IMPACT OF CRUDE OIL REVENUE ON FOREIGN RESERVE IN NIGERIA (2000-2017)

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Abstract

The study examines impact of crude oil revenue on foreign revenue in Nigeria using quarterly data from 2000 to 2017. Data were sourced from Central Bank of Nigeria (CBN) Statistical bulletin, while Foreign Reserved (FR), Exchange Rate (ER) and Inflation Rate (IR) were sourced from World Bank journal 2016. The major findings of the study reveal among others, that in the long-run there is equilibrium among oil revenue, exchange rate, foreign reserve and inflation rate. The short-run analysis indicates that foreign reserve measured by crude oil revenue, exchange rate and inflation. The impulse response analyses further support the ARDL results. The study, therefore, concludes that foreign reserve is important in explaining the relationship between oil revenue exchange rate and inflation rate in Nigeria. The study recommends that the government should constitute anti-corruption policies to mitigate corruption and to improve crude oil revenue generation in the country in order to ensure sustainable growth per capita, to protect existing investment, and to attract new investment in the country at large.

Keywords: Crude Oil Revenue, Foreign Reserve, Inflation Rate, Exchange Rate

Introduction

The economy of Nigeria depends heavily on export of crude oil at the international market as the major source of government revenue. The oil sector of Nigeria accounts for over 95 percent of export earnings, 85 percent of government revenues in 2016 (Aliyu, 2017). The concentration of the economy on crude oil production has affect agriculture, as the mainstay of the economy, from the early 1950's and 1960's, to the backward (Odularu, 2016). Crude oil price and oil is volatile and it makes the economy vulnerable to external shocks. Falling crude oil price can cause serious strains on Nigerian economy on their ability to borrow from abroad while rising oil prices can be accommodated by economy (Kilian, 2015). Some of the additional revenues as a result of rising oil prices are used to finance imports of refined petroleum products and the balance is shared among the three tiers of Government from the excess crude oil account. Oil price volatility have enough capacity to cause harmful effects on external accounts of a country both for oil importers and exporters,

deranging countries to deplete their reserves and sometimes borrow from abroad to balance trade or exchange rate appreciation for crude oil exporters, (Chuku, 2010). The conversion of crude oil revenue into monetary value has been a major problem in management of liquidity in Nigeria. Measuring liquidity as the narrow and broad money definitions by the Central Bank of Nigeria, which is responsible for keeping liquidity at its disposal so that the key macroeconomic variables such as exchange rate, inflation rate and interest rate are not affected by creating market distortions and inflationary pressure (Biodun, 2012). An excessive deficit fiscal operation which brings increase in crude oil revenue makes authority to engage in silly spending on inappropriate projects, Deficit spending makes economy resort to borrowing from the Central Bank through some instruments, which are converted into short term debts that are quite expensive to service at market rates (Odularu, 2013).

In achieving this objective, the study is divided into five parts. This is an introduction, followed by literature review as the second part. The third part is methodology and the fourth part is result and analysis, while the last part is conclusion and policy implication.

Literature Review

Foreign Reserve referred to as International Reserves, or External Reserves. International reserve can be defined as "consisting of official public sector foreign assets that are readily available to, and controlled by the monetary authorities, for direct financing of payment imbalances, and directly regulating the magnitude of such imbalances, through intervention in the exchange markets to affect the currency exchange rate for other purposes" (IMF, 2007).

Crude Oil is largest among mineral resources produced in Nigeria in commercial quantity. The oil sector serves as the main source of government revenue in the country. The natural gas and oil reserves are mostly found where there are Crude Oil deposit (Onigbinde, 2014).

Exchange rate is amount at which one country currency is change for another. Exchange rate is the price of one country currency to another country. It is the required amount of units of a currency that can buy another amount of units of another currency.

Theoretical Review

Explaining the phenomenon of crude oil revenue in Nigeria has been one of the most enduring issues in Nigerian economy. Dutch disease model described by Corden and Neary in 1982. They assumed a small open economy divided into three sectors – a non-tradable sector determined by domestic demand and supply and two tradable export sectors with internationally given prices, the booming and lagging one. The non – tradable sector represents the domestic supply of services, retail trade or construction. Booming export sector is usually sector exporting natural resources or crops. The lagging sector is traditional export sector in economy producing usually manufacturing or agricultural products.

Empirical Review

Farzanegan and Markwadt (2013) examined the dynamic relationship between asymmetric of price shocks and macroeconomic variables. By applying a VAR approach. Farzanegan and Markwardt (2013) also studied further the effects of oil price shocks on the Iranian economy and found a strong positive between oil price changes and industrial output growth and observe the Dutch disease syndrome through significant real effective exchange rate appreciation.

Guo and Kliesen (2010) also examined the negative and significant effect of oil future prices on future Gross Domestic Product, and discovered that this effect became more significant after oil price changes were also included in the regression to control for the symmetric effect. His findings were in confirmation with Hamilton (1996, 2003) that is, increase in the price of oil matter less as compared to the future uncertainty about the direction of prices. To control for the symmetric effect. As oil price volatility is mainly driven by exogenous events such as significant terrorist attacks and military conflicts in the Middle East and youth restiveness especially in the Niger Delta region in Nigeria. His findings provide economic rationales for Hamilton's (2003) non-linear oil shock measure, as it captures overall effects, both symmetric and asymmetric of oil shocks on output.

Krichene (2009) analyzed the relationship between monetary policy and oil prices within a world oil demand and supply model and discovered that during supply shock, rising oil prices caused interest rates to increase, whereas during a demand shock, falling interest rates caused oil prices to rise. The result further revealed that world economic growth and price stability requires stable oil markets and therefore more prudent monetary policies.

Le Blanc and chinn (2009) estimated the effects of oil price changes on inflation for the United States, United Kingdom, France, Germany, and japan using an augmented Phillip curve framework and found that current oil price increases are likely to have only a modest effect on inflation in the U.S, Japan, and Europe.

However, Saunter and Awerbuch (2009) examined recent research in the area of oil price movements and their effect on economic and financial performance in IEA countries and found that there is negative relationship between oil prices and macroeconomic activity.

Torul (2009) investigate the effects of oil price changes on the real output for a net oil importing small open economy, Turkey, found that the negative response of real output to oil price increases have diminished since the early 2000s.

Odularu (2008) examined the impact of crude oil on the Nigerian economy. The study analysed the relationship between the crude oil sector and the Nigerian economic performance using the Ordinary Least Square regression method. The study found that crude oil consumption and export have contributed to the improvement of Nigerian economy. The study conclude that the production of crude oil (domestic consumption and export) despite its positive effect on the growth of the

Nigerian economy has not significantly improved the growth of the economy, due to many factors like misappropriation of public funds (corruption) and poor administration

Usman, Madu and Abdullahi (2015) examined the impact of petroleum on Nigerian's Economic development. The variables were two, that is, crude oil revenue and the Gross Domestic Product GDP. The study was based on secondary data. Data was sourced from the Central Bank of Nigeria Statistical Bulletin and National Bureau of Statistics. The tool of analysis used was simple linear regression model with the aid of Statistical Packages for Social Sciences (SPSS). The study found that petroleum has a direct and positive significant relationship with the economy.

Amaira Bouzid (1990-2013) assessed the causal relationship between oil prices and economic growth in Tunisia. The empirical analysis starts by analyzing the time series properties of the data which followed by examining the nature of causality among the variables. Tunisia is not oil producing country rather than oil importing country. An increase in oil price decrease economic growth.

Adedoyin, Lawal (2016) examined the impact of both the exchange rate volatility and oil price volatility on stock market volatility in Nigeria, so as to guide policy formulation based on the fact that the nation's economy was foreign induced and mono-culture with heavy dependence on oil. EGARCH estimation techniques were employed to examine if either the volatility in exchange rate, oil price volatility or both experts on stock market volatility in exchange rate, oil price volatility in Nigeria.

Lawal, (2016) examined the impact of both the exchange rate volatility on stock market volatility and oil price volatility on stock market volatility in Nigeria, so as to guide policy formulation based on the fact that the nation economy was foreign induced and mono cultured with heavy dependence on oil. EGARCH estimation techniques were employed to examine if either the volatility in exchange rate, oil price volatility or both experts on stock market volatility in Nigeria.

Ifeanyi O. Nwanna (2014) investigate the impact of crude oil price volatility on economic growth in Nigeria. Multiple regressions were used as a tool for data analysis and the findings revealed that there is positive and significant relationship between oil price and economic growth.

Chuku (2016) assessed the effect of the monetary policy innovation in Nigeria. He opined in his work that correctly identifying the effect of monetary policy innovation is necessary for good policy making. He used a structural vector auto regression (SVAR) model to trace the effects of monetary policy shocks on output and prices in Nigeria for the period 1998:1 to 2013:4. He used three alternative policy instrument i.e broad money (M2), Minimum Rediscount Rate (MRR) and the Real Effect Exchange Rate (REER). Other variables considered are real GDP, CPI, and inflation rates.

Umar and Abdulhakeem (2012) examined oil prices shocks and Nigerian economy, employed a vector auto regressive (VAR) model to examine oil prices shocks. The study was concerned with the effects of recent spikes in crude oil prices in Nigeria. The results showed that oil prices significant impact on real GDP, money supply and unemployment. Its impact on consumer price index was not significant; the study concluded that the Nigerian economy is vulnerable to external shocks which could be minimized via diversification of the economy.

Adam and Goderis (2011) examined the long history of mismanagement of oil boom in Nigeria. According to them, without support of a disciplined and broadly predictable fiscal stance. Central bank cannot make credible comments to an inflation target, they however believed that the successful consolidation of the financial sector in 2005 and the unification of foreign exchange rate market in 2006 and measures such as the fiscal responsibility bill in the National Assembly have laid the foundation for improved fiscal management of oil revenue.

Eravwoke, Alobari and Ukavwe (2014) examined crude oil export and its impact in developing Countries: A case of Nigeria. The objectives of the study centered on empirical investigation of crude oil export and it impact on growth of the Nigerian economy. The study used ordinary least squares regression method. Augmented Dickey Fuller unit root co- integration test and short run dynamics. Data was collected from secondary sources, such as the central bank of Nigeria, Nigeria bulletin, Bureau of statistics, journals and text book

Akpan, (2015) examined oil price shocks and Nigeria's macro economy using VAR model for the period 1975 to 2015, He was also concerned about the effects of recent rise in crude oil prices on some macroeconomic variables. The study considered these variables; inflation rates derived from CPI, real oil. The result of the study suggests that oil prices significantly increase inflation and also directly increase real national income through higher export earnings.

Ayadi, (2005) examined the effects of oil production shocks for Nigeria as a net exporter of oil over the 1975-2005 periods. The study revealed the positive response of output after a positive oil production shock however, they notice that the response of inflation is negative after a positive oil production shock, to the extent that an oil price increase leads to an oil production increase. Therefore the response suggests that output increases, inflation decrease and the national currency depreciate following a positive oil price shock.

In a related study, Olomola and Adejumo (2006) employed the vector auto regression (VAR) method, using quarterly data from 1970 to 2006 to examine the effect of oil price shock on macroeconomic activity in Nigeria. They considered the following variables in the structural VAR. model namely; real GDP proxied by index of industrial production (y), domestic price level measured by CPI, real exchange rates, and real oil prices. The result revealed that oil price shock does not affect output and inflation in Nigeria.

Aliyu, (2014) assessed the impact of oil price shock and real exchange volatility on real economic growth in Nigeria using quarterly data from 1986Q1 to 2007Q4. The study found unidirectional causality from oil price to real GDP and bidirectional causality from real exchange rate to real GDP. Finding further show that oil price shock and appreciation in the level of exchange rate exert positive impact on real economic growth in Nigeria. They concludes that diversification of economy through investment is key factor to promote the productive sectors of economy to guard against the vicissitude of oil price shock and exchange rate volatility.

Olusegun (2008) examined crude oil price and the Nigerian economic performance **the** period 1970 to 2008. The result of the study shows that crude oil consumption and exports have contributed to the improvement of the Nigerian economy. However, the study concluded that despite the positive effect of crude oil consumption and exports on real output, it has not significantly improved the economy.

Methodology
Model Specification
In order to empirically analyze impact of crude crude oil revenue on foreign reserve in Nigeria, the study adopted Dutch Disease model developed by Corden and Neary in 1982.

$$FR_t = f(EXR_t, COR_t, IR_t),\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Equation (1) is rewritten in log form and to account for the stochastic property of the model as follows;

$$LFRt = \beta_0 + \beta_1 LCOR_t + \beta_2 LEXR_{t+} \beta_3 LIR_t + U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

The conditional variance of the model is giving as;

$$\delta^2 = c + \alpha\varepsilon^2_t + \beta\delta^2_{t-1} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots.. (3)$$

Where:
COR = Crude Oil Revenue
FR = Foreign Reserve
EXR = Exchange Rate
IR = Inflation Rate
U_t = Random or error terms of the mean equation at time t
β_1 (i = 1, 2…3) = elasticity coefficients of the variables
ε_1 = error disturbance term of Ut at time t

Estimation Techniques
This section describes the estimation procedure used by the study which includes; stationarity test, ARDL bound test for cointegration, and error correction model.

Presentation and analysis of Result
Stationarity Test- ADF Unit Root Test
Before estimating our models, it is pertinent to start by testing the stationarity of the variables of the study because ARDL bound test approach to cointegration could not be applied to I (2) variables. To this end, the study employed ADF unit root tests which include both trend and intercept under the null hypothesis that the variables are not stationary at 5% level of significance. The result of the ADF test presented in table 1 shows that most of the variables are stationary at their first difference FR which is stationary at level.

Table 1: Stationary Test: ADF unit Root

	ADF Method			Phillips Perron Method		
	Level			**1st Difference**		
Variables	**ADF Stat** level	**Critical Value** 1st	**Inference**	**ADF Stat** level	**Critical Value** 1st	**Inference**
COR	-1.990945NS	-10.23724*		-1.909507NS	-10.32160*	
ER	-1.152022NS	-6.532314*		1.875975NS	-7.190662*	
LOG(FR)	-1.898702NS	-7.053164*		-2.163023NS	-11.89487*	
IR	- 3.110188**		-3.304109**			

Source: Author's Computation

Note: ADF unit root test include trend and intercept. NS means not significance (*) and (**) indicate 5% and 10% level of significance respectively.

Estimation of the Model

Having estimated the unit root test, some variables are stationary at levels while some are stationary at first difference, the Auto-Regressive Distributive Lag model (ARDL) will be the appropriate technique for this study. Before estimating the ARDL model there is need to conduct model selection criteria.

In order to estimate the impact of crude oil revenue on foreign reserve in Nigeria, various model selection criteria suggest that LR, FPE, AIC, SC and QH. The maximum lag for this model is lag three. While SC suggests that the maximum lag is two. Therefore we are going for the majority as presented in table.

Table 2: Model Selection Criteria

LAG	LR	FPE	AIC	SC	HQ
0	NA	20749.44	21.29178	21.35989	21.31937
1	2500.352	0.035619	8.016571	8.357123	8.154510
2	111.8718	0.022782	7.569430	8.182424*	7.817721
3	49.58219*	0.020399*	7.458417*	8.343853	7.817060*

Source: Author's Computation using e-views 7.1. *LR: Sequential modified LR test statistics (each at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: schwarz information criterion, HQ: Hannan-Quinn information criterion*

Table 3: Bound Test Cointegration Result Dependent Variable: Foreign Reserve.

Tests-statistic		Value		K
F-statistic		4.37		3
Significance		I(0) Lower bound		I(1) Upperbound
10%		2.72		3.77
5%		3.23		4.35
2.5%		3.69		4.89
1%		4.29		5.61

Source: Author's Computation using e-views 7.1.

Note: K is the number of independent variables in the ARDL model.

The bound test cointegration developed by Pesaran et al. in Table 3 shows evidence of cointegration as the F-statistic (4.37) is greater than the upper (4.35) and the lower bound (3.23) at the 5% significance level. This implies the rejection of the null hypothesis of no long-run relationship among the variables. This result indicates that there is a long run relationship among oil revenue, exchange rate, and inflation rate over the study period in Nigeria. This is contrast with the results by Mustapha and Masih for Nigeria. They found no cointegration among oil revenue, exchange rate, agricultural output, and corruption used in their study.

As a result of the presence of cointegration among oil revenue, exchange rate and inflation we proceed

to the short run, the error correction term (ECM), and the long-run estimate of the impact of crude oil revenue on foreign reserve in the sample country.

The table 3 shows that in the long run, crude oil revenue has positive but insignificant impact on foreign reserve in Nigeria at 5% level of significance as the probability value in parenthesis is above 5%. As crude oil revenue increases by 1%, foreign reserve, exchange rate and inflation increases by

0.41% in the long run. This implies that there is no evidence of long run negative effect of crude oil revenue on foreign reserve in Nigeria. This finding is inconsistent with Dauda (2012), model two, which shows that crude oil revenue has negative and statistically significant impact on the growth of the economy of Nigeria in the long-run; but consistent with Bloom and Mahal (2009) who found that crude oil revenue has insignificant effect on the growth rate of per capita income.

Table 4: Parsimonious Error Correction Model to Estimate the Impact of Crude Oil Revenue on foreign reserve in Nigeria

Dependent Variable: D(FR)
Method: Least Squares
Date: 07/07/18   Time: 02:54
Sample (adjusted): 2010M05 2017M08
Included observations: 88 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.000239	0.000613	-0.389467	0.6980
D(COR(-2))	0.000121	9.00E-04	1.345260	0.0824
D(COR(-3))	0.000106	8.73E-04	1.919378	0.0264
D(ER(-1))	0.000147	7.79E-05	1.884966	0.0632
D(ER(-2))	-8.62E-05	7.38E-05	-1.167715	0.2465
D(LOG(FR(-1)))	-0.012897	0.014182	-0.909407	0.3659
D(I(-1))	5.19E-05	4.95E-05	1.048728	0.2975
D(I(-3))	-7.50E-05	4.75E-05	-1.581326	0.1179
D(FR(-1))	1.064732	0.409361	2.600963	0.0111
ECT(-1)	-1.151795	0.425573	-2.706460	0.0084

R-squared	0.217863	Mean dependent var		0.000909
Adjusted R-squared	0.127617	S.D. dependent var		0.004676
S.E. of regression	0.004367	Akaike info criterion		-7.922619
Sum squared resid	0.001488	Schwarz criterion		-7.641103
Log likelihood	358.5952	Hannan-Quinn criter.		-7.809203
F-statistic	2.414091	Durbin-Watson stat		2.005549
Prob(F-statistic)	0.017916			

Source: Author's Computation using e-views 7.1

Crude oil revenue in the last two periods the coefficient is positive significant at 10% so also at last three quarters the coefficient is positive and statistically significance at 5%. If the crude oil revenue increases other things being equal it leads to inflation. Therefore, if there is increase in the price of crude oil at international market the dollar in Nigerian account would increase which can bring appreciation to the Nigerian currency. Increase in the crude oil revenue other things being equal; it would increase the amount of foreign reserve, exchange rate in Nigeria economy. If crude oil revenue increases other things remain the same the liquidity in the economy would increase so much money in the economy which can lead to inflation.

The result of the parsimonious error correction model shows that the coefficient of Error Correction Term (ECM) is negative and statistically significant at 1%. This implies that short-run disequilibrium will converge to equilibrium in the long run at a speed of about 115%. This is a clear indication that crude oil revenue has influence on exchange rate, foreign reserve and inflation even in the long run.

The result also shows that crude oil revenue has negative and significant impact on foreign reserved in the short run at 5% level of significance. A percentage increase in crude oil revenue in the previous year would cause foreign reserve in the current year to decrease by about 9.22%. This implies that crude oil revenue in the current year will

have negative but significant impact on foreign reserve in the next year.

Also table 4 shows that R^2 is 0.217863 value which means that the independent variables accounted for about 21.79% variation in the dependent variable while the remaining were captured by residuals. The probability value of F-statistic (0.017916) means that the independent variables are jointly significant at 5%. While the Durbin -Watson (2.005549) Statistics shows that there is absence of auto-correction model.

Other diagnostic test shows that; first, the model has serial correlation as we could not reject H_0 at 5% level of significance, meaning that the residuals of the model are independently distributed. Secondly, specification error test (Ramsey Reset Test) shows that the model is correlated as we could not reject H_0 at 5% level of significance. Finally, CUSUM test of parameter instability presented in appendix VI reveals satisfactory plot at 5% level of significance.

Conclusion and Recommendations

In conclusion, the study has, to a very large extent suggest that crude oil revenue definitely have significant impact on foreign reserve in Nigeria. The implication of this finding is that government budget, revenue and spending are also highly sensitive to crude oil revenue generation in Nigeria. Diversifying the economy will reduce downward shocks coming from crude oil revenue fluctuations. However, the current surge in crude oil revenue has great potentials for an improvement in foreign reserve performance in Nigeria. Finally, it is hoped that other researchers as well as government agencies, will find the study useful and eventually extend its frontiers through new research endeavors. It is also hoped that governments and other policy makers will be aided by the study in articulating policies for economic growth and development.

The study therefore recommends the following measures based on the findings that hold.

1. We recommend that more attention should be given to the development of strong institutions by setting up anti-corruption agencies to prosecute corrupt individuals in order to strengthen the oil sector, whose impact remains important to the per capita growth level in the economy.

2. The government should improve its revenue collection mechanism through the proper monitoring and strict implementation of the oil agencies such as NNPC, DPRR Department of Petroleum Resources (DPR), and Petroleum Products Pricing Regulatory Agencies (PPPRA) so as to reduce embezzlement of funds and corrupt practices and to block revenue leakages.

3. The government should ensure through its institutions that the revenues from oil are invested in productive sectors through budgetary allocations that must be monitored for proper implementation to attract more investment into the country.

4. The government needs to protect the investment interest of existing international investors by strengthening its institutions and engaging in capacity building for both human and physical capital to attract new foreign investment.

5. Diversifying the Nigerian economy. It should be done in such a way that over dependence on crude oil alone as a major source of export revenue will be reduced.

6. The recent petroleum industry bill is a step in the right direction because it will encourage private individuals and enhance private sector's participation in the oil sector.

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APPENDIX: NORMALITY TEST