

# Oil Revenue and Nigeria Macroeconomic Performance: An Econometric Analysis

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**Abstract:** *Considering the oil revenue stream and the slow rate of economic growth in the Nigerian economy, the study was carried out to ascertain the effects of oil revenue on the macroeconomic performance of Nigeria. This study made use of data obtained from the Central Bank of Nigeria (CBN) and the World Bank 1981 to 2014. The Ordinary Least Squared (OLS) technique and the Granger Causality test were used to ascertain the effect of oil revenue on Nigeria macroeconomic performance. The result shows that oil revenue is statistically significant to economic growth in Nigeria and a positive relationship exists between them. Co-integration result shows evidence of long run relationship between oil revenue and economic growth in Nigeria. However, the result of Granger causality test shows that oil revenue does not Granger cause Economic growth. The study recommends the implementation of the petroleum industry bill with alternative sources of revenue for greater economic performance.*

**Keywords:** Oil Revenue, economic growth, co-integration, Granger causality, Nigeria

**JEL Classification:** C10, E69, Q43

## 1. Introduction

Oil was first discovered in Nigeria in 1956 at Oloibiri, Bayelsa state in the Niger Delta by shell-BP after half a century of exploration, and in 1958 Nigeria joined the rank of oil producers when its first oil field came on stream. (Azaiki & Shagary 2007). Since then, Oil revenue began to play a prominent role in the Nigerian economy. In recent time oil has been the major source of energy for the households and industries in Nigeria and in the whole world. Oil being the mainstay of the Nigerian economy plays a vital role in shaping the economic and political destiny of the country. The oil industry began to play a prominent role in the economic life of the country at the end of the Nigeria (Fashola (1999).

Nigeria is Africa's highest oil exporter and the world's tenth largest oil producing country. It has realized over US\$ 600 billion in oil revenues since 1960, and is currently the 5<sup>th</sup> highest net oil exporter in the World (CIA The world fact book, 2015). Nigeria's economy is heavily dependent on natural resources; oil and gas constitutes 98% of total exports, 80% of government revenues and about 20% of GDP (CBN, 2010). In spite of the enormous economic potentials in Nigeria, it has largely failed to live up to the ambitious growth projections that followed the first oil boom in the 1970s (Bawa & Mohammed 2007).

According to Anyanwu, et al (1997) Petroleum has transformed poor nations into rich ones, deserts into watersheds and bankrupt nations into creditors. Specifically, with respect to Nigeria, there is no gain saying that the oil sector has undergone tremendous transformation over the years. The industry which was merely the "supportive" economic sector in the 1960's with agricultural sector as the dominant one turned to be the predominant source of Nigeria's foreign exchange earnings and most viable access to international investment opportunities in the 80's and 90's, no other resources in Nigeria has played such a great role over the national economy as crude oil. The revenue

derived from oil through tax and royalties has been used to carry out development projects in the country (Iyoha 2000).

Basically before the advent of oil, Nigeria was entirely an agrarian economy endowed with both labour and material resources which includes abundant water resources, potential productive land for agricultural production and related activities due to high range of climate, vegetation and good soil condition Otaha (2012). In the pre-independence era, the contribution of the agricultural sector to the Gross Domestic Product surpassed every sector in the economy (Bawa 2007). The petroleum industry on the other hand has brought unprecedented changes to the Nigerian economy particularly in the past five decades when it replaced agriculture as the cornerstone of the Nigerian economy (Bawa (2007). The oil industry has risen to the commanding height of the Nigeria economy, contributing the lion share to Gross Domestic Product and accounting for the bulk of federal Government revenue and foreign exchange earnings since 1970 Baghebo (2012). However, Nigeria's endowment in fossil fuel has not translated into a sustainable economic performance (Adeleke 1988). There was an extensive exploration and export of petroleum products in 1970s and strong neglect of agricultural base in favour of an unhealthy dependence on oil for more than 97% of export earnings and 80% federal revenue (United States Department of States, 2005).

The Nigerian economy is still faced with different challenges because of infrastructural decay, unstable power supply, absence of pipe-borne water and deplorable state of highways (Adeleke 1988). This may be attributed to the neglect of agriculture and other other sectors of the Economy. It is important to note that the petroleum sector which brings lion share of GDP is not given much attention coupled with the recent global decline in oil price. The country is still importing refined fuel as the refineries are not functioning at their full capacity. In light of the above problems inherent in the Nigerian economy, the following research questions are asked.

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- What are the effects of oil revenue on economic growth in Nigeria?
- Does a long run relationship exist between oil revenue and economic growth in Nigeria?
- Is there causality between oil revenue and economic growth in Nigeria?

### Objective

The specific objectives of the study are as follows:

- To identify the effects of oil revenue on economic performance in Nigeria.
- To determine long run relationship between oil revenue and economic growth in Nigeria.
- To examine causality between oil revenue and economic growth in Nigeria.

## 2. Literature Review

The major theories that back up this work are the, the big push theory, The Unbalanced growth theory, the Rostow Stages of growth theory and the Harrod-Domar Growth theory. The basic idea behind the Big Push theory is that a big push and a comprehensive investment package can be helpful to bring economic development (Peet & Hartwick 1999). In essence, a certain minimum amount of resources must be devoted for development programme if the success of the programme is required. The unbalanced growth theory states that investment should be made in selected sector rather than simultaneously in all sectors of the economy (Hunt 1989). It will be difficult to find any developing economy that will possess the capital and other resources that are needed for simultaneous investment in all sectors. This theory suggests that investment should be made in a few selected sectors for the development of the economy with the gains being reinvested in other sectors. This will gradually move the economy from the unbalanced growth path to that of balanced growth (Greig et al (2007).

The Rostow's process of economic growth was identified as traditional society, preconditions for takeoff, takeoff, drive to maturity and age of high mass consumption. The Harrod-Domar growth model shows a functional economic relationship in which the growth rate of gross domestic product depends directly on the national savings ratio and inversely on the National Capital output ratio.. Every economy must save a certain proportion of its national income, if only to replace worn-out capital goods. However, in order to grow, new investments representing net additions to the capital stock are necessary. If the country is not capable of generating that level of saving, a justification or an excuse for borrowing from international agencies can be established. Thus this models state that growth is directly related to savings (Blomström 1992).

Certain empirical works have been carried out by various researchers to ascertain the effect of oil revenue on economic growth within and outside Nigeria. In Iran, Farzanegan (2011) analyzed the dynamic effects of oil shocks on different categories of the Iranian government expenditures from 1959 to 2007. The main results showed that Iran's military and security expenditures significantly

responded to a shock in oil revenues, while social spending components did not show significant reactions to such shocks. Kablan, Loening and Tanaka (2014) examined Chad's economy with respect to volatility in government resources, poor institutions, recurrent tensions, and mismanagement of oil resources. The results suggested that changes in domestic output and prices were determined by aggregate demand and supply shocks. However, findings showed that oil production and high international prices negatively affected agricultural output by small proportion. While associating the findings with structural underemployment and the inefficient use of existing production factor, the study concluded that increased public expenditures in tradable sectors present the opportunity to make oil revenues an engine of national development. Sachs and Warner (1997) using a sample of 95 developing countries that included Indonesia, Venezuela, Malaysia, Ivory Coast and Nigeria, found that countries that have a high ratio of natural resource exports to GDP appear to have shown slower economic growth than countries with low ratio of natural resource export to GDP. Similarly, Collier and Hoeffler (2002) are of the opinion that increase in natural resources income does not result in increase in economic growth.

On the domestic empirical literature, Odularu (2008), using causality approach and Johansen Multivariate co-integration technique examined the relationship between oil revenue and non-oil revenue in Nigeria. The result shows that there is significant relationship between exports on both oil products and non-oil products and Gross Domestic Product (GDP) and there is feedback causality between exports and economic growth. Thus, the study concluded that government should implement policies that would encourage active private sector participation in the crude oil sector in the country. Adedokun (2012) examined the effect of oil export revenue on economic growth in Nigeria between the period of 1975 and 2009. Empirical analysis from the study suggested that oil export revenue had a positively significant effect on growth both in the short-term and long-term in the country. The study further revealed that the primary determinant of foreign exchange earnings in Nigeria was changes in the world crude oil prices. Akinlo (2012) assessed the importance of oil in the development of the Nigerian economy over the period 1960 to 2009. In a multivariate Vector Autoregressive (VAR) model and the empirical evidence showed that the five sub-sectors are co-integrated and that oil revenue could cause other non-oil sectors to grow. However, oil sector had adverse effect on the manufacturing sector. Findings revealed bi-directional causality between oil and manufacturing, oil and building and construction, manufacturing and building, and construction, manufacturing and trade and services, and agriculture and building and construction. It also confirmed uni-directional causality from manufacturing to agriculture, and trade and services to oil. However, the paper found no causality between agriculture and oil, likewise between trade and services and building and construction. In conclusion, the study recommended appropriate regulatory and pricing reforms in the oil sector in order to integrate it into the economy, and as well reverse the negative impact of oil on the manufacturing sub sector in Nigeria. Oladipo and Fabayo (2012) investigated global recession and the oil

sector based on its effects on economic growth in Nigeria. Analysis from the study revealed a negatively significant relationship between GDP and oil produced (domestic consumption and export) in the country. The result also showed the existence of a decline in the oil sector due to global recession. The study, therefore, recommended deregulation of the oil sector for efficient performance, and more rigorous policies that will reduce global effects on the sector as it contributes the largest percentage of income to the Nigerian economy. Egesi (2010) studied the impact of petroleum industry on the socioeconomic development of Nigeria using the OLS method. The hypothesis testing was carried out on the premise that crude oil export is a dominant contributor to GDP and the result proved this. Kanu (2010) studied the case of Nigeria's over Dependence on Crude oil. The OLS result shows that Nigeria stands to suffer income losses when global community begins to substitute renewable energy alternatives for fossil fuels.

Appah and Ogbonna (2012) indicates that oil revenue has a positive and statistically significant relation with GDP and per capita income respectively, but its relationship with inflation is negative and not statistically significant. Similarly petroleum profit tax and royalties has a positive and statistically significant relation with GDP and per capita income respectively, but its relationship with inflation is negative and not statistically significant.

### 3. The Model

The Augmented Dickey Fuller (ADF) test for unit root was carried out to ascertain the stationary status of the data series. The model for the study is the log-log model which was derived from the endogeneous growth model framework. The choice of the model is because of its ability to handle multi variables in addition to its simple interpretation. The functional form of the model for the study is specified as:

$$RGDP = f(OREV, FDI, EXDT, ODA) \dots \dots \dots (1)$$

Transforming equation 1 to econometric specification for computation of parameters and other necessary tests gives equation 2

$$LOGRGDP = \beta_0 + \beta_1 LOGOREV + \beta_2 LOGFDI + \beta_3 LOGODA + \beta_4 LOGEXTD + U_t \dots \dots \dots (2)$$

Where;

LOGRGDP = Log of Real gross domestic product.

LOGOREV = Log of Oil revenue.

LOGFDI = Log of Foreign Direct Investment.

LOGODA = Log of Official development Assistance.

LOGEXTD = Log of External debt.

$\beta_0$  = Intercept term.

$\beta_1, \beta_2, \beta_3, \beta_4$  are the parameters.

$U_t$  = Stochastic term

The a priori expectations are:

$\beta_0 > 0, \beta_1 > 0, \beta_2 > 0, \beta_3 > 0, \beta_4 < 0$

### 4. The Results

The results of the ADF unit roots are shown in table 1.

**Table 1:** Augmented Dickey Fuller (ADF) Unit root test

Variable	ADF	5% critical value	Order of integration
RGDP	-7.446091	-3.562882	I(2)
OREV	-0.175392	-3.612199	Not integrated
FDI	-9.436612	-3.574244	I(2)
EXTD	-5.735890	-3.568379	I(2)
ODA	-5.693069	-3.574244	I(1)

Source: Estimated results

All the variables except OREV and ODA were integrated of order 2. ODA was stationary at first difference while RGDP, FDI and EXTD attained stationarity at second difference.

The co-integration test was carried out to test the evidence of long run relationship among the variables. The residual series attained stationarity at level form which indicate that long run equilibrium relationship exist among the variables in the model. This conclusion is based on the fact that the calculated Augmented Dickey-Fuller test statistic (-8.318852) is greater than the tabulated Test critical value (-3.568379) at 5% level of significance.

**Table 2:** The result of the log- log model

Variable	Coefficient	Std Error	t-value	prob
LOGOREV	0.193853	0.036549	5.303900	0.0000
LOGFDI	0.067039	0.064716	1.035890	0.3091
LOGEXTD	-0.082360	0.024549	-3.354932	0.0023
LOGODA	0.046952	0.036298	1.293515	0.2064
C	9.038221	0.995182	9.081980	0.0000

$R^2 = 0.940446$

Source: Estimated Results.

The coefficient of LOGOREV is 0.193853 with a t-value of 5.303900. Since the t-value is greater than 2 in absolute sense, we reject the null hypothesis at 5% level of significance using the 2-t rule of thumb. This means that oil revenue is statistically significant and affects economic growth in Nigeria. Specifically a unit increase in oil revenue will on average increase LOGRGDP by 0.193853% ceteris paribus. This is confirmed by the probability value of 0.0000 which shows that there is insignificant error in rejecting the null hypothesis.

The coefficient of LOGFDI is 0.067039 with a t-value of 1.035890. Since the t-value is not greater than 2 in absolute sense, we do not reject the null hypothesis at 5% level of significance using the 2-t rule of thumb. This means that foreign direct investment does not statistically significantly affect economic growth in Nigeria. Specifically a unit increase in inflow of foreign direct investment will on average increase LOGRGDP by 0.067039 % ceteris paribus.

The coefficient of LOGOEXTD is -0.082360 with a t-value of -3.354932. Since the t-value is greater than 2 in absolute sense, we reject the null hypothesis at 5% level of significance using the 2-t rule of thumb. This means that external debt statistically significantly affects economic growth in Nigeria. Specifically a unit increase in debt stock will on average decrease economic growth by -0.082360 % ceteris paribus. This is confirmed by the probability value of 0.0023 which shows that there is insignificant error in rejecting the null hypothesis. The coefficient of LOGODA is 0.046952 with a t-value of 1.293515. Since the t-value is not

greater than 2 in absolute sense, we do not reject the null hypothesis at 5% level of significance using the 2-t rule of thumb. This means that official development assistance does not statistically significantly affect economic growth in Nigeria. Specifically a unit increase in official development assistance will on average increase economic growth by 0.046952% *ceteris paribus*.

R-Squared measures the percentage of the total variation in the dependent variable that is explained by the explanatory variables. In the model, the total variation in LOGRGDP jointly explained by the variations in LOGOREV, LOGFDI, LOGEXTD and LOGODA is 94.04%. This means that the explanatory variables are able to explain to a large extent the total variations in the dependent variable.

Adjusted R squared penalizes the model for introducing unimportant variables. From the model above, the  $R^2$  adjusted penalizes the model by decreasing from 94.04% to 93.19%.

The F statistic is highly significant showing the joint significance of all the variables in the model. From the Durbin Watson (DW) table  $d_L=1.193$  and  $d_U=1.730$  at 5% level of significance. Therefore since we have our  $0 < d < d_L$ , we conclude that there is inconclusive evidence regarding the presence or otherwise of positive first order serial correlation.

Other elements such as “Sum squared residuals”, “Log likelihood”, “Akaike info criterion”, “Schwarz criterion”, and “Hannan- Quinn criter”, are used for making statistical comparisons between two different regressions. For the record, the sum of squared residuals is used in computing F-tests; the log likelihood is used in Bayesian model comparison. “Mean dependent var” and “S.D. dependent var”, report the sample mean and standard deviation of the left hand side variable. These are the same numbers that one gets by asking for descriptive statistics on the left hand side variables, so long as the same sample is used in the regression.

## 5. Granger Causality Test

The variables in the model are used to conduct the granger causality test and the results show that the log of oil revenue does not granger cause the log of real GDP. This conclusion is based on the fact that the probability value of the F-statistic is greater than 0.05 (i.e. 0.2170). Since the probability value of the null hypothesis is not statistically significant, the Null hypothesis is not rejected.

## 6. Conclusion

The work was done to ascertain the effect of oil revenue on macroeconomic performance of Nigeria for the sample period of 1981 – 2014, using ordinary least squares (OLS) with the aim of providing basis for objective policy formulation and effective implementation. The variables used to ascertain the growth rate of real gross domestic product which is a proxy for macroeconomic performance are log of oil revenue (LOGOREV), log of foreign direct investment (LOGFDI), log of external debt (LOGEXTD),

log of official development assistance (LOGODA). The findings of the study are hereby stated to make for better policy guidance. Oil revenue was observed to be significant to economic growth in Nigeria. In developed countries, resources from oil sector are used to develop other sectors simultaneously but in less developed country like Nigeria; the one case is different because the dependency on one side of the economy will affect the growth of the other sectors. Foreign direct investment was observed to be significant to growth. Foreign direct investment has a positive impact on economic growth in Nigeria. This shows that there is a positive relationship between net flows of foreign direct investment and economic growth. External borrowing was observed to have a negative impact on economic growth and it is a statistically significant variable affecting the growth rate of real gross domestic product. That means that a negative relationship exists between external debt and economic growth. Official development assistance has a positive impact on economic growth and it is statistically significant. That means that in Nigeria, a positive relationship exists between economic growth and development assistance received from abroad.

Based on our result, the following policy recommendations are made for effective administration of petroleum policies in Nigeria to enhance an increased economic growth. The Nigeria government should adopt a disaggregated approach to policy formulation and implementation in the petroleum sub-sector. This would suggest involvement of all stakeholders in both the introduction and implementation of petroleum policies. Total deregulation of the petroleum sub-sector is equally recommended. This would minimize free-market distortions and encourage competitive tendencies. Nigeria governments should emphasize on alternative sources of energy, such as gas, solar, and hydraulic sources. The proposed liquification of the Nigerian natural gas is a way forward. If effectively implemented, the liquefied natural gas (LNG) project has many economic advantages such as minimal transportation cost and most importantly, it is potential source of foreign-exchange reserve. Diversification of the economy can go a long way to ameliorate the problem facing us a Nation. In this way, the government can utilize the potentials of other sectors of the economy that can contribute positively to our Gross domestic product. There is a need for the Nigerian government to develop the agricultural sector side by side with the oil sector, the government need to develop agricultural sector which has been neglected over the years because oil is a wasting assets and too much reliance on oil to the neglect of agriculture is not of much benefit to the economy. Through this means, the industrial sector will be modernized through the transfer of resources from the agricultural sector. There is also need to renew ageing facilities, working hard to reduce the number of spill in the course of operation, the amount of gas flared and reduce waste products. All these will also help to meet the latest safety and environmental standard. Nigeria government should equally institute environmental monitoring and management. The concept of environmental impact assessment (EIA) should be encouraged and enforced by regulators. EIA is a good project development strategy that forces developers to look through the life cycle of a project from the conceptual stages through design, construction and

production phases to the decommissioning or abandonment phase, in so doing, the impacts of the project on the environment through life cycle are identified, modeled and evaluated with the objectives to mitigate the effect of all negative impacts and enhance the benefit of all positive effects in their host communities. As much as possible, established market based instrument like pollution, taxes, and affluent changes should be utilized. This will economize the use of bureaucracy and reduce the cost of enforcement. Also, revenue obtained from pollution taxes should be used for environmental begging projects or to compensate inhabitants of oil producing areas of the economy. There is also, the need to work closely with the communities. This will help to reduce or settle the various communities in the country and will enable federal and state government, oil industry and communities to plan better for developments and minimize the impact on the environment. More so, there should be contingency team that will comprise the representative from the oil industry, the host communities, the NNPC, professional etc. This group will be responsible for the drawing up of emergency preparedness plans and implementation, which will be used to combat spills. The group should also be in charge of relief packages for affected communities.

In summary, the result shows that oil revenue a catalyst to economic growth. Prior to the discovery of oil, agriculture was known as the sector that drives the economy. This was in the 1960s and 1970s until the oil boom era which witnessed the total diversion of interest of the populace to the oil sector leaving out agriculture for petroleum sector which currently contributes about 90% of foreign earnings to the Nigerian economy. However, the empirical works in the study proved that there has been environmental degradation as a result of the activities of the oil companies especially in the host communities, neglect of the people, and neglect of the agricultural and manufacturing sectors which have a reasonable contribution to gross domestic product, though with variation in the trend. Hence, corruption in the Nigerian nation may have contributed immensely to the poor contribution of the oil sector to the economic development in Nigeria. For example, allegations abound where retired military officers and some influential politicians are offered oil licenses to the proceeds and revenue accruing from oil are reflected in the private pockets of such people only. The implication of this is the concentration of the wealth of the nation in the hands of few Nigerians while majority suffers in abject poverty. Therefore, For Nigeria to correct this anomaly, derive more benefits from its oil and gas resources and calm down local agitations, the petroleum industry bill if passed to Law would improve the performance of the petroleum sector. This will further address the problems of corruption, and the negative impacts of oil companies operating in the country.

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