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**OIL REVENUE AND BEHAVIOUR OF SELECTED MACROECONOMIC INDICATORS IN NIGERIA: 1981 – 2019**

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**ABSTRACT:** *The paper studied oil revenue and behavior of selected macroeconomic indicators in Nigeria from 1981-2019. The main purpose were interest rate, inflation rate and exchange rate within the time frame. The paper was anchored on the Endogenous growth theory. The study adopted ex-post facto research method while Ordinary Least Square was used to process the data gathered using E-view software. The findings indicates that apart from interest rate, no significance relationship exist between the two other variables study with oil revenue. While the study concludes that inflation rate and exchange rate can be stabilized through effective monetary policy measure. The study therefore recommends diversification and encouragement of more participation of nongovernmental sector in economy development.*

**KEYWORDS:** oil boom, interest rate, inflation rate, and oil proceeds.

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## **INTRODUCTION**

Before the advent of oil in Nigeria, the agrarian sector was the main driver of the nation, contributing about 95% to her external earnings, generating over 60% of her employment capacity and approximately 56% to her gross domestic earnings (World Bank, 2013). The advent of oil at Oloibiri area of Bayelsa State in 1956 by Shell BP, oil has remained a basic source of energy and income in Nigeria. Although Nigeria's oil industry was discovered very early, it was after the 1967-1970 civil war that oil sector began to play a dominant role in economy development.

According to Oshikoya (2008), oil being an essential means of income plays a crucial part in shaping both the political and economic destiny of our economy. The oil industry is has been regarded as engine that drives the economic wheel of Nigerian economy, it has transformed poor nations into rich ones, deserts into watersheds and bankrupt nations into creditors. Olaniyi, 2005 stated that the Nigeria oil sector has undergone tremendous transformation which has enhanced better performance.

In the 1960 oil industry play a supportive role to agricultural sector as it was that sector that dominated external exchange earnings, however the narrative change in the 1980's and 1990's as crude oil became the basic means of revenue generation with the neglect of the initial sector (Fredrick and Linus, 2015).

Revenue generated from oil tax and royalties has been used to for the general development of the economy (Iyoha 2001). The oil boom of the 1970's which supposed to be an additional means of revenue generation to the Nigeria economic resulted to the neglect of the manufacturing and agricultural sector. Thus, this work empirically examined the kind of link existing between related macroeconomic variables and oil revenue.

### **Statement of the Problem**

Since the advent of oil, the industry has played significant role towards development of the nation's economy, however the impacts are both positive and negative as excessive reliance on oil revenue tend to have make the government not to source funds from other sources available for them; for instance, there is de-emphasis of income tax not until now that oil is dwindling as a source of income to the country (Nweze and Greg 2016). Nigeria with all its great potential has failed to leave to expectation in growth with all the first oil boom of the 1970's as the economy is still faced with challenges of power supply instability, little or no pipe-borne water, deployable state of our high ways and rail way and inflation tendency with regards to government yearly deficit expenditure (Bawa and Mohammed 2007). However, Mohammad and Amaral (2010), Pindyck (2015), and Udeh, Ugwu and Onwuka (2016) discovered that stability in macroeconomic variable such as price of commodity and money supply determines government revenue structure, proceeds received from sales and exports of oil products act like a multiplier to other sectors, this directly or indirectly determine price of commodity; this has generated the needs to properly investigate the behaviour of macroeconomic indicators and how it have affected oil revenue in our country.

### **Objectives of the Study**

The specific objectives of the research are as follows;

- i. To determine the relationship between interest rate and Oil proceeds in Nigeria.
- ii. To ascertain the relationship between inflation rate and Oil proceeds in Nigeria.
- iii. To examine the relationship between exchange rate and Oil proceeds in Nigeria.

### **Research Questions**

1. Is there any relationship between interest rate and Oil proceeds in Nigeria?
2. What is the relationship between inflation rate and Oil proceeds in Nigeria?
3. Is there any relationship that exists between exchange rate and Oil proceeds in Nigeria?

### **Research Hypotheses**

**H<sub>01</sub>:** There is no significant relationship between interest rate and Oil proceeds in Nigeria.

**H<sub>02</sub>:** There is no significant relationship between inflation rate and Oil proceeds in Nigeria.

**H<sub>03</sub>:** There is no significant relationship between exchange rate and Oil proceeds in Nigeria.

## **REVIEW OF RELATED LITERATURE**

### **Implications of Oil Proceeds Fluctuation on Economic Growth**

Most Economists believed that a rise in price of oil will have a positive effect on countries that are exporting oil. This is as a result of petroleum bang prices created a shift in the trading pattern since

income was transferred from imports to exports nations which resulted to rise in the nation's income. The rise in price of exports stand to have potential gains which later diminished since the down fall demand of oil from the importing countries. Example, in the 1984 oil prices substantially increased and demand for the oil from import economies has downgraded which resulted into economic recession (Pindyck, 2015). Although, alterations in price of oil, may not always result positively on oil export of some economies even when revenue increases. Instead, great rise and fall may occur in these countries which may lower the investment rate (Bernanke, 2012).

Hamilton (2012) stated that the request for oil demand always fluctuates. Therefore, nations that are rich in oil like Nigeria depend heavily on petroleum proceeds as a means of income for nation which will be faced by the issue of volatility in price. Oil export countries are exposed to price volatilities as they experience an increase and broken cycles in which the government's level of expenditure differs from oil prices. These made it more difficult for such countries to plan against uncertainty about future fall in revenue which affects the long-term planning they may lead to costly reallocation of the revenue (Humphreys, 2007).

Since 1970s, the link between oil proceeds and macroeconomic nexus has steadily attracted different researcher's attention. Many empirical studies discovered a negative effect between the price of oil shocks and the economic growths. Hamilton, (2012) investigation revealed that the price of oil rambles is tailed by a decrease in the output. Some found a consistent negative correlation between the price of oil changes and Gross National Product (GNP) growth by using U.S data from 1948 to 1972 and they concluded that oil price shocks are the major contributing factor in the US recessions before 1972.

### **Theoretical Framework**

This study anchored on comparative advantage theory based on its emphasis on production of goods that a country can produce at a very minimal cost and import those commodities that they are having minimum cost advantages.

### **Endogenous Growth Theory**

This theory simply emphasized on different growth prospects in both knowledge capital and the physical capital. It was actually built on the view that we believed extensive outside returns on capital. Major postulation is that a more advanced technology is being manufactured as a result of investment in capital. It also assumed that the technological level is directly proportional to level of the per capita worker in a nation (Baharuddin 2011). In conclusion, the theory states that high rate of saving rate will result to a higher growth rate which is having a positive effect on Nigeria due to low base of technology (Dornbusch 1966).

### **Export Led Growth Theory**

This theory states that growth of export which is having a positive impact on the growth of an economy. This simply means that exports are key element on the growth of the general economy. It also means that the general growth of a country can be derived from increase in the amounts of capital and labour that is within a particular economy and also through the enlargement of exports. This therefore means that export is regarded as a channel or as an indicator of economic growth and development (Maneschi

1998). This export led growth theory was noted to be having an implication on development of a country like Nigeria that is relying more on the exportation of raw materials and the importation of finished products should be minimal.

### **Theory of Comparative Cost Advantage**

This theory was postulated by David Ricardo in 1817. He stipulated that nations should produce goods that they can produce at a very minimal cost and import those commodities that they are having minimum cost advantages (Dornbusch 1966). The stated theory was appropriate for this paper because the trade between Nigeria and some other nations are still trading till today.

### **Empirical Review**

Imoisi (2013) investigated the relationship that exist between inflation rate and BOP in Nigeria through the use OLS method. He discovered that an inconsiderable relationship was existing between inflation rate and BOP while the association existing between exchange rate, interest rate and BOP was also considerable. Akpan and Atan (2012) carried out an investigation on exchange rates macroeconomic aggregate in the economy of Nigeria through the use Generalized Moment Method (GMM) and a simultaneous equation. The test made use of inflation, real exchange rate, growth rate, real government revenue, real exports and government expenditures. The result revealed that there is no strong direct association between the change in inflation growth rate and exchange rate. Perhaps, the economic growth of Nigeria was affected by the monetary and fiscal policies and the growth of exportation.

Hua (2011) was able to investigate social and economic impact of the real exchange rate which was evidenced from the Chinese province and he made used of the 1 step Generalize Movement Model (GMM) and a set of a panel data to study the variables of RER, GDP, share of employment, export share, capital intensity, coastal provinces, education level etc. The result implied that growth in exchange rate was having a negative effect on economic growth was higher than the inland provinces which was paying to minimize the GAP of the GDP among the 2 provinces. The outcome equally revealed that RER increase was having a negative effect on employments.

Oosterbaan (2000) assessed the association between yearly rate of real interest rate and annual rate of economic growth. The examined result indicates the impact of an increase in the interest rate on the economic growth. They were able to claim that growth is optimized when the real rate of interest falls within a normal range from between -5 to +20%.

### **GAP IN THE LITERATURE**

Previous empirical work such as Bawa and Mohammed (2007), Ibeh (2013), Nweze and Greg (2016) and Fredrick and Linus (2015), their empirical work only investigate oil proceeds and economic growth in the Nigeria. In my research work, it investigates the effect of oil proceeds on macro-economic variables in Nigeria. This paper intends to fill the gap identified by investigating oil proceeds and behaviour of macroeconomic indicators in Nigeria making use of time series data from 1981 – 2019.

## METHODOLOGY

The research design employed in this study includes the survey, ex post facto and descriptive research design. These designs form the background upon which the research was carried out. It is ex-post facto research design because the data used in this research already exist and were not subjected to the manipulation of the researchers.

### Nature and Source of Data

This research made use of secondary data, these data are generated from Central Bank of Nigeria statistical bulletin which can readily be gotten from CBN website. The data were extracted from the deposit money bank statement of account in the CBN statistical bulletin.

### Empirical Model Specification

For the objective, we utilize the both reduced form and structural VAR (Impulse Response, Variance Decomposition and Granger Causality) models. However, we first state the functional relationship as follows:

$$INTR = f(OILR) \quad (3.13)$$

$$INFR = f(OILR) \quad (3.14)$$

$$EXCR = f(OILR) \quad (3.15)$$

where:

*OILR* = Oil Revenue

*INTR* = Interest Rate

*INFR* = Inflation Rate

*EXCR* = Exchange Rate

$$INTR_t = \beta_{01} + \beta_{11}INTR_{t-1} + \beta_{21}OILR_{t-1} + \beta_{31}INFR_{t-1} + \beta_{41}EXCR_{t-1} + e_{1t} \quad (3.16)$$

$$INFR_t = \beta_{02} + \beta_{12}INTR_{t-1} + \beta_{22}OILR_{t-1} + \beta_{32}INFR_{t-1} + \beta_{42}EXCR_{t-1} + e_{2t} \quad (3.17)$$

$$EXCR_t = \beta_{03} + \beta_{13}INTR_{t-1} + \beta_{23}OILR_{t-1} + \beta_{33}INFR_{t-1} + \beta_{43}EXCR_{t-1} + e_{3t} \quad (3.18)$$

$$OILR_t = \beta_{05} + \beta_{15}INTR_{t-1} + \beta_{25}OILR_{t-1} + \beta_{35}INFR_{t-1} + \beta_{45}EXCR_{t-1} + e_{5t} \quad (3.19)$$

### Data Presentation

The data employed in this study includes: interest rate (INTR), inflation rate (INFR), exchange rate (EXCR) and money supply growth rate (MSGR) which represents explanatory variables while Oil revenue (OILR) represents the explained variable for the time frame of 1981 to 2019 are presented in Table 4.1.

### Data Analysis

This study makes use of descriptive statistics, followed by unit root test, vector autoregression with extension of impulse response function and granger causality models as methods for the analysis.

**Unit Root Test (Augmented Dickey Fuller)**

This test is used to ascertain the point (level) at which the variable under investigation becomes stationary, it also helps to determine the shocks that maybe inherent in the time series data, this study make use of Augmented Dickey Fully (ADF) test to establish the stationarity level.

**Table 4.1: Descriptive Statistics**

	<b>OILR</b>	<b>INTR</b>	<b>INFR</b>	<b>EXCR</b>
<b>Mean</b>	0.227568	9.542162	18.16216	81.84865
<b>Median</b>	0.090000	9.500000	11.60000	92.30000
<b>Maximum</b>	1.280000	18.80000	73.10000	275.5000
<b>Minimum</b>	-1.000000	3.750000	5.400000	0.600000
<b>Std. Dev.</b>	0.480303	4.214694	16.64736	78.12158
<b>Skewness</b>	0.244647	0.317350	1.853447	0.579407
<b>Kurtosis</b>	3.078014	2.096327	5.530730	2.403710
<b>Jarque-Bera</b>	0.378472	1.880013	31.05787	2.618384
<b>Probability</b>	0.827591	0.390625	0.000000	0.270038
<b>Sum</b>	8.420000	353.0600	672.0000	3028.400
<b>Sum Sq. Dev.</b>	8.304881	639.4912	9976.847	219707.3
<b>Observations</b>	39	39	39	39

Source: E-View Output.

**The Mean:** The overall, average value of oil revenue (OILR) stood at 0.227568, exchange rate (EXCR) has the highest mean value of 81.84865, followed by inflation rate (INFR) with a mean value of 18.16216, finally interest rate (INTR) has a mean value of 9.542162.

**Standard Deviation:** Based on the standard deviation value we can logically conclude that the point of deviation from the mean is seen to be minimal between oil revenue (OILR), exchange rate (EXCR), inflation rate (INFR) and interest rate (INTR) after considering the value of standard deviation with that of the mean.

**Kurtosis:** Two variables were said to be platykurtic in nature because their Kurtosis value stood at INTR 2.096327 and EXCR 2.403710 which means they have less than 3 indicating a thin tail compared to the standard normal distribution, which indicate it return tend to have less major fluctuation. While OILR, 3.078014 and INFR, 5.530730 were leptokurtic in nature, because the kurtosis value was larger than 3.

**Table 4.2: Result of Unit Root Test (Using ADF)**

<b>Variable</b>	<b>ADF test statistic</b>	<b>Critical Value 5%</b>			<b>Order of Integration</b>	<b>Prob.</b>
		<b>1%</b>	<b>5%</b>	<b>10%</b>		
<b>D(OILR)</b>	-5.795269	-3.653730	-2.957110	-2.617434	I(1)	0.0000
<b>D(INTR)</b>	-5.326786	-3.632900	-2.948404	-2.612874	I(1)	0.0001
<b>D(INFR)</b>	-5.460732	-3.632900	-2.948404	-2.612874	I(1)	0.0001
<b>D(EXCR)</b>	-4.425703	-3.632900	-2.948404	-2.612874	I(1)	0.0012

Source: E-View Output.

The result of the Augmented Dickey Fuller (ADF) test result shows that D(OILR), D(INTR), D(INFR) and D(EXCR) were all stationary at level one I(1) first difference, because the ADF test statistics is greater than the critical level at 1%, 5% and 10%, and the probability value were all significant after

differencing the data at level one, this further show that the data can be used for forecasting and decision making on the long run, moreover another test called Johansen Co-integration test can be conducted since the unit root test have passed the test of been stationary at level one.

### Estimation of Var Model

#### Var Lag Length Selection

To ascertain the best lag length for a parsimonious VAR model for the dynamic relationships between the OILR, INFR, INTR and EXCR, we fit a VAR (3) and use five different information criteria. The results are shown in table below.

**Table 4.3: VAR lag order selection; \* indicates the selected lag order**

VAR Lag Order Selection Criteria						
Endogenous variables: OILR INTR INFR EXCR						
Exogenous variables: C						
Date: 07/10/20 Time: 09:50						
Sample: 1981 2019						
Included observations: 36						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-441.9945	NA	180682.0	26.29379	26.51826	26.37034
1	-347.1380	156.2343*	3022.589*	22.18459*	23.53137*	22.64388*
2	-324.0656	31.21552	3748.606	22.29798	24.76709	23.14002
3	-297.1421	28.50721	4437.385	22.18483	25.77627	23.40961
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

*Source: E Views output*

From the results in table 4.3 shows that each of AIC, SIC and HQ has a minimum value at lag 1 as indicated by the asterisks (\*). This shows that VAR (1) is the best specification for the dynamic relationship being investigated.

#### Estimation of VAR (1) model

Table 4.4 shows the fitted VAR (1) model for OILR, INTR, INFR, EXCR and MSGR. Here, since EViews VAR output does not contain the associated probabilities of a fitted VAR, we obtain the associated p-values by estimating VAR equivalent systems equations through the VAR window. This is necessary because it will allow us compare the fitted VAR coefficients with the results of the structural Granger causality analysis in terms of their economic significance.

**Table 4.4: Estimation results for VAR(1) model; ( ) contains p-values**

Vector Autoregression Estimates				
Date: 07/10/20 Time: 09:59				
Sample (adjusted): 1982 2019				
Included observations: 38 after adjustments				
	OILR	INTR	INFR	EXCR
OILR(-1)	-0.155305 (0.1839)	0.207903 (0.0083)	- 0.005992 (0.7846)	-0.001339 (0.2675)
INTR(-1)	0.003651 (0.0222)	0.842647 (0.1091)	0.826928 (0.5641)	-0.248414 (0.8293)
INFR(-1)	-2.64E-06 (0.0055)	-0.019880 (0.0272)	0.527730 (0.1406)	-0.090146 (0.2067)
EXCR(-1)	-0.003061 (0.0011)	-0.002146 (0.0058)	0.008032 (0.0300)	1.053042 (0.0441)
C	0.417832 (0.2651)	1.683913 (0.3021)	-7.908188 (0.7326)	7.251213 (0.89778)
Q Statistic	24.80481 (0.8139)		LM Statistic	10.43134 (0.8432)
R-squared	0.224718	0.750844	0.586930	0.958572
Adj. R-squared	0.095504	0.709318	0.518085	0.951667
F-statistic	1.739116	18.08128	8.525375	138.8279

*Source: E Views output*

From table 4.7, we can see that the Q-statistic and the LM statistic each up to lag 3 has a p-value that is higher than the three conventional levels of significance (1%, 5% and 10%), indicating that both tests are not significant. We therefore accept the null hypothesis of no serial correlation in the fitted VAR residuals, and resolved that the model has no specification problems. In the light of the relationship being studied, OILR has a positive relationship with each of INTR with a coefficient of 0.985715 respectively, while there is evidence of negative relationship with each of INFR and EXCR with a coefficient of -5.093173 and -3.324434 respectively. In terms of significance, INTR are significantly influenced by OILR while an insignificant relationship exists between each of INFR and EXCR.

### Test of Hypothesis

In this section we make use of the probability value to accept or reject the null hypothesis.

#### Hypotheses 1

**H<sub>01</sub>:** There is no significant relationship between interest rate (INTR) and oil revenue (OILR) in Nigeria.

**H<sub>A1</sub>:** There is a significant relationship between interest rate (INTR) and oil revenue (OILR) in Nigeria.



**Interpretation**

Judging by the VAR estimate it was discovered that the P- value of interest rate (INTR) stood at 0.0083 which is less than 0.05 confidence level, we therefore, reject the null hypothesis and accept the alternate hypothesis, implying that significant relationship exists between interest rate (INTR) and oil revenue (OILR) in Nigeria.

**Hypotheses 2**

**H0<sub>2</sub>:** There is no significant relationship between inflation rate (INFR) and oil revenue (OILR) in Nigeria.

**HA<sub>2</sub>:** There is a significant relationship between inflation rate (INFR) and oil revenue (OILR) in Nigeria.

**Interpretation**

Judging by the VAR estimate it was discovered that the P- value of inflation rate (INFR) stood at 0.7846 which is greater than 0.05 confidence level, we therefore, reject the alternative hypothesis and accept the null hypothesis, implying that no significant relationship exists between inflation rate (INFR) and oil revenue (OILR) in Nigeria.

**Hypotheses 3**

**H0<sub>3</sub>:** There is no significant relationship between exchange rate (EXCR) and oil revenue (OILR) in Nigeria.

**HA<sub>3</sub>:** There is a significant relationship between exchange rate (EXCR) and oil revenue (OILR) in Nigeria.

**Interpretation**

Judging by the VAR estimate it was discovered that the P-value of exchange rate (EXCR) stood at 0.2675 which is greater than 0.05 confidence level, we therefore, reject the alternative hypothesis and accept its null, implying that no significant relationship exists between exchange rate (EXCR) and oil revenue (OILR) in Nigeria.

**DISCUSSION OF FINDINGS**

**Interest Rate (INTR) and Oil Revenue (OILR):** There is a positive and significant relationship between interest rate and oil revenue, this suggests that for every one percentage increase in INTR there is an increase of 0.207903 in oil revenue, we therefore accept our apriori expectation, The positive increase arises as a result of the excessive profit marketers of this crude oil get from hording the commodity which they will eventually sell at a very high price, supports the study of Oosterbaan (2000), Chibu and Njoku (2015) and Ogbonna and Ebimobowei (2011) they revealed that hording is detrimental to accountability and return.

**Inflation Rate (INFR) and Oil Revenue (OILR):** From the result of VAR in table 4.4 above, INTR has a negative (co-efficient of -0.005992) and an insignificant relationship (p-value 0.7846) with OILR, this result is contrary with our apriori expectation, this means for every one percent increase in government revenue there is approximately -0.005992% fall in oil revenue. The negative relationship arises due to consistent fluctuation in the prices of petroleum in Nigeria, this result is in acceptance with

the findings of Akpan and Atan (2012) and Imoisi (2013) they ascribed that inflation rate affects the naira value of exchange rate and balance of payment in the economy.

**Exchange Rate (EXCHR) and Oil Revenue (OILR):** There is a negative and insignificant relationship between exchange rate and gross domestic product, this suggests that for every one percent increase in EXCR there is fall of -0.001339 in OILR, we therefore reject our apriori expectation, contrary to Hua (2011) and Gbadebo (2015) who discovered an inverse relationship, the negative relationships as a result of the fall in the prices of oil barrel in the world financial market, the fluctuation in the demand and substitute for oil have made the price to fall which resultantly will result in reduction in its revenue contribution.

## CONCLUSION

Based on the research findings we can conclude that inflation rate and exchange rate can be stabilized via the monetary policy and the potency of this variable affect other macro-variable at large for these policies to be effectively tackled the problem of exchange rate fluctuation need to be addressed then there is need for this policy to be maximize to its fullest it also requires that policy objective should always have control means to embrace any instrument that can be corrected. There is need for stability in the social and political economy of the country, and this can be achieved the host community need adequate attention from both the oil company and government, because the environmental activity also contributes to what affect the macro-economic variable which results to fluctuation or stability of exchange rate which might affect aggregate revenue.

## Recommendations

- i. All these calls for a sound well-encompassing stabilization policy that will enforce stability of the monetary tool which will not counter previous policies.
- ii. Competitive investment climate should be encouraged and this can be achieved via the different tools used by monetary policy with the objective of attracting investors, provide employment, and promote other bi-product from crude oil, which will eventually result to an increase in receipt from oil revenue and boost naira exchange rate.
- iii. From the study it was discovered that oil revenue contributes greatly to government receipt and in order for the shock in this sector to not have an adverse effect on the country at large there is need for diversification, and the government needs to encourage more participant mostly the non-government sector, this will curb the illegal activities attributed to marketers of the product.

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