# An Econometric Analysis of the Effect of Crude Oil Revenue and Governance on Per Capita Income in Nigeria from 1990 to 2021.

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## Abstract

The study investigated the effect of crude oil revenue and governance on per capita income in Nigeria from 1990 to 2021. The study adopts the descriptive statistics, unit root test, bound co-integration test as well as Autoregressive Distributive Lag (ARDL) modelling techniques for the data analysis. Data for the empirical analysis were sourced from secondary sources like World Data Index (WDI) and CBN Statistical Bulletin (Various- Issues). The results of theanalysis indicated as follows; the ARDL ECM regression results showed that in the short run, the coefficient of current value of ORV had a positive (0.351395) relationship with RPI, the coefficients of both current and past lag 1 value of GOE has a positive (0.252742 and 1.095449) relationship with RPI, the coefficient of both current and past lag 1 value ROQ have a positive (0.619140 and 0.737970) relationship with RPI, the coefficient of VOA had a negative (-0.245623) relationship with RPI, the coefficient of COC had a positive (0.003027) relationship with RPI, The coefficient of ROL had a negative (-0.599409) relationship with RPI, while the coefficient of EXH had a positive (0.015328) relationship with RPI. The Breusch-Godfrey Serial Correlation LM Test result showed that there is no serial correlation in the model. The Breusch-Pagan-Godfrey Heteroskedasticity Test result suggests that there is no evidence of heteroskedasticity in the model. The study concluded that Crude Oil Revenue reduced Per Capita Income in Nigeria in the short run but increased Per Capita Income in Nigeria in the long run and recommended that Government should use the revenue generated from petroleum to invest in other domestic sectors such as Agriculture and manufacturing sectors in order to expand the revenue source of the economy and further increase the revenue base of the economy.

**Keywords:** Crude oil, Governance, Per-Capita Income

## INTRODUCTION

Crude oil is Nigeria's major natural resource endowment and it is an integral part of national wealth, which enhances a country's potential for economic growth around the world.Nigeria is genuinely rich in both categories of natural resources, but still has not been able to sustain the much-needed economic growth.(Bannon & Collier, 2003; Collier &Hoeffler, 2002; Ross 1999, Sachs & Warner, 1995).Nigeria is one of the top ten oil exporters in the world. However, its economy had been stagnant and failed to alleviate poverty (Budina, Pang & Van Wijnbergen, 2007).As an illustration, in 1965, when oil revenues per annum were approximately $33 billion, the per capita GDP of Nigeria was US$245. In 2000, when oil revenues were US $325 billion, the per-capita GDP remained at the 1965 level, US $245 (Kablan&Loening, 2012). In 2012 when cumulative oil revenues were well over US $402billion, the per-capita GDP of Nigeria was US $1,630.00 (IMF, 2012). This was still considered negligible for enhancing the welfare of

Nigerians. It has been estimated that oil and gas exports accounted for more than 98% of export earnings and about 83% of federal government revenue in the year 2000 (Odularu, 2008). The aim of the study was to determine the effect of crude oil revenue and governance on the per capita income in Nigeria. Governance was proxied by control of corruption, voice and accountability, regulatory qualities, rule of law, government effectiveness and exchange rate.

Keynesian economics is an economic theory of total spending in the economy and its effects on output and inflation. Keynesian economics was developed by the British economist John Maynard Keynes during the 1936 in an attempt to understand the great depression.

Income and employment theory, a body of economic analysis concerned with the relative levels of output, employment and prices in an economy. By defining the interrelation of these macroeconomic factors, governments try to create policies that contribute to economic stability.

In the Keynesian theory, employment depends on effective demand. Effective demand results in output. Output creates income. Income provides employment. Since Keynes assumes all these four quantities, viz., effective demand (ED), output (Q), income (Y) and employment (N) equal to each other, he regards employment as a function of income.

**Methodology**

**Research Design**

This study adopted the quasi-experimental research design. The choice of this approach emanated from its suitability in assessing the impact of multivariate explanatory variables on a single dependent variable.

**Data Collection**

The data for this study is time series data obtained basically from secondary sources such as Central Bank of Nigeria and Federal bureau of statistics bulletin, the World Bank data base, the Nigerian national petroleum corporation statistics bulletin, National Bureau of statistics (NBS) and index Mudi for the period of 1990 to 2021.

**Data Analysis**

This study employed descriptive statistics, unit root test, bound cointegration, and Autoregressive Distributed Lag (ARDL) to estimate the effect of the explanatory variables on the dependent variable.

**Model Specification**

The model is expressed explicitly as

$RPI = f(ORV, COC, VOA, ROQ, ROL, GOE, EXR)$ 1

$RPI_t = \alpha_o + \beta_1 ORV_t + \beta_2 COC_t + \beta_3 VOA_t + \beta_4 ROQ_t + \beta_5 ROL_t + \beta_6 GOE_t + \beta_7 EXR_t + U_t$ 2

Where;

RPI = Real Per Capita Income

ORV = Oil Revenue

COC = Control of Corruption

VOA = Voice and Accountability

ROQ = Regulatory qualities

ROL = Rule of Law

GOE = Government Effectiveness

EXH = Exchange Rate

$\alpha_o$, $\beta$ = Unknown Parameters

a priori; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_7 > 0$, while $\beta_6 < 0$.

The Autoregressive Distributed Lag (ARDL) Model (Bound Test Approach) for the model is specified as follows:

$$\Delta RPI_t = \beta_0 + \Delta RPI_{t-1} + \Sigma\beta_{1t}\Delta ORV_{t-1} + \Sigma\beta_{2t}\Delta GOE_{t-1} + \Sigma\beta_{3t}\Delta ROQ_{t-1} + \Sigma\beta_{4t}\Delta VOA_{t-1} + \Sigma\beta_{5t}\Delta COC_{t-1} + \Sigma\beta_{6t}\Delta ROL_{t-1} + \Sigma\beta_{7t}\Delta EXH_{t-1} + RPI_{t-1} + \Sigma\,\Phi_{1t} ORV_{t-1} + \Sigma\,\Phi_{2t} GOE_{t-1} + \Sigma\,\Phi_{3t} ROQ_{t-1} + \Sigma\,\Phi_{4t} VOA_{t-1} + \Sigma\,\Phi_{5t} COC_{t-1} + \Sigma\,\Phi_{6t} ROL_{t-1} + \Sigma\,\Phi_{7t} EXH_{t-1} + U_t \quad 3$$

Where;

$\beta_0$ is the constant terms, RPI, OREV, COC, VOA, ROQ, ROL, GOE, EXR, are as earlier defined, $\beta_1$ – $\beta_7$are the coefficients of independent variables while µis the error terms, $\Delta$ = first difference of the variable, $U_t$= white noise disturbance error term.

## RESULTS AND DISCUSSION

**The trends per capital income is presented in Figure 1**

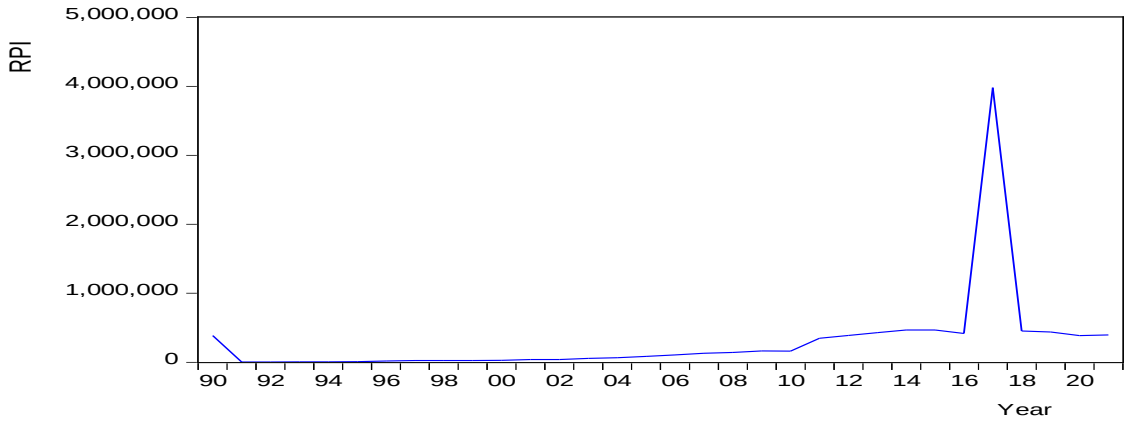


**Figure 1: Time Series Plot of Nigeria's RPI (1990-2021)**

Figure 1 shows that the values of Nigeria's RealPer Capita income (RPI) have been fluctuating within the period of the study. The value decreased from 1990 to 1992 and later increased steadily in 2015 and increased the following year to its peak in 2017 and dropped down in 2021.

**Unit Root Test**

Table 1 present the results of the stationarity test for each of the variables in the model using the Augmented Dickey Fuller (ADF) test. The results were conducted with intercept and no trend.

**Table 1: ADF at Constant for Per Capita Income**

| Variable | ADF at Level | ADF at 1st Difference | Status | Remark |
|---|---|---|---|---|
| LOG(RPI) | -1.441760 | -11.03578 | I(1) | Stationary |
| LOG(ORV) | -2.244909 | -5.171234 | I(1) | Stationary |
| COC | -5.591949 | - | I(0) | Stationary |
| VOA | -2.366186 | -5.861804 | I(1) | Stationary |
| ROQ | -4.891003 | - | I(0) | Stationary |
| ROL | -2.013433 | -6.032527 | I(1) | Stationary |
| GOE | -1.916496 | -5.392830 | I(1) | Stationary |
| EXH | 0.013689 | -5.307288 | I(1) | Stationary |
| | | ***Critical Values*** | | |
| 1% level | -3.670170 | -3.679322 | | |
| 5% level | -2.963972 | -2.967767 | | |
| 10% level | -2.621007 | -2.622989 | | |

**Source: Author's Computation using E-view 10**

The results of the unit root test in Table 1 reveals that COC and ROQ were stationary at level while RPI, ORV, VOA, ROL, GOE and EXH were stationary at 1st difference.Since the ADF results indicate that the series are of different order of integration, we cannot use the Engle-Granger and Johansen co-integration tests but rather the appropriate test to use in this study is the Bounds co-integration test.

**Bound Co-Integration Test Result**

The result of the Bound Co-integration test is presented in Table 2

**Table 2: ARDL Bound Test Co-Integration Result for Model One**

| Test Statistic | Value | K |
|---|---|---|
| F-statistic | 4.450833 | 7 |
| | Critical Value Bounds | |
| Significance | I(0) Bound | I(1) Bound |
| 10% | 2.03 | 3.13 |
| 5% | 2.32 | 3.5 |
| 2.5% | 2.6 | 3.84 |
| 1% | 2.96 | 4.26 |

**Source: Author's Computation using E-view 10**

From Table 2, the result of the bound co-integration test shows that the calculated f-statistic value of 4.450833 falls higher than the theoretical critical value for the upper bound I(1) bound at 5 percent. This means that there is co-integration, hence, a long run relationship exists between ORV, COC, VOA, ROL, ROQ, GOE, EXH and RPI in Nigeria within the period under review.

Since there is a long run relationship among the variables, we now proceed to estimate the short run dynamics and long run models based on the ARDL approach.

**Long Run Estimation Results for Per Capita Income**

Table 3shows the estimated coefficients of the long run relationship between the variables in the model.

**Table 3: ARDL Long Run Estimation Result for the Model**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(ORV) | 1.112985 | 0.193732 | 5.744969 | 0.0001 |
| GOE | -2.649187 | 1.687049 | -1.570309 | 0.1423 |
| ROQ | -1.018046 | 0.405516 | -2.510498 | 0.0208 |

| | | | | |
|---|---|---|---|---|
| VOA | -0.316302 | 0.127052 | -2.489551 | 0.0178 |
| COC | 0.002981 | 0.054736 | 0.054469 | 0.9575 |
| ROL | -1.160599 | 0.170795 | -6.795287 | 0.0000 |
| EXH | 0.000899 | 0.001748 | 0.514257 | 0.6164 |
| C | -2.904555 | 4.607562 | -0.630389 | 0.5403 |

**Source: Author's Computation using E-view 10**

Table 3 shows that in long run, the coefficient of ORV has a positive (1.112985) relationship with RPI,meaning that a unit increase in ORVincreases RPI in Nigeria. The coefficient of ORVis statistically significant with RPI at 5 percent level of significance, implying that a direct relationship exists between ORV and RPI in Nigeria all things being equal. The positive sign of the coefficient of ORV in the long run conform to the a priori expectation.

In the long run, the coefficient of GOE has a negative (-2.649187) relationship with RPI,meaning that a unit increase in GOE decreases RPI in Nigeria. The coefficient of GOE is not statistically significant with RPI at 5 percent level of significance, implying that an indirect relationship exists between GOEand RPI. The negative sign of the coefficient of GOE in the long run do not conform to the a priori expectation.

While the coefficient of ROQ has a negative (-1.018046) relationship with RPI, meaning that a unit increase in ROQdecreases RPI in Nigeria. The coefficient of ROQ is not statistically significant with RPI at 5 percent level of significance, implying that anindirect relationship exists between ROQ and RPI in Nigeria. The negative sign of the coefficient of ROQ in the long run does not conform with the a priori expectation.

The Table 3also shows that in long run, the coefficient of VOA has a negative (-0.316302) relationship with RPI,meaning that a unit increase in VOA decreases RPI in Nigeria. The coefficient of VOAis not statistically significant with RPI at 5 percent level of significance, implying that an indirect relationship exists between VOA and RPI in Nigeria all things being equal. The negative sign of the coefficient of VOAin the long run do not conform to the a priori expectation.

Again, in the long run, the coefficient of COC has a positive (0.002981) relationship with RPI,meaning that a unit increase in COCincreases RPI in Nigeria. The coefficient of COC is statistically significant with RPI at 5 percent level of significance, implying that a direct relationship exists between COCand RPI. The positive sign of the coefficient of COCin the long-run conform to the a priori expectation.

The coefficient of ROL has a negative (-1.160599) relationship with RPI, meaning that a unit increase in ROL decreases RPI in Nigeria. The coefficient of ROL is not statistically significant with RPI at 5 percent level of significance, implying that anindirect relationship exists between ROL and RPI in Nigeria. The negative sign of the coefficient of ROL in the long run does not conform to the a priori expectation.

While the coefficient of EXH has a positive (0.000899) relationship with RPI, meaning that a unit increase in EXHincreases RPIin Nigeria. The coefficient of EXH is statistically significant with RPIat 5 percent level of significance, implying that a direct relationship exists between EXH and RPI in Nigeria. The positive sign of the coefficient of EXH in the long run conform to the a priori expectation.

**Short Run Estimation Results for Per Capita Income**

The results of the short run dynamics estimation of model one (per Capita Income Model) is presented in equation 3

**Table 4: ARDL Short Run Estimation Result for the Model**

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(RPI(-1)) | -0.786736 | 0.222220 | -3.540350 | 0.0017 |
| DLOG(ORV) | 0.351395 | 0.428889 | 0.819315 | 0.4286 |
| DLOG(ORV(-1)) | -1.081399 | 0.374893 | -2.884555 | 0.0137 |
| D(GOE) | 0.252742 | 1.123131 | 0.225033 | 0.8257 |
| D(GOE(-1)) | 1.095449 | 0.741003 | 1.478333 | 0.1651 |
| D(ROQ) | 0.619140 | 0.490556 | 1.262119 | 0.2309 |
| D(ROQ(-1)) | 0.737970 | 0.519750 | 1.419854 | 0.1811 |
| D(VOA) | -0.245623 | 0.106147 | -2.313999 | 0.0268 |
| D(COC) | 0.003027 | 0.055603 | 0.054433 | 0.9575 |
| D(ROL) | -0.599409 | 0.154393 | -3.882368 | 0.0009 |
| D(EXH) | 0.015328 | 0.005360 | 2.859609 | 0.0144 |
| ECM (-1) | -0.350041 | 0.098625 | -3.549203 | 0.0020 |
| **$R^2$ = 0.509942; Adj-$R^2$ = 0.387427; F-stat. = 4.162295 with F-Prob. = 0.002971; DW = 2.164163** | | | | |

**Source: Author's Computation using E-view 10**

From Table 4 the result shows that the ECM included in this model has the right sign (i.e. negative) and is statistically significant at 5 percent level. The coefficient indicates a low adjustment speed of about 35 percent. This adjustment implies that 35 per cent of errors are corrected within one year since that data were annual series. The ECM also reveals that a long run relationship exists between the regressors (ORV, GOE, ROQ, VOA, COC, ROL and EXH) and the response variable RPI in this model.

Furthermore, the calculated Adj-$R^2$ is 0.387427. This means that about 39 per cent of the total variation in RPI is caused by the explanatory variables ORV, GOE, ROQ, VOA, COC, ROL and EXH. Thus, the remaining 61 per cent of variations is caused by exogenous factors to the model but covered by the error term. Also, the F-statistics calculated of 4.162295 with F-Probability value of 0.002971 is less than 0.05 level. This means that the overall model is significant at 5 per cent level. The value of the D.W is 2.164163 suggests that there is minimal serial autocorrelation in the model one.

Table 4 shows that in short run, the coefficient of current value of ORV has a positive (0.351395) relationship with RPImeaning that a unit increase in ORV increases RPI in Nigeria while the coefficient of past lag 1 value of ORV has a negative (-1.081399) relationship with RPI,meaning that a unit increase in ORV decreases RPI in Nigeria in the short run.The coefficient of the current value of ORV is statistically significant with RPI at 5 percent level of significance, implying that a direct relationship exists between ORV and RPI in Nigeria while the coefficient of past lag 1 value of ORV is not statistically significant with RPI at 5 percent level of significance, implying that an indirect relationship exists between ORV and RPI in Nigeria all things being equal. The positive sign of the coefficient of the current value of ORV in the short run conform to the a priori expectation while the negative sign of the coefficient of past lag 1 value of ORV does not conform to the a priori expectation in the short run.

In the short run, the coefficient of both current and past lag 1 value of GOE has a positive (0.252742 and 1.095449) relationship with RPI,meaning that a unit increase in GOEincreases RPI in Nigeria. The coefficient of both current and past lag 1 value of GOE is statistically significant with RPI at 5 percent level of significance, implying that a direct relationship exists between GOE and RPI. The positive sign of the coefficient of both current and past lag 1 value of GOE in the short run conforms to the a priori expectation.

The coefficient of both current and past lag 1 value ROQ has a positive (0.619140 and 0.737970) relationship with RPI, meaning that a unit increase in ROQ increases RPI in Nigeria in the short run. The coefficient of both current and past lag 1 value ROQ are statistically significant with RPI at 5 percent level of significance, implying that a direct relationship exists between ROQ and RPI in Nigeria. The positive sign of the coefficient of both current and past lag 1 value ROQ in the short run conforms with the a priori expectation.

The table 5 also shows that in short run, the coefficient of VOA has a negative (-0.245623) relationship with RPI,meaning that a unit increase in VOA decreases RPI in Nigeria. The coefficient of VOA is not statistically significant with RPI at 5 percent level of significance, implying that an indirect relationship exists between VOA and RPI in Nigeria all things being equal. The negative sign of the coefficient of VOA in the short run do not conform to the a priori expectation.

Again, in the short run, the coefficient of COC has a positive (0.003027) relationship with RPI,meaning that a unit increase in COC increases RPI in Nigeria. The coefficient of COC is statistically significant with RPI at 5 percent level of significance, implying that a direct relationship exists between COC and RPI. The positive sign of the coefficient of COC in the short run conforms to the a priori expectation.

The coefficient of ROL has a negative (-0.599409) relationship with RPI, meaning that a unit increase in ROL decreases RPI in Nigeria. The coefficient of ROL is not statistically significant with RPI at 5 percent level of significance, implying that an indirect relationship exists between ROL and RPI in Nigeria. The negative sign of the coefficient of ROL in the short run does not conform with the a priori expectation.

While the coefficient of EXH has a positive (0.015328) relationship with RPI, meaning that a unit increase in EXH increases RPIin Nigeria. The coefficient of EXH is statistically significant with RPIat 5 percent level of significance, implying that a direct relationship exists between EXH and RPI in Nigeria. The positive sign of the coefficient of EXH in the short run conforms to the a priori expectation.

**Post Estimation Tests**

The researcher also conducted a diagnostic test to ascertain whether or not the series are free from autocorrelation (Breusch-Godfrey Serial Correlation LM Test), heteroscedasticity (Breusch-Pegan-Godfrey Test).

The result of the diagnostic test is presented in Table 5.

**Table 5: Serial Correlation LM Test and Homoscedasticity Test Results**

| Test | F-Statistic | Prob. Value |
|---|---|---|
| Breusch-Godfrey Serial Correlation LM Test | 1.267235 | 0.3438 |
| Breusch-Pagan-Godfrey Heteroskedasticity Test | 2.452801 | 0.1304 |

**Source: Author's Computation using E-view 10**

From Table 5, the results of the diagnostic test show that the serial or autocorrelation test using Breusch-Godfrey Serial Correlation LM Test shows that the f-statistic is 1.267235, and a Chi-Square probability value is0.3438. This indicates that the probability value of about 34 percent (0.3438) is greater than 5 percent (0.05) critical value; hence we confirm no serial correlation in the model.

The result of the heteroscedasticity test using Breusch-Pegan-Godfrey test shows that the f-statistic is 2.452801 with a Chi-Square probability value of 0.1304. The result suggests that there is no evidence of heteroskedasticity in the model since the probability Chi-square value is more than 5 percent ($p>0.05$). So, residuals do have constant variance which is desirable in regression meaning that residuals are Homoscedastic.

**Conclusion**

The study concluded that Crude Oil Revenue reduces Per Capita Income in Nigeria in the short run but increases Per Capita Income in Nigeriain the long run; Government effectiveness reduces per capita income in Nigeria both in the short run and long run; Regulatory quality increases per capita income in Nigeria in the short run but it causes a reduction in per capita income in the long run; Voice & Accountability reduces per capita incomein Nigeria both in the short and long run; Control of Corruption increases per capita incomein Nigeria both in the short and long run; Rule of Law reduces per capita incomein Nigeria both in the short and long run; Exchange rate increases per capita incomein Nigeria both in the short and long run.

**Recommendations**

Government should use the revenue generated from petroleum to invest in other domestic sectors such as Agriculture and manufacturing sectors in order to expand the revenue source of the economy and further increase the revenue base of the economy.

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