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Oil Price Shocks and Fiscal Spending in Oil Producing Economy: The Role of Asymmetry

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Author's contribution

Author BOM designed the study, performed the statistical analysis, interpreted the result, wrote the protocol and wrote the first draft of the manuscript. He also managed the analyses of the study and the literature searches, read and approved the final manuscript.

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ABSTRACT

Given their over reliance on proceeds from the sale of crude oil, fiscal spending in the oil-producing economy are often characterised with some specific challenges mainly due to the uncertainty in the nature of oil price movements in the international crude oil market. Motivated by the historical up – down trends in the international oil prices and their potential implications particularly for oil-producing countries, this paper explores linear and non-linear ARDL frameworks to examine the symmetric and asymmetric impact of oil price shocks on fiscal spending. Using the case of the Nigerian economy, this empirical finding suggests that shocks to international oil prices did matter for fiscal spending in the oil-producing economy. On the direction of the impact of the shocks, the finding of the non-rejection of the null hypothesis of no asymmetry thus implies that fiscal spending in Nigeria reacts indifferently to either a positive or negative oil price shocks.

Keywords: Fiscal spending; oil price shocks; asymmetry; Nigeria.

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1. INTRODUCTION

Given the unpredictable nature of oil prices, government fiscal spending in the oil-producing economy tends to face specific challenges because oil revenue originates from abroad and is exhaustible and volatile [1]. This among other makes fiscal spending rather challenging in the oil- producing economy, where the volatility of oil prices is likely to prompt corresponding volatility in oil revenues; and a kind of complexity in government fiscal spending. These challenges tend to be greater with the larger the share of oil revenues is, in the government's overall revenues and the larger the oil sector is in the economy. Being the largest oil producer in Africa, government fiscal spending and/or public finances in Nigeria has shown a tendency of over- reliance on oil revenues since the country discovered crude oil in commercial quantity. According to Olofin et al. [1], besides the fact that Nigeria is one of the developing economies, one of its major economic challenges is that it is susceptible to volatile macroeconomic environment constrained by external terms of trade shocks and reliance on crude oil export. With about 75% of her revenue sourced from crude oil proceeds [1], fiscal policy in Nigeria is likely to be influenced by oil-driven volatility impacting both revenue and expenditure.

The reliance of Nigerian economy on oil revenue which in turn depends on oil price movements as it was with other oil exporting nations tend to render fiscal management, budgetary planning, and the efficient use of public resources difficult. In recent time, for instance, the Nigerian foreign reserve depleted from about $42 billion USD to about $30 billion USD. This has been mainly attributed the recent drastic drop in the international crude oil prices, from over $110 USD in the fourth quarter of 2014 to about $40 USD in the first quarter of 2015 [1]. As a consequence, a number of Nigerian states at the subnational level failed to effectively perform their fiscal responsibility due to their overly dependent on proceeds from the sale of crude oil at the national level. On the whole, the uncertainty nature of oil price in the international market appears to have had its share on fiscal instability in Nigeria, and the effects have been channeled to the rest of the economy with fundamental effect on government revenue and provision of public goods.

The aforementioned though, it must be pointed out, however, that the extent to which fiscal policy reacts to changes in oil prices may depend on whether the shocks to oil price is positive or negative shocks. For instance, a rising or positive oil price shock, on the one hand, can easily be accommodated by oil- producing countries since it enhances fiscal policy by increasing the revenue and consequently government fiscal expenditure. On the other hand, however, falling oil prices or negative oil price shocks rather constitute a major fiscal policy problem as it put a strain on oil revenue and in turn fiscal expenditure. What this portends is that negative oil price shocks do not have an equivalent effect with positive oil price shocks. It is, therefore, expected that the way in which the governments adjust its expenditure and revenue policies to oil price shocks is likely to be predicated on whether the oil price shock is negative or positive.

Given the above, the objective of this study was to examine in relative term, the asymmetries consequence of oil price shocks on fiscal spending in Nigeria. Essentially, the study employed the recently developed NARDL model [2] to examine the short run and long-run asymmetrical response of fiscal policy to oil price shocks in Nigeria. Following this introductory section, the rest of the paper is structured as follows: Section 2 is the review of the literature. The theoretical framework is in section 3. Section 4 is the model and data description, while section 5 is the econometric methodology. Section 6 presents and discusses the results, while section 7 depicts the conclusion and policy recommendation.

2. REVIEW OF LITERATURE

Available literature on government fiscal activity and oil prices can be categorised into three strands of studies. The first includes those that focus mainly on the impact of oil price changes on macroeconomic fundamentals such as growth, inflation, exchange rates, stock market, among others. This strand of literature is traceable to the major oil price shocks of the 1970s and the subsequent attempts by [3,4] to unravel its macroeconomic consequence (see for example, [4,5,6,7,8] for a review. The second strand of studies tends to investigate the optimal fiscal policy for oil-exporting countries, while the third on the other hand includes studies whose concerns are on how fiscal activities or variables in such economy respond to the changes in oil prices. Quite a number of studies have examined the optimal fiscal policy for oil-exporting countries (see, [9,10,11,12,13,14,15,16]).

However, despite the vastness of literature on the macroeconomic consequence of oil price shocks as well on an optimal fiscal policy of oil-producing economies, only a few studies have actually evaluated the impact of oil price shocks on the fiscal activity of such economy.In this regard particularly in recent time, studies by Aregbeyen and Fasanya [17] as well as Aregbeyen and Kolawole [18] for the example of Nigeria, Anshasy and Bradley [19] for the cases of selected oil exporting countries, Farzanegan [20] for Iran, Jbir and Zouari-Ghorbel [21] Tunisia, Farzanegan and Markwardt [22] Iranian economy, Reyes-Loya, M. and Blanco [23] and Tijerina-Guajardo and Pagán [24] for Mexico. Some of these studies concluded that oil prices influence fiscal policy and that can be a key propagation mechanism for transmitting oil price shocks to the domestic economy ([25,26,27,28]). Ossowski et al. [29] in particular emphasised the trade-offs between increasing spending – in response to higher oil prices – and the institutional ability to effectively and efficiently absorb such an increase. They find that while the latest oil boom (2004–2008) allowed oil-producing countries to increase public spending, these countries had relatively low indices of government effectiveness.

The aforementioned present extensive studies on oil prices, however, it must be mentioned that the bulk of these studies assume linearity of oil price changes in their respective specification. Hence, inference drawing base on their findings must be with caution since the resulting estimates are likely to be asymptotically biased if the true relationship is nonlinear and mistakenly specified as linear and vice-versa (see [4,30,31] for review on nonlinear and asymmetric effects of oil price changes). It is in this light, therefore, that this present study further advances this emerging strand of literature using the case of the Nigerian economy. Essentially, the study considered both the linear (symmetry) and nonlinear (asymmetry) impact of oil price shocks on government fiscal spending following the approach proposed by Shin and Greenwood-Nimmo [2]. This approach simplifies the decomposition of the oil price into positive and negative partial sum decompositions of changes. By asymmetry, the impact of oil price shock is, assumed to differ between positive and negative changes in oil price. In other words, the asymmetric model is used to test whether the government in the course of their fiscal spending reacts more to positive (negative) oil price shock than to negative (positive) oil price shock.

3. THEORETICAL FRAMEWORK

The task of examining the impact of the oil price shock on government fiscal spending of an oil-producing economy would require as a starting point, a theoretical framework on the probable response of policymakers to oil price changes. is the study aims to derive a policy equation which identifies how oil price changes can affect policy formation and then; use the model that follows from the theoretical equation to estimate and interpret the impact of oil prices on fiscal policy. Thus, the following summarises the main features of the model (see [19] for the full model and derivation of the equations).

The model assumes a household sector and a government sector, tied together with goods and asset market equilibrium conditions. Production in the economy consists of oil output and non-oil output. The private sector output fluctuates in response to changes in real oil prices reflecting the fact that despite diversification efforts, the non-oil sector in oil exporting countries closely follows the ups and downs in oil revenues. All oil revenue goes to the government, so real oil output represents government revenues. There is one, infinitely lived, risk-averse, individual agent that can either consume or accumulate assets in the form of government bonds. The private sector can import (export) consumption goods such that the trade balance is zero at the beginning of every period. The private agent maximises her expected lifetime utility from the future consumption stream subject to an intertemporal budget constraint. Finally, the government finances its spending through revenue from oil and borrowing on financial markets and faces a conventional intertemporal budget constraint. A social planner maximises utility from government spending subject to the intertemporal budget constraint. The model is closed with two equilibrium conditions for both the goods market and the financial market.

To derive the government's fiscal reaction, the study started with the Euler equations for consumption and government spending. Both variables co-vary to the exogenous common oil price shock. Solving the two Euler equations along with the equilibrium conditions dictating the time path of government spending yields an equation in the gross growth of government spending as a function of the government's discount rate, $\tilde{\rho}$ the private discount rate, $\tilde{\beta}$ the growth in consumption g_t^C , and the variance of oil price shocks σ_{pt}^2.

$$E_t \ln\left(1+g_t^G\right) = \tilde{\beta} - \tilde{\rho} + E_t \ln\left(1+g_t^C\right) - \frac{\rho\alpha\delta}{\beta}\sigma_{\tilde{\rho}_t}^2 \quad (1)$$

Carroll and Kimball [32],33], showed that a log-linearised Euler equation would miss important parameters of the distribution of future income, namely all the non-linear parameters. Therefore, to capture potential nonlinear effects of higher order terms of the distribution of oil prices, which might affect government spending, a third order Taylor approximation to equation (1) was employed. Since the fiscal reaction function can be further modified to account for some peculiarities depending on the researcher's argument, therefore, the study follows the approach of Anshasy and Bradley [19] to replace the consumption growth with government revenue such that; the unobservable expectations for government spending and government revenue with their realisations are: $g_t^G = \overline{g} + \delta\tilde{\rho}$ for government spending and $g_t^r = \overline{g}_{rp} + \alpha\tilde{\rho}_t$ for government revenue where, $\overline{g}$ and $\overline{g}_{rp}$ represent the deterministic portions of government spending and government revenue respectively, and $\tilde{\rho}$ is the oil price shock. These two steps yield equation 2 as follows:

$$g_t^G = \left(\tilde{\beta} - \tilde{\rho}\right) + g_{rpt} + \left(\delta + \alpha\right)\tilde{\rho}_t + \left[\frac{\delta^2}{2} - \frac{\beta\alpha^2 + 2\rho\alpha\delta}{2\beta}\right]\sigma_{\tilde{p}_t}^2 + \frac{\alpha^3 - \delta^3}{3}\lambda\tilde{p}_t \quad (2)$$

Equation (2) serves as the basis of our empirical investigation, where $\lambda\tilde{p}_t = E\left[\tilde{p}\right]$ is a measure of the skewness of oil price shocks.

4. THE MODEL AND DATA DESCRIPTION

Stemming from the aforementioned theoretical foundation, there are three classes of explanatory variables, which affect the growth in government fiscal spending and size. First, country-specific effects, such as the differential between the private sector and government discount rates. The second group of variables captures the revenue stream of the fiscal system, which in the context of this study are oil revenue and non-oil revenue. The third group, which is the central of this investigation, is the set of variables associated with oil prices.

The theoretical model though includes three different channels through which oil prices affect fiscal policy, namely; oil price shocks, the volatility of oil prices, and the skewness of oil price shocks. However, the study only isolated the effect of oil price shock. And this because, measure for the volatility of oil price and the skewness of oil price requires high- frequency data, yet the fiscal policy variables are mostly measured on quarterly and/or annual basis. More so, the study controlled for macroeconomic stability and relative price. Thus, a log-linear transformation of the above government's fiscal reaction specification can be re-specified in a more empirical and estimable form as follows:

$$\Delta g_{t-1}^G = \beta_0 + \beta_1 id_t + \beta_2 or_t + \beta_3 nr_t + \beta_4 exr_t + \lambda' Z_t' + \varepsilon_t \quad (3)$$

To capture the role of asymmetries in the response of government fiscal spending to oil price shocks, the study further partition the oil price shock in equation (3) into positive and negative oil price shocks. The essence, however, is to test for the asymmetric impact of oil price shocks on the government fiscal spending. Thus, the revised model is as follows:

$$g_t^G = \beta_0 + \beta_1 id_t + \beta_2 or_t + \beta_3 nr_t + \beta_4 op_t + \beta_5 op_t^- + \lambda' Z_t' + \varepsilon_t \quad (4)$$

Equation (4) is the asymmetric version of the equation (3) where op^+ and op^- denote positive and negative oil price shocks, respectively. The growth of government fiscal spending (g_t^G) is measured as the log of total government expenditure. id_t is interest rate differential measure as a log of difference between the household lending rate and government monetary policy rate. or_t and nr_t denote log of oil revenue and non-oil revenue, respectively. The oil price shocks (op_t) is measured as the log of the world Brent crude oil price, while Z_t' is a vector for the control variables namely; macroeconomic stability (mac) measure as the log of consumer price index and the log of Naira/USD exchange rate (EXR). The data sources include the Central Bank of Nigeria database and the American Energy Information Administration (EIA).

5. ECONOMETRIC METHODOLOGY

To evaluate the asymmetry response of government fiscal spending to changes in oil price, the present study employs the Non-linear Autoregressive Distribution Lag (NARDL) approach of Shin et al. [2]. Highlighting some of the advantages of using the NARDL approach, Hoang et al. [34] stated that, it allows modelling the cointegration relation that could exist between the dependent and independent variables; it permits to test both the linear and nonlinear cointegration; it distinguishes between the short and long-run effects from the independent variable to the dependent variable. These benefits may, of course, be also valid for nonlinear threshold Vector Error Correction Models (VECM) or smooth transition models. These latter models may, however, suffer from the convergence problem due to the proliferation of the number of parameters. For robustness, however, this study also considers the traditional ARDL (symmetric approach) in addition to the Non-linear ARDL (asymmetric approach). The specification of the symmetric ARDL model following the standard framework of [35] is as follows;

$$\Delta g_t^G = \alpha_0 + \alpha_1 g_{t-1}^G + \alpha_2 \mathrm{id}_{t-1} + \alpha_3 or_{t-1} + \alpha_4 nr_{t-1} + \alpha_5 op_{t-1} + \alpha_6 mac_{t-1} + \alpha_7 exr_{t-1} + \sum_{i=1}^{N1} \lambda_i \Delta g_{t-i}^G + \sum_{j=0}^{N2} \gamma_j \Delta \mathrm{id}_{t-j} + \sum_{j=0}^{N3} \gamma_j \Delta or_{t-j} + \sum_{j=0}^{N4} \gamma_j \Delta nr_{t-j} + \sum_{j=0}^{N5} \gamma_j \Delta op_{t-j} + \sum_{j=0}^{N6} \gamma_j \Delta mac_{t-j} + \sum_{j=0}^{N7} \gamma_j \Delta exr_{t-j} + \varepsilon_t \quad (5)$$

The long- run parameters for the intercept and slope coefficients are computed as $-\frac{\alpha_0}{\alpha_1}, -\frac{\alpha_2}{\alpha_1}, -\frac{\alpha_3}{\alpha_1}, -\frac{\alpha_4}{\alpha_1}, -\frac{\alpha_5}{\alpha_1}, -\frac{\alpha_6}{\alpha_1}$ and $-\frac{\alpha_7}{\alpha_1}$, respectively since in the long run it is assumed that $\Delta g_{t-i}^G = 0, \Delta id_{t-j} = 0, \Delta or_{t-j} = 0, \Delta nr_{t-j} = 0, \Delta op_{t-j} = 0, \Delta mac_{t-j} = 0$ and $\Delta exr_{t-j} = 0$. However, the short run estimates are obtained as λ_i for government spending growth and γ_j interest rate differential, oil revenue, non-oil revenue, oil price, macroeconomic stability and exchange rate. Since the variables in first differences can accommodate more than one lag, determining the optimal lag combination for the ARDL becomes necessary.

The optimal lag length can be selected using the Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HIC) or Schwartz Information Criterion (SIC). The lag combination with the least value of the chosen criterion among the competing lag orders is considered the optimal lag. Consequently, the preferred ARDL model is used to test the long run relationship in the model. This approach of testing for cointegration is referred to as Bounds testing as it involves the upper and lower bounds. The test follows an F distribution and, therefore, if the calculated F-statistic is greater than the upper bound, there is cointegration; if it is less than the lower bound, there is no cointegration and if it lies in between the two bounds, then, the test is considered inconclusive. In the spirit of the present model, the null hypothesis of no cointegration can be expressed as $H_0 : \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = 0$, while the alternative of cointegration is symbolised as $H_1 : \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq 0$. The other variables in the model remain as earlier defined, ε_t denotes error term. The equation (5) can be re-specified to include an error correction term as follows:

$$\Delta g_t^G = \delta \upsilon_{t-1} + \sum_{i=1}^{N1} \lambda_i \Delta g_{t-i}^G + \sum_{j=0}^{N2} \gamma_j \Delta id_{t-j} + \sum_{j=0}^{N3} \gamma_j \Delta or_{t-j} + \sum_{j=0}^{N4} \gamma_j \Delta nr_{t-j} + \sum_{j=0}^{N5} \gamma_j \Delta op_{t-j} + \sum_{j=0}^{N6} \gamma_j \Delta mac_{t-j} + \sum_{j=0}^{N7} \gamma_j \Delta exr_{t-j} + \varepsilon_t \quad (6)$$

Where, υ_{t-1} is the linear error correction term; the parameter δ is the speed of adjustment while the underlying long- run parameters remain as previously defined. Note that in both equations (5) and (6), there are no decompositions of oil price into positive and negative changes; hence, the assumption of the symmetric behaviour of the oil price shock on government fiscal spending under this scenario. To capture the probable asymmetric behaviour of the oil price shock on government fiscal spending; the oil price variable (op) is further decomposed into positive and negative changes such that in the analysis, to the study can evaluate the asymmetry response of government fiscal spending to oil price changes. The consideration of oil price asymmetry is premised on the fact that economic agents such as households, business entities and government, may respond differently to positive and negative changes in oil prices. However, the approach used here follows the NARDL of Shin et al. [2] which appears less computationally intensive compared to other asymmetric models and does not require an identical order of integration [i.e. I(1)] for all the series in the model. The NARDL is given as:

$$\Delta g_t^G = \alpha_0 + \alpha_1 g_{t-1}^G + \alpha_2 \mathrm{id}_{t-1} + \alpha_3 or_{t-1} + \alpha_4 nr_{t-1} + \alpha_5 op_{t-1}^+ + \alpha_6 op_{t-1}^- + \alpha_7 mac_{t-1} + \alpha_8 exr_{t-1} + \sum_{i=1}^{N1} \lambda_i \Delta g_{t-i}^G + \sum_{j=0}^{N2} \gamma_j \Delta \mathrm{id}_{t-j} +$$

$$\sum_{j=0}^{N3} \gamma_j \Delta or_{t-j} + \sum_{j=0}^{N4} \gamma_j \Delta nr_{t-j} + \sum_{j=0}^{N5} (\gamma_j \Delta op_{t-j}^+ + \gamma_j \Delta op_{t-j}^-) + \sum_{j=0}^{N6} \gamma_j \Delta mac_{t-j} + \sum_{j=0}^{N7} \gamma_j \Delta exr_{t-j} + \varepsilon_t \quad (7)$$

In equation (7), the oil price shock variable (op_t) has now been decomposed into op_t^+ and op_t^- denoting positive and negative changes of oil price respectively. The study can re-specify equation (7) to include an error correction term thus:

$$\Delta g_{t-1}^G = \rho \psi_{t-1} + \sum_{i=1}^{N1} \lambda_i \Delta g_{t-i}^G + \sum_{j=0}^{N2} \gamma_j \Delta id_{t-j} + \sum_{j=0}^{N3} \gamma_j^+ \Delta or_{t-j} + + \sum_{j=0}^{N4} \gamma_j \Delta nr_{t-j} + \sum_{j=0}^{N5} (\gamma_j \Delta op_{t-j}^+ + \gamma_j \Delta op_{t-j}^-) +$$

$$\sum_{j=0}^{N6} \gamma_j \Delta mac_{t-j} + \sum_{j=0}^{N7} \gamma_j \Delta exr_{t-j} + \varepsilon_t \quad (8)$$

In equation (8), the error-correction term that captures the long run equilibrium in the NARDL is represented as ψ_{t-1} while it's associated parameter (ρ) [the speed of adjustment] measures how long it takes the system to adjust to its long run when there is a shock. It is important to note here that, just like the linear ARDL (symmetry), the long run is estimated only if there is the presence of cointegration. However, the underlying hypotheses for cointegration involve the long run asymmetric parameters. Hence, the study employed the Wald test for testing restrictions to ascertain whether the asymmetries matter both in the long run and short run.

6. RESULT PRESENTATIONS AND DISCUSSION

6.1 Preliminary Analysis

As a precondition for dealing with time series data, the issue of stationarity deserves attention. Hence, the study commences the empirical analysis by subjecting each of the series in the model to unit root tests. This was necessary to ascertain that none of the series under consideration exhibits an integrated order higher than one (i.e. I(1). Essentially, the study considered three different types of unit root tests, namely; the Augmented Dickey-Fuller (ADF), Ng-Perron (Ng-P) and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) unit root tests. The rationale for the combination of these tests in this study is to ensure some level of consistency and the robustness of results across the various test types considered. Thus, inconsistent with the chosen underlying framework for estimation which allows for the combination of both I(0) and I(1) (in so far the level of stationarity does not exceed I(1)). The results as presented in Table 1 shows that the integration properties for each of the series though vary across the different tests but hover between I(0) and I(1). This, in essence, reaffirms the appropriateness of the choice of ARDL as the preferred estimation framework in the context of this study.

Table 1. Unit root test results

Variable	ADF			Ng-P			KPSS		
	Level	*First Diff.*	*I(d)*	*Level*	*First Diff.*	*I(d)*	*Level*	*First Diff.*	*I(d)*
g_t^G	-2.3195^a	-9.1579^{b***}	*I(1)*	-0.7603^b	-2.7659^{b*}	*I(1)*	0.3163^b	0.0725^{b***}	*I(1)*
id_t	-2.1923^a	-11.4288^{b***}	*I(1)*	-0.8957^b	-5.5224^{a***}	*I(1)*	0.2950^b	0.0851^{b***}	*I(1)*
or_t	-1.9804^a	-5.3154^{b***}	*I(1)*	-1.8430^b	-8.2730^{b***}	*I(1)*	0.2038^b	0.0540^{b***}	*I(1)*
nr_t	-0.2224^b	-4.9723^{b***}	*I(1)*	0.3061^b	-3.4825^{b***}	*I(1)*	0.3410^b	0.0661^{b***}	*I(1)*
op_t	-9.2289^{b***}	-	*I(0)*	-4.8379^{b***}		*I(0)*	0.0565^{a***}		*I(0)*
exr_t	-2.0908^b	-9.5328^{b***}	*I(1)*	-1.6371^b	-5.4691^{b***}	*I(1)*	0.1162^{b***}		*I(0)*
mac_t	3.4334^b	-3.9485^{b**}	*I(1)*	-2.4254^b	-3.4788^{b***}	*I(1)*	0.3254^b	0.1129^{b***}	*I(1)*

*Note: [a]Indicates a model with constant but without deterministic trend; [b] is the model with constant and deterministic trend as exogenous lags are selected based on Schwarz info criteria. ****, **, * imply that the series is stationary at 1%, 5% and 10% respectively. The null hypothesis for ADF and Ng-P is that an observable time series is not stationary (i.e. has unit root) while that of KPSS tests for the null hypothesis is that the series is stationary*

6.2 Empirical Results

Presented in Table 2 are the empirical estimates obtained from the estimation of the linear and nonlinear ARDL models explored in the examination of the symmetry and asymmetry response of fiscal spending to oil price shocks. In determining the appropriateness of the estimated equations, model diagnostics are carried out in testing for the explanatory power of the model using R-square. In testing for the first order and higher order autocorrelation, the Ljung-Box Autocorrelation test was explored, while ARCH LM and Jaque-Berra tests are carried out to examine the presence of time- varying conditional variance in the model as well as normality or otherwise of the series in the models. Quite an interesting finding which affirms the reliability of the estimated models is the consistency of the results of these post-estimation tests all of which appear to uniformly ascertain the viability and appropriateness of the estimated models.

On the study's hypothesis that the response of fiscal policy to oil price shocks is asymmetry. The non-rejection of the null hypothesis of no asymmetry given the insignificant evidence of the Wald test results seem to be suggesting that the impact of the oil price shocks on fiscal spending is asymmetry in the case of investigated economy. Saying it differently, the insignificance of the Wald test results which test for the asymmetric impact of oil price shock on fiscal spending is an indication that, irrespective of short or long run situations, fiscal spending in Nigeria is likely to respond differently to oil price shocks. That is, irrespective of the short or long run dynamics of government fiscal spending; its response to positive and/or negative oil price changes is likely to be identical in both the short and long run situations.

Similar to our finding is Aregbeyen and Fasanya [17] results which also suggest the response of government spending to oil price shocks is not asymmetric in Nigeria. But, the evidence of significant impact of oil revenue on fiscal spending in the case of the present study yet suggests an important but indirect impact of oil prices on fiscal spending in Nigerian. On the contrary, though and quite surprising results, especially for an oil based economy, is the fact that the significance of such indirect impact of oil price mainly holds in the short run situation as against the long run evidence of the impact of non-oil revenue. For instance, the empirical findings based on coefficients obtained from symmetric and asymmetric models seem to be suggesting that, regardless of the direct or indirect impact of oil price shocks on fiscal spending in Nigeria. The likelihood of spending in Nigeria responding significantly to oil price shocks is rather a short run phenomenon. This, therefore, further reaffirms as has been agitated for, the need for the diversification of the Nigerian economy away from its current over- reliance on proceeds from oil export.

Table 2. Regression results

Long run	**Symmetry model (Linear ARDL)**			**Asymmetry model (Nonlinear ARDL)**		
	Coefficient	***Std. error***	***T – stat.***	***Coefficient***	***Std. error***	***T – stat.***
id_t	0.0558	0.0812	0.6870	0.0515	0.0834	0.6177
or_t	0.3461	0.3710	0.9327	0.4774	0.4051	1.1783
nr_t	0.4768**	0.2746	1.7357	0.5895*	0.3294	1.7894
op_t	-0.0395	0.1775	-0.2226			
op_t^+				-0.1383	0.1542	-0.8970
op_t^-				-0.1465	0.1593	-0.9200
exr_t	0.5016***	0.0764	6.5603	0.4969***	0.0759	6.5430
mac_t	0.4184***	0.1398	2.9919	0.4068***	0.1438	2.8285
Trends	-0.0011	0.01001	-0.1164	-0.0027	0.0105	-0.2566
Short Run						
Constant	0.0559	2.2091	0.0253	-1.2739	2.6556	-0.4796
Δg_{t-1}^G	-0.2567***	0.0847	-3.0295	-0.2961***	0.0849	-3.4855
Δid_t	0.0324	0.0471	0.6877	0.0291	0.0471	0.6174
Δor_t	-0.0232	0.1655	0.1405	-0.0744	0.1603	-0.4645
Δor_{t-1}	0.5031***	0.1598	3.1483	0.6111***	0.1395	4.3782
Δnr_t	0.2769*	0.1601	1.7293	0.3330*	0.1803	1.8466
Δop_t	-0.0229	0.1035	-0.2216			
Δop_t^+				-0.0781	0.0841	-0.9291
Δop_t^-				-0.0828	0.0866	-0.9558
Δexr_t	0.2913***	0.0546	5.3314	0.2806***	0.0527	5.3253
Δmac_t	-0.3496	0.3005	-1.1635	-0.4024	0.3040	-1.3237
ECT	-0.5808***	0.0957	-6.0669	-0.5648***	0.0971	-5.8160
$AdjR^2$	0.994			0.994		
$JB\ stat.$	1.5949 (0.4504)			1.0454 (0.5928)		
$F-stat.$	1282.224 (0,0000)			1265.375 (0.0000)		
$LM\ test$	0.2682 (0.7653)			0.1879 (0.8290)		
$ARCH\ test$	0.5030 (0.6060)			0.2824 (0.7544)		
Bound Test (F-stat.)	3.3877*			3.1011*		
Short-Run Asymmetry Wald test Results				***Lon-Run Asymmetry Wald test Results***		
W_{SR} F – stat. = 0.2636 (0.6087)				W_{LR} F – stat. = 0.2549 (0.6147)		

****, ** and * denotes significance at 1%, 5% and 10% level of significance*

7. CONCLUSION AND POLICY RECOMMENDATION

Motivated by the historical ups – down trends in the international oil prices and their potential implications particularly for oil producing countries, this paper explored linear and non-linear ARDL frameworks to examine the symmetric and asymmetric impact of oil price shocks on fiscal spending. Consequently, the choice of Nigeria as the study's investigated economy was informed among others, by the country's reliance on oil revenue which in turn depends on oil price movements as it were with other oil exporting nations. Understanding the asymmetric responses of government spending to the changes in oil prices, rather than assuming such impact is symmetric will inform policy-makers on the need for policy initiative that can mitigate the potential adverse effect of positive oil price shocks as relatively for meant for negative oil price shocks. However, contrary to the hypothesis of asymmetries impact of oil price shocks on fiscal spending, the empirical findings rather suggest a symmetric and short-run impact of oil price shocks on fiscal spending. This though, the long run evidence of non-oil revenue on the Nigeria fiscal spending as against the short-run impact of oil revenue can be taken to mean the role of oil price directly or indirectly in the Nigerian fiscal may only matter in the short run situation. It is in this light among other, that the study recommends that the policymaker should intensify on the ongoing efforts at diversifying the economy away from its presently over- reliance on proceeds from oil export at least in the long run.

Since the degree of responsiveness of fiscal spending to oil price shocks is likely to vary for across different oil producing economies, the study, therefore, suggests that future study should delve into a comparative analysis of the impact of oil price shocks on fiscal spending focusing on OPEC member countries.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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