

ANALYSIS OF OIL REVENUE AND THE NIGERIAN CAPITAL MARKET: A VECTOR AUTOREGRESSION APPROACH

BABARINDE, Gbenga Festus

Department of Banking and Finance,
Modibbo Adama University, Yola, Nigeria
liftedfgb@gmail.com; 08060801953 (corresponding author)

SULEIMAN, Moses Baidu

Department of Accountancy,
Federal Polytechnic Mubi, Nigeria
baidumoses@gmail.com

ABDULMAJEED, Tajudeen Idera

Department of Banking and Finance,
Nasarawa State University, Keffi, Nigeria
Idera4ever@yahoo.com

ABSTRACT

It is expected that revenue generated by the government should be used to grow both the real and financial sectors of the economy. The extent to which capital market as an engine room for capital formation and economic growth, is impacted by government oil revenue is a subject worthy of consideration especially in an oil-dependent country such like Nigeria. Therefore, this study applied Vector Autoregression (VAR) technique to the analysis of the nexus between oil revenue and market capitalization of the Nigerian Stock Exchange. Based on secondary data obtained from Central Bank of Nigeria's statistical bulletin for the period 1981 to 2020, the study attests to lack of long-run relationship between oil revenue and stock market capitalization in the country. Therefore, in the short-run, oil revenue has positive but non-significant impact on capital market capitalization in Nigeria. Inference from the VAR analysis reveals that there is no causal relationship between oil revenue and stock market capitalisation in Nigeria. By this analysis, oil revenue is shown to have the potential of promoting the expansion of Nigeria's capital market, but the potential seems not to be presently harnessed so as to be significantly impactful. It is thus concluded that oil revenue exerts no significant impact on capital market performance in Nigeria even though both are positively correlated. It is recommended that a greater portion of oil revenue of Nigeria should be ear-marked for developing institutions, policies, programmes, and infrastructures capable of stimulating the growth of the Nigerian capital market.

Keywords: Capital market, Market capitalization, Oil Revenue, Vector Autoregression

INTRODUCTION

The stock market is an aspect of the financial system which mobilizes and channels long-term funds for economic growth; and it is one of the means through which foreign funds are injected into most economies (Ojikutu, Onolemhemen & Isehunwa, 2017). The capital market is thus a barometer of the health of an economy, apart from serving as a platform for economic agents to raise investible capital in the form of shares, bonds, loan stocks, debentures, etc.

The petroleum industry is a major source of revenue generation for the government of Nigeria and a contributor to gross domestic product (Ojikutu *et al.*, 2017). After the discovery of oil at Oloibiri area of Bayelsa State, in 1956 by Shell BP, oil has remained a major source of energy and income in Nigeria. Although, the Nigerian oil industry began commercial extraction in 1956, it was not until the end of the Nigeria civil war (1967-1970) that the oil industry began to play a prominent role in the economic life of the country (Efanga, Ugwuanyi, & Ogochukwu, 2020). The public sector is believed to have active role to play in the economy of any nation. One weapon by which the government fulfil this role is through its revenue generated from various sources. In an oil producing and dependent country such as Nigeria, the oil revenue constitutes a major means for financing government operations and by extension facilitates various institutional reforms, capacity building, implementation of government policies towards the enhancement of real and financial sector growth.

However, the dwindling nature of global oil prices in recent times affect oil revenue of different oil producing countries and this has brought to fore, the need to evaluate the effect of oil revenue on different aspects of the Nigerian economy (Onyeke, Nwakoby, Onwumere, Ihegboro, & Nnamani, 2020). Oil and gas industry is an important sector of the economy, given its ability to provide gainful employment and contribute to basic services like security, health and education, and servicing of foreign debts in addition to being a viable source of foreign exchange earnings (Babarinde, 2021b). Despite these contributions, there seems to be little empirical studies on the role of oil revenue in capital market in an oil dependent country such as Nigeria. Therefore, this study is an attempt to fill the gap by examining the connection between oil revenue and capital market performance in Nigeria for the period 1981 to 2020. Specifically, this study aims to determine whether or not there is long-run relationship between oil revenue and Nigerian capital market and evaluate the impact of oil revenue on the size of the Nigerian capital market.

LITERATURE REVIEW

The stock market is a segment of the financial market where long-term loanable funds packaged in the form of securities, such as shares, stocks, bonds, debentures, loan stocks, and derivatives, are traded (Babarinde, Abdulmajeed, Mohammed & Shuaib, 2020). The capital market could also be described as a financial market where medium to long term funds are exchanged by the deficit and surplus economic units; hence, the stock markets provide an avenue for raising capital which are employed in the real sector for trade and investment and by implication, the market encourages business growth and ultimately economic growth (Babarinde, 2021a).

Capital market variables such as market capitalisation simply refers to total market values of all securities listed on the capital market at each point in time; and mathematically, market capitalisation is a product of prices and number of securities listed on the Exchange (Babarinde, 2021a; Ojikutu *et al.*, 2017). Market capitalization is also a measure of the size of the market. However, stock market size can also be measured by the number of listed companies in the stock exchange and the volume of stocks traded in each period (Ojikutu *et al.*, 2017). Statistics from the statistical bulletin produced by Central Bank of Nigeria [CBN] (2020) shows that as at 1981, the market capitalization in the Nigerian Stock Exchange stood at ₦5billion while in 1990, market capitalization had increased to ₦16.30billion. However, in 2000, market capitalization became ₦472.30billion unlike in 2010 when ₦9,918.21billion was the figure for the market capitalization in the Nigerian Stock Exchange. In 2020, market capitalization stood at ₦38,589.58billion (CBN, 2020).

Oil revenues are revenues from the sale of crude oil and gas exports, receipts from petroleum profits tax as well as royalties and revenue from domestic crude oil sale (Udeh, 2021; Ihendinihu Jones, & Ibanichuka, 2014). Oil revenue is dependent on the price of crude, oil measurement, volume traded and quality of crude extracted (Wright & Gallun, 2008). The price of crude oil is a key factor for oil revenue and it is very volatile in the international market due to factors such as politics, pressure of demand and supply etc. Nigeria, a member of the Organization of Petroleum Exporting Countries (OPEC), has obligation to adhere to crude supply regulation by the organization. In times of low price, OPEC cuts supply to force the price up and vice versa (Udeh, 2021). Oil revenue sometimes could be influenced by the nature of the crude. For example, sour crude oil requires more refining and processing than sweet crude, hence, sells for a lower price (Wright & Gallun 2008). Statistics shows that as at 1981, the oil revenue of the Government of Nigeria was ₦8.6billion while in 1990, the total revenue generated from oil and gas in Nigeria increased to ₦71.9billion. In 2000, oil revenue got to ₦1591.7billion as against the 2010 figure of ₦5,396.1billion. In 2020, the total revenue generated from oil and gas in Nigeria was ₦4,732.5billion (CBN, 2020).

Empirically, Kelikume and Muritala (2019) examined the impact of oil price on African stock markets of five selected oil producing countries. The study confirms the existence of an adverse effect of oil prices on stock markets in Africa while economic growth positively influences stock returns in the selected African countries. Nkukuu (2012) examined the effects of government budget balance on the performance of securities listed on the Nairobi Securities Exchange. The study shows a weak negative relationship between budget balances and performance of companies listed on the Nairobi securities exchange. Ofori-Abebrese (2016) investigated the impact of macroeconomic policy on the development of the Ghana Stock Exchange. The study concludes that government revenue and exchange rate have negative impact on stock market development in Ghana unlike government expenditure and government borrowing interest rate which exert no influence on stock market development in the country.

Also, Alamgir and Amin (2021) examined the interactive link between oil prices and stock market in 4 selected South Asian countries and found a positive asymmetric relationship between world oil price and stock market index. Ilijevski (2015)'s study established that stock markets positively influence government's ability to raise tax revenue in a panel of 96

countries of the world. Specifically, Ilievski shows some evidence that a stock market total value traded positively correlates with tax revenue collection. Algia and Abdelfatteh (2018) investigated the impact of structural shocks from oil price change on stock market returns in emerging and developed countries. The authors conclude that financial shocks from oil price changes adversely impact stock prices of all developed countries but only for one emerging one (Brazil).

Similarly, Ojikutu *et al.* (2017) investigated the nexus between oil price, exchange rate and stock market performance in the Nigerian context. The study indicates that crude oil price has insignificant effect on the performance of stock market in the country. In a related study, Abubakar, Ahmad, Sani and Jinjiri (2016) investigated the impact of oil revenue on the Nigerian economy and found that changes in oil prices are important in explaining stock price movements. Furthermore, findings of Ogiri, Amadi, Uddin, and Dubon (2013) on the nexus between oil prices and stock market performance indicate that change in oil price is a significant determinant of stock price changes in the Nigerian stock market.

Additionally, Efang, Ugwuanyi and Ogochukwu (2020) analyzed the impact of oil revenue on Nigeria's economic growth. The results of the study indicate that oil revenue has positive and significant impact on economic growth of Nigeria. Abeng (2016)'s study focused on the impact of oil price fluctuation on sector level activities of stock market returns for the banking, insurance, food beverages and tobacco, oil and gas and industrial sectors in Nigeria. The results suggest that changes in oil prices significantly affect stock returns of all the sectors, except the food and beverages and tobacco sector. Omoregie (2019) reappraised Nigeria's petroleum sector's relationship with the economy of Nigeria and posits that the missing link between the petroleum sector and Nigeria's GDP growth is the country's petroleum refining capacity.

Furthermore, Asaolu and Ilo (2012) investigated the relationship between the Nigerian stock market return and world crude oil price; and confirm the existence of a long-run inverse connection between oil price and Nigerian stock market return. Omodero and Ehikioya (2020) evaluated the role of oil and non-oil revenues in improving infrastructural development in Nigeria; and reveal among others, that oil revenue has a significant negative impact on infrastructural provisions unlike non-oil revenue which exerts a significant positive impact on infrastructural development in the country. Olufisayo (2014) examined the relationship between changes in oil prices and stock market growth in Nigeria and reports that a unidirectional causality runs from oil price change to stock market development and the impulse response function shows that oil price has a temporary positive impact on stock market. From the variance decomposition, the study also shows stock market development to be very dependent on shock in oil price change.

In summary, the review above exposes the gap in literature on the nexus between oil revenue and capital market performance, such that most of the extant studies focused mostly on oil prices and their relationship with stock market performance. This shows a scarcity of studies that specifically focus on oil revenue and capital market performance, most especially, in an oil dependent cum developing economy like Nigeria.

METHODS

This study aims to investigate the nexus between oil revenue and market capitalization in the Nigerian Stock Exchange between 1981 and 2020. The time series data employed in this study being secondary in nature, were analyzed via econometric techniques situated within the Vector Autoregression (VAR) model. A six-step estimation procedure was adopted in the study. Firstly, description of the data via descriptive statistical test was carried out. This is considered necessary as to have a preliminary understanding of the statistical behavior and pattern of the variables of the study. In addition to the descriptive statistics, unit root tests via the Augmented Dickey-Fuller and Phillips-Perron tests as well as the break point unit test were applied to the annual time series data to avoid spurious regression results. Thereafter, the cointegration test was another preliminary test conducted. Hence, this study applied the Engle-Granger cointegration test in ascertaining whether or not there is cointegration between oil revenue and market capitalization in the Nigerian Stock Exchange. Fourthly, the VAR model was employed to determine the nexus between oil revenue and market capitalization in the Nigerian Stock Exchange. Aside, the impact and relationship analysis, causality between oil revenue and market capitalization in the Nigerian Stock Exchange was also inferred from the VAR analysis. Fifthly, the Impulse Response analysis within the VAR model was carried out to uncover the response of the variables to shocks/innovations in itself, as well as other variables of study. Finally, the Variance Decomposition analysis was carried out to uncover the contribution of the variable to variation in other variables.

In this study, data on both variables of study market capitalization (MCAP) and oil revenue (OILREV) were sourced from Central Bank of Nigeria (2020)'s statistical bulletin. Oil revenue is the Nigeria's total revenue generated from oil sector of the economy in form of sales of crude oil, licensing, etc. Market capitalization is a representation of the market size. Both variables are expressed in billion Naira.

RESULTS AND DISCUSSIONS

Descriptive Statistics

The descriptive statistics of the market capitalization (MCAP) of the Nigerian Stock Exchange and oil revenue of the federal government of Nigeria (OILREV) as presented in Table 1 show the respective average value for the series over the 40 years' period of study (1981-2020) to be ₦6409.438billion and ₦2487.908billion which is less than their respective standard deviation values (9367.791 and 2712.812). This signifies that the two series are relatively widely dispersed from their mean values. While MCAP ranges between ₦5billion and ₦38589.58billion; the corresponding minimum and maximum values for OILREV stands at ₦7.3billion and ₦8879billion respectively. Based on the Jarque-Bera test of normality, only one of the variables (OILREV) attains normality while the other (MCAP) are not normally distributed.

Furthermore, a look at the Pearson correlation coefficient shows a strong and positive correlation (0.7176) between oil revenue and stock market capitalisation in Nigeria and the relationship is significant at 1% level.

Table 1: Summary Statistics and Correlation Coefficients

	Descriptive Statistics					Correlation Matrix		
	N	Mean	Min.	Max.	Std. Dev.	Jarque-Bera	MCAP	OILREV
MCAP	40	6409.438	5.0000	38589.58	9367.791	21.2898*	1.0000	
OILREV	40	2487.908	7.3000	8879.000	2712.812	4.4738	0.7176*	1.0000

Source: Authors' computation, 2021. **Note:** * denotes significant at 1% due to the fact the p-value is less than 0.01. (2021).

Unit Root Tests

Table 2 presents the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests' results indicating the non-stationarity of market capitalization and oil revenue at level. However, after first differencing of both variables, they became stationary. Hence, the two series are integrated of order one.

Table 2: Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) Unit Root Tests

Variable	Test at Level	Remarks	Test at First Difference	Remarks	I(d)
	t-statistics		t-statistics		
ADF:MCAP	2.7967 [0.1000]	Not stationary	-3.5938 [0.0106]**	Stationary	I(1)
ADF:OILREV	-2.5939 [0.1050]	Not stationary	-5.5074 [0.0001]*	Stationary	I(1)
PP:MCAP	4.1114 [1.0000]	Not stationary	-3.4766 [0.0142]**	Stationary	I(1)
PP:OILREV	-1.3998 [0.5725]	Not stationary	-6.6257 [0.0000]*	Stationary	I(1)

Source: Authors' computation, 2021. Note: Values in [] represent the probability values while * and ** denotes stationarity at 1% and 5% because we can reject hypothesis of unit root in the series. (2021).

In addition to the conventional unit root tests (ADF and PP) conducted on the variables, this study went ahead to examine the unit root properties of the variables in the face of possible structural changes (breaks). This was carried out using the ADF break point unit root tests and the results are reported in Table 3. This test is necessary in time series studies that are of long duration and most especially when the variables are macro-economic in nature. The merit of this study is that it helps to avoid conclusion of stationarity in case the variables are subjected to structural breaks. Furthermore, the test helps to identify the specific date in which the particular variable is possibly affected by structural changes.

Table 3: Breakpoint Unit Root Test: Augmented Dickey-Fuller Test Statistic

	Test	Test Critical Values :			Prob.	Break date	Remarks
	Statistic	1% level	5% level	10% level			
MCAP: Level	0.3371	-4.9491	-4.4436	-4.1936	> 0.99	2017	Not Stationary
OILREV: Level	-4.1585	-4.9491	-4.4436	-4.1936	0.1092	2019	Not Stationary
MCAP: 1 st Diff	-6.1194	-4.9491	-4.4436	-4.1936	< 0.01*	2019	Stationary
OILREV:1 st Diff	-6.5877	-4.9491	-4.4436	-4.1936	< 0.01*	2015	Stationary

Source: Authors' estimation

Note: * denotes stationarity at 1%

In tune with the results of the conventional unit root test reported in Table 3, the ADF break point unit root tests also indicate both market capitalization and oil revenue to be non-stationary in level, but both variables attain stationarity at first difference. At stationarity, the identified break date for market capitalization and oil revenue are years 2019 and 2015 respectively.

The ₦25,890.22billion market capitalization for 2019 happened to be the highest from 1981 till 2018. The next in line which was ₦21,904.04 in 2018 and the 2019 figure still exceeded it by 43 per cent. Year 2019 is the year preceding the year of novel coronavirus disease but surprisingly, even in 2020, there was an increase in market capitalization in the Nigerian capital market to ₦38,589.58billion against the 2019 figure of 25,890.22billion.

In terms of oil revenue in 2015 whose figure stood at ₦3,830.1billion is less than that of 2014 figure of ₦6,793.8billion by 23 per cent. However, in 2016, the oil revenue increased to ₦4,109.8billion. In Nigeria, 2015 coincided with the year of political elections in the country.

Cointegration Test

This study applied both Engle-Granger cointegration and Johansen cointegration tests in examining the existence of cointegration between oil revenue and market capitalization in the Nigerian Stock Exchange. Tables 4 contains the Engle-Granger cointegration test's results respectively. The test, due to the fact that we cannot reject the null hypothesis that the series are not cointegrated, attests to lack of cointegration between oil revenue and stock market capitalization in the Nigeria. This implies that there is no long-run relationship between oil revenue and stock market capitalization in the Nigeria between 1981 and 2020.

Table 4: Engle-Granger Cointegration Test

Dependent	tau-statistic	Prob.	z-statistic	Prob.
MCAP	-0.016888	0.9879	-0.092484	0.9871
OILREV	-1.879525	0.5945	-8.880380	0.3896
Null hypothesis: The series are not cointegrated				

Source: Authors' computation (2021).

Vector Autoregression Model Estimation

This study applied Vector Autoregression (VAR) technique in estimating the short-run relationship between oil revenue and capital market size in Nigeria as suggested by the preliminary tests of stationarity and cointegration. The estimates of the VAR model as presented in Table 5 indicate that in the short run, oil revenue positively aligned (0.123157) with market capitalization but the relationship is statistically non-significant (given a probability value of 0.6274). This suggests that oil revenue has a short-run positive but non-significant impact on capital market size in Nigeria. In other words, the higher the oil revenue, the greater the tendency of the coast of the Nigerian capital market to enlarge, all other things being equal. This position is based on the notion that higher oil revenue is used judiciously to improve the economy generally and particularly in developing programmes, initiatives, policy implementation, infrastructure capable of facilitating the growth of the capital market; the greater the tendency the capital market to expand in size.

In the same vein, according to the VAR estimates in Table 5, the positive (0.023280) short-run impact of market capitalization on oil revenue in Nigeria is not statistically significant, considering the probability value of 0.5587. Generally, it can also be inferred from the VAR analysis that there is no causal relationship between oil revenue and stock market capitalisation in Nigeria. In other words, stock capital market size and oil revenue are independent of each other. By this analysis, oil revenue is shown to have the potential of promoting the expansion of capital market in Nigeria but the potential seems not to be presently harnessed so as to be significantly impactful.

Table 5: Vector Autoregression (VAR) Estimates

		MCAP	OILREV
MCAP(-1)	Coefficients	1.1176	0.0232
	Standard errors	(0.0873)	(0.0396)
	t-statistics	[12.8011]	[0.5875]
	Probability values	0.0000***	0.5587
OILREV(-1)	Coefficients	0.1231	0.8472
	Standard errors	(0.2526)	(0.1146)
	t-statistics	[0.4874]	[7.3884]
	Probability values	0.6274	0.0000***
C	Coefficients	33.1996	362.4731
	Standard errors	(571.707)	(259.466)
	t-statistics	[0.0580]	[1.3970]
	Probability values	0.9539	0.1667
R-squared		0.9253	0.8147
Adj. R-squared		0.9211	0.8044

Note: *** denotes statistically significant at 1%.
 Source: Authors' computation, 2021.

Impulse Response Functions

The Impulse Response Functions (IRFs) in Fig.1 show that market capitalization (MCAP) responds positively to own shock and shock to oil revenue (OILREV). Likewise, oil revenue responds positively to own shock and to shock in market capitalization.

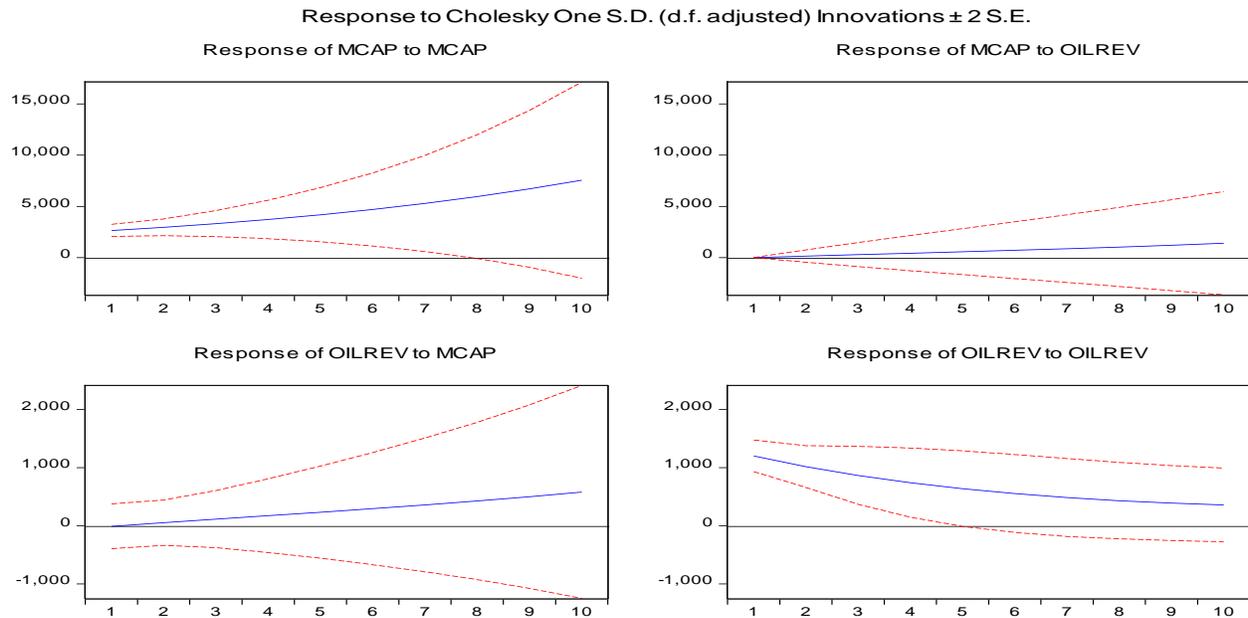


Fig. 1: Impulse Response Functions
 Source: Authors' estimation (2021).

Variance Decomposition Outputs

The results of the Variance Decomposition analysis which provides estimates, in percentage, of the contribution of each variable to own variation and the portion explained

by shocks emanating from other variables, are presented in Table 6. Panels I and II of the Table contain the variance decomposition estimates of market capitalization and oil revenue respectively. In Panel I of Table 6, in period one, the variation in market capitalization is due wholly to own contribution while oil revenue did not contribute to explaining the variation in market capitalization. With variance decomposition estimates of 97.69807 and 2.301933 in the 10th period, for market capitalization and oil revenue respectively, it can be said that 98 per cent variation in market capitalization is occasioned by own shocks while the remaining 2 per cent is caused by shocks emanating from oil revenue. The implication of this discovery is that shocks from oil revenue are negligible to explain a significant variation in market capitalization in the Nigerian stock Exchange in the short run.

Furthermore, according to Panel II of Table 6, in the first period, 0.007411 and 99.99259 are the variance decomposition coefficients for oil revenue and market capitalization respectively. This suggests that almost all the variations in oil revenue are accounted for by shocks in oil revenue while less than 0.01 per cent changes in oil revenue could be explained by market capitalization. In the 9th period, market capitalization contributed about 13 per cent (12.88882) to variation in oil revenue while the remaining roughly 87 per cent (87.11118) changes was due to own shock. This implies that in the short run, oil revenue explains a significant portion of variation in itself with very little caused by external factor such as market capitalization.

Table 6: **Variance Decomposition Outputs**

Period	I			II		
	Variance Decomposition of MCAP			Variance Decomposition of OILREV		
	S.E.	MCAP	OILREV	S.E.	MCAP	OILREV
1	2648.190	100.0000	0.000000	1201.867	0.007411	99.99259
2	3973.278	99.86123	0.138772	1576.067	0.116901	99.88310
3	5181.381	99.60336	0.396637	1801.934	0.487408	99.51259
4	6391.071	99.28306	0.716936	1955.858	1.199990	98.80001
5	7655.451	98.93880	1.061198	2070.304	2.342524	97.65748
6	9009.200	98.59571	1.404290	2163.188	4.005146	95.99485
7	10480.52	98.26938	1.730620	2245.925	6.273428	93.72657
8	12095.62	97.96872	2.031281	2326.613	9.219117	90.78088
9	13880.83	97.69807	2.301933	2411.556	12.88882	87.11118
10	15863.81	97.45872	2.541279	2506.098	17.29194	82.70806

Source: Authors' estimation (2021).

CONCLUSION AND RECOMMENDATIONS

This study examined the nexus between oil revenue and capital market performance in Nigeria between 1981 and 2020 using Vector Autoregression (VAR) analytical technique. Results from data analyses reveal no long-run relationship between oil revenue and capital market size in Nigeria. It was also uncovered that oil revenue has a strong positive correlation with market capitalization in the Nigeria Stock Exchange. The estimates of the VAR Vector model indicate that oil revenue has a short-run positive but non-significant impact on capital market performance in Nigeria. Similarly, there is a positive but non-significant short-run impact of market capitalization on oil revenue in Nigeria. Generally, this indicates a non-causal relationship between oil revenue and stock market capitalization in Nigeria. The Impulse Response Functions show that market capitalisation responds

positively to own shock and shock to oil revenue. Likewise, oil revenue responds positively to own shock and to shock in market capitalization. The results of the Variance Decomposition analysis provide that shocks from oil revenue are negligible to explain a significant variation in market capitalization in the Nigerian stock Exchange in the short run, rather, stock market capitalization explains a significant portion of variation in itself. Furthermore, in the short run, oil revenue explains a significant portion of variation in itself with very little caused by external factor such as market capitalization.

It is therefore concluded that oil revenue does not have significant impact on market capitalization in the Nigerian Stock Exchange. The study recommends increased listing of more oil and gas firms on the Exchange. A greater portion of the oil revenue of Nigeria should be ear-marked for developing institutions, policies, programmes, and infrastructure capable of stimulating the growth of the Nigerian capital market.

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