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Long Run Relationship between Oil Revenue and Economic Growth in Nigeria.

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Abstract

The paper study the impact oil revenue on Nigeria's economic growth using Vector Auto Regressive (VAR) model. It was established that oil revenue serve as a major source of foreign earnings, public revenue and budget. Since oil price is determined by demand and supply in the international market any slight change in price affect the revenue. The objective is to examine the effect of oil revenue fluctuations in the Nigerian economy. The type of data used is time series from secondary source. The methodology used to achieve the objective isVector Auto Regressive (VAR) model. It was discovered that the log of oil revenue (OR) is negatively related to the GDP. This means that there is mismanagement of oil revenue in the country. Revenue from oil failed to create linkages to other sectors of the economy .it is therefore recommended that government should provide the necessary infrastructures to diversify the productive base of the economy.

Key words: oil revenue, economic growth: GDP, vector auto regressive model (VAR)

INTRODUCTION

Oil is naturally regarded as a gift from God, as theoretically regarded as a major source of income (foreign exchange earner) to the government. A high ratio of oil revenue over GDP can facilitate economic development, if the resource revenue is used to boost level of public investment. The major question to ask here is why does oil revenue is fluctuates? Many researches tried to provide answers through the mechanisms in which volatility is transmitted. Since 1970s, changes in the price of oil have been an important source of economic fluctuations as well as paradigm of global economic shock, this affects many macroeconomic indicators in Nigeria. More specifically, the upswings and the downswings in the price of oil resulted to instability in the government revenue generated from oil. This affected both the level of public revenue, public investment lower output and consequently the level of growth in the economy. Furthermore, in so far as oil is the dominant source of government revenues and given that the public sector is the main driving force in the economy as it is the major recipient of oil rent, it was obvious that the large albeit periodic shocks from the world oil market would constitute a powerful destabilizing influence on government fiscal operation as well as economic planning and management.

LITERATURE REVIEW

DFID (2005) asserted that between 1970 and 1993, countries without petroleum resources grew four times more rapidly than petroleum rich countries. It was noted by World Bank (2003) that between 1970 and 2000 the number of petroleum rich states with disappointing outcomes in terms of economic growth and poverty alleviation far out weighted the number of successful outcomes. Some of the reasons given by World Bank are under developed

governmental institutions and weak civil society participation as strong factors leading to the inadequate management often very substantial windfalls from oil exports.
Al Mulali and Che Sab (2010) conducted a study on the impact of oil shock on Qatar's GDP, using time series data from 1970 – 2007 covering all the oil shocks. They used Johasen-juselius cointegration test (VAR) and vector and error correction model (VECM). The study used four variables to measure the impact, these are GDP, Oil price, total trade value and inflation. It was found that oil price have a longrun postive relations with gross domestic product but at the expense of higher inflation. Qatar, seems to suffer from financial surpluses and rapid economic growth caused by sharp increase in oil prices. At the same time, with a fixed exchange regime and tight monetary policy to deal with these events, this has caused the price of assets to increase sharply, leading to a high levels of inflation in the country.

Mehrara, Maki and Tavakolian (2010) examined non linear relationship between oil revenue and real output growth in Iran between 1959-2007 using Threshold Error Correction Model. The estimation result showed that the response of economic growth to oil revenue growth in low regimesof oil revenue is greater than in high regimes of oil revenue. In the study, three variables were used i.e GDP, Real oil revenues and capital accumulation. It was concluded that capital stock has the greatest effect on economic activity in regimes of low oil revenue. The effect is not significant, civil projects in periods of high oil revenues are likeli to have lower productivity leading to more rent seeking.

Aliyu (2009) present a paper on oil price shock and macroeconomy using non- linear approach. He used Granger causality test and multivariate VAR analysis using five variables. GDP, oil price, money supply and government expenditure. It was found that non linear models have positive impact on GDP than assymetric oil price which results to a decrease on the GDP.

Kilian (2009) examined the effect of oil price volatility from both the demand and supply sides. He argued that there is a difference between demand between supply shock has effect depending whether a country is oil exporter or importer.Negative effects of oil shock is more harmful to oil importing economies: the adverse effects on economic growth can be viewed interms of trade shock: such shock have traditionally been thought to have effect on production decisions, because oil is seen as an intermediate input in production of goods. Under standard assumption oil is considered as an imported commodity therefore it enters the production function of domestic gross output this can otherwise been interpreted as productivity shocks for real GDP similarly increase oil price act as a cost shock to domestic output:

There were alot of literatures that focused on the reduction of demand for goods and services triggered by energy price shocks rather than treating energy price shock. Hamilton 2008 stresses that a key mechanism where by energy prices affect the economy is through the distruption in consumers and firms spending on goods and services other than energy. This view is consistent with the evidence from industry sources of how oil price shock affect US industries. Most US firms percieve energy price shocks to the demand for their products rather than shocks to the cost of producing these products, Lee, Ni 2002.

Rajhi, Ben Abdallah, and Hmissi (2006) examined the impact of oil price shock in 24 African economies. They used an annual data of oil price from1960-2002 period, using cointegration techniques and Granger causality procedure, to examine the oil price relationship with some macroeconomic indicators (namely GDP,consumer price index,current account balance, overall budget balance and total reserves). The result showed that African economies are influenced significantly by fluctuations in oil prices either through the longrun equilibrium

conditions for some of them, or via shortrun direct impacts for others. The analysis has gone to exploration of response functions of changes in GDP and CPI to an impulse in oil prices. For many countries, results gave strong evidence that an oil price shock event is highly disruptive for the economic activity.

Moradi (2009) conducted a research on "Oil resource abundance, economic growth and income distribution in Iran" between 1968 -2005. He used time series of Auto Regressive Distributive Lag approach and Error Correction Model (ECM). The variables used in this study are economic growth, and income distribution. The findings of the study confirmed that there is a longrun positive effect between oil abundance and GDP. The result from both models highlight the importance of natural resource abundance and confirms that oil revenue has a positive effect on gini coefficient. The magnitude of coefficient in both models are confirming the effects is minor. So the effect of oil revenue on income distribution is not very strong. The findings show that physical and human capital have positive and significant effect on GDP in the longrun. Moreover, the study found that oil abundance have negative and significant effect on income distribution of Iran. He concludes that countries can get more benefits from oil revenue if it is converted towards efficient activities. This means that there is huge need to revise bugdeting systems.

MANAGEMENT OF OIL REVENUE

Historically the economies of most oil exporting countries in the developing world have grown at a slower rate than resource poor countries. This has been supported by Ranis (1991), Sachs and Warner (1995) Auty (2001) and Gylfason (2001). Some of the reasons that can help explain this phenomenon include government corruption, mismanagement of revenue windfalls and Dutch disease (Slaibi and kyle 2006).

The government pension fund – a global run by Norway is accepted as a good example of effective management of oil revenues. The distinctive feature of this fund is that it is an integral part of the general budget process, because the explicit use of the fund is to support non- oil budget deficits. Transfers into or out of the fund take place according to the non oil budget deficit which itself is determined through budgetary process. The fund keeps the parliament fully informed of its activities. It also publishes complete audited statements while providing good returns (Bacon and Tordo 2006). A part from this, the Norwegian government petroleum fund was established in 1990 with two main purposes. First, to act as a buffer to smooth fluctuations in oil revenues and mitigate exchange rate pressures to avoid Dutch disease and preserve a diversified industrial structure. Secondly, to save part of current oil rents to help address future needs related to the aging population and the eventual decline in oil revenues. At the end of 2001, the size of the fund corresponded to about 45 percent of GDP. The income of the fund consists of government net cash flow from petroleum activities plus the return of capital. Its expenditures are transfers to the goverment's budget. Thus, the fund is an integrated part of the budget: higher government spending or lower taxes from the mainland activities result in smaller allocations to the Fund. The annual allocation of oil revenues between budget and the fund is flexible, depending on stabilisation considerations (Eifert, Gelb &Tallroth, 2003).

In Alaska (Goldsmith, 1992) argued that since oil was discovered in Prudhoe Bay over 25 years ago, the government depends on state taxes and royalties from oil production. Oil revenue makes up 85 % of the state general revenue and creates 30 percent of Alaska's Personal income. The fiscal strategy taken by Alaska in order to manage its oil revenues is by cutting spending, use permanent fund earnings, encourage economic development, levy taxes, conceive and invest windfalls. These according to Goldsmith are some of the measures by the

government to avoid the impact of fluctuations in oil revenue. Alaska has a permanent fund which it invest. This fund s funds out of the state and its returns part of the earnings as dividends to the residents of Alaska as direct cash payments, amounting to nearly US$ 2000 per person in year 2000. The design of the Alaska dividend system reflects the strong individualistic character of the Alaskas and sense of knowing better than the politicians how to use their money (Eifert et al, 2003). In 1976, Alaskans approved a constitutional amendment creating a saving account called Alaska permanent fund. The amendment requires that a portion of oil and other source revenues should go into the fund. The Alaska constitution prohibits spending the principal of the permanent fund, but allows appropriation of earnings. Today it has a balance of about $13 billion including earning reserve. After inflation the fund produces $500 million annual earnings which go into the

Alaska Economy through Annual Dividend Payments

The management of oil wealth in Soa Tome used a principle which is basically under the Milton freedman's permanent income hypothesis. This implies that constant government consumption (in real terms) of oil resources overtime and its equivalent on interest income or the net present value of the country's oil wealth by definition exportation will be stable, thus avoiding boombust cycles. The permanent income hypothesis entails the use of permanent fund for future generations to secure intergeneration equity and, guarantee permanent flow of resources that will foster economic development even after oil resources have been exhausted. All financial resources owed to the state as oil revenue are deposited in the National Oil Account (NOA) with the central bank on behalf of the government, with a foreign custodian bank. With strong aggregate fiscal discipline oil exporters can manage windfall revenues even without an oil fund, a country could prosper well as Indonesia did in the 1970s (Usui 1997 and Davis et al 2003).

Indonesia's experience is quite different from others. The country doesn't have any stabilization or oil fund. Rather during the first oil boom, it devoted the income earned to a wide variety of programmes especially in agriculture to rural areas and, labor intensive public works program me that appears successful. Elfeert, Gelb and Tallroath (2002) and Pinto (1987) argued that Indonesia's management of oil revenue is quite different from Nigeria's experience for two reasons. One is the difference in power base of the government. In addition to the army-was GOLKAR groups with strong representation of farmers, women, workers and youths rather than a narrowly based political party. This provide vehicle for developing consensus and reduced rivalry over how oil revenues were to be spend. Second, Indonesians economy was over whelming rural. In 1970 only about 17 percent of the population live in the urban areas. In Indonesia agriculture and increasingly labor intensive industry is the direct concern of the government. Another area of concern is the quality public of spending as well as policies that will protect the real exchange rate.

METHODOLOGY

The type of data used in this study is secondary data (time series). It is sourced from Central Bank of Nigeria (CBN), Organisation of Petroleum Exporting Countries (OPEC website) and Energy Information Administration (EIA). Data sourced covered the period 1970 to 2009. In addition to this, variables considered in the study include exchange rate (sourced from CBN statitical Bulletin), GDP (in real values was sourced from CBN web sites), and oil price (UK Brent in US dollars) was sourced from EIA and OPEC websites. Value of exports was sourced from both EIA and CBN and value of oil revenue (OR) is obtained by multiplying oil price by quantity of oil exports.

TECHNIQUES OF ANALYSIS

In this study, econometric model of analysis is employed to examine the relationship between oil revenue and economic growth in Nigeria. Vector Auto Regressive (VAR) model is used to measure the dynamic relationship among variables. The model is choosen as it treats all variables as endogeneous. At the sametime the model is useful for forecasting a system of interelated time series and, for analysing the dynamic impact of random disturbances on the variables. Five variables are used in the study which include; oil price, exchange rate, oil revenue and total oil export as the independent variables while the GDP as the dependent variable.

MODEL SPECIFICATION

The model used in this research is vector auto-regressive. It is used to analyze the dynamic relationship among the variables used. VAR analysis can also be used to evaluate the performance of large scale macroeconomic models.

GDP= f (EXG, OR) 3.1

The vector autoregressive model (VAR) is presented as

P

YT P¦3k ytk Ht (3.2)

K 1

Where Pis a vector of constants, and Ht is a g-vector of white noise residuals at time t with zero mean and constant variance.

The model (VAR) comprises of three stages. The first stage, is to test for the stationarity of the variables. This is possible through the unit root test, and will enable us to find out if the variables GDP, OP, EXG, OR and EXP are stationary or not. The Augmented Dickey Fuller and Phillips Perron test is used to test the stationarity of the variables. Secondly, if all the variables are found to be stationary of the same order, then cointegration test is to be used, to determine the longrun relationship between the dependent and independent variables. Under cointegration, Johansen and Julius test is to be used. This allow us to specify the VAR at level or the through reparamatization of the variables. Similarly VAR can also be specified using the – matrix. Meaning that – DE1 D= error correction adjustment (shortrun equilibrium) and E = longrun equilibrium. Thirdly, after determining cointegration, the vector errorcorrection model (VECM) will be used to investigate the temporal shortrun causality between the variables. The VECM allows us to capture both the shortrun and longrun relationships. The last aspect of the model is to test for causality. This causality may be short run causality i.e Granger causality test, and there is weak exogenality test that provides longrun relationship among the variables.

The variables used in this study include Real Gross Domestic Product (GDP), Real Exchange Rate (EXG), Oil price (OP), Oil Revenue (OR) and Total Oil Export (EXP). Table 4.1 presents the summary of unit root tests results at both levels. The Augmented Dickey Fuller test (ADF) and Phillips – Perron test were conducted on all the variables. The result of the unit root showed that all variables are stationary at both levels and at first difference as well as constant and a trend at 1% level of significance. This allows us to conduct cointegration test on the first difference for the four variables. The result found the presence of cointegration among the variables.

Table 4.1 Unit Root Test Results

Variable	At level		At first Difference	
	ADF	PP	ADF	PP
RealGDP	-2.358	-2.179	-11.682***	-17.578***
Exchange rate	0.981	0.285	-11.013***	-11.007***
(EXG)				
Oil Price (OP)	-2.131	-2.094	-12.474***	-12.507***
Oil Export (OE)	-2.929	-5.524	-21.156***	-21.607***
Oil Revenue(OR)	0.8886	0.6821	0.0000	0.0000

Source: authors computation, E-Views, 6.0, 2011.

***Stationary at 1% to both ADF and PP.
Note that * - represent stationarity at 10%.
** - represent stationarity at 5%
*** - represent stationarity at 1%.

The log of oil exports and oil revenue, are all I (1) at level of Phillips Perron test. The remaining three variables are not cointegrated to the order of 1. That they are I (0). This means that there are only two cointegrating variables. Oil price in model one and oil revenue in the second model are all cointegrated with GDP. This allows the researcher to conduct Johansen cointegration test since some of the variables are of the same order.

Table 4.3 Lag Length Selection Criteria from VAR Estimates (using Model Two.)

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1108.335	NA	1575.914	15.87622	15.93926	15.90184
1	-602.0514	983.6377	1.295087	8.772162	9.024303*	8.874625
2	-593.4680	16.30839	1.303084	8.778114	9.219361	8.957424
3	-572.9526	38.09999	1.105954	8.613609	9.243961	8.869765
4	-570.7076	4.073091	1.219069	8.710109	9.529566	9.043112
5	-569.2741	2.539395	1.360128	8.818201	9.826764	9.228051
6	-554.2824	25.91416	1.251109	8.732606	9.930275	9.219303
7	-527.3699	45.36687	0.971377	8.476712	9.863487	9.040256
8	-496.8450	50.14793*	0.716910*	8.169215*	9.745095	
	8.809605*					

Source:Research ers computation

LR: sequential modified LR test statistic (each test at 5% level)

FPE:final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

From table 4.3, model two establishes relationship between GDP, EXG and OR. Based on Schwartz information criteria, lag one is the optimal lag to be selected. Others such as LR, Akaike Information Criteria, Final Prediction Information Criteria and Hannan-Quinn Information criteria prefers lag eight as the optimal lag.

Table 4.6 Unrestricted Cointegration Rank Test (Trace) (Model Two)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.202908	48.68414	42.91525	0.0120
At most 1	0.063528	15.57356	25.87211	0.5272
At most 2	0.040202	5.990745	12.51798	0.4615

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4.7 Unrestricted Cointegration Rank Test (Maximum Eigenvalue) Model Two

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.202908	33.11058		
25.82321	0.0046 At most 1	0.063528	9.582813	
19.38704	0.6634			
At most 2	0.040202	5.990745	12.51798	0.4615

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

The tables 4.6 and 4.7 show the number of cointegrating equations in the second model of the study. The tables showed that there is only one cointegration at 5% level at a none hypothesized cointegrating equation. Meaning that the Johansen procedure using Trace test and Maximum Eigenvalue statistics indicate only one cointegration. This cointegration is found by comparing the trace test statistics with its critical value at 0.05. If the trace test is higher than the critical values this means that there is the presence of cointgration. Similarly, the maximum Eigen value test is found by comparing the maximum eigenvalue with its critical value at 0.05. If the maximum Eigen value is higher than critical values it means that there is cointegration. In this case 33.11058 is higher than 25.8232, indicating one cointegration. So also the trace test 48.6 is higher than 42.9 indicating one cointegration.

Table 4.9 Normalized cointegrating coefficients (Model Two).

LGDP	EXG	LOR	Adjustment coefficient
1.00000	-1.470187	127.7247	-6.260426
	(0.49250)	(21.3749)	(1.11535)

Source; Researchers Computation using Eviews 6.0, 2011.
From the above table, when GDP is normalised with respect to other variables, EXG is positively related to GDP, while OR is negatively related to GDP. This implies that a percentage increase in exchange rate may change the GDP with about 14.7% and a percentage increase in

OR may led to a reduction in the GDP. The first relationship in the model meets the apriori expectations of the theory. Secondly, the negative relationship between oil revenue and GDP is interpreted as the way Nigeria's government utilises the oil revenue. Revenue from oil failed to create linkages with other productive sectors of the economy like agriculture and manufacturing. Similarly, government utilises the revenue in an unproductive way (by increase in government expenditure e.g salary increment), rather than investing in productive ways. The adjustment coefficient will take 6.26% per quater. To adjust to full equilibrium at 100% may take 16 quaters.

Table 4.12 showing Longrun Weak Exogeneity of the Variables (Model Two).

Null Hypothesis (H_o)	**Chi Square X^2**	**P- Value**
A(1,1) = r	0.008241	0.927667
A(2,1) = r	1.900236	0.168052
A(3,1) = r	23.49701	0.000001

Source: Researchers Computation using Eviews 6.0, 2011.

From table 4.12, in a cointegrated system, if a variable does not respond to the discrepancies from longrun equilibrium relationship, it is weakly exogeneous. Hence if the speed of adjustment parameter is zero, the variable in question is weakly exogenous. Model two indicates that the first variable which is the GDP is statistically significant at 0.927 and is greater than 0.05, therefore endoeneous to the system. The second variable shows asignificant relationship with the first variable and is greater than 0.05. The third variable is the OR which is weakly endogeneous to the system. This showws that there is unidirectional relationship from GDP to OR not from OR to GDP.

CONCLUSION

1. The study found a negative relationship between oil revenue (OR) and GDP in the second model. But the researcher attached it to the mismanagement of oil revenue by public authority.
2. Instability in government polices result to fluctuations in the value of Naira. From fixed exchange rate to flexible exchange rate. This may affect other economic variables like GDP etc.
3. The study found that oil revenue volatility affects government planning decision to invest. I.e. either within the domestic or foreign investment, this has policy implication by neglecting the important, sectors of the economic like power, manufacturing etc. Rather foreign investment dominates the economy as is evident in the inflow of Chinese and their products in our markets. Thus retard economic growth in some periods under the study.
4. Increase in oil price within the period of study has impacted the economy seriously by increase in revenues from oil and a rise in foreign reserve, i.e. why the utilization of the revenue is less effective in achieving macroeconomic stability in the country as is evident in developed economies.

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