

## ANALYSIS OF THE IMPACT OF THE UNCERTAINTY IN CRUDE OIL PRICE ON ECONOMIC GROWTH: EVIDENCE FORM NIGERIA (1986-2021)

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### Abstract

*The Nigerian populace has begun to experience the bare vagaries of the changes in crude oil prices following the complete stoppage of the subsidy regime especially as the country is both a crude oil exporting and petroleum product importing economy. To offer deeper and more relevant information on the consequences of this, this study therefore analyses the impact of the uncertainty in crude oil prices on economic growth of Nigeria. The study utilized annual data from 1986 to 2021 and employed Non-linear Autoregressive Distributed Lag (NARDL) approach to investigate the asymmetric effects of the variables utilized in the study. The findings indicated that crude oil price did not impact the growth of the economy in the short run much as it did impact on it in the long run. It followed that until there are major adjustments in the use of the resources obtained due to price changes in crude oil, the change in price did not impact on the growth of the economy. A rise or fall of crude oil price within a short period (say a couple of days) does not impact on the economy as no major adjustments would be made in production capacities across the country on the strength of the changes within such short period of time. The study led to the conclusion that public expenditure should not be based on few changes on the price of crude oil but sustained price change and on other economic fundamentals.*

**Keywords:** Crude Oil Prices, Economic Growth, nonlinear ARDL.

### Background of the Study

Among others, events like wars (the Gulf War of the early 1990s, the Russia-Ukraine war etc), global financial crises (the melt-down) and global pandemic (corona disease) are associated with the uncertain nature of the price of crude oil in the past half-century thereby making it difficult for the macroeconomic objectives of most countries to be easily achieved. This is because crude oil is a single commodity that shapes the performances and levels of output in the economy of many countries of the world (Mamothoana, Reneé, Rangan & Mark, 2018). Depending on the type of economy, volatility in the prices of crude oil affects the economic stability of the countries negatively or positively (Mukhtarov, Aliyev & Zeynalov 2020).

Cycles of major events in recent years like the Ukraine war, and the unrest in the Middle East among several others have been followed by several major oscillations in the prices of crude oil thereby causing disruptions in the macroeconomic programmes of countries through major changes in the production output (Apostolos & Khandokar, 2013), general price levels (Bala & Chin 2018), foreign exchange (Delgado et. al 2018), employment levels among others.

Although a rise in crude oil price transfers more resources from crude oil importing to crude oil exporting countries of the world (Amir & Mohammad, 2017), the total consequences of continuous volatility in the prices of crude oil are not clear for a country like Nigeria that exports crude oil and imports refined petroleum products at the same time. This is because crude oil exports benefit Nigeria when the price of the commodity rises but hurt it at the same time. After all, the prices of refined petroleum products that Nigeria imports like gasoline and petrol motor spirit also reflect the changes in the increase in the price of crude oil (Oriakhi & Iyoha, 2013). So, it is not clear where the balance of gains rests in the performance of the economy of Nigeria following volatility in the price of crude oil.

More precisely, the recent changes in the price of crude oil in the international market is associated with a rise in inflation and exchange rate in Nigeria and this has increased untold hardship on Nigerians when the government decided to remove subsidy on refined petroleum products in 2023 as well as allow the country's currency, the naira, to float freely in the foreign exchange market. On the other hand, should the price of crude oil fall as experienced in 2013-2015, Nigeria will suffer a huge decline in the revenue accruing to the economy but enjoy relative stability in the general price but not (necessarily) in the exchange rate.

This research aims to identify the direction of the impact of volatility in the prices of crude oil to countries that are both crude oils exporting and refined oil-importing economies like Nigeria. So, the specific objective of the study is to determine the magnitude with which the volatility in crude oil prices affects the economic growth of Nigeria. This will be achieved by conjuring up the asymmetric argument of both the impact of a rise and a fall in the price of crude oil, following the advances made by Shin et al. (2014) on asymmetric models in econometrics. The research question of the study is simply; what is the magnitude and direction of the effects of volatility in crude oil prices on economic growth? So, the hypothesis of the study sets out to test is as follows: there is no relationship between oil price volatility and economic growth in Nigeria.

This research is important in offering relevant inputs to both the expenditure framework of government in Nigeria which mainly depends on the activities of crude oil and the management/planning of the entire economy to obtain internal and external balance.

The study covered the period from 1986 to 2021 because this period marked the most influential volatilities in the price of crude oil. The study uses yearly figures on GDP: Crude oil prices; West Texas Intermediate (WTI). The study notes the use of monetary policy rate and government spending as policy handles for stimulating and smoothening of the country's economic growth from the influence of the volatility of crude price.

The paper is made up of five sections beginning with the background of the study, Literature review is the second section of the study and methodology is presented as the third section of the study after which the results of the analysis: the fourth section is presented. The last section presents the conclusions, discussion and recommendations of the study.

### **Review of Literature**

The term oil price volatility refers to instability, changes, or a rise or fall, in the supply or demand side of oil prices in the international oil market (Donwa, Mgbame & Aigboduwa, 2015). The rise in the prices of crude oil can be termed positive or negative (i.e. a fall). Volatility is regarded as a popular proxy for uncertainty (Gupta, Pierdzioch, & Salisu, 2022). So more precisely, crude oil price volatility is defined as the standard deviation of oil prices in a given period while an oil price shock is a manifestation of extreme volatility (Ebele, 2015).

The overall performance of an economy otherwise termed economic growth is measured by the change in the volume of its output or the real incomes of its residents (World Bank, 2006). Economic growth is the continuous expansion of the productive potential of an economy; it means that the capacity utilization to produce goods and services as well as to meet the wants of the populace is increased.

Several theoreticians have offered explanations for economic growth in the literature. The traditional growth theories (such as Harrod-Domar, and Rostow's stages of growth), neoclassical (Solow-Swan), and endogenous or new growth theories (such as Arrow's learning by doing, Romer model, Lucas), etc., focus on primary inputs such as; Capital, labour, and Technology while failing to recognize the role of primary energy inputs such as; oil deposits.

Samuelson and Nordhaus (1985) shed light on the traditional growth theory by maintaining that the primary determinant of growth is production which in turn depends on energy. This idea categorizes capital, labor and land as primary factors of production. It maintained that these factors exist at the beginning of the production process and are not directly used up in production even though they can be degraded or added whereas energy resources (such as; oil and gas, fuels, and coal) are categorized as intermediate inputs which are created during the production period and are entirely used up during the production process.

Many scholars have explained some characteristics and the nature of economic growth. For example, otherwise called the linear/symmetric theory of economic growth, the volatility in economic growth is said to be mainly driven by volatility in the price of crude oil (Hamilton (1983), Gisser (1985), Goodwin (1985), Hooker (1986) and Laser (1987)). The events of the oil market between 1948 and 1972 and its impact on the economies of oil-exporting and importing countries respectively were the bases of the thought underlying this hypothesis. However, some have also shown that the effect of crude oil prices on economic growth could be asymmetric (Mark et. al (1994), Ferderer (1996) and Balke (1996))

Several empirical investigations of the effects of the impacts of crude oil volatility on economic growth have equally shown varying results. Using the panel Vector Autoregression model on 32 Sub-Saharan African economies spanning the period of 37 years (190-2017), Clovis and Elvis (2021) conducted a comprehensive examination of the intricate relationship between crude oil prices and economic growth. Their results for both the long and short run indicate a positive effect of crude oil prices on economic growth. However, a study by Sławomir, Monika, Michal, and Małgorzata (2021) on the impact of uncertainty in oil prices on economic growth indicates a different result. Unlike those of Clovis and Elvis (2021), the authors (Sławomir et.al (2021)) used a more advanced technique (SVAR) of analysis in their investigation and their results show that a consistent and enduring decline in industrial production in response to oil price uncertainty shocks, with varying degrees of impact across the sampled countries (Russia, Canada, Mexico, and Norway).

The results of the analysis of the impact of crude oil price volatility and economic growth on a more expanded scope of the investigation and for a larger number of sample countries also corroborate the results in Slowomir et. al (2021). That of Mamonthoana, Renee, Rangan, and Mark (2019) was an earlier comprehensive investigation into the consequences of oil price volatility on economic growth for advanced economies, spanning the period from 1870 to 2013. The results show a negative and statistically significant impact of oil price volatility on the economic growth of OECD countries.

Apart from the evidence from panel studies, some country-specific evidence is quite revealing as they show how crude oil price impacts the respective economies under investigation in each case. For example, in a study covering the period from (1995-2020) through the use of VAR methods, oil price uncertainty results in a decrease in China's real economic activity, world oil production, and world oil price (Qinhua, Buben & Wang;2022). For South Africa, oil price uncertainty shock has an adverse and persistent effect over time (Junior, Chiweza & Goodness 2018). Structural Vector Autoregressive (SVAR) was used on a monthly data set from 1990 to 2015 to arrive at this result. Consistent with GIRF, the Generalized Variance Decompositions (GFEVDs) analysis also points out that oil price uncertainty shocks contribute substantially to variations in real output, inflation, and various macroeconomic variables of South Africa.

For the case of Mexico, the results of the analysis of the impact of crude oil price uncertainty on economic growth show that the uncertainty of the international price of oil has a different effect on each of the different sectors of economic activities in Mexico; it does not influence the primary sector, it negatively impacts the secondary sector, and there is mixed evidence in the tertiary sector (Rodriguez-Benavides, Andres-Rosales, Del Rio-Rama & Irfan (2022). It is a quarterly data set spanning the period 1993:1 to 2020:4 and a bivariate structural (VAR) model is the method of analysis. The GARCH in mean was used to capture the impact of oil volatility on economic growth at the sectoral level of economic activity.

Research on the changes/volatility in crude oil prices and Nigeria's economic growth has been studied by several scholars especially as Nigeria is considered both an oil-exporting and importing economy. Using the Autoregressive Distributed Lag (ARDL) method for the period spanning 1985 to 2020, Sule-Iko and Nwoye (2023) investigated the effect of oil price and its volatility on the development of Nigeria's economy and the result showed that in the short run, there was a positive impact of oil price on real GDP which was statistically significant at one percent level. It also revealed that while oil price volatility affected economic growth positively in the short term, its effect in the long term was not statistically significant. Abel, Ishmael and Gideon's (2021) conclusion on Nigeria's economy corroborates those of Sule-Iko and Nwoye (2023) despite their use of different sampled periods (1970-2021) but the same method of analysis.

Similarly, using VAR, Baba (2020) investigated the effect of oil price volatility on economic growth in Nigeria for the period between 1997-2017 and concluded that oil price volatility has a negative and significant effect on the current GDP growth rate. The study also concludes that both GDP Growth and Oil Price volatility impact affect each other. Using the GARCH approach to estimate the impact of oil price volatility on economic growth in Nigeria for the period spanning 1984 to 2017, Joseph, Callistus, and Paschal (2020) showed that oil price and fluctuations in oil price have a positive effect on the economic growth in Nigeria. However, the effect of fluctuations in oil prices is not statistically significant. Like Joseph, Callistus, and Pascal (2020), Bernard (2019) used the GARCH approach as a test of the symmetric nature of the impact of oil price uncertainty on economic growth in Nigeria for the period spanning 1980 to 2019 and the result show that real output tends to respond negatively to positive real oil price uncertainty, and positively to negative real oil price uncertainty. The responses of real output following positive and negative real oil price uncertainties are asymmetric.

Like Junior, Chiweza and Goodness (2018), Muhammad and Benedict (2019) used SVAR to examine empirically the effect of oil price volatility on economic growth in Nigeria using annual time series data from (1985–2016). The findings revealed that oil price volatility has a negative and insignificant effect on economic growth in Nigeria. It was also found that the variables used

in the study had a long-run relationship and finally, no evidence of causality was found between oil price volatility and economic growth in Nigeria.

From the foregoing empirical investigations, there is no definite consensus on the impact of oil price volatility on economic growth in the literature. Although the only consensus is mainly on the existence of the relationship between them but there is yet to be any consensus on the direction of the relationship. Except for the research by Bernard (2019), most of the other studies assume a symmetric relationship between volatility in oil prices and economic growth. Among others, the main contribution of the present study is methodology: the study employs the Non-Linear Autoregressive Distributed Lag (NARDL) due to its unique property of asymmetry in effects which is more realistic than the Standard Autoregressive Distributed Lag (ARDL) as it does not impose linearity on the relationship between the regressors (volatility of oil price) and the explained (economic growth). It does not also impose the symmetric assumption on each of the variables in the relationship. The advantage of deploying this method of analysis is that it relaxes unrealistic assumptions and works with more realistic assumptions.

### **Methodology**

This section sheds light on the method of the empirical analysis and the reason for applying it to achieve the main objective of the research. The paper expresses the growth of the economy in the form of real gross domestic product (RGDP) often reported in the publication of the Central Bank of Nigeria (CBN) otherwise called by the Statistical Bulletin of the CBN and crude oil price volatility (OILP) is the price of West Texas Intermediate (WTI) price of crude that is often used as the international price of crude oil. This data set was obtained from the US Energy Information Administration. Other measures accorded consideration as intervening factors in the investigation are the following: exchange rate (EXR), inflation rate (INF), interest rate proxied by the rate to which CBN controls money creation of the commercial banks otherwise called the monetary policy rate (MPR) and public expenditure i.e. government (GEXP). Both EXR and INF are obtained from the World Development Indicator while MPR and GEXP are obtained from the Statistical Bulletin of the CBN. All data sets are for the period spanning 1986 to 2021. Until 2006, the minimum rediscount rate (MRR) was the least.

To have insight into the symmetric nature of the relationship and not to impose linearity assumption on the relationship, we adopt the NARDL model advanced by Shin et. al (2014) to estimate the relationship between RGDP and OILP while taking EXR, INF, MPR, and GEXP as intervening factors that are capable of influencing the impact of OILP on RGDP.

The attraction of NARDL is that it represents the simplest method available for modeling combined short-run and long-run asymmetries. The model provides more reliable results than the standard ARDL because it is more realistic due to its asymmetry-in-effect property. For example, most people are assumed to be rational and risk-averse which makes them respond quickly to negative shocks more than positive shocks. It follows uncertainty shocks which is a major advantage over linear VAR and nonlinear methods such as quantile regression and Markov models that have recently become popular in the uncertainty literature (Liang, Troy & Rouyer, 2020). Therefore, the model to be estimated is given as follows:

$$\begin{aligned}\Delta \ln RGDP_t = & \alpha + \sum_{i=1}^{p-1} \beta_0 \Delta \ln RGDP_{t-1} + \sum_{i=0}^q \beta_1^+ \Delta \ln OILP_{t-1}^+ + \sum_{i=0}^q \beta_1^- \Delta \ln OILP_{t-1}^- \\ & + \sum_{i=0}^q \beta_2^+ \Delta \ln EXR_{t-1}^+ + \sum_{i=0}^q \beta_2^- \Delta \ln EXR_{t-1}^- + \sum_{i=0}^q \beta_3^+ \Delta \ln INF_{t-1}^+ + \sum_{i=0}^q \beta_3^- \Delta \ln INF_{t-1}^- \\ & + \sum_{i=0}^q \beta_4^+ \Delta \ln GEXP_{t-1}^+ + \sum_{i=0}^q \beta_4^- \Delta \ln GEXP_{t-1}^- + \sum_{i=0}^q \beta_5^+ \Delta MPR_{t-1}^+ \\ & + \sum_{i=0}^q \beta_5^- \Delta MPR_{t-1}^- + \rho y_{t-1} + \varphi_1^+ \ln OILP_{t-1}^+ + \varphi_1^- \ln OILP_{t-1}^- + \varphi_2^+ \ln EXR_{t-1}^+ \\ & + \varphi_2^- \ln EXR_{t-1}^- + \varphi_3^+ \ln INF_{t-1}^+ + \varphi_3^- \ln INF_{t-1}^- + \varphi_4^+ \ln GEXP_{t-1}^+ + \varphi_4^- \ln GEXP_{t-1}^- \\ & + \varphi_5^+ \ln MPR_{t-1}^+ + \varphi_5^- \ln MPR_{t-1}^- + \mu_t\end{aligned}$$

Where  $\Delta$  represent first difference operator,  $\varphi_i^+$  and  $\varphi_i^-$  are the positive and negative long-run multipliers.  $\beta_i$  for each positive and negative parameter represent the short run dynamic coefficient,  $\mu$  is white noise,  $\alpha$  is an example of drift, term  $p$  and  $q$  are optimal lag lengths for the dependent and independent variables respectively. We took the natural log of all values not in percentage form to be able to express the results of the estimations in percentage and not money values.

The existence of long-run relationships is ascertain by conducting an F-test for the joint significance of the coefficients of the lagged values of the variables taking into account the null hypothesis of no co integration,  $H_0 : \rho = \varphi_1^+ = \varphi_1^- = 0$ . We calculate the NARDL long-run levels by asymmetric coefficients by dividing the coefficient of  $OILP_{t-1}^+$  (i.e.  $-\varphi_1^+$  by the coefficient of  $RGDP_t$  (i.e.  $\beta$ ) :

$$\frac{-\varphi_1^+}{\beta}$$

And also, by diving the negative of the coefficient of  $OILP_{t-1}^-$  (i.e.  $-\varphi_1^-$ ) by the coefficient of  $RGDP_t$  (i.e.  $\beta$ ):

$$\frac{-\varphi_1^-}{\beta}$$

Short-run asymmetric effects of **OIPL** on **RGDP** is represented by  $\sum_{i=1}^q \beta_i^+$  and  $\sum_{i=1}^q \beta_i^-$

Using Wald test, if the null hypothesis  $\frac{-\varphi_1^+}{\beta} = \frac{-\varphi_1^-}{\beta}$  for long-run symmetric and  $\sum_{i=1}^q \beta_i^+ = \sum_{i=1}^q \beta_i^-$  for short-run symmetric relationship are rejected, we conclude the impact of **OIPL** on **RGDP** is asymmetric.

Using the Augmented Dickey-Fuller (ADF) unit root test, we obtained the stationarity test of each of dataset and they are all either stationary at levels or at first difference to enable us have reasonable ground for deploying the NARDL model (Shin et. al 2014).

## Results of Analysis and Discussions

This section presents the results of the empirical estimation of the data of this study. We start by presenting the result of the diagnostics checks on the data: stationarity, serial correlation, heteroscedasticity and normality.

The results of the unit root test indicates stationarity at levels or first indifference for the variables and this enabled us to make use of the NARDL model to explain the relationship between economic growth and crude oil price volatility. This result is presented in Table 1.

**Table 1: Result of Unit Root Test**

| VARIABLES | ADF<br>@Level | P-value | ADF<br>@FirstDiff. | P-value | ORDER OF<br>INTEGRATION |
|-----------|---------------|---------|--------------------|---------|-------------------------|
| LNRGDP    | -0.582026     | 0.8617  | -3.803929          | 0.0066  | I(1)                    |
| EXR       | 2.267170      | 0.9999  | -3.875857          | 0.0055  | I(1)                    |
| OILP      | -1586217      | 0.4789  | -6.178348          | 0.0000  | I(1)                    |
| INFR      | -4.616865     | 0.0007  |                    |         | I(0)                    |
| LNGEXP    | -1.976815     | 0.2951  | -7.759705          | 0.0000  | I(1)                    |
| MPR       | -3.479013     | 0.0146  |                    |         | I(0)                    |

*Note 1: LNRGDP and LNGEXP denote natural logarithm of Real Gross Domestic Products and natural log of Government expenditure.*

Source: Authors' estimation using Eviews

A choice of the most optimal lag length is important for a robust result in the estimation of a NARDL model. This study employs the AR root test, which clearly indicates that lag 1 falls within the stability region of the AR root circle. Consequently, lag length one (1) is deemed the most suitable criterion for the model and is, therefore, adopted for further analysis.

**Table 2: Result of VAR Lag Selection Criteria**

| Lag | LogL      | LR        | FPE       | AIC       | SC        | HQ        |
|-----|-----------|-----------|-----------|-----------|-----------|-----------|
| 0   | -612.6093 | NA        | 2.56e+08  | 36.38879  | 36.65814  | 36.48064  |
| 1   | -449.8698 | 258.4687* | 153595.4* | 28.93352* | 30.81902* | 29.57653* |
| 2   | -427.3824 | 27.77849  | 419421.4  | 29.72838  | 33.23003  | 30.92254  |

Source: Authors' estimation using Eviews

### Result of Model Estimation

The analysis of NARDL results for the impacts of the uncertainty in crude oil prices on economic growth in Nigeria reveals several significant findings as shown in Table 3. The result of the model (NARDL) of the study is quite revealing. With regard to the impact of crude oil prices on economic growth, either an increase or a decrease in crude oil prices has a statistically significant impact on economic growth but the impact is asymmetry which means that the strength of positive and negative effects differs. The result shows that in the short run, the crude oil price decrease is statistically insignificant, which means that a 1% decrease in oil price has no influence on

economic growth in the short run hence the positive change in crude oil price is omitted in the results of the regression through EViews which means that the effect becomes negligible suggesting that other factors play a more significant role in determining economic growth in the short-run.

Precisely, the result shows that in the long run, a 1% increase in crude oil price leads to a 0.001963(1.96%) increase in economic growth. On the other hand, a 1% decrease in crude oil price leads to a lower 0.002445 (0.24%) decrease in economic growth. This minuscule coefficient (1.96%) for every positive change in crude oil price and even a lower (0.24%) coefficient for negative change is an indication that the non-oil sector of the economy offers huge potentials for economic growth than the oil sector.

As shown in Table 3, the impact of the changes in crude oil prices on economic growth is only slightly (0.07%) felt through negative changes in crude oil prices in the short run.

**Table 3: NARDL Result**

| <b>Dependent Variable: LNRGDP</b> |                    |                   |                    |              |
|-----------------------------------|--------------------|-------------------|--------------------|--------------|
| <b>Variable</b>                   | <b>Coefficient</b> | <b>Std. Error</b> | <b>t-Statistic</b> | <b>Prob.</b> |
| <b>Long run estimate</b>          |                    |                   |                    |              |
| LNRGDP(-1)                        | -0.506699          | 0.117187          | -4.323856          | 0.0004       |
| LNRGEXP_POS                       | 0.043152           | 0.010889          | 3.962921           | 0.0009***    |
| LNRGEXP_NEG                       | -0.038331          | 0.014102          | -2.718171          | 0.0141**     |
| MPR_POS(-1)                       | 0.007755           | 0.003871          | 2.003191           | 0.0604       |
| MPR_NEG                           | 0.004597           | 0.002802          | 1.640358           | 0.1183       |
| OILP_POS                          | 0.001963           | 0.000785          | 2.502273           | 0.0222**     |
| OILP_NEG(-1)                      | -0.002445          | 0.001108          | -2.20592           | 0.0406**     |
| INFR_POS(-1)                      | 0.000762           | 0.000682          | 1.116734           | 0.2788       |
| INFR_NEG                          | 0.002607           | 0.000703          | 3.708199           | 0.0016**     |
| EXR_POS                           | -0.001223          | 0.000424          | -2.883204          | 0.0099***    |
| EXR_NEG                           | 0.000677           | 0.004336          | 0.156240           | 0.8776       |
| <b>Short run estimate</b>         |                    |                   |                    |              |
| D(MPR_POS)                        | -0.002074          | 0.002536          | -0.818103          | 0.4240       |
| D(OILP_NEG)                       | -0.000798          | 0.000645          | -1.237628          | 0.2318       |
| D(INFR_POS)                       | -0.000960          | 0.000392          | -2.449394          | 0.0248**     |
| R-Square                          | 0.999079           |                   |                    |              |
| Adj. R-Square                     | 0.998311           |                   |                    |              |
| F-statistic                       | 1301.437           |                   | Prob(F-statistic)  | 0.000000     |

*Note 1: LNGDP and LNGEXP, denote natural logarithm of real gross domestic product, exchange rate, inflation and monetary policy rate. Note 2: \*\*\*, \*\* and \* indicates significant at 1%, 5% and 10% respectively.*

Regarding exchange rates, the results show that any appreciation in the value of the exchange rates hurts economic growth in the long term, with a coefficient of -0.01223, meaning that a 1% appreciation in exchange rate leads to a 0.01223(1.23%) decrease in economic growth in Nigeria. A strong currency can lower the competitiveness of exports; and potentially decrease economic growth. Any depreciation issues of exchange etc have no statistical significance on economic growth in the long run and this is indicated by the p-value (probability value) of 0.8776. This means that the depreciation of the exchange rate does not contribute to changes in economic growth in the long run. However, in the short run, the effect becomes negligible which suggests that other intervening factors play a more significant role in determining long-term growth prospects in Nigeria.

The public sector space captured by public finance i.e. government expenditure eventually (in the long run) impacts the economy larger than crude oil price or exchange rate for that matter. However, there is no such impact of public expenditure on economic growth in the short run but the long-run coefficient of 0.043152 implies that a 1% increase in government spending positively influences economic growth by 0.043152(4.31%) in the long term. An increase in government expenditure can stimulate economic activity, create jobs, and enhance infrastructure development in stimulate economic activity and this takes some time to fully mature due to the lag of full implementation. On the other hand, a decrease in government expenditure results in a decline in the country's economic growth but not as an increase in expenditure would have increased the growth of the economy. Precisely, the coefficient -0.038331 for the decrease in government spending implies that a sustained decline in government spending reduces economic growth in the long run by 0.038331(3.83%).

Often perceived as an evil, the evidence from estimation did not show that inflation is capable of hugely slowing economic growth and by extension increasing unemployment. The result of the estimation shows a substantial negative relationship with a coefficient of 0.002607 between inflation and economic growth. In other words, in the long term, a 1% decline in the rate of inflation seems to lead to increased economic growth by a minuscule rate of 0.002607(0.26%). This can be explained by the fact that a decrease in the rate of inflation may encourage consumers to spend money quickly before money loses value due to a rise in inflation. Similarly, the result of an increase in the inflation rate on the economy in the long run is negligible at 0.07% for every 1% increase in inflation rate and this is not even statistically significant at a 10 percent rate of significance. Also, the short-run impact of inflation on changes in economic growth is insignificant, meaning that it does not influence changes in economic growth. Lastly, the result for monetary policy rates shows that both increase and decrease in the rate do not affect economic growth in the long run. Using the error correction term (ECT), the correction of deviations from short-run to long-term values is estimated to be 0.57 % each year. This shows that it takes close to 6months to correct any deviation from the long-run equilibrium. Also, the R-square which measures the degree to which the explanatory variables (crude oil price, exchange rate, government spending monetary policy rate, and inflation) explained economic growth is high at 99.91%. Also, F-statistics ( $F=1301.437$ ) which measures the overall significance of the model indicates that all the estimated regression coefficients are highly statistically significantly different from zero. The result also shows that only a rise in inflation has a significant impact on economic growth.

**Table 4: Result of Long-run and Short-run Asymmetry**

| Variable                   | F-statistic | df      | P-value |
|----------------------------|-------------|---------|---------|
| <b>Long run asymmetry</b>  |             |         |         |
| LNGEXP                     | 0.487390    | (1, 20) | 0.4931  |
| MPR                        | 5.459443    | (1, 20) |         |
| 0.0300**                   |             |         |         |
| OILP                       | 1.300018    | (1, 20) | 0.2677  |
| INFR                       | 10.59747    | (1, 20) |         |
| 0.0040***                  |             |         |         |
| EXR                        | 9.166364    | (1, 20) | 0.0066  |
| <b>Short run asymmetry</b> |             |         |         |
| MPR                        | 4.313108    | (1, 20) | 0.0509  |
| *                          |             |         |         |
| OILP                       | 3.700566    | (1, 20) |         |
| 0.0687*                    |             |         |         |

Source: Authors' computation using Eviews and \*\*\*, \*\* and \* indicate significance at 1%, 5% and 10% respectively.

Shown in Table 4, the result of analysis on the asymmetry nature of the relationship indicates asymmetrism in the price of crude oil in the short run at 10% level of significance but not in the long run where the level of significance is well above 20%. It means that positive and negative changes in the price of crude oil does not have the same effect on economic growth in the short run but in the long run, the effects are the same. Similarly, the MPR is asymmetric at 10 % level of significance in the short run and also asymmetric in the long run but at 5% level of significant. In the long run however, result shows that EXR and INFR also indicate asymmetrism behavior and they are individually statistically significant at 5% level of significance. But for government expenditures (LNGEXP), the result shows that it is symmetric in the long run. This is because the Wald test result shows that government expenditures is statistically insignificant in the long run with a value almost 50% and also the result in the short run is immaterial.

#### Discussions of Findings, Conclusions and Recommendations

The main points to be drawn from the findings of this study is that crude oil price does not impact on the growth of the economy in the short run much as it does impact on it in the long run. It follows that until there are major adjustments in the use of the resources obtained due to price changes in crude oil, the change in price does not impact of the growth of the economy. The rise or fall of crude oil price within a short period (say a couple of days) does not impact on the economy as no major adjustments would be made in production capacities on the strength of the changes within such short period of time by most business and households who earns income directly or indirectly from the sales of crude oil or refined products.

Should a major sustained price changes events like the gulf war in the 1980s, the global financial crises, the gulf war, Ukraine-Russia wars etc. occur like it did recently, the impact of a rise in crude oil price will eventually cause a rise in the economic growth of the country but not immediate.

From the findings and conclusions indicated above, public expenditure should not be based on few changes on the price of crude oil but sustained price change and on other economic fundamentals. Reduction in crude oil price should not be allowed to discourage public expenditure that has been adequately planned to improve infrastructure in the country this is

because the likely reduction in prices does not cause major reduction in the economy like increase in price will cause improvement in the economy.

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