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The Impact of Oil Export Earnings on Government Income and Expenditure: A Policy Implication on Sustainable Development of the Nigerian Economy

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Abstract

This study examines the effect of oil fluctuation export earnings on government income and expenditure in Nigeria using time series data from 1986 to 2015. The study utilized co-integration techniques and ordinary least squares as the analysis methods. The co-integration tests indicate a long-run equilibrium relationship between oil export earnings, government income, and expenditure. The results also show that oil export earnings positively impact total government income and expenditure. However, the impact of oil export earnings on government revenue was significant. Other variables influencing government income and expenditure are the total income and population size. The policy implication derivable from this study is that increase in government expenditure without a corresponding increase in revenue could widen the budget deficit. Therefore, the government should explore other sources of revenue, especially the non-oil minerals sector, reduce the size of large recurrent expenditures and move towards capital and other investment expenditures.

Keywords: Oil Export, Government Income, Expenditure, Population, Nigeria.

JEL Classification: F1, F4, H2, H5.

1. Introduction

Nigeria has a long history of oil, and among the challenges associated with oil, frequent changes in the prices of oil have produced macro-

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fiscal risk for the country. The consequential place of oil to Nigeria's economy is well established. Since its discovery in commercial quantities during the years 1973/74, it has grown to assume a pivotal place in Nigeria's economy; constituting the main source of export earnings, foreign exchange and public generated revenue (Obadan, 2010; Odusola, 2006) but has not translated into meaningful growth and development (Alimi, Yinusa, & Ilo, 2016). By the year 1985, the country produced a total of 1.9 million barrels of oil, and that generated a total of ₦1.78 million as export earnings. By the year 1980, the production of oil rose to 760.1 million barrels and that trickled in a total of N13, 306.93 million as export earnings, constituting 96.8% of total export earnings (Central Bank of Nigeria, 2012). Oil revenue stood at ₦167 million in the year 1970, which constituted only 26.3% of totally federal collected revenue. By the year 1974, oil revenue constituted 82.1% of public generated revenue. Though the proportion of oil revenue has been unsteady, it has never fallen short of sixty-five percent (Orubu, 2003). The growth in the oil industry has a great impact on the Nigerian economy but its effect on output growth has been reported to be a jobless growth (Maku and Alimi, 2018).

The discovery of oil has brought both blessings and curses to Nigeria as a nation. One major disadvantage of oil is the volatility in its prices and the attendant macroeconomics implication. The price of oil has experienced great fluctuation since the 70s. The price of oil which has stayed between $2.50 and $3.0 per barrel since 1948 quadrupled from $3 per barrel in 1972 to $12 per barrel by the end of 1974, and from $14 per barrel in 1978 to $35 per barrel in 1981. The price of oil however plummeted between $10 per barrel in the year 1956 but surged again to between $18 and $ 23 in the 90s. it oscillated between $17 per barrel and $26 at different times in the year 2002 and about $ 53 per barrel by Oct. 2004 and rose to $60 by 2005 (Philip and Akintoye, 2006). During the summer of 2007, the price of one barrel of crude oil jumped to above $70 and even crossed $145 mark in July 2008. The price staggered between $61.73 per barrel in October 2009 and remained at an average of $75 per barrel until August 2010 (Hassan and Zahid, 2011). The price recently stood around an average value of $70 per barrel.

The interest of this study lies in the impact of oil export earnings on government income and expenditure since the country has just regained from the recession with the hope of a steady gain from oil exports. The recent economic crisis hold had affected the Nigerian economy adversely, thus, this study is of immense benefit as it provides empirical evidence of how oil export earnings influence government income and spending. Apart from the introductory section, the study is divided into four parts. The second section presents the literature review while section three provides a methodology. The empirical result and discussion are presented in section four and the last section concludes and proffers policy options.

2. Literature Review

The earliest theory of public expenditure could be traced to Adolph Wagner (one of the leading German economists of his time) who in 1883 propounded an interesting development thesis, which loosely held that as a nation develops its public sector and consequently public spending will grow in importance. Following Wagner's Law, as the national income rises, public expenditure also rises to meet the demands of the people. As the economy grows and income rises, the demand for goods, including public goods will rise, which as a consequence pushes the public expenditure up. With the rise in per capita income, the public provision of consumer goods also rises.

The previous literature on the factors determining the level of government income and expenditure is vast, with varying techniques and methodologies adopted in their investigations. Many of these empirical studies focus on the determinants of military spending (Davoodi, Clements, Schiff & Debaere, 2001; De Masi & Lorie, 1989; Schiff, Gupta & Clements, 1998; Gupta, Sanjeev, McDonald& Ruggiero, 1998; Hewitt, 1991, 1992 & 1993), since military expenditure absorbs more than 5 percent of world resources annually. Related studies investigated for Nigeria (Taiwo, 1989; Babatunde, 2011; Aregbeyen & Akpan, 2013) suggest that per capita income, government revenue, demographics, and institutional variables are significant determinants of government expenditure.

Okafor and Eiya (2011) examine the impact of macroeconomic variables like inflation, public debt, tax revenue, and population on the

growth of government expenditure in Nigeria within the periods, 1999-2008. The results from the ordinary least square indicate that inflation has an indirect association with government total government expenditure. However, the other macroeconomic variables, population, public debt, and tax revenue have a positive relationship with total government expenditure. The authors conclude that the variables are major determinants of government expenditure in Nigeria.

Akanbi (2014) investigates the factors determinants of government expenditure with specific reference to capital and recurrent expenditure in Nigeria. The authors employed a public choice framework using time-series data from 1974 to 2012. The vector error correction model was used to estimate the parameters. The results show that capital and recurrent expenditure are resilient to shocks in total government spending and, similarly, total government expenditure is found to be resilient to shocks in the capital and recurrent spending. However, whereas total and capital expenditure tends to be resilient to shocks in government revenue, recurrent expenditure is found to be significantly affected by shocks in government revenue. The effects of governance show that recurrent expenditure is not affected by any elements of poor governance as much as are capital and overall expenditure. Increased per capita income was found to be in support of Wagner's law, given the response of total and capital expenditure, but this law was refuted by the recurrent expenditure response.

Ukwueze (2015) employed the error correction model and long-run static equation to examine the determinants of the size of public expenditure in Nigeria for the periods, 1961-2012. The results of this study show that the size of revenue and growth rate of national income (output) and private investment significantly influence the size of public expenditure both in the short run and long run. External and domestic debts significantly influence the size of government expenditure only in the short run. The author concludes that revenue, private investment, and the income boost public spending while public debts might be counterproductive.

Alimi et al. (2015) investigate the macroeconomic effects of fiscal policy changes in Nigeria using a time series data sets from 1970 to

2013. The authors employed impulse response, variance decomposition, and Granger causality tests to evaluate the links. Findings showed that public sector finance contributes significantly to macroeconomic performance indices except for income per capita growth. They found that the supply of money has a direct impact on total government spending. Fiscal balance has a positive relationship with the lending rate, trade openness, and exchange rate. While evaluating the nexus between government expenditure and government revenue in Nigeria, Abdulrasheed (2017) found that changes in government revenue are triggered by changes in public spending. The study concluded that there is a spend-revenue practice in the country which complies with the theoretical foundations of Barro (1974) and Peacock and Wiseman (1979).

Aregbeyen and Kolawole (2015) investigate the impact of oil revenue on government expenditure and output growth in Nigeria. They employed Johansen cointegration, Granger causality, and error correction to evaluate the relationship using a time series data from 1980 to 2012. The result from the causality test showed that a unidirectional relation runs from oil revenue to government spending and output and no causal relationship between the latter. Adesoye, Adelowokan & Alimi (2018) used a vector error correction model to investigate the effect of non-oil export on output growth in Nigeria for the periods, 1975-2013. The result found that non-oil export demand has a direct relationship with economic performance, most especially in the agriculture, manufacturing, and service sectors.

3. Methodology

The study covers the periods between 1986 and 2015. The data were sourced from the Central Bank of Nigeria (CBN) Statistical Bulletin, volume 27, 2016. The framework used in this study follows a public choice approach similar to that used by Hewitt (1991, 1992, 1993), Nyamongo (2007), and Akanbi and Schoeman (2010). The model analyses the relationship between government capital (infrastructure) spending, recurrent spending, and overall government spending. Previous studies mostly used the public choice model to analyses the relationship between military spending and overall government spending, in which the former is regarded as a pure public good. A

slight deviation from this is seen in Akanbi and Schoeman (2010), where the relationship between education spending and overall government spending is explored. Therefore, what distinguishes this study from previous studies is that it disaggregates capital and recurrent spending from overall government spending, rather than the split of military and education spending from overall government spending in the previous studies. Thus, the determination of capital and recurrent expenditures is modeled as a government optimization problem, meaning that the decision on the size of a budget for capital and recurrent expenditure is taken by the political leadership.
Assuming the welfare function of the government to be as follows:

$$W = f(P, C, R, Z) \quad (1)$$

Where; P = private consumption; C = government capital spending; R = government recurrent spending; and Z = state variables (i.e. GDP per capita, government revenue, governance index, population and urbanization index, etc.)

The government's choice of the level of capital and overall government spending is affected by the state variables. Overall government spending is represented by the following equation:

$$G = C + R \quad (2)$$

Abstracting from private investment and the external account, the budget constraint is determined by the available resources in the economy:

$$G = Y - P \quad (3)$$

Where; Y represents the value of the gross domestic product, P=private consumption, and G=government spending.

In line with the existing empirical specification, the econometric models are specified in natural logarithms, based on equations above, which are presented below:

$$\ln G_t = f(\ln OREV_t, \ln GDP_t, \ln POP_t) \quad (4)$$

$$lnREV_t = f(lnG_t, lnOREV_t, lnGDP_t, lnPOP_t) \quad (5)$$

In linear form, the study is specified as:

$$lnG_t = \alpha_0 + \alpha_1 lnOREV_t + \alpha_2 lnGDP_t + \alpha_3 lnPOP_t + \mu_t \quad (6)$$

$$lnREV_t = \beta_0 + \beta_1 lnG_t + \beta_2 lnOREV_t + \beta_3 lnGDP_t + \beta_4 lnPOP_t + \mu_t \quad (7)$$

where; G = government spending, REV = government revenue, OREV = oil export earnings, GDP = real gross domestic product, POP = total population, α_0, $\alpha_{1\text{-}3}$, β_0, $\beta_{1\text{-}4}$ = parameters, *t* = time and μ = error term.

The state variables specified in the above equations include the real GDP, total population, government revenue, government revenue, oil revenue, and government expenditure. These variables are assumed to influence the parameters of the different categories of government expenditure, similar to the approach followed by Davoodi et al. (2001).

The directional effect from total government expenditure to the two categories of expenditure is found to be ambiguous. That is to say that, an increase in total government expenditure results in a corresponding rise in capital expenditure, but such a rise in overall government expenditure may also be directed towards recurrent expenditure in the budget. On the other hand, an increase in capital and/or recurrent expenditure is expected to increase total government expenditure. The GDP per capita, which serves as a measure of welfare or development, is expected to show evidence in favor of Wagner's law. This means that a higher level of welfare is accompanied by an increase in government expenditure. However, in the literature, evidence in favor of this phenomenon is mixed (Easterly, William & Rebelo, 1993; Rodrik & Dani, 1996).

Considering the population structure and density that are used in this paper as evidence from Hewitt (1992), it is expected that the size of the urban population should correlate positively with capital expenditure. This is because the majority of the active population will likely move to the urban center where better physical infrastructure facilities are available, thereby leading to increased pressure on the

government to spend more on capital projects. The total population is also expected to correlate positively with overall government expenditure since an increase in population size also increases both capital and recurrent government expenditure. Likewise, the rise in the active population will significantly increase government recurrent expenditure, mainly through salaries, wages, and transfer payments.

The tests of the unit root of the variables using the Augmented Dickey-Fuller (ADF) were conducted. The null hypothesis for the tests is that there is a unit root. All unit root test regressions are run with an intercept. The work segregates annual data on Government expenditure (G) and oil government revenue (OREV) into the current (TREXP) and capital expenditures (TCEXP), and oil revenue (OILREV), government revenue (R), real per capita GDP (YPR), and total population (POP). This study employed classical ordinary least square. In estimating the multiple regression model for the unrestricted Ordinary Least Square (OLS) is used. The estimated parameters are subjected to evaluation by using other tests: student t-statistic test and F-statistic test. Thus, the overall stability of the specified empirical model is tested using multiple coefficients of determination (R^2), and adjusted R^2.

4. Data Analysis and Interpretation

This section of the research study dealt with an econometric analysis of the impact of oil export earnings on government income and expenditure in Nigeria between two decades after independence (1986) and 2015.

4.1 Descriptive Analysis

The study presents the trend of oil export earnings, government revenue and expenditure, and real gross domestic product and population in Nigeria between two decades after independence till 2015. The time series plot of oil export earnings, government revenue and expenditure is presented in Figure 1, while the time series plot of oil export earnings, real gross domestic product and population are presented in Figure 2.

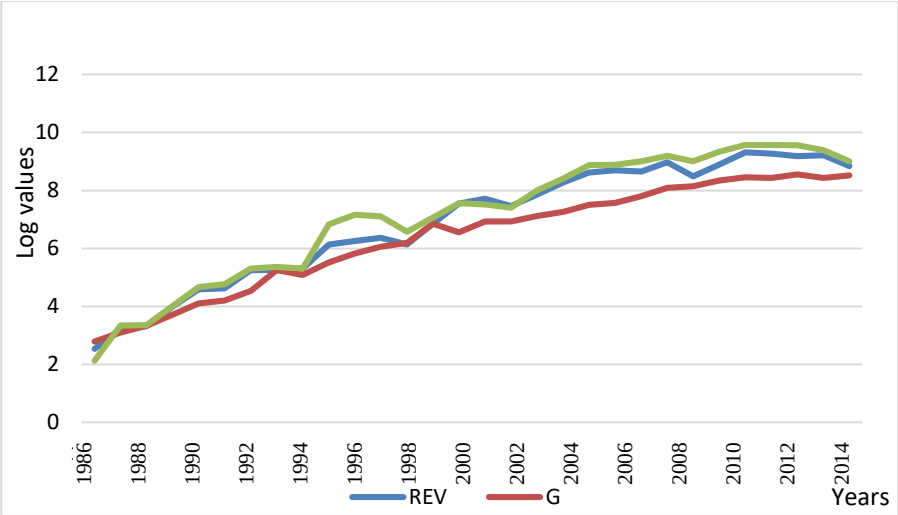

Figure 1: Oil Export Earning, Government Revenue, and Expenditure

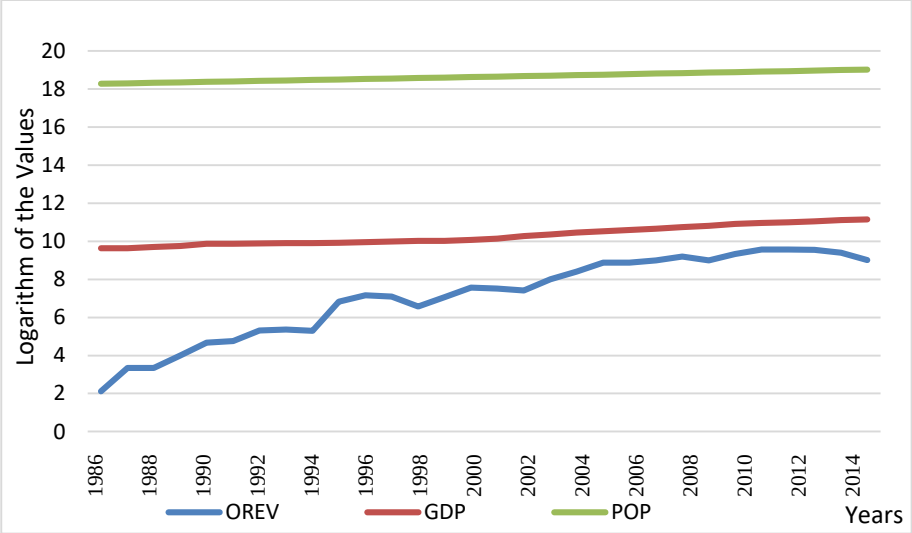

Figure 2: Oil Export Earnings, GDP and Population

From the above Figure 1, it reveals the time series plots of all the indicators follow the same pattern from 1986 till 2015. The patterns then change appearance in opposite ways for government revenue and expenditure from 1991 till 2002. A similar movement was also witnessed from 2004 to 2015. Figure 2 shows that both the labor and gross domestic product move in the same direction but their movement concerning oil export earning is not clear enough to

indicate whether it is positive or negative. The inconclusiveness of the direction of our variables necessitates the need for empirical analysis.

Table 1: Descriptive Statistics

	REV	G	OREV	GDP	POP
Mean	6.894932	6.371378	7.107769	10.29594	18.64266
Maximum	9.316222	8.553587	9.569633	11.14221	19.02063
Minimum	2.533363	2.786473	2.124475	9.631547	18.27123
Std. Dev.	2.07011	1.824101	2.17178	0.491981	0.226028
Skewness	-0.57973	-0.537	-0.69866	0.402749	0.030666
Kurtosis	-0.87401	-0.94635	-0.575	-1.29355	-1.17676
Jarque-Bera	3.152455	3.424768	1.633087	1.317480	9.934593
Prob.	0.206754	0.180435	0.441957	0.517503	0.006962
Obs.	30	30	30	30	30

Source: Research findings.

Table 1 shows that the mean values of government spending (G), government revenue (REV), oil revenue (OREV), real gross domestic product (GDP), and total population (POP) stood at 6.37%, 6.89%, 7.11%, 10.3%, and 18.64% respectively. All the variables have standard deviation values lower than their respective minimum value from the distribution. The standard deviation values of government spending (G), government revenue (REV), oil revenue (OREV), real gross domestic product (GDP), and total population (POP) were 1.82%, 2.07%, 2.17%, 0.49% and 0.23% correspondingly. The probability value of the Jarque-Bera statistics for all variables shows their distribution level at mean zero and constant variance.

Table 2: Correlation Analysis (Ordinary)

	REV	G	OREV	GDP	POP
REV	1				
G	0.989509	1			
OREV	0.993149	0.985709	1		
GDP	0.914095	0.924501	0.901185	1	
POP	0.963238	0.975555	0.952961	0.981046	1

Source: Research findings.

Table 2 shows the correlation coefficients of the variables employed for analysis. From the table, the variability of the relationship among the variables ranges from strong positive through moderate positive relations. Also, the dependent variables show a different level of association among themselves.

4.2 Unit Roots Test

The unit root test results of the incorporated times series variables in our regression model are presented in Table 3 using the Augmented Dickey-Fuller (ADF) unit-root test.

Table 3: Unit Root Table Using ADF

Variables	ADF statistics	Critical Value	P-value	Order of Integration
REV	-5.8923	-4.2191	0.0000	I(1)
G	-6.0728	-4.2268	0.0000	I(1)
OREV	-4.9273	-4.2268	0.0051	I(1)
GDP	-5.8232	-4.2268	0.0000	I(1)
POP	-4.6431	-4.2191	0.0075	I(1)

Source: Research findings.

The test results indicate that all the variables that are government spending (G), government revenue (REV), oil revenue (OREV), real gross domestic product (GDP), and total population (POP) were was found not to reject the null hypothesis "*it has the unit root*" at the level. This implies that these series are not stationary at levels. Thus, the series is not integrated of order zero i.e. I(0). However, they were found to be stationary at first differences, that is integrated at order one [I(1)]. Thus, they were found not to reject the null hypothesis "*no stationary*" at level but after several iterations based on the number of lag length and differencing, the series were found to reject the null hypothesis at first difference. This indicates that the first-difference of those series is *mean-reverting* and stationary.

4.3 Co-integration Test

A co-integration test was performed using the Johansen (1988) approach to find out the existence or inexistence of a long-run

relationship among the variables employed for this study and the results are presented in Table 4. The table indicates three (3) cointegrating equations since both the Trace Statistics and Max Eigen statistics in Model 1 of the hypothesized number of co-integrating equations are greater than their critical values at a 5% significance level respectively.

Table 4: Cointegration Rank Test Results (Trace Statistics)

Johansen Cointegration Test
Lags interval (in first differences): 1 to 2
Trend assumption: Linear deterministic trend
Variables: G, OREV, GDP, POP

Hypothesized No. of CE(s)	Trace Statistic	Max-Eigen statistics	Prob.**
None *	143.1849	56.57841	0.0000
At most 1 *	86.60650	36.32235	0.0013
At most 2 *	50.28415	29.62046	0.0290
At most 3	20.66369	11.86516	0.3789
At most 4	8.798531	7.577471	0.3844
At most 5	1.221061	1.221061	0.2692

Variables: REV, G, OREV, GDP, POP

Hypothesized No. of CE(s)	Trace Statistic	Max-Eigen statistics	Prob.**
None *	95.75366	40.07757	0.0003
At most 1 *	69.81889	33.87687	0.0250
At most 2 *	47.85613	27.58434	0.0270
At most 3	29.79707	21.13162	0.5610
At most 4	15.49471	14.26460	0.4233
At most 5	3.841466	3.841466	0.2692

Notes: * indicates 3 cointegrating equations at a 5% level and rejection of the hypothesis at a 5% level.
** MacKinnon-Haug-Michelis (1999) p-values.
Source: Research findings.

For the second model, the Trace statistics and the Maximum Eigenvalue reported three (3) co-integrating equations since the values of the hypothesized number of co-integrating equations are greater than their critical values at 5% significance level respectively. Thus,

this indicates that there exist three cointegrating vector equations among the considered variables in the order. This implies that there is a long-run relationship between oil export earnings and government revenue and expenditure in Nigeria within the periods of 1986-2015.

4.4 Empirical Results

4.4.1 Regression Estimates of Oil Export Earning and Government Expenditure

The results of the estimated regression on the relationship between oil export earnings and government revenue and expenditure in Nigeria are presented in Tables 5 and 6.

Table 5: Result for Long-run Estimates

Dependent Variable: G

Method: Least Squares

Sample: 1986 2015

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	68.37728	12.78781	5.347066	0.0000
OREV	0.144855	0.106758	1.356854	0.1846
GDP	3.269147	0.866093	3.774590	0.0007
POP	4.025582	1.130840	3.559816	0.0012
R-squared	0.968056	Mean dependent var		20.60384
Adjusted R-squared	0.964964	S.D. dependent var		2.241902
S.E. of regression	0.419634	Akaike info criterion		1.208345
F-statistic	313.1476	Durbin-Watson stat		1.740463
Prob(F-statistic)	0.000000			

Source: Research findings.

The long-run estimates using the ordinary least square (OLS) method for the model are presented in Table 5. The table shows that oil export earnings (OREV), gross domestic product (GDP) and population (POP) have a direct impact on government expenditure (G) in Nigeria. In magnitude terms, this implies that for a 1% change in oil export earnings (OREV), gross domestic product (GDP), and population (POP); the government expenditure (G) of the Nigerian economy increases by 0.15%, 3.27%, and 4.03% respectively. Gross

domestic product and population growth were found to be statistically significant at a 5% significance level.

The F-statistic result shows that all the incorporated government expenditure and its inputs indicators are simultaneously significant at a 5% critical level. Also, the adjusted R-squared result reveals that 96.5% of the total variation in government expenditure is accounted for by changes in oil export earnings (OREV), gross domestic product (GDP) and population (POP) during the reviewed periods. The Durbin-Watson test result reveals that there is a presence of a semi-strong positive serial correlation among the residuals, because of the d-value (1.7405) is approximately two. The model is not spurious since R-square is lesser than the Durbin-Watson value.

4.4.2 Regression Estimates of Oil Export Earnings and Government Revenue

The long-run estimates using the ordinary least square (OLS) method for the model are presented in Table 6. The table shows that government expenditure (G), oil export earnings (OREV), gross domestic product (GDP), and population growth (POP) have a direct impact on government revenue (REV) of Nigeria and these do follow apriori expectation. In magnitude terms, this implies that for a 10% growth in government expenditure (G), oil export earnings (OREV), gross domestic product (GDP) and population growth (POP); government revenue (REV) of the Nigerian economy increases by 0.40%, 0.32%, 0.03%, and 0.22% respectively. All the variables are found to be significant at a 5% significance level except for gross domestic product which was insignificant at 0.05 critical values.

Table 6: Result for Long-run Estimates

Dependent Variable: REV

Method: Least Squares

Sample: 1986 2015

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	32.86222	9.865548	3.331008	0.0022
G	0.402558	0.113084	3.559816	0.0012
OREV	0.328045	0.060563	5.416603	0.0000
GDP	0.026363	0.033270	0.792385	0.4342
POP	0.220175	0.054838	4.015032	0.0004

R-squared	0.926383	**Mean dependent var**	24.05059
Adjusted R-squared	0.919259	**S.D. dependent var**	0.491877
S.E. of regression	0.139767	**Akaike info criterion**	-0.990472
F-statistic	130.0327	**Durbin-Watson stat**	1.758564
Prob(F-statistic)	0.000000		

Source: Research findings.

The F-statistic result shows that all the incorporated government revenue and all the indicators are simultaneously significant at a 5% critical level. Also, the adjusted R-squared result reveals that 91.9% of the total variation in government revenue is accounted for by changes in government expenditure (G), oil export earnings (OREV), gross domestic product (GDP) and population growth (POP) during the reviewed periods. The Durbin-Watson test result reveals that there is a presence of moderate positive serial correlation among the residuals, because of the d-value (1.7586) is approximately two. The model is not spurious since R-square is lesser than the Durbin-Watson value.

5. Conclusion

The study examined the effect of oil fluctuation export earnings on government revenue and expenditure in Nigeria using time series data from 1986 to 2015. The study used the ordinary least square method to establish the links. The results also show that oil export earnings have a positive impact on total government income and expenditure. However, the impact of oil export earning on government revenue was significant. Other variables that influence government income and expenditure are the total income and population size. The policy implication derivable from this study is that the increase in government expenditure without corresponding revenue will widen the budget deficit. Also, dependence upon revenue from oil proceeds only will strengthen our budget deficit and increase debt servicing. Thus, the government will be left with an option to borrow which could increase indebtedness to lending countries and institutions. This could further widen the budget deficit and the provisions for debt servicing. Internal borrowing also reduces the amount meant for private investment in the country.

The government should reduce the size of large recurrent

expenditures and move towards capital and other investment expenditures. Deliberate efforts should be made to check the inflation of contract sums, these will help reduce the budget deficit. The government should diversify the economy. Other sources of revenue should be explored especially the non-oil minerals sector to correct the disparity between revenue and expenditure and reduce the attendant budget deficit. Taxes have a role to play in the economy especially in deemphasizing the mono-economic (petroleum sector) nature of Nigeria. Expenditure reforms analysis should be considered vis-à-vis taxes and all other revenue sources (oil and non-oil) reforms which will help set targets for revenue mobilization and utilization as well as expenditure spreading over the entire economy.

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