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Patrick Ologbenla (Nigeria)

# DETERMINANTS OF FISCAL POLICY BEHAVIOR IN NIGERIA

## Abstract

The study investigated the factors that determine fiscal behavior in Nigeria. The vulnerability of fiscal policy framework in Nigeria to different shocks and the attendant effects on the behavior of fiscal policy are parts of the reasons that prompted this research work. Annual data between 1980 and 2015 on core fiscal variables such as government revenue, government expenditure, fiscal balance, public debt, as well as other variables such as oil price, exchange rate, and inflation rate commodity price among others, are used. The Auto-Regressive Distributed Lag ARDL estimating technique is used to analyze both the long-run and short-run effects of these variables on fiscal behavior in Nigeria. Findings from the study show that fiscal policy in Nigeria is highly vulnerable to shocks from these variables mostly in the short run. Notwithstanding, variables like government revenue, government expenditure, regime of administration, oil price and commodity price volatilities all have sustained effects till the long-run periods. It was discovered that oil price movements is not the only external factor that has pronounced effects on fiscal behavior, but commodity prices volatility generally constitutes an important influential factor in determination of fiscal policy behavior in Nigeria.

## Keywords

fiscal policy behavior, government expenditure, oil price volatilities, government revenue

## JEL Classification

H30, H50, H59

## INTRODUCTION

Over the years, the behavior of fiscal policy practiced in Nigeria has been in form of deficit. The idea behind this form of fiscal policy has been to expand government activities in the economy by increasing investment and thereby creating job opportunities for the citizens. The increase in government expenditure which is a major factor resulting in fiscal deficit has been on the rising trend since 2005. For instance, during this period, the expenditure of government rose to 19% of the GDP from 14 % that it was in 2000; it also rose further from 19% in 2005 to about 25% in 2012 before reaching its current position of almost 30% of the GDP in 2017. The implication of this has been the upward movement of the public debt of the country. The resultant effect of this was the accumulated public debt stock moving from 88% of the GDP in the 1980s to about 96% of the GDP in the 90s. Also, between 2010 and 2017, the stock of debt has increased to 91 per cent of GDP from 45 per cent in 2009 (World Bank, 2018).

Within the last two decades, there has been a relatively increase in the government indebtedness in Nigeria. Apart from the issue of poor quality of public expenditure, the government have failed to save the excess crude oil revenue realized from oil windfalls to cushion the pressure on government expenditure. This is very critical to ensuring sustainability in government expenditure that is consistent with the absorptive capacity of the economy. There has been immense increase in government expenditure, primary deficit and debt in Nigeria within the period 1996–2012 and this has continued till date (Obinyeluaku, 2009).

However, operation of fiscal deficit might not be a bad fiscal policy framework for an economy if the priority of the government in terms of what the expenditures are utilized for are growth propelling. The situation in Nigeria shows that the effectiveness of fiscal policy in achieving the set macroeconomic objectives has been far below expectation, since the major problems of economic instability, slow growth rate, unemployment have continued to worsen despite the increase in the fiscal deficit. The reason for this has been attributed to the composition of the fiscal policy framework in Nigeria, which has been largely dependent on the revenue from oil. According to the findings of the World Bank (2010), identification of factors that account for the behavior of the fiscal policy in many developing countries is important to ensure fiscal policy targets are met and guide against unnecessary accumulation of deficit.

In Nigeria, oil, being an international commodity is highly susceptible to both external and cyclical changes in the world oil market, this, among others, has caused unprecedented instability in recent times in the oil revenue accruing to Nigeria as an oil dependent country. Administration of fiscal policy in Nigeria is largely anchored on government revenue, which is seriously affected by the fluctuations in the oil revenue. Government has attempted over the years to shift its revenue base from oil so as to reduce the vulnerability of government revenue to oil price fluctuations. All these efforts appear not to yield any positive results and the reason behind this has been attributed to the inability of the country to identify the exact relationship that exists between other factors apart from oil that are responsible for fiscal policy behavior and fiscal policy. Kinnunen, Sulla, and Merotto (2013), Gosse and Guillamin (2012) categorized these variables to external and internal factors. They stated that exchange rate, interest rate, public debt, among others, can be termed internal, which are controllable by the Nigerian government, while some variables such as oil price volatility, commodity price volatility, exchange rate volatility among others are purely external, that is outside the control of the Nigerian government.

Studies like Olasunkanmi and Babatunde (2013), Obinyeluaku (2009), among others, in the past have focused more on the effects of fiscal policy on growth of Nigeria without investigating the factors that influence its effectiveness and growth. These causative factors are referred to as fiscal policy behavior determinants and if their relationship with fiscal policy is not properly understood, they can constitute major drawbacks to effectiveness of fiscal policy in Nigeria (Obinyeluaku, 2009). On this note, the major objective of this study is to empirically investigate the factors that determine fiscal policy behavior in Nigeria.

## 1. METHODOLOGY

This aspect of the research work discusses the research method adopted for examining the determinants of fiscal policy behavior. It discusses the theoretical build-up, as well as the model specification. Apriori expectation will be stated where necessary and variables will be defined accordingly. In addition, the estimating techniques adopted for achieving the stated objective shall be highlighted.

### 1.1. Theoretical framework

Barro and Sala-i-Martin (1992, 1995) developed a production function where output was expressed as a function of investment in infrastructure, labor and capital and from there they generated

endogenous growth model. This enables them to study the influence of the supply of public goods on growth rates. Clearly, output growth rate can be directly related to the share of government purchases in the form of public services, while examining various policy implications under alternative schemes of the production function. Consequently, government expenditure in the form of public investment plays a decisive role for the performance of the economy through its influence on gross national output. Several empirical studies have also established a strong positive link between investment and output growth rates (Easterly & Rebelo, 1993)

According to Barro and Sala-i-Martin (1992, 1995) and Lucas (1988), in an economy that embraces a

large number of competitive firms without loss of generality and aggregating across firms, the production function may be given in the following expression:

$$Y = AK^\alpha (hL)^{1-\alpha}, \quad (1)$$

where  $Y$  is output,  $K$  is capital, and  $L$  stands for labor, with  $\alpha$  and  $1-\alpha$  being the shares of capital and labor, respectively. Parameter  $A$  reflects the constant technology level, with  $A > 0$ .

According to Lucas (1988), the assumption of constant returns becomes more plausible, whenever, as in our case, capital is broadly viewed to encompass both human and physical capital. Indeed, parameter  $h$  represents human capital and is considered to be a function of the existing total (private and public) capital of the economy, denoted by  $K$  and  $G$  respectively, so that:

$$h = \psi \frac{K^\beta G^{1-\beta}}{L}, \quad (2)$$

where  $\psi > 0$  stands for an efficiency parameter that captures the degree of the economy's efficiently used total capital.  $G$  represents the aspect of supply of capital through the government expenditure. Substituting equation 2 into 1, we have:

$$Y = AK^\alpha \left( \psi \frac{K^\beta G^{1-\beta}}{L} \right). \quad (3)$$

Note that both  $\alpha$  and  $\beta$  are the same being elasticities of the respective inputs. Through factorization we can rewrite equation 3 as follows:

$$Y = AK^\alpha \left( \psi \frac{G^{1-\alpha}}{L} \right), \quad (4)$$

where  $G^{1-\alpha} / L$  denotes governments expenditure adjusted to the workforce population.

Re-arranging equation 4 we have the following:

$$Y = A\psi K^\alpha \left( \frac{G^{1-\alpha}}{L} \right), \quad (5)$$

Since both  $A$  and  $\psi$  are efficiency parameters, we denote the product by  $\sigma$  giving rise to;

$$Y = \sigma K^\alpha \left( \frac{G^{1-\alpha}}{L} \right). \quad (6)$$

Equation 6 can be re-arranged as:

$$Y = \sigma K^\alpha \left( \frac{1}{L} G^{1-\alpha} \right). \quad (7)$$

Linearizing equation 7 through log we have:

$$\log Y = \log \sigma + \alpha \log K + (1-\alpha) \log \frac{1}{L} G. \quad (8)$$

Making  $\log \frac{1}{L} G$  subject of the formular we have.

$$\log \frac{1}{L} G = \frac{1}{1-\alpha} (\log \sigma + \alpha \log K + \log Y). \quad (9)$$

Equation 9 is adopted in this study to examine the determinants of fiscal behavior in Nigeria. The components of the equation are GDP, which is  $Y$ ,  $K$  is the gross capital formation and the fiscal component is represented with  $G$ , i.e. government expenditure. However, since government expenditure is strongly linked with fiscal deficit/surplus,  $G$  is proxy by  $Fd/Fs$  that is fiscal balance, which represents fiscal behavior as in Ayodeji (2015)

## 1.2. Model specification

It would be recalled that part of the objectives of this study is to identify those variables that are core variables of fiscal policy, as well as those variables that constitute shocks to fiscal policy. From the literature, government revenue and government expenditure are the core variables of fiscal policy, while public debt, external reserve, oil price volatility, commodity price volatility, exchange rate, regime of administration and inflation rate are variables that determine the fiscal policy behavior in Nigeria and all of them also constitute shocks or disturbance of fiscal policy in Nigeria.

Following the theoretical framework, equation 9 is modified to involve those fiscal policy determinants, which are regarded as shocks, extracted from the literature as stated in the previous paragraph. Fiscal balance is used as the dependent vari-

able, as it is shown from previous studies that fiscal outlook or behavior of a country is portrayed by the fiscal balance, which could either be fiscal surplus or deficit (Olasunkanmi & Babatunde, 2013):

$$\ln FB = f \ln (GE, GR, ER, DEBT, EXR, DUMR, INFR, OILPVOL, COMPVOL) \quad (10)$$

where  $FB$  is the fiscal behavior proxied by fiscal balance,  $GE$  is government expenditure,  $GR$  is government revenue,  $ER$  is external reserve,  $EXR$  is exchange rate,  $INFR$  is the inflation rate,  $DEBT$  is public debt,  $DUMR$  is the dummy variable for regime of administration,  $OILPVOL$  is oil price volatility and  $COMPVOL$  is commodity price volatility.

### 1.3. Estimating technique and procedure

Equation 10, which is the equation examining the effect of the fiscal policy variable and fiscal policy shocks on the fiscal behavior in Nigeria, will be estimated through cointegration and error correction model. This is because this approach will enable us to investigate the possibility of both transitory and permanent effects of these variables on the fiscal outlook in Nigeria.

### 1.4. Unit root test

Testing for the existence of unit roots is a key pre-occupation in the study of time series models and co-integration. What are unit roots? Let us begin with a definition. A stochastic process with a unit root is itself non-stationary. Another way of looking at it is that testing for the presence of unit roots is equivalent to testing whether a stochastic process is a stationary or non-stationary process. In sum, the presence of a unit root implies that the time series under scrutiny is non-stationary, while the absence of a unit root means that the stochastic process is stationary, Maddala and Wu (1992) have offered an interesting perspective and interpretation on the testing for unit roots.

According to Maddala and Wu (1992), testing for unit roots is a formalization of the Box-Jenkins method of differencing the time series after a visual inspection of the correlogram. No wonder then

that testing for units roots plays a central role in the theory and technique of co-integration. Currently, there are some commonly accepted methods of testing for unit roots. These are the Dickey-Fuller (DF), Augmented Dickey-Fuller (ADF) test and the Philips-Perron (PP) test. The Augmented Dickey-Fuller (ADF) test is considered superior to the Dickey-Fuller (DF) test, because it adjusts appropriately for the occurrence of serial correlation.

$$X_t = b_0 + b_1 X_{t-1} + b_2 X_{t-2} + b_n X_{t-n} + U, \quad (11)$$

where  $U$  is a stationary error term. The null hypothesis that  $X_t$  is non-stationary is rejected if  $b_1$  is significantly negative. The number of lag ( $n$ ) of  $X_t$  is usually chosen to ensure that the regression is approximately white noise. It is simply referred to as the DF test if no such lags are required in which case  $b_i = 0 (i = 1 \dots n)$ . However, the  $t$ -ratio from the regression does not have a limiting normal distribution.

### 1.5. Estimating technique: ARDL model

The choice of ARDL is dependent on the pre-estimation test, precisely the unit root test. Again, the need to have the lagged value of the dependent variable among the dependent variables, which ARDL will do also inform the usage of the estimating technique.

As part of the objectives of the study, which is to assess the existence of long-run relationship among the variables, the ARDL is one of the techniques in econometrics that provides avenue for assessing long-run relationship via ARDL cointegration bound test. The most common techniques for assessment of co-movement among variables in a multivariate model are ARDL and Johansen cointegration approaches. However, their usage depends on the results of the unit root test. For Johansen cointegration, all the variables to be used in the model must be integration of order one that is  $I(1)$  variables all through. ARDL comes with less stringent condition by allowing variables that are stationary at levels that is  $I(0)$ , therefore it permits inclusion of both  $I(1)$  and  $I(0)$  variables. In this study, ARDL is used because the variables after the unit root test show both  $I(1)$  and  $I(0)$  order of integration (Pesaran et al., 2001).

Consequently, the ARDL model formulation of a conditional error correction model (Pesaran et al., 2001) is shown below:

$$\begin{aligned} \Delta fb = & \beta_0 + \sum_{i=1}^p \beta_i \Delta ge_{(t-i)} + \sum_{j=0}^{q_1} \alpha_j \Delta gr + \\ & + \sum_{k=0}^{q_2} \theta_k er + \sum_{l=0}^{q_3} \varepsilon_l \Delta exr + \sum_{m=0}^{q_4} \varepsilon_m \Delta dumr_{(t-m)} + \\ & + \sum_{v=0}^{q_5} e_v \Delta ge_{(t-v)} + \theta_0 gr_{(t-1)} + \theta_1 er_{(t-1)} + \\ & + \theta_2 exr_{(t-1)} + \theta_3 dumr_{(t-1)} + e_t, \end{aligned} \quad (12)$$

where  $p, q_1, \dots, q_5$  represents appropriate maximum lags.

The remaining two variables oil price volatility and commodity price volatility are generated through an EGARCH (Exponential Generalized Autoregressive Conditional Heteroskedasticity). The process is discussed as follows.

## 1.6. Derivation of oil price and commodity price volatilities

Literatures have confirmed both oil price fluctuations and commodity price movement as important factors affecting fiscal policy framework in many of the resource endowed countries, which are producers of primary products. In addition, Demachi (2012), Wagithunu, Muthee, and Thinguri (2014) and Ayodeji (2015), among others, argued that the nature of the volatility of these two commodities has important implications for fiscal policy dynamics in developing economies due to their reliance majorly on primary commodity export and being largely import dependent. The nature of the volatility can either be symmetric or asymmetric. Either of the two cases has its own implication on fiscal policy framework of Nigeria. Consequently, Exponential Generalized Conditional Heteroskedasticity (EGARCH) is adopted.

Firstly, volatilities for the commodity and oil prices used in the study are developed via the exponential generalize autoregressive conditional heteroskedasticity EGARCH [1,1]. The EGARCH process described as follows:

$$comp_t = \varphi + comp_{t-1} + \mu_t, \quad (13)$$

$$oilp_t = \varphi + oilp_{t-1} + \mu_t. \quad (14)$$

The AR [1] approach is followed. The following EGARCH model is estimated for each of the commodities prices used:

$$\ln \sigma^2 = \omega + \ln \sigma_{t-1}^2 + \alpha \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right| + \gamma \left| \frac{\mu_{t-1}}{\sigma_{t-1}} \right|. \quad (15)$$

In the equation 15,  $\gamma$  is residual, and  $\sigma$  denotes the conditional variance obtained from equations. Here, if  $\gamma < 0$ , it indicates the asymmetric nature of commodity price and oil price movements on volatility. This means that a negative price shock has larger influence on volatility than a positive price shock. The estimates of the conditional variance for each of the commodity prices are used as their volatility components and are used in equation 10 as in Demachi (2012). This is capable of allowing us to know which of the prices has asymmetric effects. The a priori expectation is that the commodity and oil price volatility will impact negatively on growth due to the fact that both are direct consequence of macro-economic mismanagement, which will likely have negative feedback effect on the economy.

## 2. RESULTS AND DISCUSSIONS

### 2.1. Unit root test

Table 1 presents the unit root test for all the variables in the model and the Augmented Dickey-Fuller test is applied.

**Table 1.** Unit root test

Source: Author's computation.

Variables	ADF statistics	Order of integration
<i>FB</i>	-3.937	I (1)
<i>GR</i>	-8.707	I (1)
<i>GE</i>	-3.096	I (0)
<i>ER</i>	-3.568	I (1)
<i>ED</i>	-5.244	I (1)
<i>EXR</i>	-5.516	I (1)
<i>DUMR</i>	-5.831	I (1)
<i>OILPVOL</i>	-3.988	I (0)
<i>COMPVOL</i>	-3.600	I (0)
<i>INF</i>	-5.515	I (1)
<i>K</i>	-5.500	I (1)
<i>GDPGR</i>	-4.514	I (1)



The result of the unit root test indicates that the variables are either stationary at levels or at the first difference. The implication is that Johansen type of cointegration techniques cannot be applied, since it emphasizes the need for all the variables in the model to be stationary at first difference. However, from Table 1 variables like oil price volatility, commodity price volatility, government expenditure are all stationary at levels, hence, the need to apply ARDL approach to cointegration more so none of the variable is stationary at the second difference. All other variables in the model apart from the three are all stationary at first difference.

Notwithstanding before the ARDL analysis, it is important that the lag length of each of the variables is determined. This is one of the pre-conditions for applying the ARDL approach to cointegration.

## 2.2. Lag length selection criteria

Tables 2 to 13 present the results on the lag length selection criteria. The ARDL model is estimated based on the lag length selected using the AIC criterion.

**Table 2.** Lag length for FB

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-395.802	—	—	—	3.5e + 09	24.8001	24.8153	24.846
1	-393.688	4.2292*	1	0.040	3.2e + 09	24.7305	24.7609	24.8221*
2	-392.306	2.7626	1	0.096	3.1e + 09	24.7067*	24.7522*	24.8441
3	-392.217	.17852	1	0.673	3.3e + 09*	24.7636	24.8243	24.9468
4	-392.157	.12005	1	0.729	3.5e + 09	24.8223	24.8982	25.0513

Note: \* Lag length significance.

**Table 3.** Lag length for GE

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-435.604	—	—	—	4.2e + 10	27.2877	27.3029	27.3335
1	-430.084	11.04*	1	0.001	3.1e + 10*	27.0052*	27.0356*	27.0968*
2	-429.752	.66258	1	0.416	3.3e + 10	27.047	27.0926	27.1844
3	-429.742	.02161	1	0.883	3.5e + 10	27.1089	27.1696	27.2921
4	-429.67	.14226	1	0.706	3.7e + 10	27.1669	27.2428	27.3959

Note: \* Lag length significance.

**Table 4.** Lag length for GR

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-439.326	—	—	—	5.2e + 10	27.5204	27.5356	27.5662
1	-431.913	14.827*	1	0.000	3.5e + 10	27.1196	27.1499*	27.2112*
2	-430.773	2.2794	1	0.131	3.5e + 10*	27.1108*	27.1564	27.2482
3	-430.709	.12836	1	0.720	3.7e + 10	27.1693	27.23	27.3525
4	-430.433	.55289	1	0.457	3.9e + 10	27.2145	27.2904	27.4436

Note: \* Lag length significance.

**Table 5.** Lag length for ER

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-487.47	—	—	—	1.1e+12	30.5294	30.5445	30.5752
1	-450.898	73.143	1	0.000	1.2e+11	28.3061	28.3365	28.3977
2	-450.619	.55718	1	0.455	1.2e+11	28.3512	28.3968	28.4886
3	-417.73	65.779*	1	0.000	1.6e+10	26.3581	26.4188	26.5413*
4	-416.057	3.3457	1	0.067	1.6e+10*	26.3161*	26.392*	26.5451

Note: \* Lag length significance.

**Table 6.** Lag length for DEBT

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	−499.804	–	–	–	2.3e + 12	31.3003	31.3154	31.3461
1	−468.155	63.298*	1	0.000	3.4e + 11*	29.3847*	29.4151*	29.4763*
2	−467.941	.42914	1	0.512	3.6e + 11	29.4338	29.4793	29.5712
3	467.941	.00017	1	0.990	3.8e + 11	29.4963	29.557	29.6795
4	−467.86	.16029	1	0.689	4.0e + 11	29.5538	29.6297	29.7828

Note: \* Lag length significance.

**Table 7.** Lag length for EXR

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	−177.723	–	–	–	4155.99	11.1702	11.1853	11.216
1	−128.158	99.13*	1	0.000	199.767*	8.13486*	8.16523*	8.22647*
2	−128.142	.03144	1	0.859	212.524	8.19638	8.24193	8.33379
3	−128.103	.07818	1	0.780	225.851	8.25644	8.31717	8.43966
4	−128.1	.0052	1	0.943	240.683	8.31878	8.39469	8.5478

Note: \* Lag length significance.

**Table 8.** Lag length for INF

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	−138.519	–	–	–	358.543	8.71991	8.73509	8.76571
1	−130.599	15.839*	1	0.000	232.691	8.28743	8.31779	8.37903
2	−128.793	3.6106	1	0.057	221.355*	8.23709*	8.28264*	8.37451*
3	−127.875	1.8362	1	0.175	222.661	8.24221	8.30294	8.42543
4	−127.774	.20353	1	0.652	235.817	8.29835	8.37427	8.52737

Note: \* Lag length significance.

**Table 9.** Lag length for GDPGR

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	−107.917	–	–	–	52.9564*	6.80733*	6.82251*	6.85313*
1	−107.211	1.412	1	0.235	53.9461	6.8257	6.85607	6.91731
2	−107.211	.0003	1	0.986	57.4472	6.88819	6.93374	7.0256
3	106.849	.72403	1	0.395	59.8297	6.92806	6.9888	7.11128
4	−106.802	.09408	1	0.759	63.5819	6.98762	7.06354	7.21665

Note: \* Lag length significance.

**Table 10.** Lag length for DUM

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	−23.1627	–	–	–	.265089	1.51017	1.52535	1.55597
1	11.0784	68.482*	1	0.000	.033203*	−.567397*	−.537032*	−.475789*
2	11.0784	0	1	–	.035358	−.504897	−.459349	−.367485
3	11.0784	0	1	–	.037667	−.442397	−.381666	−.25918
4	11.0784	0	1	–	.040148	−.379897	−.303983	−.150876

Note: \* Lag length significance.

**Table 11.** Lag length for OILPVOL

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	−131.12	–	–	–	225.849*	8.25772*	8.27291*	8.30353*
1	−130.46	1.3267	1	0.249	230.684	8.27876	8.30913	8.37037
2	−130.405	.10948	1	0.741	244.819	8.33784	8.38339	8.47526
3	−130.148	.51531	1	0.473	256.641	8.38424	8.44497	8.56746
4	−129.453	1.3887	1	0.239	261.922	8.40334	8.47926	8.63236

Note: \* Lag length significance.



**Table 12.** Lag length for COMPVOL

Lag	LL	LR	df	P	FPE	AIC	HQIC	SBIC
0	-145.351	—	—	—	549.547	9.14695	9.16213*	9.19276*
1	-144.207	2.2886	1	0.130	544.691*	9.13793*	9.1683	9.22954
2	-144.169	.07505	1	0.784	578.687	9.19809	9.24364	9.3355
3	-143.04	2.2598	1	0.133	574.446	9.18997	9.2507	9.37319
4	-142.849	.38003	1	0.538	605.041	9.24059	9.31651	9.46961

Note: \* Lag length significance.

**Table 13.** Lag length for K

Lag	LL	LR	Df	P	FPE	AIC	HQIC	SBIC
0	-154.064	—	—	—	947.346	9.69152	9.7067	9.73733
1	-113.452	81.225*	1	0.000	79.68*	7.21573*	7.2461*	7.30734*
2	-113.225	.45297	1	0.501	83.6593	7.26408	7.30963	7.40149
3	-113.136	.17789	1	0.673	88.6287	7.32102	7.38175	7.50424
4	-112.778	.71694	1	0.397	92.3715	7.36111	7.43703	7.59014

Note: \* Lag length significance.

Tables 2 to 13 show the respective lag length selected for the purpose of estimating the ARDL model. The AIC criterion is relied upon, as it is used in previous empirical studies such as Altug, Neyapti, and Emin (2012). After the optimum lag length for each of the variables has been determined, the next is to estimate the ARDL model.

Table 14 shows the general estimated regression equation for the relationship between fiscal

policy shocks and fiscal balance. The estimated model shows that all the identified shocks are responsible for about 99% change in the fiscal behavior in Nigeria as indicated through the value of the *R*-square. The *F* value also confirms this by showing that all the variables can jointly affect fiscal behavior in Nigeria significantly. However, to split the relative impacts of each of the variables to long-run and short-run, Table 15 is presented.

**Table 14.** ARDL regression for fiscal policy shocks and fiscal balance

Method: ARDL

Selected model: ARDL (2, 2, 2, 2, 2, 2, 2, 1, 2, 2)

Variable	Coefficient	Std. error	t-statistic	Prob.*
FB (–1)	–0.859629	0.313842	–2.739049	0.0408
FB (–2)	0.396277	0.304876	1.299797	0.2504
GR	0.656625	0.085770	7.655669	0.0006
GR (–1)	0.760604	0.170560	4.459448	0.0066
GR (–2)	0.130735	0.085281	1.532992	0.1859
GE	–1.067228	0.109264	–9.767412	0.0002
GE (–1)	–0.779109	0.240261	–3.242757	0.0229
GE (–2)	0.091465	0.150321	0.608462	0.5695
ER	–0.018923	0.029145	–0.649280	0.5448
ER (–1)	–0.067530	0.028254	–2.390089	0.0624
ER (–2)	0.071883	0.052772	1.362141	0.2313
ED	–0.017125	0.007993	–2.142380	0.0851
ED (–1)	0.001486	0.009286	0.160076	0.8791
ED (–2)	0.073138	0.034730	2.105916	0.0891
EXR	–1663.537	434.9376	–3.824771	0.0123
EXR (–1)	1814.525	659.9441	2.749513	0.0403
EXR (–2)	–696.1182	103.5169	–6.724682	0.0011
INF	131.9497	53.17054	2.481632	0.0557
INF (–1)	62.74385	63.61635	0.986285	0.3693
INF (–2)	–66.29291	76.25004	–0.869415	0.4244

**Table 14 (cont.).** ARDL regression for fiscal policy shocks and fiscal balance

Variable	Coefficient	Std. error	t-statistic	Prob.*
DUMR	96481.49	30976.82	3.114635	0.0264
DUMR (–1)	–176050.8	43655.98	–4.032685	0.0100
COMPVOL	–634.8538	241.3365	–2.630575	0.0465
COMPVOL (–1)	562.7036	209.3143	2.688319	0.0434
COMPVOL (–2)	655.1934	296.5082	2.209698	0.0781
OILPVOL	–163.1138	237.7326	–0.686123	0.5231
OILPVOL (–1)	–406.2991	285.0998	–1.425112	0.2134
OILPVOL (–2)	–571.1676	266.0860	–2.146553	0.0846
C	–2184.024	3703.388	–0.589737	0.5810
R-squared	0.999788	Mean dependent var		–21510.65
Adjusted R-squared	0.998600	S.D. dependent var		56368.14
S.E. of regression	2108.847	Akaike info criterion		17.93463
Sum squared resid	22236181	Schwarz criterion		19.23653
Log likelihood	–275.8887	Hannan-Quinn criter.		18.37861
F-statistic	841.8622	Durbin-Watson stat		3.100981
Prob (F-statistic)	0.000000	–		–

**Table 15.** ARDL Short-run and long-run forms for fiscal policy shocks and fiscal balance

Selected model: ARDL (2, 2, 2, 2, 2, 2, 2, 1, 2, 2)

Variable	Coefficient	Std. error	t-statistic	Prob.
D (FB (–1))	–0.367458	0.036856	–9.970045	0.0002
D (GR)	0.652160	0.008782	74.262956	0.0000
D (GR (–1))	–0.124468	0.020325	–6.123908	0.0017
D (GE)	–1.062585	0.012576	–84.492421	0.0000
D (GE (–1))	–0.083854	0.020935	–4.005393	0.0103
D (ER)	–0.017959	0.002196	–8.179681	0.0004
D (ER (–1))	–0.069434	0.005624	–12.346700	0.0001
D (ED)	–0.016267	0.001288	–12.631022	0.0001
D (ED (–1))	–0.072111	0.004316	–16.709479	0.0000
D (EXR)	–1520.578355	138.940138	–10.944126	0.0001
D (EXR (–1))	650.056021	50.529441	12.864896	0.0001
D (INF)	135.457670	20.889523	6.484479	0.0013
D (INF)	86124.409466	9702.513982	8.876505	0.0003
D (DUMR)	–614.870639	67.851507	–9.062004	0.0003
D (COMPVOL)	–673.169305	66.330236	–10.148755	0.0002
D (COMPVOL (–1))	–168.841569	86.560603	–1.950559	0.1086
D (OILPVOL)	676.360461	99.126497	6.823206	0.0010
D (OILPVOL (–1))	1.419851	0.064396	22.048781	0.0000
<b>Long-run coefficients</b>				
GR	1.057821	0.151456	6.984347	0.0009
GE	–1.199214	0.152324	–7.872794	0.0005
ER	–0.009957	0.038750	–0.256955	0.8075
ED	0.039293	0.023071	1.703157	0.1493
EXR	–0.37252610	0.22359667	–1.660377	0.1577
INF	0.87744182	0.10825574	0.798941	0.4606
DUMR	–0.54374005	0.126511827	–4.288729	0.0078
COMPVOL	–0.39829844	0.13090552	–1.268519	0.0605
OILPVOL	0.77930026	0.944871304	1.736422	0.0430
C	–0.149280471	0.265610104	–0.572795	0.0316

The results in Table 15 are a clear indication of the fact that all the variables included in the model have different impacts on fiscal behavior in Nigeria both in the long-run and short-run periods.

Firstly, from the table it appears that the variables have more of transitory impact on fiscal policy behavior in Nigeria than permanent impact. Virtually all the variables have significant impact in the short run, but as they approach the long-run period, the impact diminishes. The core variables of fiscal policy such as government revenue and expenditure, then other shocks variables such as external reserve, exchange rate, inflation rate, external debt, as well as the exogenous shocks like oil price and commodity price volatilities, all have significant impact on fiscal policy behavior in the short run. This is an indication that fiscal policy in Nigeria is highly vulnerable to shocks from these variables mostly in the short run.

However, approaching the long-run period, the effects of some of the shocks is reduced and they are no longer significant on fiscal policy behavior. These variables are external reserve, external debt, inflation rate and exchange rate. But the effects of variables like government revenue, government expenditure, regime of administration, oil price and commodity price volatilities are all sustained till the long-run periods.

Another revelation from the result is the coefficient of the shocks. For upward oil price shocks, it attracts positive fiscal balance, but upward commodity price shocks causes negative fiscal balance. Government expenditure also causes a more negative fiscal balance, while government revenue increase causes a positive fiscal balance. These four variables have been shown to have more effects on fiscal policy behavior in Nigeria than other variables in the model.

In addition to further confirm the existence of the long-run relationship between fiscal policy behavior and other variables in the model, the bound test is conducted.

### 2.3. ARDL cointegration bound test

The bound test is one of the diagnostic tests to confirm the presence of co-movement among the variables in the estimated ARDL model. The result is shown in Table 16.

**Table 16.** ARDL bound test for fiscal behavior

**Null hypothesis:** no long-run relationships exist.

Test statistic	Value	K
<i>F</i> -statistic	33.42047	9
Critical value bounds		
Significance	10 bound	11 bound
10%	1.8	2.8
5%	2.04	2.08
2.5%	2.24	3.35
1%	2.5	3.68

Table 16 shows *F* value of 33.4207. This value is greater than all the critical values at various significant levels from 1% to 10%. This implies that the hypothesis of no long-run relationship is rejected, hence, we conclude that there exists a significant long-run relationship between the fiscal policy shocks and fiscal policy behavior in Nigeria.

### 2.4. Test for serial correlation

This is another diagnostic test that investigates the presence of auto-correlation in the estimated ARDL model. The result is presented in Table 17.

**Table 17.** Breusch-Godfrey serial correlation LM test

<i>F</i> -statistic	1.875175	Prob. <i>F</i> (2,3)	0.2963
Obs*R-squared	18.88967	Prob. Chi-square (2)	0.0001

Table 17 shows that the value of *F*-statistic is not significant at 5%, therefore, we accept the null hypothesis that there is no serial correlation in the ARDL estimated model. This further confirms the reliability of the model.

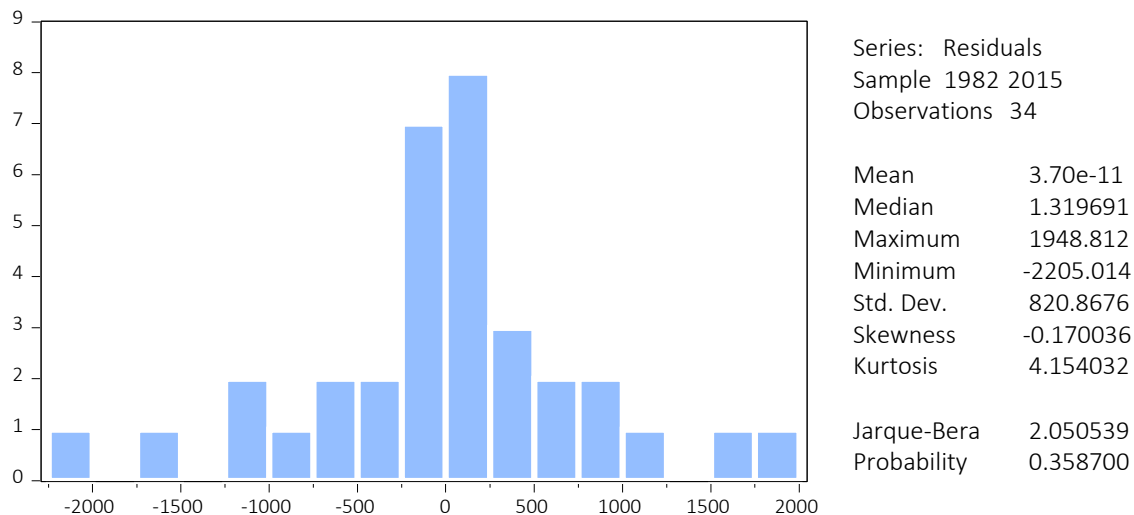
### 2.5. Test for heteroskedasticity

This test is necessary to investigate if the error term is constant for all levels of observation that homoscedasticity which is requirement for a good estimated model. The result is presented in table 18

**Table 18.** Heteroskedasticity Test: Breusch-Pagan-Godfrey

<i>F</i> -statistic	4.384797	Prob. <i>F</i> (28,5)	0.0529
Obs*R-squared	32.66953	Prob. Chi-Square (28)	0.2481
Scaled explained SS	1.114195	Prob. Chi-Square (28)	1.0000

The null hypothesis of no heteroskedasticity is also accepted, since the *F*-statistics value fails to pass



**Figure 1. Normality test**

the significant test at 5%. Therefore, we conclude that the estimated ARDL model is homoscedastic in nature.

## 2.6. Normality test

The distribution of the variable used in the model must be normal to have a good estimated model.

The normality test is hereby conducted to verify this. The result is presented in Figure 1.

Figure 1 shows that the Jarque-Bera statistics is not statistically significant at 5%, therefore we conclude that the estimated model is normally distributed. This is also good for our result in this analysis.

## SUMMARY AND CONCLUSION

The analysis begins from confirmation of the nature of volatilities of both oil price and commodity prices. The study shows that the findings of previous authors like Demachi (2012) who concluded that oil price have symmetric effect on Nigerian economy rather than asymmetric effect is also supported by the findings in this study. The implication is that positive oil price change is capable of causing much further spontaneous changes and fluctuations in oil prices and commodity prices, which may spur further economic uncertainties for the economy, the situation that is precarious for the health of the Nigerian economy.

Again, the study has shown that shocks variables such as external reserve, exchange rate, inflation rate, external debt, as well as the exogenous shocks like oil price and commodity price volatilities, all have significant impact on fiscal policy behavior in Nigeria though their effects appear to be more pronounced in the short run than in the long run. However, core fiscal variables such as government revenue and expenditure, as well as the exogenous shocks and regime of administration, maintained their significant impacts of fiscal policy in Nigeria in the long-run period. The implications are that all these variables that are put into empirical tests on the levels of their influence on fiscal policy in Nigeria have all justified their inclusions in the model. It thus supports the various economic theories on fiscal policy and empirical studies such as Obinyeluaku (2012), Vieg and Obinyeluaku (2004), among others, who have also confirmed these variables as highly influential on fiscal policy behavior in Nigeria.

It should be noted from the findings that fiscal policy horizon in Nigeria is highly susceptible to external shocks. Both oil price and commodity price volatilities are shown to have significant impact on fiscal

behavior in Nigeria. This is contrary to the findings of Bakare (2010) who concluded from his study that only oil price dictates fiscal policy behavior in Nigeria and that the role of commodity price might not be significant. The reason for the difference in our result might not be unconnected with the fact that while he made use of commodity price, this study used commodity price volatility thus supporting the school of thought that identify price movement as very influential to macroeconomic policy than price itself. According to this school, the dynamic nature of commodity prices is bound to produce more pronounced effects in primary export based and import dependent economy, since it determines the level of uncertainties in macroeconomic policy like fiscal policy (Obinyeluaku, 2012). This justifies the significance of commodity price volatility influence on the fiscal behavior in Nigeria.

In addition, the study discovers that oil price volatility produces positive significant impacts of fiscal balance. This appears to be reasonable, since Nigeria is an oil dependent economy where oil contributes more than 80% of the foreign exchange earnings, therefore the revenue of the government is highly dependent on proceeds from oil hence the importance of oil price fluctuations on fiscal policy. Christiane and Isabel (2008) also found similar results that increase in oil price increases government revenue and hence positive fiscal balance is envisaged in this regard.

However, the situation is different for commodity price volatilities, because the relationship with fiscal balance is negative, that is a rise in commodity price will bring about negative fiscal balance. The implication is that commodity price volatility is more attached to government expenditure than government revenue. This situation further justifies the position of Nigeria as import dependent economy. According to Olasunkanmi and Babatunde (2013), increase in commodity price supposed to be a blessing to Nigerian economy, but rather it is a problem, because Nigeria imports primary, intermediate and secondary goods, therefore, when there is rise in commodity prices, it puts pressure on government expenditure, thus resulting in negative fiscal balance. Had it been that the export base of Nigerian economy is diversified, the country supposed to make higher revenue from increase in commodity prices like Botswana, South Africa, among others, who recorded massive increase in their government revenue during the rise in commodity prices in 2014 (see Mountford & Uhlig, 2014). But the situation in Nigeria is contrary to this, because import bill of the country has been on the rise since 2014. The import bill rose to unprecedented all high of about 479 billion USD in 2016 last quarter, making Nigeria the largest consuming nation in the whole African continent. The attendant effect is on government expenditure, which adversely affects the fiscal balance and puts a negative pressure on fiscal behavior in Nigeria.

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