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Asymmetric Shocks In Oil Price: An Exponential Generalized Autoregressive Conditional Heteroskedasticity Approach

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Abstract:

This study empirically examined the asymmetric oil price shocks in Nigeria from 1981q1-2019q4 using the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model. The EGARCH model was employed to investigate the asymmetric oil price shocks by obtaining the conditional variance from the estimated results. Empirical results revealed a weak indication for leverage effect and a strong indication for asymmetric effect. The positive egarch (L2) coefficient means that unanticipated increases in the price crude Oil are more profitable than unanticipated decreases in the price of crude Oil. Also, the results revealed strong asymmetry of oil price shocks in Nigeria. In specific terms, the positive asymmetric coefficient (1.8276) means an observed tendency of the crude oil price shock to be higher by approximately 1.83 per cent in declining oil prices in the crude oil market than in rising prices in the oil markets. Based on the above, the study recommended appropriate export diversification policies to reduce the dependency on crude oil exports as the major export (revenue) in the economy. This will offset crude oil price shocks such as the COVID-19 pandemic shock on Oil price, especially from an unanticipated decrease in crude oil prices in the international market.

Key Words: *Oil price, Oil Price Shocks, Asymmetry, EGARCH, Nigeria*

1. Introduction

Nigeria has abundant oil and gas resources, with output accounting for one-fourth of its GDP on average from 1981 to 2018. Similarly, oil exports accounted for approximately 95.7 per cent of total exports over the same time, while oil revenues accounted for an average of 73.3 per cent of government collected revenues. As a result, the oil sector has had a strong influence on the macroeconomic output of the country. However, despite being Africa's largest oil producer, Nigeria lacks refining capacity and must import refined petroleum products to meet domestic demand. Thus, the government subsidizes petroleum products to keep rates stable, regardless of foreign crude oil prices or the exchange rate. Although this has limited the government's fiscal room over time, the subsidy has ensured that rising oil prices do not spill over into domestic prices for refined oil products, reducing the effect on consumer prices (Omotosho, 2019; Abdullahi, Tukur, Barda, & Adams, 2020).

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Since the oil industry plays such a significant role in economic growth, fluctuations in crude oil prices can be the primary cause of inflation, which in turn creates the conditions for wage-price spirals (Salisu, Isah, Oyewole & Akanni 2017; Bildirici & Badur, 2019; Yue, Korkmaz & Zhou, 2020). Furthermore, if the oil price continues to increase, production prices will rise, and labour productivity will fall (Liu & Zhang, 2015; Elfayoumi, 2018). Oil price volatility has aided the existence of business cycles (Troster, Shahbaz, & Uddin, 2018; Alege, Oye & Adu, 2018), as demonstrated by macroeconomic fluctuations (Hou, Mountain, and Wu, 2016; Aminu, 2017), and raises serious concerns for policymakers in addressing welfare issues. Oil price volatility, whether it is a decrease or an increase, has a negative impact on aggregate output.

Nigeria has a proven oil reserve of 37,453 million barrels and a natural gas reserve of 5,475.2 billion cubic feet, with an estimated daily production of 2.022 million barrels (Energy Information Administration, 2018). The hydrocarbon sector generates more than 75 per cent of the federal government's revenue (EIA, 2018). Since crude oil revenues account for most of Nigeria's government spending on infrastructure growth and most economic activities, it suggests that its economy relies heavily on the oil sector. As a result, even a little change in oil prices can have a significant impact on the economy's monetary and fiscal policies. Apart from that, oil prices in Nigeria have been more volatile than other commodities. To prevent the spread of the endemic problem, the government and policymakers would have to respond based on the structure of the oil price volatility. Indeed, the oil price decreased swiftly from a high of 130 dollars to a low of 28 dollars between 2015 and early 2016, causing the country's revenue to drop (Adedokun, 2018). As a result, understanding the impact of asymmetric oil price shocks on Nigeria's domestic economy has become increasingly important, necessitating the estimation and testing of asymmetric oil price shocks in Nigeria. Following the introductory section is the review of literature in section two, section three contains the methodology, the discussion of results is shown in section four and section five contains the summary of the findings and conclusion.

2. Theoretical Background

Asymmetry-in-effects Theory of Economic Growth

The asymmetry-in-effect theory of economic growth, as proposed by Mark, Olsen, and Mysen (1994), validated the asymmetric influence of oil price on economic growth in Africa. According to this theory, an increase in oil prices has a negative influence on future GDP growth, whereas a fall in oil prices is uncertain.

Renaissance growth model
Oil price changes and volatility, according to proponents of this model, have a negative impact on economic growth, though in diverse ways (Lee, 1998 and Oriakhi and Osaze, 2013).

Both hypotheses agree that there is a connection between crude oil prices and economic growth in both developed and developing economies. Even among nations, however, the impacts have been shown to be different based on empirical evidence. Similarly, depending on the internal mechanism for stability, both exporting and importing countries feel the effects of oil price shocks in different ways.

Review of Empirical Literature
Charfeddine and Barkat (2020) investigated the asymmetric short- and long-run effects of oil price shocks and changes in oil and gas revenue on Qatar's total real GDP and level of economic diversification. The A-B structural vector autoregressive (AB-SVARX) model and the nonlinear autoregressive distributed lag (NARDL) model were used in the investigation. In the short run, the results demonstrated that negative shocks to real oil prices and real oil and gas revenues have a greater impact on total real GDP and non-oil real GDP than positive shocks. This suggests that shocks have an asymmetric impact. The findings reveal, however, that the effect of shocks does not linger more than three quarters of the time.

Using data from January 2010 to December 2017, Abdulaziz et al. (2019) used non-linear ARDL to examine the asymmetric impact of oil shocks on food prices in Nigeria. Positive oil price shocks have a positive impact on food prices, but negative shocks have no such effect, according to the data.

Using a vector error correction methodology, Kelikume (2017) investigated the asymmetric effect of exchange rate and oil price shocks on inflation in Nigeria (VECM). The study discovered, among other things, that an increase in oil prices causes a 43% increase in inflation in a year, whereas a decrease in oil prices causes a 29% increase in inflation.

Hu, Liu, Pan, Chen, and Xia (2018) investigated the short- and long-run asymmetric effects of structural oil price shocks on the Chinese stock market using a combination of the Structural Vector Autoregressive (SVAR) and nonlinear Autoregressive Distributed Lag (NARDL) models. Demand-side oil price shocks have a significant short- and long-term impact on the Chinese stock market, according to the study, whereas supply-side shocks have no effect. While there is no indication of asymmetric impacts in the supply shock, there is evidence of asymmetric effects in the oil-specific demand shock in the short run.

Akinsola and Odhiambo (2020) found that asymmetric oil price decreases have a negative impact on real GDP and that nonlinear estimation of oil price shocks on real macroeconomic activities outperforms linear estimation. Furthermore, according to Abdulaziz (2020), symmetric oil price shocks have a positive influence on fiscal policy, despite the fact that fiscal policy has proven to be the key route for reducing the negative consequences of oil price shocks. Oil price fluctuations have a significant impact on macroeconomic activities in emerging economies, particularly in oil-exporting countries, according to Oyelami (2018), with evidence of asymmetric effects for output and exchange rate

3. Methodology

Sources of Data

The data for this study are time-series data; as such, they are secondary data. Data were obtained from the Central Bank of Nigeria Statistical Bulletins, 2009 and 2019. The data covers the period 1980 - 2018. This period is considered large enough for the study and, it covers periods of sharp descent of global crude oil prices, such as the 60 per cent drop in the price of Bonny light – Nigeria's crude between 2014 – 2016. The sample period also covered periods oil price rallied, such as in 2017.

Model Specification

To estimate and test Nigeria's asymmetric oil price shocks, the researchers employed Nelson's (1991) Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model. This model accounts for information asymmetry while simultaneously ensuring that the conditional variance is always positive. The model's logarithmic specification also allows the parameters' positive constraints to be relaxed. Given that yt follows a k-order autoregressive process, the mean equation is:

$$y_t = \beta_0 + \sum_{i=1}^{k} \beta_i y_{t-i} + \varepsilon_t \qquad (3.1)$$

Where y_t is the current price of crude oil (OILP) at time t. The constant term is β_s, and the coefficients are β_t, whereas the error term is ε_t, and it is independently distributed with a constant mean and variance. In its full form, the model will include the following variance equation:

$$log\sigma_t^2 = \varphi + \sum_{i=1}^{q} \alpha_i log\sigma_{t-i}^2 + \sum_{i=1}^{p} \beta_i \left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right| + \sum_{k=1}^{r} \gamma_k \left(\frac{\varepsilon_{t-k}}{\sigma_{t-k}}\right) \tag{3.2}$$

The logarithm of the conditional variance of crude oil prices is the left-hand side of equation (3.2). The EGARCH (p, q) model's logarithmic form certifies the conditional variance's non-negativity without requiring the model's coefficients to be constrained. The inclusion of the term $\varepsilon t - i/\sigma t - i$ represents the asymmetric effect of positive and negative shocks (information about sharp rise or fall in oil prices). If $\gamma k > 0 \ (< 0)$ volatility (in oil price shock) tends to rise (fall) when the lagged standardized shock, $\varepsilon t - i/\sigma t - i$ is positive (negative). The persistence of volatility to the conditional variance is given by $\sum_{i=1}^{q} \alpha_i$.

This study considers a special case EGARCH (1,1) model as follows:

$$log\sigma_t^2 = \varphi + \alpha log\sigma_{t-1}^2 + \beta \left|\frac{\varepsilon_{t-1}}{\sigma_{t-1}}\right| + \gamma \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \tag{3.3}$$

For a positive shock, $\varepsilon_{t-1}/\sigma_{t-1} > 0$ eqn. (3.3) becomes:

$$log\sigma_t^2 = \varphi + \alpha log\sigma_{t-1}^2 + (\beta + \gamma) \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \tag{3.4}$$

and for negative shocks, $\varepsilon_{t-1}/\sigma_{t-1} < 0$ it becomes:

$$log\sigma_t^2 = \varphi + \alpha log\sigma_{t-1}^2 + (\beta - \gamma) \frac{\varepsilon_{t-1}}{\sigma_{t-1}} \tag{3.5}$$

Therefore, the presence of a leverage effect can be tested by the hypothesis $\gamma=0$. There is an asymmetric if $\gamma \neq 0$. Furthermore, the parameter α governs the persistence of volatility (oil price shocks) for the EGARCH (1, 1) model.

Estimation Technique

The study used a step-by-step estimating approach to achieve its objective. The variables were first tested for unit root. Second, the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model was estimated to investigate asymmetric oil price shocks and obtain the oil price shock from the estimated findings by deriving the conditional variance. Nelson (1991) developed the EGARCH model to capture information asymmetries and ensure that conditional variance is always positive. If yt follows an autoregressive process of order k, the mean equation is:

$$y_t = \beta_0 + \sum_{i=1}^{k} \beta_i y_{t-i} + \varepsilon_t \tag{3.6}$$

The complete model will include the following variance equation:

$$log\sigma_t^2 = \varphi + \sum_{i=1}^{q} \alpha_i log\sigma_{t-i}^2 + \sum_{i=1}^{p} \beta_i \left|\frac{\varepsilon_{t-i}}{\sigma_{t-i}}\right| + \sum_{k=1}^{r} \gamma_k \left(\frac{\varepsilon_{t-k}}{\sigma_{t-k}}\right) \tag{3.7}$$

The conditional variance's logarithm is on the left-hand side of (3.7). The EGARCH (p, q) model's logarithmic form certifies the conditional variance's non-negativity without requiring the model's coefficients to be constrained. The asymmetric effect of positive and negative shocks is represented by the expression, $\varepsilon t - i/\sigma t - i$. If $\gamma k > 0\ (< 0)$, volatility tends to rise (fall) when the lagged standardized shock, $\varepsilon t - i/\sigma t - i$, is positive (negative). The persistence of volatility to the conditional variance is given by $\sum_{i=1}^{q} \alpha_i$.

The EGARCH model has the following advantages: (i) because the logarithm of volatility is used as the regressand, there is no need to impose a nonnegative constraint on the parameters of variance dynamics; (ii) the EGARCH model considers the asymmetric effect of volatility; and (iii) the persistence of shocks is determined solely by the coefficients of the GARCH term.

4. Empirical Findings/Results

By obtaining the conditional variance from the estimated result, the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model was estimated to evaluate the asymmetric oil price shocks and the oil price shocks. However, before estimating the equation for the objective, the descriptive statistics of the variables were examined. Also, the variables were subjected to unit root tests, and the lag order was selected using the Akaike information model selection criteria.

Descriptive Statistics of the Variables

The descriptive statistics of the variables were examined to understand more about the data set's time-series behaviour, and the findings are displayed in Tables I and II, respectively. The descriptive statistics presented in Table I showed that the values of GDPG and INF in the data set cantered around their respective mean values, as revealed by the respective small standard deviation values (close to their mean values). The values of the remaining variables in the data set, on the other hand, are further apart from their respective mean values, as seen by the large standard deviation values, which are significantly greater than their respective mean values. All of the variables under investigation have minimum values that are less than their respective mean values. Except for GFCF, which is less than its mean value, the maximum values are all greater than their respective mean values.

Table 1. Mean, Standard Deviation Maximum Values and Minimum Values of the Variables

Variables	Obs.	Mean	Standard Deviation	Minimum value	Maximum value
GDPG	148	1.0925	1.5134	-7.654733	7.651231
OILP	148	56.3566	28.5392	18.47	117.09
FDI	148	510608.6	855754.7	264.3	5600000
GFCF	148	3231447	5321193	8799.48	1.7700
INF	148	20.0671	16.9451	0.2000	76.8000
OILR	148	21051.9600	44216.6000	164.0800	164078.1000

Source: Authors' Computation

Table 2. Skewness and Kurtosis

Variables	Obs.	Pr(Skewness)	Pr(Kurtosis)	adj chi2(2)	p-value
GDPG	148	0.2239	0.0000	31.25	0.0000
OILP	148	0.0023	0.0001	19.68	0.0001
FDI	148	0.0000	0.0000	0.1000	0.0000
GFCF	148	0.0000	0.1313	28.46	0.0000
INF	148	0.0000	0.0016	38.81	0.0000
OILR	148	0.0000	0.0000	60.49	0.0000

Source: Authors' Computation

The Skewness and Kurtosis of the data set were also examined, as shown in Table II. Skewness could be defined as the symmetry of the distribution of the data set. Kurtosis, on the other hand, establishes the peakedness of a distribution. GDPG and OILP have positive skewness coefficients. Positive skewness coefficients indicate a totally symmetrical and right-skewed distribution. In other words, the variables were clustered to the left, with a tail extending to the right. At the same time, the 0 skewness coefficients of the rest of the variables indicate that the variables did not deviate from a normal distribution. That is, none of the variables except for GDPG and OILP deviate from a normal distribution. The Kurtosis coefficients are all 0 except GFCF with a Kurtosis coefficient of 0.1313, indicating peak. The probability values of all the variables are significant at the five per cent level, therefore, pointing to the rejection of the hypothesis that these variables are normally distributed.

Determination of the Asymmetric of Shocks in Oil Price and the Oil Price Shocks

The Asymmetric of Shocks in Oil Price

To obtain the oil price shocks and the asymmetric shocks in crude oil price in Nigeria – in line with the study's objective, the Autoregressive-Exponential Generalized Autoregressive Conditional Heteroskedasticity model was estimated. However, before the model was estimated, the level form series and the differenced oil price series were plotted. The graph of the empirical distribution of oil price was also examined. The graphs are presented in.

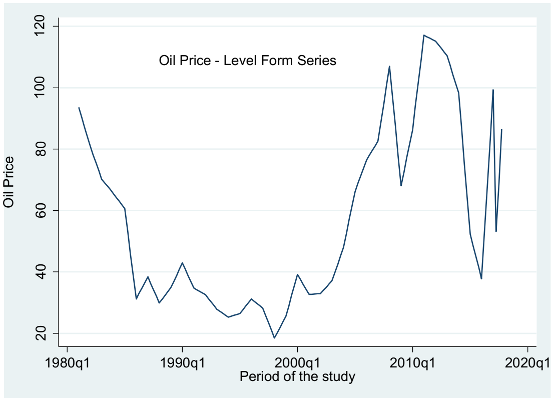

Figure 1. below

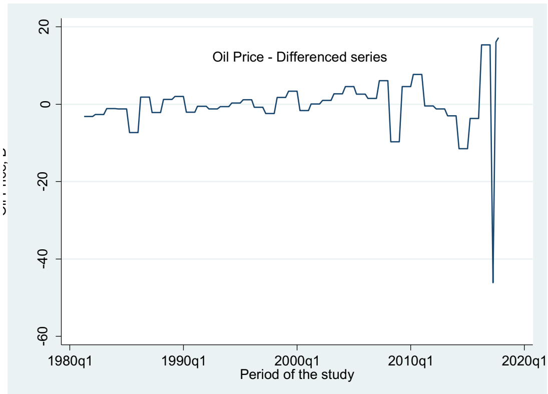

Figure 2. below

Figure 3. below
Source: Authors' Plots

The level form of the oil price variable showed a fluctuating trend. The differenced series of oil prices, on the other hand, is characterized by random, rapid changes in price movement and can be described as volatile (shocks). The volatility changes over time in addition to the evidence of oil price volatility clustering (volatility clustering enables the researcher to quantify the impact of any shock on the variance, which continues to transmit itself during adjacent time interval – as a larger one follows a significant shock, and a small shock is followed by a smaller one). For example, from the first quarter of 2000 to the last quarter of 2009, the oil price was relatively sedate or calm (periods of relative tranquillity). This was, however, followed by periods of high volatility of oil price, as indicated in the first quarter of 2010 until 2017 in the graph in panel (b) of Figure II. Crude oil price generally exhibits relatively calm periods followed by increased volatility (shocks). Panel (c) shows that the oil price series are not leptokurtic, as shown by the graph of the empirical distribution of oil price. In other words, the series contains a significant number of observations that are not close to the average and a small number of observations that are far from the average; the histogram's center has a low peak, and the tail is light in comparison to the normal.

Given that oil prices showed periods of high volatility and periods of relative tranquillity, the series is considered suitable for ARCH modelling. Although the oil price has been a typical target of the ARCH family of models, the study used OLS to build a constant-only model and then used Engle's Lagrange multiplier test to examine ARCH impacts in oil price. This is to guarantee the appropriateness of the EGARCH model in fitting the (oil price) data. The result is reported in Table 3. below

Table 3. Result of Engle's Lagrange multiplier test for ARCH effects in the exchange rate

The result of a constant-only model by OLS used to test for the ARCH effect				
D. LogOILP	Coefficient	Standard Error	t	p
Constant	3.9049	0.0416	93.90	0.000
LM test for autoregressive conditional heteroskedasticity (ARCH)				
chi2	128.797			
Prob.	0.0000			
Lags	2			
The lag length of 2 was empirically determined using the Akaike's final Prediction Error (FPE), and Akaike's information criterions				

Source: Authors' computation

Engle's LM test showed a p-value (0.0000) that is well below 0.05 in an absolute sense. The probability value is less than the 5 per cent critical value. Therefore, the null hypothesis of no ARCH effects at the 5 per cent level is rejected. Thus, there is an ARCH effect on the oil price. We estimate the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model specified in section 3.0 now since the ARCH effect has been established. The result is shown in Table IV below

Table 4. Result of the EGARCH model

EXR	Coefficient	OPG Standard Error	z-value	p-value
LogOILP				
Constant	3.5277	0.0118	298.83	0.000
ARCH				
earch(L2)	0.1452	0.2804	0.52	0.605
earch_a(L2)	1.8276	0.4031	4.53	0.000
egarch (L2)	0.8099	0.1019	7.95	0.000
Constant	-0.5873	0.3175	-1.85	0.064
Using Akaike's final Prediction Error (FPE) and Akaike's information criteria, the lag length was empirically established.				

Source: Authors' computation

The result showed a weak indication for leverage effect (leverage effect shows the shock that may strongly influence the variance due to a "negative shock" causes more significant loss in returns than the gains from a "positive shock"). It also showed a strong indication for asymmetric effect (asymmetric effect measures the significance and proportional contribution of negative shock that destabilizes variance). The positive earch (L2) coefficient means that positive innovations (unanticipated increase in the price of crude oil) are more profitable than negative innovations (unanticipated decrease in the price of crude oil). On the other hand, the asymmetric oil price shocks showed a positive coefficient of 1.8276 with a t-value of 4.53. Since the t-value of 4.53 is significant at the 5 per cent level, the null hypothesis of no asymmetric oil price shocks in Nigeria is rejected. The significant probability value (0.000) also confirms an insignificant error in rejecting the null hypothesis.

Thus, there are asymmetric oil price shocks in Nigeria. In specific terms, the positive asymmetric coefficient (1.8276) means an observed tendency of the crude oil price shock to be higher by approximately 1.83 per cent in declining oil prices in the crude oil market than in rising prices in the oil markets. The leverage effect is weak in comparing the leverage and asymmetric oil price shock (0.1452, with an insignificant t-value). It is substantially smaller than the symmetric crude oil price shock (1.8276). Specifically, the relative scales of the two coefficients showed that the asymmetric oil price shock completely dominates the positive leverage. The EGARCH asymmetry coefficient (0.8099) showed the opposite of what would have been expected in the case of applying a GARCH model to the crude oil price. Specifically, for a positive oil price shock, the egarch (L2) coefficient (0.8099) decreases oil price. Falling oil prices lead to more significant next period negative shocks in crude oil prices than increasing prices by the same amount.

The Oil Price Shocks

To capture the crude oil price shocks, we generated the conditional variance of crude oil prices and the plot of the generated series is shown in figure III

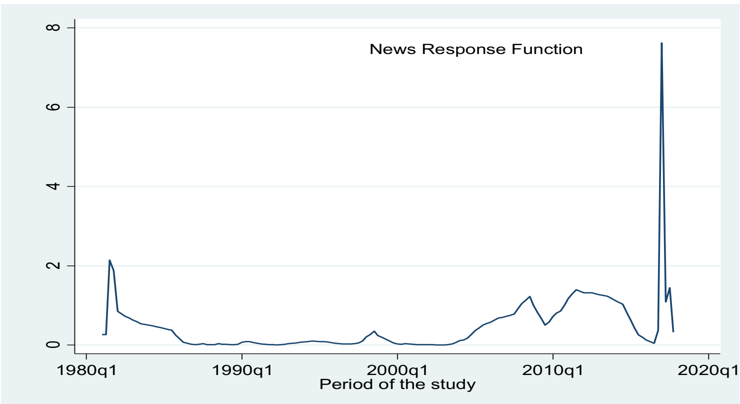

Figure 4. Conditional variance – Crude oil price shocks
Source: Authors' plot

There is an indication that positive asymmetry does dominate the shape of the news response function of crude oil price. The response is a fluctuating function of positive news about crude oil prices. The crude oil prices were much more volatile between the 1st quarters of 1981 to the 4th quarters of 1983 and became relatively tranquil from the 1st quarter of 1945 until around 2003. Early 2017 until late 2018 also marked periods of much more volatile crude oil prices

5. Conclusion

Since the 1970s, academics, policymakers, and market practitioners have been increasingly interested in the causes and implications of oil price shocks. Oil price fluctuations can have a variety of effects on the domestic economy, depending on the factors that cause them to fluctuate. The majority of research were unable to distinguish between positive and negative oil price shocks. As a result, they have assumed symmetric fluctuations in oil prices without empirically testing for asymmetry. The research is based on the fact that the inflationary consequences of an exogenous oil price shock vary significantly amongst economies. Oil price shocks do not happen on a regular, consistent, and predictable basis. To investigate the asymmetry of oil price shocks, the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model was estimated.

The significant findings of this study are summarized below:
First, a strong indication for asymmetric effect was found. There was an observed tendency of the crude oil price shock to be higher by approximately 1.83 per cent in declining oil prices in the crude oil market than in rising prices in the oil markets. The asymmetric oil price shock completely dominates the positive leverage. This is evident in the Nigerian economy that relies mostly on the revenue generated from oil. The price of oil cannot be determined within the Nigerian economy. The economy takes part in the international risk sharing resulting from any shock to the price of Oil, which is exogenously determined. A very clear example is the COVID-19 pandemic that came as a shock; the uncertainty occasioned by the pandemic especially with regards to the price of Oil, has disrupted the budget plans of most economies such as Nigeria. This is because the Federal Government could not fund the budget which was initially pegged at $130 per barrel of Oil. The effect on household consumption is also reflected on the declining gross domestic product given the productivity shock on the entire economy.

Second, a strong asymmetric effect with a positive asymmetric coefficient of 1.83 implies that an unexpected decrease in crude oil prices has higher crude oil price shocks and has a higher impact on the economy than the increase in crude oil prices in the oil markets. This is a perfect example of the case in Nigeria, where the sharp fall in oil prices in the international oil market led to the recession of 2014-2015– were seriously felt, and compared to the periods of high oil prices, leading to colossal oil revenue, which was not felt in the economy in relative terms. It means that the effect of (unanticipated) crude oil price decrease is more devastating to the domestic economy of Nigeria than the (unanticipated) increase in the crude oil prices in the crude oil market. The COVID-19 pandemic impact on oil price may present similar consequences on the Nigerian economy, given that the price of Oil is exogenously determined.

Third, this study has shown that there is a strong asymmetric effect in Nigeria. An unexpected decrease in crude oil prices is associated with higher crude oil price shocks, which has a higher impact on the Nigerian domestic economy than the unanticipated increase in crude oil prices in the oil markets. This means that Nigeria must be mindful of crude oil price decrease than oil price increase in the international market and have effective alternative sources of revenue that can complement an unanticipated oil price decrease.
The following policy recommendation is proffered Appropriate export diversification policies are relevant to ensure diversification of exports to reduce the dependency on crude oil exports as the major export (revenue) in the economy. This will offset crude oil price shocks, especially from an unanticipated decrease in crude oil prices in the international market.

References :

Abdulaziz S., Abdullah S.S and Nasiru A.Y. (2019). 'Asymmetric Effect of Oil Shocks on Food Prices in Nigeria: A Non-Linear Autoregressive Distributed Lags Analysis' International *Journal of energy economics and policy*, 2019, 9(3), 128-134. Doi: https://doi.org/10.32479/ijeep.7319.

Abdulaziz, H. A. (2020). Symmetric oil price shocks and government expenditure-real exchange rate nexus: ARDL and SVAR models for an oil-based economy, 1970–2018. *Cogent Economics & Finance*, 8:1, 1782076, DOI: 10.1080/23322039.2020.1782076.

Adedokun, A. (2018). 'The effect of oil shocks on government revenue and government expenditure nexus in Nigeria (with exogeneity restrictions). *Future Business Journal,* 4(2018) 219- 232, Elsevier inc. https://doi.org/10.1016/j.fbj.2018.06.003.

Akinsola, M. O. and Odhiambo, N. M. (2020). Asymmetric effect of oil price on economic growth: Panel analysis of low-income oil-importing countries. *Energy Reports*, *Elsevier*, 6(2020), 1057- 1066.

Alege, P. O., Oye, Q. E. and Adu, O. (2018). Renewable Energy, Shocks, and the Growth Agenda: A DSGE Approach. A paper presented at the Centre for Petroleum, Energy Economics and Law (CPEEL) on the theme: Renewable Energy Development in Africa. 5th – 6th March.

Alley, I., Asekomah, A., Mobolaji, H. and Adeniran, Y.A. (2014). Oil price shocks and Nigeria economic growth. *European scientific journal*, Vol 10, No. 19(2014).

Aminu, N. (2017). Evaluation of a DSGE Model of Energy in the United Kingdom Using Stationary Data. *Computational Economics*, 51(4), 1033–1068.

Bildirici, M.E., Badur, M.M. (2019). The effects of oil and gasoline prices on confidence and stock return of the energy companies for Turkey and the US. *Energy* 173, 1234–1241. https://doi.org/10.1016/j.energy.2019.02.137.

Charfeddine L., & Barkat K. (2020). "Short-and long-run asymmetric effect of oil prices and oil and gas revenues on the real GDP and economic diversification in oil-dependent economy". *Energy Economics*. Vol. 86.

Chen, X., Sun, X., Wang, J. (2019). Dynamic spillover effect between oil prices and economic policy uncertainty in BRIC countries: a wavelet-based approach. *Emerging Markets Finance and Trade*,115. https://doi.org/10.1080/1540496X.2018.1564904.

ElFayoumi, K., (2018). The balance sheet effects of oil market shocks: an industry level analysis. *Journal of Banking and Finance*, 95, 112–127. https://doi.org/10.1016/j. jbankfin.2017.12.011.

Hou, K., Mountain, D. C., & Wu, T. (2016). Oil Price Shocks and their Transmission Mechanism in an Oil-exporting economy: A VAR Analysis Informed by a DSGE Model. *Journal of International Money and Finance*, 68, 21-49.

Hu, C., Liu, X., Pan, B., Chen, B. and Xia, X. (2018). Asymmetric Impact of Oil Price Shock on Stock Market in China: A Combination Analysis Based on SVAR Model and NARDL model. *Journal of Emerging Markets Finance and Trade*, 8(54), 1693 – 1705.

Kelikume, I. (2017). Do exchange rate and oil price shocks have asymmetric effect on inflation? Some evidence from Nigeria. *The Journal of Developing Areas,* 51(4), 271- 283.

Liu, L., Zhang, T. (2015). Economic policy uncertainty and stock market volatility. *Finance Res. Letters,*15 99–105. https://doi.org/10.1016/j.frl.2015.08.009.

Omolade, A., Ngalawa, H., and Kutu, A. (2019), Crude oil price shocks and macroeconomic performance in Africa's oil-producing countries. *Cogent Economics & Finance*, 7(1).

Omotosho, B. S. (2019). Oil price shocks, fuel subsidies and macroeconomic (in) stability in Nigeria. *CBN Journal of Applied Statistics* 10(2), 1 - 38.

Oriakhi, D. E. and Osaze, I. D. (2013). Oil Price Volatility and its Consequences on the Growth of the Nigerian Economy: An Examination (1970-2010). *Asian Economic and Financial Review*, 3(5), 683-702.

Oyelami L.O (2018) 'Effect of oil price movement on Nigeria Macroeconomic variables: Evidence from linear and Nonlinear ARDL modelling'. *Iran Economic Review*, 22(4) 2018, pp. 908-933.

Salisu, A.A., Isah, K.O., Oyewole, O.J., Akanni, L.O., (2017). Modelling oil price-inflation nexus: the role of asymmetries. *Energy*, 125, 97–106. https://doi.org/10.1016/ *j.energy*. 2017.02.128.

Troster, V., Shahbaz, M. and Uddin, G. S. (2018). Renewable energy, oil prices, and economic activity: A Granger-causality in quantiles analysis. Energy Economics, *Elsevier*, 70(C), pages 440-452.

U.S. Department of Energy, Energy Information Administration (2018), Independent Statistics & Analysis. (September 25).

Yue, P., Korkmaz, A.G., and Zhou, H. (2020). Household financial decision making amidst the COVID-19 pandemic. *Emerging. Market Finance*. Trade 56 (10), 2363–2377. https://doi.org/10.1080/1540496X.2020.1784717.