more energy-intensive capital. The magnitude of this effect is in turn stronger the more the shock is perceived to be long-lasting. For this reason, the theoretical literature has been of a general equilibrium nature, with different authors assigning different weights to the supply and demand channels. Other explanations include income transfers from the oil-importing nations to the oil-exporting nations, a real balance effect and monetary policy.

The present study is motivated by the findings that it was not the oil price shocks themselves but monetary policy's response to them that caused fluctuations in aggregate economic activity. In a recent study, Bohi (1989), Bernanke, Gertler, and Watson, (1997) analyzed the possibility that the 1974 economic recession in the United States may have been the consequence of the Federal Reserve's policy response to the inflation triggered by an oil price shock. The studies found out that changes in domestic output arose due to the Federal Reserve's policy of monetary tightening induced inflation sparked off by the oil price shock.

However, most of the empirical studies carried out have focused on the oil importing economies, particularly the developed economies. Few studies exist yet on the effect of oil price shock on key macroeconomic variables for an oil exporting country as Nigeria. This study intends to fill this gap.

Thus the specific objectives of this study are to analyze the impacts of oil price fluctuations on key macroeconomic variables in Nigeria and measure the magnitude of such impacts. Quarterly data from 1980 to 2014 are used for estimation.

Therefore, The main contribution of this paper is its further examination of the relationships between oil price shocks and macroeconomic variables, a granger causality test is used to analyse the statistical causality link between oil price shocks and the selected variables while the principal components analysis (PCA) is conducted to capture a common pattern in the estimated conditional variance which links volatility in the variables and reflects the interaction between oil price volatility and the key macroeconomic variables.

Related Literature and Theoretical Perspective: In line with much of the research on oil price shocks and economic performance as initiated by the work of Hamilton (1983), which concluded that positive oil price shocks are a substantial cause for economic recession in the US, many researchers began to analyze the importance of oil price volatility to economic activity. The research of oil price volatility was conducted in many different ways, for example by analyzing the relationship between oil price shocks and stock market as done by Huang et al. (1996), Sadorsky (1999), and Guo and Kliesen (2005) for US, Papapetrou (2001) for Greece, Park and Ratti (2008) for US and 13 European countries, and Cong, Wei, Jiao, and Fan (2008) for China.

Research conducted by Sadorsky (1999) concluded that oil price changes influence the economic activity. More specifically they found that an increase in the oil price is followed by declining stock returns, this is especially true for after the mid 1980s. Papapetrou (2001) and Park and Ratti (2008) came with the same conclusion for Greece and some European countries. Moreover, Guo and Kliesen (2005) concluded that oil price uncertainty has a negative impact on economic activity especially when they included oil price changes. Cong, Wei, Jiao, and Fan (2008) did not find any statistical significant results at 5 percent level; however they noted that some "important" shocks to oil prices do have a negative impact on the stock market. On the other hand, work by Huang et al. (1996) came to a different conclusion. Results revealed that the oil future price does not play any role in determining the stock returns.

Olomola and Adejumo (2006) examine the effect of oil price shock on output, inflation, the real exchange rate and the money supply in Nigeria using quarterly data from 1970 to 2003. The VAR method was employed to analyze the data. Their findings were contrary to previous empirical findings in other countries; oil price shock does not affect output and inflation in Nigeria. However, oil price shocks did significantly influence the real exchange rates. The implication was that a high real oil price gave rise to wealth effect that appreciated the real exchange rate. This squeezed the tradable sector, giving rise to the "Dutch Disease".

Akide (2007) investigated the impact of oil price volatility on economic growth indicators in Nigeria using quarterly data from 1970 to 2000. He found out that within the period of study oil price shocks did not affect output and inflation in Nigeria, but significantly influenced real exchange rate.

Duncan (2008) defined Nigeria as a crude oil exporter and importer of refined petroleum products. He re-stated the fact that oil price volatility tends to exert a positive effect on the GDP growth of a net-oil exporting country and a negative effect on a net-oil importing country. On the basis of this, Nigeria's situation is clearly peculiar. The literature on the relationship between oil price volatility and economic growth volatility keeps expanding as new economic challenges unfold.

Aliyu (2009) assessed the impact of oil price shock and real exchange rate volatility on real economic growth in Nigeria on the basis of quarterly data from 1986Q1 to 2007Q4. The empirical analysis started by analyzing the time series properties of the data which is followed by examining the nature of causality among the variables. Furthermore, the Johansen VAR-based cointegration technique was applied to examine the sensitivity of real economic growth to changes in oil prices and real exchange rate volatility in the long-run while the short run dynamics was checked using a vector error correction model. Results from ADF and PP tests show evidence of unit root in the data and Granger pairwise causality test revealed unidirectional causality from oil prices to real GDP and bidirectional causality from real exchange rate to real GDP and vice versa. His findings showed that oil price shock and appreciation in the level of exchange rate made positive impact on real economic growth in Nigeria. He recommended greater diversification of the economy through investment in key productive sectors of the economy to guard against the vicissitude of oil price shock and exchange rate volatility.

Okonju (2009), after a careful assessment of Nigeria‘s growth path in post oil discovery period, judged it as having been very rough. He explained that during the oil boom era GDP grew positively by 6.2% annually, but the growth rate turned negative through the larger part of the 80‘s when oil prices crashed; this period also saw inflation rate jump to 11.8% on average, with a period peak of 41% in 1989; Gross Domestic Investment (GDI) as percentage of GDP fell from 16.3% to 14%. However GDP growth rate managed to turn positive (averaging about 4%) between 1988 and 1997 as a result of structural adjustment policies (SAP). Okonju concluded that oil price volatility has been a major contributory factor to instability in GDP growth pattern in Nigeria.

Oriakhi and Iyola (2013) in their study on the consequences of oil price volatility on the growth of the Nigerian economy within the period 1970 to 2010. Using quaterly data and employing the VAR methodology, the study finds that of the six variables employed, oil price volatility impacted directly on real government expenditure, real exchange rate and real import, while impacting on real GDP, real money supply and inflation through other variables, notably real government expenditure.

Data: Quarterly data from the first quarter of 1980Q1 to the last quarter of 2014Q4 is used for all variables in the country. Data of nominal GDP was obtained from the CBN (Central Bank of Nigeria) Statistical Bulletin and the consumer price index (CPI) from the same source is used as a deflator to compute the real GDP figures. Exchange rate variability was measured using the CPI-based real exchange rate, which is derived from the nominal exchange rate using both the US producer and the Nigerian price indexes. We deduced oil price shock as the average quarterly price of internationally traded variety of crude (UK Brent) in US dollars. All variables are included to capture some of the most important transmission through which oil price fluctuations may affect economic activities indirectly. These channels include effects of oil prices shocks on inflation rate, exchange rate, growth in GDP, interest rate, rate of unemployment, government spending and balance of payment, which then lead to changes in real economic activity.

Methodology:

The Principal component-Garch model: The task is to estimate the volatility of the oil price of a particular specification formed of key inter-correlated macroeconomic variables (inflation rate, GDP, Exchange rate, BOP, Government expenditure, interest rate and unemployment rate) using PCA in conjunction with the GARCH model. The selection of these seven macroeconomic variables has been driven by the fact that PCA works best when there is a reasonable amount of correlation between the variables; there is good reason to suppose that the chosen seven macroeconomic variables would be correlated.

Alexander (1997) suggested the construction of unconditionally uncorrelated linear combinations of the observed series based on the principal component analysis. It is called PCA-GARCH model. It starts from doing the principal component analysis on the sample variance-covariance matrix.

If we have an M dimensional data $\{d_t\}$ with length N and summarize it in a N X M matrix D. Then the sample variance-covariance matrix is

$$\Sigma = \frac{1}{N} X'X$$

where $X_{ti} = {(D_{ti} - \mu_i)}/{\sigma_i}$ is the standardized D_{ti}, μ_i and σ_i are the mean and standard deviation of D_{ti}. Now let the $Q = [q_1 .... q_m]$ be the matrix of eigenvectors of $\sum$, and $\lambda = diag\{\lambda_1, \lambda_2, ..., \lambda_m\}$ be the associated diagonal matrix of eigenvalues, following a descending order of the magnitude of eigenvalues, i.e. λ_i for k = 1,……M are the eigenvalues of $\sum$ and $\lambda_1 \le \lambda_2 \le .... \le \lambda_m$.

Thus, the ith principal component (PC) is:

$$P_k = q'_k\ X, \qquad K = 1, ..., M.$$

Provided $\sum = Q \Lambda Q'$ and $\sum q_k = \lambda_k q_k$

From the above setting, we can see that the PCs are just the simple linear combination of original data. The amount of volatility accounted for by the kth factor is its correspondent eigenvalue. In other words, the proportion of total variance accounted for by the kth PC is

$$Var(P_k) = Var(q'_k\ X)$$
$$= q'_k\ Var(X) q_k = q'_k \sum q_k$$
$$= q'_k\ (\lambda_k q_k) = \lambda_k q'_k\ q_k = \lambda_k$$

Therefore the proportion of total variance accounted for by the kth PC is

$\frac{\lambda_k}{\lambda_1 + \lambda_2 + ... + \lambda_k}$. Thus, we can pick up to K factors which are able to explain main part of volatility, i.e. $\frac{\sum_{i=1}^{K} \lambda_I}{\sum_{i=1}^{M} \lambda_i} > 90\%$. Therefore each factor will follow a univariate GARCH model.

Granger causality test: According to Engle and Granger (1987), a linear combination of two or more non-stationary series (with the same order of integration) may be stationary. If such a stationary linear combination exists, the series is considered to be co-integrated and a long run equilibrium relationship exists. The standard Granger causality test examines whether past changes in one stationary variable X_t help predict current changes in another stationary variable Y_t, beyond the explanation provided by past changes in Y_t itself (Granger, 1969; 1986). If not, then X_t does not "Granger cause" Y_t. Granger causality test is used because the evidence reported in Geweke et al. (1983) shows that it outperforms other causality tests in a series of Monte Carlo experiments.

Empirical results: In this section, we provide empirical results for the study on macroeconomic impacts of oil price shocks in Nigeria using PC-GARCH model. The results are presented as below:

Unit Root Tests: Unit root test is carried out to determine if the variables are stationary and if not, to determine their order of integration (i.e. number of times they are to be differenced to achieve stationarity). Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) techniques are used to test for unit roots in the variables included in the model so as to avoid spurious regression; The Augmented Dickey Fuller result and the Phillips Perron test show that all the variables are stationary after first difference. That is they are integrated series of order I (1).

Table 1: Unit Root test Result

Variables	Levels				First differences			
	ADF1	PP1	ADF2	PP2	ADF1	PP1	ADF2	PP2
RGDP	2.6423	2.2579	5.5950	4.6235	-4.6643**	-4.6643**	-4.3958**	-4.8367**
EXCH	-0.0468	-2.0346	-0.1211	-2.1265	-10.4124**	-10.4078**	-10.4124**	-10.407**
INF	-2.6667	-2.7832	-2.8590	-2.9662	-11.0240**	-11.0003**	-11.0216**	-10.998**
INTR	-0.6667	-0.5265	-0.6802	-0.5265	-2.7075*	-3.5255*	-2.907491*	-3.3223*
GEX	0.8094	2.1065	1.0450	0.1864	-4.8130**	-4.4303**	-7.7561**	-7.8331**
UNE	-1.8446	-4.3654**	-2.9378	-5.4607**	-17.6845**	-17.8254**	-19.1246**	-20.836**
BOP	-2.0972	-2.1552	-2.6079	-2.5723**	-2.9597**	-3.3277**	-6.0643**	-6.0578**
ROP	-0.9774	-1.6447	-1.0524	-1.3271	-10.5666**	-10.9999**	-9.1852**	-13.4524**

Source: Authors' computation. Note ADF1, PP1 measured without trends while ADF2, PP2 were measured with trends*,** imply significant difference at 5 and 1 percent respectively

Descriptive analysis: The summary statistics of the oil price series with the macroeconomic indicators are given in table 2 below. This shows that the distribution, on average, is positively skewed relative to the normal distribution (0 for the normal distribution). The positive skewness is an indication of non-symmetric series. The kurtosis for all the variables are larger than 1. Skewness indicates non-normality, while the relatively large kurtosis suggests that distribution of the oil price and the selected macroeconomic indicators are leptokurtic, signaling the necessity of a peaked distribution to describe this series. The Jarque-Bera normality test rejects the hypothesis of normality for ROP, UNE, BOP, EXCH, GDP, GEX, INF, and INTR at 5% level of significance.

Table 2:Summary Statistics of Volatility

Variable	ROP	UNE	BOP	EXCH	GDP	GEX	INF	INTR
Mean	53.22	39913	12.78	63.25	611264	5243267	20.72	17.18
Std. Dev.	29.52	19743	4.35	61.95	224227	1756781	16.38	63.80
Skewness	0.74	0.36	0.65	0.32	4.51	3.86	1.59	11.45
Kurtosis	2.27	2.80	3.82	1.30	22.71	16.38	4.75	132.71
Jarque-Bera	15.55	3.133	13.40	18.83	2662.8	1352.99	74.36	98306.19
p-value	0.000	0.000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

The leptokurtosis reflects the fact that the market is characterised by very frequent medium or large changes. These changes occur with greater frequency than what is predicted by the normal distribution. The empirical distribution confirms the presence of a non-constant variance or volatility clustering. This implies that volatility shocks today influence the expectation of volatility many periods in the future. The results of estimating the EGARCH models for the ROP, UNE, BOP, EXCH, GDP, GEX, INF, and INTR are presented in Tables 3 using the student-t EGARCH model which assumes the conditional distribution of oil price shocks and the selected macroeconomic indicators. As the oil price return series shows a strong departure from normality, all the models will be estimated with Student t as the conditional distribution for errors. The estimation will be done in such a way as to achieve convergence.

Results Of The GARCH Models:

Table 3: Empirical result of GARCH Model

	BOP	GDP	GEX	INF	INTR	EXCH	UNE
C	15.91****	1112901.8*	-251327**	18.61***	12.11***	0.13	24372.1***
ROP	-0.09***	5987.6***	87675.1**	-0.05***	-0.004	0.76***	-282.60***
ω	-1.85***	-0.62	-0.88	-0.39	3.70***	-0.44	5.00
α	2.43***	1.97***	2.84***	0.82**	1.96***	1.63***	0.78**
γ	0.38	-0.61*	-1.26***	0.02	-0.82***	0.30	-0.04
β	0.72***	0.97***	0.97***	0.93***	-0.32***	0.86***	0.71***

Note :*, **, *** statistically significant at 10%, 5% and 1% significant level

In the above mean equation, coefficient of real oil price for BOP, INF, INTR and UNE are negative while GDP, GEX and EXCH are positive. This implies that the real oil price has a significant (except INTR) negative impact on BOP, INF, INTR and UNE.

Using GARCH (1,1) leads us immediately to the question of how much of the innovation is truly "exogenous" and how much is it explained by "other factors" not considered in the model. To improve the model, we could begin by considering other explanatory variables that could influence the volatility of our estimate (in other words, to endogenise some of the exogeneity). However, adding explanatory variables leads us to a particular weakness of the GARCH: the parameter estimation problem. Due to correlations (usually not zero) between the variables used in the GARCH, the problem requires substantial amounts of data and computational power to come up with a reasonably robust estimate. Thus, we aim to improve the volatility forecast of the selected macroeconomic variables compared to the result obtained with GARCH above by using a more tractable method that handles multiple independent variables. This is accomplished by using PC-GARCH.

Principal Component Analysis

The table 4 below shows the correlation between quarterly observations on the macroeconomic variables and the realized real oil price volatility of the Nigerian Bonny light oil (Rop). The macroeconomic variables are the yield of *Interest. Rate(Intr)*, the yield spread of balance of payment *(Bop)*, the unemployment rate (*Unemp*), the output (*Gdp*), the quarterly changes in the consumer price index (*Inflation*), the quarterly changes in the exchange rate (*Exch*), and the spread of government expenditure (Gex).

Table 4: Correlation between variables

	ROP	EXCH	BOP	GDP	GEX	INF	INTR	UNE
ROP	1.000							
EXCH	0.3885	1.000						
BOP	-0.6153	-0.0578	1.000					
GDP	0.4654	0.3683	0.0108	1.000				
GEX	0.5114	0.4271	-0.0164	0.9689	1.000			
INF	-0.2990	-0.2948	0.2973	-0.1568	-0.1700	1.000		
INTR	0.1324	0.1134	0.0727	0.4788	0.3454	-0.0365	1.000	
UNE	0.4373	0.6986	-0.0564	0.5225	0.5432	-0.2128	0.19334	1.000

The correlation of principal components with the macroeconomic variables: Because reduction of dimensionality, that is, focussing on a few principal components versus many variables, is a goal of principal components analysis, several criteria have been proposed for determining how many PCs should be investigated and how many should be ignored. One common criteria is to ignore principal components at the point at which the next PC offers little increase in the total variance explained. A second criteria is to include all those PCs up to a predetermined total percent variance explained, such as 90%. A third standard is to ignore components whose variance explained is less than 1 when a correlation matrix is used or less than the average variance explained when a covariance matrix is used, with the idea being that such a PC offers less than one variable's worth of information (Holland, 2008). A fourth standard is to ignore the last PCs whose variance explained is all roughly equal. A close look at table above reveals that the asymmetric effect of real oil price is more on rate of exchange rate and unemployment rate. This result further reveals that an increase and decrease in oil price affects unemployment rate and exchange rate while that of symmetric effect is on balance of payment and inflation rate.

The table shows the correlation between the macroeconomic variables and the principal components (PC) constructed based on these variables. Application of the above methodology reveals that the first three principal components are sufficient to explain more than 75 percent of total variation of the system of interest rate changes (Table 4). In particular, the first principal component (1) helps to explain more than 43% of the total variation over the period of study. The addition of a second principal component (PC2) contributes to increase that percentage up to almost 63% and the sum of the third principal component (PC3) does permit to explain more than 75% of the variance of the system.

Table 5: Principal Components Analysis

	PC1	PC2	PC3	PC4	PC5	PC6	PC7	PC8
Eigenvalue	3.450	1.5720	1.0419	0.7905	0.6315	0.2811	0.2149	0.0177
% of variance	43.13	19.65	13.02	9.88	7.89	3.51	2.69	0.22
Cum. %	43.13	62.78	75.80	85.68	93.58	97.09	99.78	1.00

Table 6 presents the factor loadings of the first three principal components. The firstprincipal component shows positively correlated of oil price with all the macroeconomic variables except BOP and INF. This can be interpreted as a parallel shift of the term structure, which means that all the selected variables (except BOP and INF), move in the same direction with oil price. The second principal component shows the factor loadings have positive values for exchange rate changes and oil price.

Table 6: Factor loadings

Variable	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8
ROP	0.3887	-0.3869	-0.2393	0.2719	0.0706	0.1410	0.7361	-0.0369
EXCH	0.3689	-0.0469	-0.5803	0.0023	0.2999	0.6309	-0.1842	-0.0541
BOP	-0.1357	0.6603	0.3536	-0.1435	-0.2099	0.0754	0.5918	-0.0110
GDP	0.4588	0.2889	-0.2366	0.0497	-0.3210	0.0061	-0.1918	-0.7124
GEX	0.4660	0.2304	-0.1539	0.1417	-0.4164	0.0929	-0.1707	0.6890
INF	-0.2094	0.3835	-0.1424	0.8087	0.3461	0.0894	-0.0835	-0.0082
INTR	0.2253	0.3559	-0.4448	-0.4579	0.6332	0.0237	0.0329	0.1112
UNE	0.4148	0.0421	0.4280	0.1389	0.2523	-0.7477	0.0114	0.0286

Principal Component–GARCH Model result: Using GARCH (1,1) leads us immediately to the question of how much of the innovation is truly "exogenous" and how much is it explained by "other factors" not considered in the model. To improve the model, we could begin by considering other explanatory variables that could influence the volatility of our estimate (in other words, to endogenise some of the exogeneity). However, adding explanatory variables leads us to a particular weakness of the GARCH: the parameter estimation problem. Due to correlations (usually not zero) between the variables used in the GARCH, the problem requires substantial amounts of data and computational power to come up with a reasonably robust estimate. Thus, we aim to improve the volatility forecast of the selected macroeconomic variables compared to the result obtained with GARCH above by using a more tractable method that handles multiple independent variables. This is accomplished by using PC-GARCH. The result is as shown in the table 5 below.

Table 7 : Empirical result of PC-GARCH Model

	BOP	GDP	GEX	INF	INTR	EXCH	UNE
α	-0.05	-0.004	0.10*	0.09**	0.09**	0.16**	-0.02
β	-1.41**	-0.40**	-0.58**	-0.32**	-0.29**	0.67**	-0.85
γ	2.74**	1.42**	0.87**	0.65**	0.55**	-0.65**	1.87*

Note :, **, *** statistically significant at 10%, 5% and 1*

Table 7 above shows that among the selected macroeconomic variables, real effective exchange rate (EXCH) model received the highest symmetric effect of 0.16, followed by real government expenditure model which shows 0.10. Both inflation rate and interest rate has 0.09 while others (BOP, GDP, UNE) have negative the magnitude effect or symmetric effect of oil price shocks.

All the variables under study exhibits positive conditional volatility coefficient except for real exchange rate which shows a conditional volatility coefficient of -0.65

Conclusion: The result shows that among the selected macroeconomic variables, real effective exchange rate (EXCH) model received the highest symmetric effect of 0.16, followed by real government expenditure model which shows 0.10. Both inflation rate and interest rate has 0.09 while others (BOP, GDP, UNE) have negative the magnitude effect or symmetric effect of oil price shocks.

All the variables under study exhibits positive conditional volatility coefficient except for real exchange rate which shows a conditional volatility coefficient of 0.67. The implication is that volatility in real exchange rate takes longer time to die out following oil price shocks than other selected macroeconomic variables (Alexander, 2009). Finally, the result shows that asymmetric coefficient of real effective exchange rate model has a good news. That is, positive shocks of real oil price generates less volatility than negative shocks in the real effective exchange rate model while the other variables indicating that the leverage effect have bad news (i.e. positive innovations of oil price are more destabilising than negative innovations).Our findingsdemonstrate that oil price shocks do not have substantial effects on interest rate in Nigeria over the period covered by the study. However, the findings revealed that fluctuations in oil prices do substantially affect the real exchange rates in Nigeria which is consistent with the findings of Olomola and Adejumo (2006).

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