

# ARDL Approach to Government Revenue and Economic Performance of Nigeria: Post Structural Adjustment Programme

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## **ABSTRACT**

*This study examined effect of government revenue on economic performance of Nigeria during the post structural adjustment programme and extracted relevant data in Central Bank of Nigeria statistical bulletin from 1986 to 2018. The data were transformed to annual growth rates and subjected to stationarity test using the augmented Dickey Fuller unit root test so as to ascertain the suitable analytical technique. It was found that percentage change in real gross domestic product was integrated at first difference while percentage changes in oil and non-oil revenue were each integrated at level. Hence, we employed ARDL Bounds test to examine the relationship of the variables and established that oil revenue has no short run effect on economic performance while on the long run, there was positive but insignificant effect on economic performance of Nigeria during the period studied. The result also established that non-oil revenue has positive insignificant effect on economic performance both on short and long run equilibrium positions. However, the study provided evidence that collectively, government revenue has significant effect on economic performance of Nigeria and therefore recommends that government should enact and implement the petroleum industry governance bill and employ revenue on critical infrastructure that would stimulate growth of the economy.*

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**Key Words:** Oil revenue, Non-oil revenue, Economic performance, ARDL Bounds Test, Nigeria

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## **1. INTRODUCTION**

Nigeria's revenue structure consists of proceeds from sale of crude oil and generation of non-oil revenue such as taxes other than grants. The federal government has consistently used these revenue sources to drive growth of the economy through expenditure on critical infrastructure, payment of salaries and other incidentals which increases the rate of consumption by businesses and households respectively.

A hosts of researchers including Asogwu and Okpongette (2015), Jones and Ekwueme (2016), Nwoba and Abah (2017), Jones, Nwawuru and Nmesirionye (2018), Azubike and Onukwube (2019) and Nmesirionye, Jones and Onuche (2019) had argued that government revenue in Nigeria is skewed towards the oil sector; a situation that would make the economy susceptible to unfavourable global oil politics, production of alternatives to oil at the global level and or upheavals in the nation. Statistical data had provided evidence that buttresses their assertions.

Available data in Central Bank of Nigeria statistical bulletin (2018) between 1986 and 2018 revealed that government revenue from the oil sector has consistently exceeded non-oil revenue except for 2016 where oil revenue was less than non-oil revenue by 8.5%. Expectedly, the economy experienced negative growth rate in 2016 which could be attributable to the decline in oil revenue.

An analysis of the data collected indicated that in 2006, oil revenue was at its peak comparatively with a value of 87.2% above non-oil revenue. Within the period 1986 to 2018, revenue from oil proceeds averaged 71.36% of government total revenue while non-oil revenue averaged 28.64%. However, the variance between these two major sources of revenue averaged 61.2% within the period of 33 years. This further proves the nation's high reliance on the oil sector.

Economic activities increased after the liberalization of the economy through the structural adjustment programme in 1986. Nigeria's economic performance (proxied by growth) fluctuated over the years between 1986 to 2018 ranging from 14.60% in 2002 and a negative rate of -1.58 in 2016 but with an average of 4.85% during the period. A comparative analysis of government revenue percentage of gross domestic product for some Economic Community of West African States (ECOWAS) countries data set from 2009 to 2019 as shown on table 1 indicated that Nigeria averaged 10.89%, Ghana 12.77%, Benin 12.43%, Sierra Leone 11.35% and Liberia 16.90%. Nigeria's government revenue percentage of GDP average of 10.89% is below the selected 5 ECOWAS countries average of 12.87% (International Monetary Fund, 2019).

**Table 1: Government Revenue Percentage of GDP in some ECOWAS Countries.**

Year	Nigeria	Ghana	Benin	Sierra Leone	Liberia
2009	10.11	10.03	12.57	9.12	16.91
2010	12.42	10.74	12.78	9.92	21.92
2011	17.73	12.61	12.02	11.43	21.40
2012	14.30	12.59	12.70	11.34	22.07
2013	11.05	12.29	12.87	10.70	20.27
2014	10.52	12.91	11.90	9.81	14.46
2015	7.56	13.38	12.17	10.80	14.05
2016	5.54	12.89	10.64	11.89	13.97
2017	6.61	13.34	12.80	12.16	13.51

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2018	8.51	14.20	12.98	13.67	13.35
2019	7.70	15.49	13.25	13.98	13.96

Source: Extracted from IMF (2019)

The Organization for Economic Co-operation and Development (2019) report in 2017, noted that Nigeria had tax revenue percentage of gross domestic product of 5.7% and is significantly below the African average of 26 countries of 17.2%. Amongst the 26 countries, only 7 countries had tax revenue % of GDP above the average of 17.2% in 2017. These countries are Cote d'Ivoire 17.9%, Kenya 18.2%, Mauritania 18.7%, Burkina Faso 19.3%, Mauritius 18.7%, Cabo Verde 20.1% and Togo 21%. The above therefore requires a renaissance in the approach in which the economy is managed and calls for well-articulated, structured and sustainable alternative sources of revenue to consistently stimulate growth of the economy of Nigeria.

Previous empirical studies on this phenomenon gave evidence of differing views. Notably, Azubike and Onukwube (2019) claimed that oil revenue has negative insignificant effect on economic growth of Nigeria, Ihedinihu, Jones and Ibanichukwa (2014) asserted that petroleum profit tax has no significant effect of petroleum profit tax on economic growth of Nigeria. Osuala and Jones (2014) found no significant effect of tax revenue on economic growth of Nigeria.

The rationale that prompted this study was that, how has these revenue sources individually and jointly influenced growth rate of Nigeria's economy when there have been several reported cases of oil theft, widely reported cases of corruption in the oil sector, pipeline vandalism and unrest in the oil producing regions partly based on perceived neglect of these areas and increasing number of unemployed youths. The major government owned refineries are producing below capacity or even non-functional. The nation is also noted to have massive unorganized private sector that evade and avoid taxes. The debt profile widely reported to be now over \$79 billion is likely to rise in view of the coronavirus pandemic resulting in slowdown of economic activities and drop in global oil prices. These reasons have raised questions of the need to carry out this study.

The justification for this study is based on its implications for policy makers in government, international organizations such as World Bank and International Monetary Fund, the academia, economic analyst and researchers. Consequently, we investigated whether the components of government revenue have short and long run effect on economic performance of Nigeria adopting data set from 1986 to 2018. The choice of the period was to examine how the variables are related when Nigeria deregulated her economy in 1986. In view of the foregoing, we hypothesized that there is no significant effect of government revenue on economic performance of Nigeria.

## 2. LITERATURE REVIEW

### 2.1. Theoretical Framework

#### 2.1.1. Government Revenue in Nigeria

The Federal government revenue in Nigeria is comprised of proceeds from oil revenue and non-oil revenue. Oil revenue consists of earnings from crude oil and gas exports, petroleum profits tax and royalties income and domestic crude oil sales, while non-oil revenue consists of collections from companies income tax, value added tax, customs and excise duties, federal independent revenue, education tax, customs levies and others (Central Bank of Nigeria, 2010; Ishola, 2019). Taxes are usually used to correct imbalances on some macroeconomic objectives such as maintaining stability in prices, income redistribution, sustainability of economic growth etc.

#### 2.1.2. Economic Performance

Mikesell (2011) noted that economic growth requires wide range of critical infrastructure often before any associated growth of government revenue. It is represented by increase the value of goods and services produced in an economy over time on an inflation-adjusted basis and measured as percentage change in real gross domestic product (IMF, 2009; CBN, 2010).

#### 2.1.3. Empirical Review

Joseph and Omodero (2020) examined nexus between government revenue and economic growth in Nigeria and employed secondary data from 1981 to 2018 obtained from CBN statistical bulletin. They used '*change in GDP to represent economic growth*' while federal revenue and value added tax was adopted as independent variables. Using ordinary least regression analysis, they claimed there is moderate positive effect of federal revenue and value added tax on economic growth of Nigeria.

The authors did not consider unit root test and the use of change in GDP, federal revenue and value added tax of different magnitude may produce bias findings. Hence, our paper would close the existing gap in empirical literature. There is a question as to the use of value added tax since it is administered by FIRS and should have been included in the data as part of federal government revenue.

Azubike and Onukwube (2019) investigated effect of government revenue on economic growth of Nigeria. They obtained secondary data from CBN statistical bulletin (2016) and extracted oil and non-oil revenue and gross domestic product from 2002 to 2016. Adopting multiple regression analysis they claimed oil revenue has negative insignificant effect on

economic growth while non-oil revenue has positive significant effect on growth of the economy of Nigeria. They however stated that 94.7% of GDP was accounted for by the 2 sources government revenue.

Their study didn't give reasons why revenue from oil had negative insignificant effect on economic growth of Nigeria particularly in view of the nation's dependence on the oil sector. It is also the view of this current paper that 15 years period was too small to carry an analysis using secondary data and they failed to conduct stationarity test to ascertain the level of stationarity which may have redirected the authors to the appropriate data estimation technique if need arises.

Jones, Ihendinihu and Nwaiwu (2015) empirically determined effect of total revenue on economic growth in Nigeria. It adopted secondary data between 1986 and 2012 while the error correction mechanism (ECM) was engaged to analyze the data. They claimed total revenue has short and long run equilibrium relationship with economic growth of Nigeria. The study further proved that about 64% of the total variation on economic growth was attributable to total revenue. What distinguishes this paper from their study is hinged on studying the components of government revenue for which this research work sought to carry out. Again, the two studies differ in terms of scope.

Ihendinihu, *et.al.* (2014) investigated long run equilibrium relationship between tax revenue and economic growth in Nigeria. Data set from 1986 to 2012 were employed. The Autoregressive Distributed Lag (ARDL) /Bounds Test General-to Specific Approach to Co-integration was adopted to estimate the variables and found that total tax revenue has significant effect on economic growth as 73.4% of the total variations on economic growth was accounted for by tax revenue components. They claimed that there was no significant effect of Petroleum Profit Tax on economic growth in Nigeria. They claimed that the reason was due to corruption and fiscal indiscipline the oil sector. Our study was conducted to cover the gap in empirical literature and extended the scope to 2018.

### **3. METHODOLOGY**

#### **3.1. Research Design**

The study applied secondary data and hence used historical research design because the existing data and errors of measurement are outside the purview of the authors.

### 3.2. Method of Data Collection

The study extracted data from Central Bank of Nigeria Statistical Bulletin (2018). It engaged real gross domestic product (RGDP), oil revenue and non-oil revenue from 1986 to 2018. Percent rate change in RGDP was adopted as proxy for economic growth whereas annual growth rates of oil and non-oil revenue respectively were jointly used as independent variables and proxy for government revenue of Nigeria. The purpose for adopting the annual growth rate of the revenue sources and growth rates of the economy was to ensure that the dependent and independent variables have the same behavioral pattern.

### 3.3. Method of Data Estimation

The study engaged the augmented Dickey-Fuller unit root test, Vector auto regression lag selection criteria and the autoregressive distributed lag (ARDL) Bounds test method of data analysis to determine the relationship of the variables.

### 3.4. Model Specification and Operational Definition of Variables

The model adapted the work of Azubike and Onukwube (2019) and Jones *et.al.* (2015) but made modifications in respect of using annual percentage changes which brings the variables to similar pattern. We therefore formulated the model as follows:

$$\% \Delta \text{RGDP} = f(\% \Delta \text{OILR}, \% \Delta \text{NONOILR}) \quad (1)$$

$$\% \Delta \text{RGDP}_t = \beta_0 + \beta_1 \% \Delta \text{OILR}_t + \beta_2 \% \Delta \text{NONOILR}_t + e_t \quad (2)$$

Where:

$\% \Delta \text{RGDP}_t$  = Percent rate change in Real Gross Domestic Product (proxy for Economic Performance)

$\% \Delta \text{OILR}_t$  = Annual percentage change in oil revenue

$\% \Delta \text{NONOILR}_t$  = Annual percent rate change in non-oil revenue

$\beta_0$  = Intercept term which explains the change in RGDP when federal government revenue is absence.

$\beta_1 - \beta_2$  = Slope coefficients for oil and non-oil revenue respectively.

$e$  = Error term<sub>t</sub>

$t$  = Different time period for each data set.

## 4. RESULTS AND DISCUSSION

### 4.1. Unit Root Test of Government Revenue and Economic Performance Variables

**Table 2: Augmented Dickey Fuller Unit Root Test on Variables**

Variable	t statistic	Test critical value	P value	Order of Integration
RGDP	- 4.4807	- 3.5742	0.0067***	1(1)
OILR	- 5.5778	- 4.2846	0.0004***	1(0)
NOILR	- 6.8063	- 2.9571	0.0000***	1(0)

Source: Researchers Computation from Extracted Data using Eviews 9

Note: \*\*\* indicates statistical significance at 0.01 level, 1(1) = order of integration at first difference. 1(0) = order of integration at level.

Consequent on the augmented Dickey-Fuller unit root result shown on table 2 where percentage change in real gross domestic product (economic growth) was stationary and integrated at first difference and oil and non-oil revenue were each integrated at level, we engaged the vector autoregressive lag order selection criteria to determine the lag order using Akaike and Schwarz criterion shown on table 3, which gave a lag length of 1 using Akaike and Schwarz selection criterion. We therefore conducted the ARDL cointegrating and long run regression as indicated on table 4 and thereafter the autoregressive distributed lag Bounds test method of data estimation as shown on table 5 using lag 1 to analyze the relationship of the variables.

**Table 3: VAR Lag Order Selection Criteria**

Endogenous variables: RGDP

Exogenous variables: C OILR NOILR

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-82.53095	NA	17.54655	5.702063	5.842183	5.746889
1	-76.92387	9.718936*	12.91830*	5.394925*	5.581751*	5.454692*
2	-76.65381	0.450105	13.58341	5.443587	5.677120	5.518297
3	-75.73422	1.471350	13.68822	5.448948	5.729187	5.538599

Note: \*indicates lag order selected by the criterion at lag 1.

LR: Sequential modified LR test statistic (each test at 5% level)

FPE: Final Predictor Error

AIC: Akaike Information Criterion

SC: Schwarz Information Criterion

HQ: Hannan-Quinn Information Criterion

Source: Researchers Computation from Extracted Data using Eviews 9

#### 4.2. ARDL Co-integration and Long Run Test of Variables.

The ARDL co-integrating and long run test as indicated on table 4 disclosed that individually, both oil and non-oil revenue has positive but insignificant short and long run co-integrating relationship with economic growth of Nigeria. However, we found that collectively the co-integrating equation is highly significant at 1% level. We hence carried the ARDL Bounds test to ascertain the long and short run equilibrium position between government revenue and economic performance of Nigeria.

**Table 4: ARDL Cointegrating and Long Run Form**

Cointegrating Form				
Variable	Coefficient	Std Error	t statistic	Prob. Value
OILR	0.000580	0.011857	0.048887	0.9614*
NOILR	0.010574	0.011558	0.914865	0.3684*
Cointeq(-1)	-0.415834	0.153469	-2.709572	0.0116***
Cointeq*RGDP – (0.0014*OILR+0.0826*NOILR+2.2570				
Long Run Coefficients				
Variable	Coefficient	Std Error	t statistic	Prob. Value
OILR	0.001394	0.028545	0.048835	0.9614*
NOILR	0.082564	0.055971	1.475120	0.1517*
C	2.256999	2.360867	0.956077	0.3475*

Source: Researchers Computation from Extracted Data using Eviews 9

Note: \* \*\*\* indicates statistical significance at 0.10 and 0.01 respectively.

### 4.3. ARDL Bounds Test of Government Revenue and Economic Performance

**Table 5: ARDL Bounds Test of %ΔRGDP and %Δ Government Revenue Variables**

ARDL Bounds Test

Test Statistic	Value	K
F-statistic	4.880260	2
Critical Value Bounds		
Significance	1(0)	1(1)
10%	3.17	4.14
5%*	3.79**	4.85**
2.5%	4.41	5.52
1%	5.15	6.36

Test Equation

Dependent Variable D (RGDP)

Variable	Coefficient	Std. Error	t-statistic	Prob.
D(NOILR)	0.010319	0.011137	0.926540	0.3624*
C	0.934240	1.167945	0.799901	0.4308*
OILR	0.002264	0.011892	0.190336	0.8505*
NOILR	0.033138	0.018281	1.812729	0.0810*
RGDP	- 0.417537	0.153342	-2.722905	0.0112***



R-Squared	0.358276	Mean dependent var	0.000817
Adjusted R-Squared	0.263206	S.D dependent var	3.706133
S.E.of regression	3.181223	Akaike info Criterion	5.295010
Sum Squared resid	273.2449	Schwarz Criterion	5.524031
Log Likelihood	-79.72016	Hannan-Quinn Criterion	5.370924
F-statistic	3.768537	Durbin Watson Stat	2.232228
Prob (F-stat)	0.014634***		

Source: Researchers Computation from Extracted Data using Eviews 9

Note: 1 \* \*\* \*\*\* denotes 0.10, 0.05 and 0.01 statistical significance levels respectively.

2. No of observations 32 after adjustment

The Autoregressive Distributed Lag (ARDL) Bounds test result on table 5 unveiled that there is existence of long run relationship between the change in annual growth rates of the joint government revenue variables and percent rate change in real gross domestic product of Nigeria based on the F statistic value of 4.88 when  $k = 2$  which is above the upper bound critical value of 4.85 at 5% level of significance. The result established that percentage change in real gross domestic product is negatively affected by its past values on the long run and the effect is significant.

On individual variable basis, oil revenue has no relationship with percent rate change in real gross domestic product of Nigeria at short run equilibrium position but there exist positive insignificant effect on economic growth of Nigeria. However, percentage change in annual rates of non-oil revenue has positive insignificant effect on percent rate change in real gross domestic product of Nigeria on both short and long run equilibrium levels. The adjusted R squared of 26.3% is the total variation on economic growth accounted for by changes in government revenue within the period studied.

The computed Durbin Watson statistic of 2.232 is higher than the upper bound of the d statistic table where  $n = 31$  and  $k = 2$  at lower and upper bound of 1.297 and 1.570 respectively. Since the computed d statistic is greater than the tabulated upper bound d statistic, we concluded that there is no evidence of autocorrelation in the model which correlated with the serial correlation test result presented on table 6 as proof.

From table 6, the F statistic probability at 40% is evidence that there is no serial correlation among the independent variables. Table 7 indicated a test of heteroscedasticity and with an F statistic probability of 11.6%; it infers that the error term does not differ across oil revenue and non-oil revenue or that the disturbances of the independent variables are homoscedastic. The study further carried out the Wald test and examined the influence of the joint independent variables on the economic performance variable.

**Table 6: Breusch Geoffrey LM Serial Correlation Test of  $\% \Delta$ RGDP and  $\% \Delta$  Government Revenue Variables**

F-statistic	0.948979	Prob F (2,25)
0.4006*		
Obs *R-squared	2.257966	Prob Chi-square (2)
0.3234*		

Source: Researchers Computation using Eviews from Data Extracted

**Table 7: Breusch-Pagan-Godfrey Heteroscedasticity Test of % $\Delta$ RGDP and % $\Delta$  Government Revenue Variables**

F-statistic	2.049685	Prob. F(4,27)
0.1156*		
Obs*R-squared	7.463668	Prob. Chi-Square (4)
0.1138*		
Scaled explained SS	10.78178	Prob. Chi-Square (4)
0.0291		

Source: Source: Researchers Computation from Extracted Data using Eviews 9

#### 4.4. Wald Test of Government Revenue and Economic Performance

**Table 8: Wald Test of % $\Delta$  in RGDP and % $\Delta$  in Government Revenue Variables**

Test Statistic	Value	Df	Probability
F-statistic		3.687768	(2, 27)
0.0384**			
Chi-square		7.375637	2
0.0250**			

Source: Source: Researchers Computation from Extracted Data using Eviews 9

The Wald test on table 8 using the F statistic and Chi-square probability values indicated that they are significant respectively at 5% level of significance. This confirms that the joint influence of oil and non-oil revenue has long run relationship with percent rate change in RGDP.

#### 4.5. Test of Hypothesis

Ho: The effect of government revenue on economic growth of Nigeria is not significant.

To test the hypothesis that:

$H_0: \beta_1 = \beta_2 = 0$  i.e. all slope coefficients are simultaneously zero.

$H_1: \beta_1 \neq \beta_2 \neq 0$  i.e., not all slope coefficients are simultaneously zero.

Decision Rule: When the F-statistic probability is less than 5%  $\alpha$  level of significance, the study would reject the null hypothesis,  $H_0$  and accept the alternative hypothesis  $H_1$ .

From table 3, the F statistic coefficient of 3.77 has probability value of 0.0146. Since the probability of 1.5% is sufficiently low, we concluded that government revenue has significant effect on economic performance of Nigeria. Ihendinihu, *et.al.* (2014) Azubike and Onukwube (2019)

#### 4.6. Discussion of Findings

On the long run, both oil and non-oil revenue has positive insignificant effect on real gross domestic product at lag length 1. Using the long run multiplier effect, an increase in 1 unit of oil revenue would result in an increase in 181.5 units, that is,  $-( - 0.4175/0.0023)$  of real gross domestic product whereas an increase in 1 unit of non-oil revenue would result in an increase in 12.6 units i.e.  $- (- 0.4175/ 0.0331)$  of real gross domestic product of Nigeria.

The long run equilibrium relationship between the variables indicated enormous influence particularly from oil revenue on real gross domestic product. Then, why was there no established significant effect between the individual independent variables and the economic performance proxy?

The reasons why the individual revenue sources have insignificant positive effect on economic performance has been validated by the unpredictable variations in annual oil and non-oil revenue over the period studied. It implies that there was no consistent growth pattern of the individual annual government revenue proxies during the period sampled. It could be occasioned by distortions in policy implementation to achieve projected revenue.

As observed in the data from IMF (2019), Nigeria's government revenue percentage of GDP between 2009 and 2019 averaged 10.9% and this is considered low in view of corresponding figures from the other African countries within the ECOWAS region. Another reason could be the observed existing low tax rate percentage of GDP of 5.2% compared to the African average of 17.2% as stated by OECD (2019).

Other reasons that can be adduced could be lack of appropriate fiscal institutional framework that are devoid from political interferences, fiscal indiscipline, inconsistencies in programmes of each successive government with those of predecessors, inappropriate policies on government spending, observed infractions in the oil sector, low rate of tax collections due to loopholes in laws, and the massive unorganized underground economy which gives herculean task for tax authorities. The result suggests that Nigeria's economy is more of private sector triggered growth in spite of the statistical significant effect of government revenue on economic performance of Nigeria.

The paper therefore recommends that the Federal government of Nigeria should, ensure that there is sufficient data from the underground economy; enact and implement the petroleum industry governance bill and employ revenue collected on critical infrastructure that would stimulate growth of the economy.

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