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# ASSESSING THE IMPACT OF TELECOMMUNICATION AND OIL SECTORS ON NIGERIA'S GROSS DOMESTIC PRODUCT USING VECTOR ERROR CORRECTION MODEL

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## ABSTRACT

The **c**ontributions of oil sector and telecommunication sectors to Gross Domestic Product (GDP) in Nigeria cannot be overemphasized. Thus, this study assesses the impact of telecommunication and oil sectors on gross domestic product using the Vector Error Correction Model (VECM). To achieve this, the annual data from 1981 to 2021 was collected from the 2021 Central Bank of Nigeria Statistical bulletin. The Augmented Dickey Fuller test revealed that all the variables are stationary after first difference and they are also co-integrated. The VECM was estimated and the long run coefficient shows that the oil sector has significant positive impact on gross domestic product while telecommunication sector has negative and significant impact on GDP in the long run. Evidence from variance decomposition revealed that the oil sector and telecommunication sector explain the variance in GDP by about 33.4% and 66.3% respectively. Based on these findings, it was recommended that government should reexamine the telecommunication sector by way of increasing tax base and introducing new taxes in such a way that it does not distort the working of the economy but to increase the economic growth.

**Keywords:** GDP, Oil-sector, telecommunication-sector, VECM.

## INTRODUCTION

Black cotton soils have been described as the goal of Nigeria's national economic development has remained to change the way that production and consumption are organized in order to diversify the country's economy, lessen its reliance on oil, and increase its independence from imports. This will help the country's citizens live better lives and fight poverty. Therefore, it will be important to assess the growth and structural changes in some key economic sectors, particularly the oil and telecommunications sectors, as we consider the economic development experience of Nigeria.

The imperative need for the telecommunications industry to exist in any economy is increased by the rapid growth, development, and contribution of telecommunication technology. Telecommunications technology is the most cutting-edge and crucial tool for information sharing and serves as the foundation for creating economically valuable commodity markets. By connecting the domestic and international financial markets as well as the commodity market, the telecommunications industry helps a nation's economy thrive. Telecom ensures the ongoing flow of added value to the GDP, whether in the form of GDP growth or an increase in GDP per capita, e.t.c (Sajjad, 2017). Globally, the telecommunications industry has been recognized as having a general impact on practically all other economic sectors (Awoleye *et. al*, 2012).

Nigeria, with a population of roughly 218 million, is the continent's second-largest

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economy and top oil producer, according to UNDP and HDI (2011). Approximately 70% of Nigerians live in poverty, despite her wealth. The recent Human Development Index (HDI) data from 2021 indicates that the average life expectancy at birth is 52.7 years. As a result, Nigeria is the member of the Organization of the Petroleum Exporting Countries with the lowest HDI score (156) overall (OPEC). Iraq is rated 132 and has a 69.0-year average life expectancy.

According to Onouha, et. al (2015), one of the main measures used to assess the strength of a nation's economy is the Gross Domestic Product (GDP). It is also used to estimate each person's standard of living within an economy. However, the market value of all legally acknowledged final goods and services produced within a nation in a specific timeframe might be used to define gross domestic product. This suggests that rather than simply adding up the quantities of each good or service, the gross domestic product also accounts for its market worth. Because it is used to gauge whether an economy is increasing faster or more slowly, gross domestic product is crucial to the health of any economy.

Several efforts have been made by researchers to empirically investigate whether relationship exists between oil and telecommunication sectors and the gross domestic product in developing Countries like Nigeria. For instance, Nwoba and Abah (2017) studied the impact of Crude oil revenue on the Nigerian Economic growth using ordinary least square regression analysis and found a long run positive relationship between oil revenue and gross domestic product. Usman, Madu and Abdullahi (2015) examined the impact of Petroleum sector on Nigeria economic growth and the result reveals that the petroleum sector has significant and positive impact on Nigeria economy. Nweze and Greg (2016) studied oil revenue and economic growth in Nigeria between 1981-2014 using co-integration test and error correction model. The results showed that there is a long-run relationship among the variables. The findings also revealed that all the variables except lag of government exerted significant impact in economic growth in Nigeria. Ronald (2017) used error correction model approach to investigate the impact of oil price on economic growth in Nigeria. The results revealed that an increase in oil price have significant negative on the Nigerian economy.

Moses (2018) studied the impact of oil revenue on Nigeria output growth using a fully modified ordinary least square method and found that the oil revenue does not have a short run relationship with economic activities of Nigeria. Ilori and Akinwunmi (2020) examined the effect of oil and non-oil revenues on economic growth in Nigeria using co-integration, ECM and found that oil and non-oil revenues harms real GDP in Nigeria. Abdulrahman (2021) empirically examined the impact of oil and non-oil export on economic performance in Saudi Arabia using OLS regression and found that oil and non-oil export have positive and significant impact on economic growth in Saudi Arabia. Ebimobowei (2020) investigated the relationship between oil revenue and economic growth in Nigeria using Pearson Product Moment Correlation and OLS regression and found that crude oil/gas export has a significant and negative relationship with real GDP in Nigeria. Akinleye, et al (2021) examined the impact of oil revenue on economic in Nigeria using ARDL and found that petroleum profit tax, inflation rate, oil revenue and exchange rate were inversely related to economic growth in both short and long run.

On the other hand, Sajjad (2012) examined the impact of Telecommunication on

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economic development using OLS Regression and the results revealed that Telecommunication sector have positive relationship with the economic growth. Asogwa, et al (2013) examined the impact of telecommunication expenditure on economic growth in Nigeria using OLS regression and discovered that telecommunication, foreign direct investment and trade openness have significant positive impact on economic growth in Nigeria. Riti, et al (2016) examined the growth of non-oil sector to act as a key to diversification and performance of the economy using ARDL and found that agriculture and telecommunication sectors positively contributes to GDP at long run while manufacturing sector contributes negatively to GDP in the long run. Awoleye, et al (2012) explored the socio-economic effects of telecommunication on gross domestic product in Nigeria using OLS regression and found that telecommunication contributes negatively to GDP in Nigeria.

Masood (2012) investigated the causality issues between economic growth ICT investment in Sweden using co-integration and Granger causality test ad found a one-way causality running from ICT investment to economic Growth. Olowo, et al (2020) examined the sectorial contributions of non-oil revenue to economic growth in Nigeria using ARDL and found that environmental sector has insignificant positive impact on GDP while ICT and financial sectors contribute positively and significantly to economic growth in Nigeria. Matalqah and Warad (2017) investigated the impact of investment in the infrastructure of the telecommunication sector on economic growth in Arab Countries using modified LS and co-integration and found that investment in infrastructure for telecommunication sector has positive and significant impact on economic growth in non-oil producing Arab Countries in the long run however, there was no significant impact of investment in infrastructure for telecommunication sector on economic growth in the oil producing Arab Countries. Oyeniran and Onikosi-Alliyu (2016) examined the effects of investment in telecommunication infrastructure on economic growth in Nigeria using ARDL bound testing and found that foreign direct investment in ICT improve and raised economic growth in Nigeria than government investment. Alugbuo and Eze (2021) examined the economic effect of telecommunication industry in Nigeria using correlation analysis and found that percentage contribution of telecommunication sector to GDP, tele density and consumer price index positively influence the Nigerian economy more than FDI.

Based on the existing literatures on the relationship between telecommunication and oil sectors and gross domestic product, the researchers observed that there are no clear findings established. The existing studies has revealed mixed findings. Furthermore, only few of these studies has examined the joined impact of telecommunication and oil sector on gross domestic product in Nigeria. This, provide the justification for the current study. Thus, this study assesses the impact of telecommunication and oil sectors on gross domestic product in Nigeria from the period of 41 years (1981 – 2021).

## MATERIALS AND METHODS

The data used in this study were obtained from Central Bank of Nigeria 2021 Statistical Bulletin covering a period of 41 years from 1981 - 2021. Augmented Dickey Fuller (ADF) Test, Johannsen Co-integration test and Vector Error Correction Model were used as the statistical techniques for Data analysis.

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**Augmented Dickey Fuller Test**

The ADF was used to test the stationarity of the time series data. The ADF model is given as:

$$\Delta Y_t = k + at + \emptyset_i Y_{t-i} + \sum_{i=1}^{n} \propto_i \Delta Y_{t-i} + E_t \quad 1$$

Where $Y$ is a variable under study;

$\Delta$ represent the first difference operator;

$t$ represents the time;

$E_t$ represents the white noise;

n represents the maximum lag length

$k$, $\emptyset$ and $\propto$ represents the parameter to be estimated.

**Co-integration Test**

The Johannsen and Juselius (1990) maximum likelihood co-integration test procedure was employed in this study. The procedure test for both the existence and number of co-integrating vectors in the given series.

The multivariate co-integration test can be expressed as:

$$Y_t = K_o + K_1 \Delta Z_{t-1} + K_2 \Delta Z_{t-2} + \ldots + K_{p-1} \Delta Z_{t-p} + \pi Z_{t-p} + U_t \quad 2$$

Where

$Y = (G, O, T)$, representing Gross Domestic Product, Oil sector and Telecommunication sector respectively.

t represents the vector of variables that are integrated of order one.

K = represents the matrix coefficients

$\pi =$ represents the matrix of parameter

$U_t =$ represents a vector of normally and independently distributed error term.

If r are the co-integrating vectors between the element of Y it shows that $\pi$ is of rank (0 < r < 3).

Johansen developed two likelihood ratio tests used in estimating the number of co-integrating vectors as follows

Trace test ( $\pi_{trace}$) = $T_r$ ( r)= $-T \sum_{i=r+1}^{n} ln\ (1 - \hat{\pi}_i)$ 3

maximum eigen value ($\pi_{max}$) = $\pi_{max}$ (r, r + 1) = $Tln\ (1 - \pi\hat{C}_{+1})$ 4

**Vector Error Correction Model (VECM)**

The general Vector Error Correction Model is giving as below:

$$\Delta X_t = B_1 \Delta X_{t-1} + \ldots + B_{p-1} \Delta X_{t-p+1} + \pi Y_{t-p} + U_t \quad 5$$

Where $\pi = aB^t$,

$B_i$ represents the matrix of parameters,

$\pi$ contains long run information. The matrix $a$ of error correction coefficients measure the speed at which the variables adjust to restore long run equilibrium.

Matrix B is long run coefficients of the error correction term.

## RESULTS

Assessing the impact of telecommunication and oil sectors on gross domestic product is the main concern of this paper. Thus, in this section the paper presents the results of ADF test, Johannsen co-integration test and VECM and their interpretation thereof. Also, the time plots of the series were also presented in this section.

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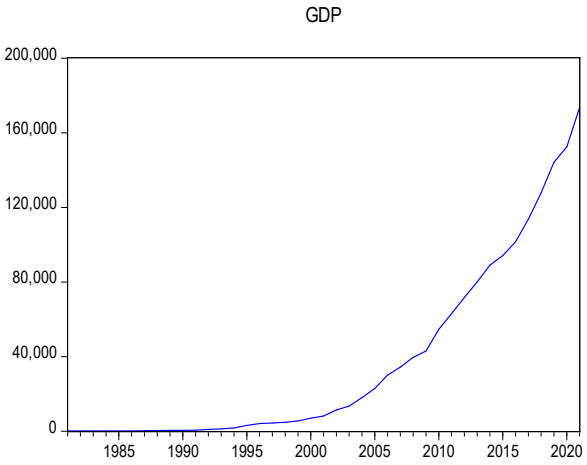


**Figure 1:** Graph of Gross Domestic Product

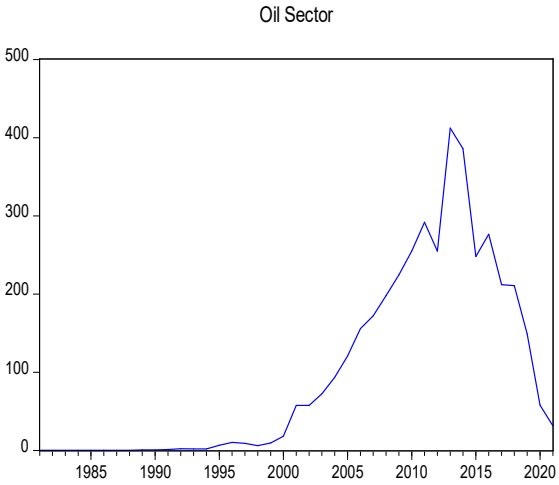


**Figure 2:** Graph of Oil Sector

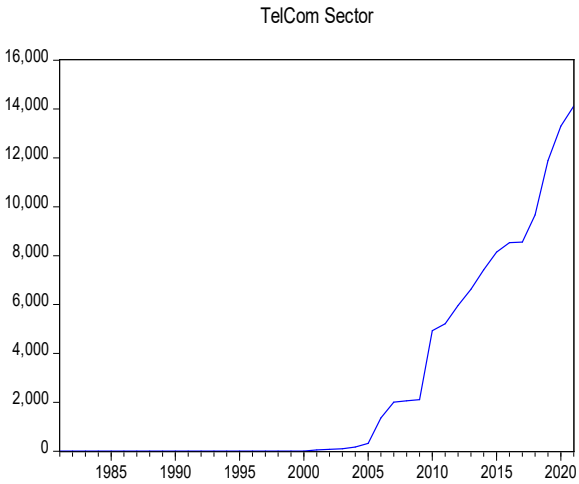


**Figure 3:** Graph of Telecommunication

The line graph of GDP, oil and telecommunication sector are presented in figure 1, 2 and 3. It is observed that GDP exhibit a positive growth while oil sector exhibit a positive growth between 1981 to 2013 and negative growth between 2013 to 2021. On the other hand, the telecommunication sector exhibits a flat output between 1981 to 2000 and positive growth pattern between 2000 to 2021.

**Table 1:** Summary Statistics Results

| | GDP | Oil Sector | Telcom Sector |
|---|---|---|---|
| Mean | 37119.15 | 97.69232 | 2747.250 |
| Median | 8150.020 | 31.31405 | 52.01000 |
| Maximum | 173527.7 | 412.3000 | 14119.35 |
| Minimum | 137.9300 | 0.050000 | 0.360000 |
| Std. Dev. | 49833.52 | 119.9785 | 4226.896 |
| Skewness | 1.281870 | 1.005605 | 1.340857 |
| Kurtosis | 3.447140 | 2.873555 | 3.512113 |
| Jarque-Bera | 11.57003 | 6.937466 | 12.73365 |
| Probability | 0.003073 | 0.031156 | 0.001718 |
| Sum | 1521885. | 4005.385 | 112637.3 |
| Sum Sq. Dev. | 9.93E+10 | 575794.1 | 7.15E+08 |
| Observations | 41 | 41 | 41 |

*Source: E-EVIEWS 10 output*

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**Table 2:** Unit Root Test Results

| Variable | t – statistics | Augmented Dickey Fuller Test Critical Values 1% | 5% | 10% | p-value | Remark |
|---|---|---|---|---|---|---|
| GDP | 4.5140 | -4.2050 | -3.5267 | -3.1946 | 1.0000 | Not stationary |
| ΔGDP | -3.8710 | -4.2119 | -3.5298 | -3.1964 | 0.0230 | Stationary |
| OIL | -1.1953 | -3.6056 | -2.9369 | -2.6069 | 0.6672 | Not Stationary |
| ΔOIL | -6.0105 | -3.6105 | -2.9390 | -2.6079 | 0.0000 | Stationary |
| TELCOM | 0.9217 | -4.2050 | -3.5266 | -3.1946 | 0.9998 | Not Stationary |
| ΔTELCOM | -5.9404 | -4.2119 | -3.5298 | -3.1964 | 0.0001 | Stationary |
| **Variable** | **t – statistics** | **Philip's Perron Test Critical Values 1%** | **5%** | **10%** | **p-value** | **Remark** |
| GDP | 6.1565 | -4.2050 | -3.5266 | -3.1946 | 1.000 | Not Stationary |
| ΔGDP | -3.9246 | -4.2119 | -3.5298 | -3.1964 | 0.0203 | Stationary |
| OIL | -1.0235 | -4.2050 | -3.5266 | -3.1946 | 0.9291 | Not Stationary |
| ΔOIL | -6.1901 | -4.2119 | -3.5298 | -3.1964 | 0.0000 | Stationary |
| TELCOM | 1.74432 | -4.2050 | -3.5266 | -3.1946 | 1.0000 | Not Stationary |
| ΔTELCOM | -5.9384 | -4.2119 | -3.5298 | -3.1964 | 0.0001 | Stationary |

*Source: E-EVIEWS 10 output*

**Table 3:** Johannsen Co-Integration Test Results

Unrestricted Cointegration Rank Test (Trace)

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.931437 | 115.9247 | 29.79707 | 0.0000 |
| At most 1 * | 0.416476 | 19.44466 | 15.49471 | 0.0120 |
| At most 2 | 0.001459 | 0.052561 | 3.841466 | 0.8186 |

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.** |
|---|---|---|---|---|
| None * | 0.931437 | 96.48002 | 21.13162 | 0.0000 |
| At most 1 * | 0.416476 | 19.39210 | 14.26460 | 0.0071 |
| At most 2 | 0.001459 | 0.052561 | 3.841466 | 0.8186 |

Max-eigenvalue test indicates 2 cointegrating eqn(s) at the 0.05 level

*Source: E-EVIEWS 10 output*

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**Table 4:** VAR Lag Order Selection Criteria

| Lag | LogL | LR | FPE | AIC | SC | HQ |
|---|---|---|---|---|---|---|
| 0 | -806.8120 | NA | 9.83e+18 | 52.24593 | 52.38471 | 52.29117 |
| 1 | -675.4355 | 228.8493 | 3.68e+15 | 44.35068 | 44.90577 | 44.53162 |
| 2 | -667.6869 | 11.99776 | 4.07e+15 | 44.43142 | 45.40283 | 44.74807 |
| 3 | -657.1007 | 14.34271 | 3.85e+15 | 44.32907 | 45.71680 | 44.78144 |
| 4 | -623.7424 | 38.73868 | 8.79e+14 | 42.75757 | 44.56162 | 43.34565 |
| 5 | -585.7095 | 36.80596 | 1.59e+14 | 40.88449 | 43.10485 | 41.60827 |
| 6 | -541.7056 | 34.06754 | 2.19e+13 | 38.62617 | 41.26286 | 39.48566 |
| 7 | -492.8479 | 28.36903 | 2.64e+12 | 36.05470 | 39.10771 | 37.04990 |
| 8 | -430.5731 | 24.10636 | 1.89e+11 | 32.61762 | 36.08694 | 33.74853 |
| 9 | -316.7019 | 22.03959* | 1.14e+09* | 25.85174 | 29.73738 | 27.11836 |
| 10 | 1376.102 | 0.000000 | NA | -82.78080* | -78.47884* | -81.37847* |

*Source: E-EVIEWS 10 output*

The results of unit root test, Johannsen Co-Integration Test Results and VAR lag order selection criteria were presented in Table 2, 3 and 4 respectively. The unit root test results in Table 2 indicates that the series are stationary at first difference that is integrated of order one. The co-integration results both Trace and Max-eigenvalue test indicates 2 co-integrating equations. Since the variables are stationary at first difference and co-integration exists, provides the justification for estimating the long and short run relationship using Vector Error Correction model. The AIC, SC and HQ lag order selection criteria in Table 4 indicates the optimal lag to be 10.

**Table 5:** Long run Relationship Estimate

| Variable | Coefficient | Std error | t- statistic | Remark |
|---|---|---|---|---|
| Oil sector | 1085.357 | 104.157 | 10.420 | Significant |
| Telcom sector | -29.748 | 4.025 | 7.391 | Significant |
| Constant | -1058.373 | | | |

*Source: E-EVIEWS 10 output*

**Dependent Variable: GDP**

**Table 6:** Short run Relationship Estimate

| Variable | Coefficient | t-statistics | P-value |
|---|---|---|---|
| ECT(-1) | -0.1440 | -2.5275 | 0.0160*** |
| | | | |
| D(GDP(-1)) | 0.1300 | 0.2832 | 0.7790 |
| D(GDP(-2)) | 1.6047 | 3.8598 | 0.0006*** |
| D(GDP(-3)) | -0.5236 | -1.0218 | 0.3150 |
| D(GDP(-4)) | 0.8215 | 1.3970 | 0.1727 |
| D(GDP(-5)) | -1.2687 | -1.5276 | 0.1371 |
| D(GDP(-6)) | 1.9706 | 3.4198 | 0.0018*** |
| D(GDP(-7)) | 0.3351 | 0.2526 | 0.8023 |
| | | | |
| D(Oil-Sector(-1)) | -164.9960 | -0.6229 | 0.5380 |
| D(Oil-Sector(-2)) | -135.9293 | -0.4622 | 0.6473 |
| D(Oil-Sector(-3)) | -197.5039 | -0.6000 | 0.5530 |
| D(Oil-Sector(-4)) | -82.8944 | -0.2535 | 0.8016 |
| D(Oil-Sector(-5)) | -170.8749 | -0.6031 | 0.5510 |
| D(Oil-Sector(-6)) | -147.9822 | -0.5796 | 0.5665 |

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| | | | |
|---|---|---|---|
| D(Oil-Sector(-7)) | -259.4736 | -2.0300 | 0.0513** |
| D(Oil-Sector (-1) | 6.3110 | 0.9463 | 0.3516 |
| D(Oil-Sector (-2) | -2.8852 | -0.6959 | 0.4918 |
| D(Oil-Sector (-3) | 3.0305 | 0.9831 | 0.3334 |
| D(Oil-Sector (-4) | -0.7808 | -0.3709 | 0.7133 |
| D(Oil-Sector (-5) | 0.7285 | 0.2048 | 0.8391 |
| D(Oil-Sector (-6) | 0.4796 | 0.0703 | 0.9444 |
| D(Oil-Sector (-7) | -0.9072 | -0.1332 | 0.8949 |
| Constant | 203.3537 | 0.4272 | 0.6723 |
| R-square | 0.9930 | | |
| Adjusted R-square | 0.9779 | | |
| F-statistics | 652651 | | |

*Source: E-EVIEWS 10 output*

**Dependent Variable: GDP**

*Note: *p<0.10, ** p<0.05, ***p<0.01 and [ns] not significant*

**Table 7:** VEC Granger Causality/Block Exogeneity Wald Tests

| Excluded | Chi-sq | df | Prob. |
|---|---|---|---|
| D(OIL_SECTOR) | 59.64845 | 7 | 0.0000 |
| D(TELCOM_SECTOR) | 79.26489 | 7 | 0.0000 |

*Source: E-EVIEWS 10 output*

**Dependent variable: D(GDP)**

**Table 8:** Variance Decomposition of GDP

| Period | S.E. | GDP | OIL_SECTOR | TELCOM_SECTOR |
|---|---|---|---|---|
| 1 | 793.7750 | 100.0000 | 0.000000 | 0.000000 |
| 2 | 1191.576 | 96.11194 | 0.185944 | 3.702111 |
| 3 | 2143.496 | 94.19551 | 0.309573 | 5.494914 |
| 4 | 2944.941 | 78.35800 | 0.374278 | 21.26772 |
| 5 | 3954.252 | 54.56747 | 0.639092 | 44.79344 |
| 6 | 4903.493 | 37.38527 | 1.248693 | 61.36604 |
| 7 | 5427.771 | 33.16038 | 1.516376 | 65.32325 |
| 8 | 5708.069 | 31.28267 | 1.375193 | 67.34214 |
| 9 | 10243.24 | 30.10172 | 0.480553 | 69.41773 |
| 10 | 19699.89 | 33.39136 | 0.291204 | 66.31743 |

*Source: E-EVIEWS 10 output*

The results of the long run estimates, short run estimate, VEC Granger Causality/Block Exogeneity Wald Tests and Variance Decomposition of GDP were presented in Table 5, 6, 7 and 8 respectively. The coefficients of the long run relationship revealed that oil sector has significant and positive impact on gross domestic product in the long run while telecommunication sector has significant and negative impact on gross domestic product in the long run.

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The Error Correction Model ECM(-1) portrays the speed of adjustment required to restore equilibrium in the dynamic model from an innovation. It affirms a priori expectation as it's coefficient is negative and has a p-value that is statistically significant at 5% level. Its value of – 0.1440 implies that an impulse to gross domestic product in the current period will be restored at a speed of adjustment of about 14.4% in the next period. This implies that 14.4% of the short-run disequilibrium is corrected annually.

The R-squared (0.9930) indicates that the explanatory variables explains 99.3% of the variations in gross domestic product while the remaining 0.7% is explained by other factors not considered in the model. This is quite high and presents a good fit of the model. The lag 2 and 6 value of GDP has significant and positive impact on the current values of GDP in the short run ($p < 0.05$). This implies that increase values of GDP in the previous years tend to increase current level of GDP by 1.6047 and 1.9706 respectively. Also, the lag 7 value of oil sector has significant and negative impact on current level of GDP in the short run. This implies that increase in oil sector tend to decrease gross domestic product by 259.4736 in the short run.

The result of VECM Granger Casualty in Table 7 revealed that Oil and Telecommunication sectors Granger cause GDP since their p-value < 0.05. Table 8 shows that at period 10 GDP explained itself by 33.4% while Oil and Telecommunication explained GDP by 0.3% and 66.3% respectively.

**Residual Diagnostic Testing**

**Table 9:** VEC Residual Normality Tests

| Component | Jarque-Bera | Df | Prob. |
|---|---|---|---|
| 1 | 13.88491 | 2 | 0.0010 |
| 2 | 35.42221 | 2 | 0.0000 |
| 3 | 4.571393 | 2 | 0.1017 |
| Joint | 53.87852 | 6 | 0.0000 |

*Source: E-EVIEWS 10 output*

**Table 10:** VEC Residual Serial Correlation LM Tests

| Lag | LRE* stat | df | Prob. | Rao F-stat | df | Prob. |
|---|---|---|---|---|---|---|
| 1 | 23.13951 | 9 | 0.0059 | 4.541403 | (9, 12.3) | 0.0082 |
| 2 | 13.04266 | 9 | 0.1607 | 1.753023 | (9, 12.3) | 0.1778 |
| 3 | 24.97590 | 9 | 0.0030 | 5.268900 | (9, 12.3) | 0.0044 |
| 4 | 17.64937 | 9 | 0.0395 | 2.808338 | (9, 12.3) | 0.0477 |
| 5 | 9.115867 | 9 | 0.4266 | 1.066787 | (9, 12.3) | 0.4465 |
| 6 | 17.97332 | 9 | 0.0355 | 2.894758 | (9, 12.3) | 0.0432 |
| 7 | 23.67154 | 9 | 0.0049 | 4.743552 | (9, 12.3) | 0.0068 |
| 8 | 13.03557 | 9 | 0.1610 | 1.751623 | (9, 12.3) | 0.1781 |

*Source: E-EVIEWS 10 output*

**Table 11:** VEC Residual Heteroskedasticity Tests

| Joint test: | | |
|---|---|---|
| Chi-sq | df | Prob. |
| 209.8746 | 192 | 0.1790 |

*Source: E-EVIEWS 10 output*

The results of residual diagnostic test (VECM residual Normality, serial correlation LM, heteroskedasticity test) were presented in Table 9, 10 and 11 respectively. The results as presented in Table 9 indicates that the residuals are normally distributed at 3rd component (p-value = > 0.05). Also, table 10 reveals that there is no serial correlation in the residual of the estimated VECM model at lag 2, 5 and 8 (p-value > 0.05). Furthermore, table 11 revealed that the variance of the residuals of the estimated VECM model are constant (p-value = 0.1790 > 0.05). This implies that there is no evidence of

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Heteroskedasticity in the residuals of the estimated model.

## CONCLUSION AND RECOMMENDATIONS

The unit root test using ADF revealed that all variables under investigation are not stationary. However, becomes stationary at first difference. Johannsen cointegration test showed an existence of 2 cointegrating equations, which is indicated by both the trace and maximum eigenvalue test. The results of the VECM revealed that oil sector has significant positive impact on gross domestic product in the long run. However, telecommunication sector has negative and significant impact on gross domestic product in the long run. The ECT affirms a priori expectation as the coefficient is negative and has a p-value that is statistically significant at 5% level. The ECT of – 0.1440 implies that an impulse to gross domestic product in the current period will be restored at a speed of adjustment of about 14.4% in the next period. Thus, this study concludes that oil and telecommunication sectors have positive and significant impact on gross domestic product in Nigeria for the study period.

Based on these findings, it was recommended that government should implement and be consistent with policies that would bring about sustainable growth in the telecommunication sector which will in turn contribute positively to gross domestic product. It was recommended also that government should reexamine its telecommunication sector by way of increasing tax base and introducing new taxes in such a way that it does not distort the working of the economy but to increase the economic growth.

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