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Vector Auto regressive model and the Nigerian Economy

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Abstract
This paper provides analytical relationship between oil exports, oil price, exchange rate and Gross Domestic Product (GDP). The objective is to find the effect of oil price on other macroeconomic variables.Vector Auto Regressive (VAR) model was used to test for both shortrun and longrun relationship among the variables in the model.It was also found that there is no significant relationship between GDP and EXG and OE. Meaning that no any shortrun or longrun relationship. EXG is negatively related to GDP and OE. This according to the researcher has a policy implication interms of either collection of the revenue.The economy favours importers than exporters or through the appreciation of the dollar as a standard currency world wide, the Naira has low value in the international market exchange. At the same time Nigerian government policy favors importers into the country than encouraging exports due to failure in the provision of basic infrastructures and power needed for production.

1.1 INTRODUCTION

Nigeria is among the oil exporting countries that enjoyed increase in oil revenuessince 1970s. Oil exports serve as a major source of foreign exchange earner to the government. For example, revenue from crude oil exports in 1969 amounted to N1.015 m. In 1970,26.3% of the federally collected revenue was from oil, which stood at N167 m. In 1975 oil revenue reached N22.329 m (Iyoha, 2002). A decade later i.e by 1984, revenue from oil fall to N 8,268 m. In 1985 revenue recieved from oil reached 10,915m but in 1986 it fell down to N8,107 m. In 1987, oil revenue rose again to N19, 027 m and to N106,155 m in 1993. In 2005 revenue from oil was estimated as $390 billion making about 97% of federally collected revenue (OPEC 2000, World Bank 2007).

Excessive reliance on crude oil exports from 1970s to date, coupled with non diversification of the productive base of the Nigerianeconomy,made the economy vulnerable to external shocks that subjected it to macroeconomic instability. Ukwu (2003) noted that Nigeria ranks among the top ten most volatile countries for the years 1961 to 2000 based on real growth rate, price inflation, money growth and real GDP. It was found that Nigeria also recorded very high volatility in private investment per capita, government revenues per capita, terms of trade shocks and real exchange rate shocks. The country is exposed to external price shock through massive importation of the refined petroleum products since the collapse of its refineries in 1980s.

Macroeconomic volatility is a major constraint on development, making planning more problematic and investment more risky.A more stable macroeconomic environment would reducemanagement problems and improve prospects of realistic planning for sustainable growth and development. Volatility in this context means the upswings and the down swings (oscillation) of oil revenue. This occurs as a result of change in oil price (per barrel), when the price changes, the revenues recieved falls or rises.

Comparative analysis of trends across countries reveals contrasting patterns of development and highlights some of the underlying factors in macroeconomic performance. Studies have shown that Nigerian development has been very slow and unsteady as per some development indicators. According to World Bank,over 65% of Nigerians live on less than $1 per day. Capacity utilization is low due to low productivity and low demand, which is also associated with finance(Ukwu, 2003).

Nigeria's GDP, was not significantly higher in the year 2000 than it was in the 1960s.A very high degree of volatility is also recorded in real growth rate. For instance the GDP grew positively at 6.2% annually between 1970 /1978. In 1980s the GDP grew at a negative rate. After the structural adjustment programme the GDP declined from 8.3% in 1990 to 1.3% in 1994. In 1995 it was 2.2% while in 2001 the GDP was 4.5%. In 2002 it again fell to 4.3%, but reached a peak of 9.5% in 2003. However, in 2004 it declineto 6.5% , and 6.2% in 2005. The peak of the GDP in 2003 was due to increase in the production of crude oil from 2.4 million bpd to 2.5 million bpd(CBN, 2006).The broad objective of the study is to examine the effectof oil revenue on economic growth in the Nigerian economy, using some variables: namely GDP, oil price, and exchange rate and oil exports. Specifically, to:Establish the effect of oil price fluctuations on other macroeconomic variables.

2.0 Literature Review

Pinto (1987) also analyzed the links between oil prices deficits, inflation and exchange rate appreciation in Nigeria and Indonesia during and after boom (1970-1985). He stressed that what mattered during the boom period were the spending effects and their impact on resource allocation in the non oil economy. He observed that barely a decade after the first oil shock, Nigeria was faced with several economic problems including a serious decline in its agriculturalsector, decline in non oil traded goods and external debt accumulation. In

contrast, Indonesia maintained a conservative foreign debt policy, market oriented agricultural policy and a marked difference with regards to fiscal and exchange rate policies.

Delving and Lewin (2004) argued that inoil dependent economy, the variability of the oil rent will, in the absence of counter measures, spill over into real exchange rate. An oil price boom will lead to a real appreciation and a decline in non oil exports.This is often taken as the main symptom of the Dutch disease, but is not in and of itself a cause of reduced welfare. Theproblem arises when the decline in net exports is due to a boom that is short lived. Further more, when the windfall revenue rate becomes over valued, it may not be possible to recover the lossin non oil export market or resuscitate the relevant sectors notably agriculture and manufacturing. Inshort adjustments to the real exchange rate are likely to be smooth.

Repeated episodes of booms and bursts in oil prices transmitted to the real exchange rate would result in large risk premiums in the non oil sector and thus depress investment in those sectors. This may cause a secular decline in productivity resulting in lower rates of growth or stagnation in the non oil sectors. Thusthe dexterous outcome from oil price variability flow isfrom the way it translates into real exchange rate volatility. The adjustment to a reversal of the windfall may be costly. From the analysis above, in oil exporting countries, government acts as a trustee of the resources for the country and is the exclusive or almost exclusive recipient of the oil rents. Itis clear that real economic effects of the mineral revenues are determined by their effect on savings / consumption /investment balances in the economy and the balance of payment. There exist a link between a use in government revenue, a fall in the level of taxes and the change in expenditure. All these affect the government budget balance as it is fully funded by the mineral revenue.

It was argued that large windfall revenues lead to poor general decision-making by governments. Several factors explain this process. First, the development of oil raises expectations among the population.Therefore, this pressures government to do something which encourages speedy responses. Often quick, ill coordinated decisions are bad decisions. Also, spending revenues too quickly is more likely to introduce distortions into the way the economy works, if only because there is less chance for the economy to adjust naturally (Auty 2001b), Second, having more money to play with tends to weaken prudence and normal procedures of due diligence. Thus, the importance of making the right choices seems somehow less important. Particular importance is when governments decide on capital spending without thought to the recurrent spending implications. Third, because, in the first instance, the revenues accrue to government, decision making is then concentrated in fewer hands compared to say peasant cash crops where a much greater number of economic agents are involved in the decision how to spend any windfalls (Auty 2001b), Gylfason et al. (1999) argues that the level of domestic investment is inversely related to dependence on primary product exports. However, intuitively it is attractive to imagine fluctuating revenues, in the absence of effective stabilizingmeasures, creating problems for government fiscal and monetary policy and macroeconomic management more generally.

Hence much of the economic turbulence in many oil exporting economies is due to over spending during the boom. If the government spends all or most of the windfall revenue, then practically all the increase in aggregate demand due to the windfall is in the form of government expenditure. The government becomes the booming sector. One way or another, if oil revenues falls, the shock will be transmitted to the rest of the economy. Maintaining expenditure at boom levels will be unsustainable, whereas reducing expenditures in line with lower revenue will affect aggregate demand directly. Thus, when government expenditure is determined by current revenue, then if the revenue is volatile, fiscal policy also becomes volatile and so does aggregate demand. This will also have a spillover effect into real exchange volatility and lead government to rely more heavily on import tariffs and other trade distorting taxes from revenue generation and management of the resulting loss of competitiveness in the oil sectors. This would be in addition to the higher production costs (Delvin and Lewis 2004).

Generally, it was believed that the poor performance ofoil exporting economy arises from the way thecountry manages its oil wealth. It was argued that spending out of oil wealth increases demand for non tradables and draws productive resources into that sector. Since the presumption is that technological progress is faster in tradable sector then in non tradable sectors, the explanation of low growth naturally follows. Similarly, volatility of oil prices leads to a corresponding volatility in fiscal cash flow. Thedependence of fiscal revenue on the oil sector renders public finances vulnerable to volatile external variables beyond the control of policy makers (Ossowski and Barnett, 2003).

Biennen (1988) made a comparison in terms of utilizing oil revenues by the government. It was observed that there was little pressure to use oil revenue to improve the productivity of traditional agriculture. Indonesia differs strongly here with Nigeria where its agriculture florish but in Nigeria it languished, although technical factors were more favorable to Indonesia than Nigeria. He argued that Nigerian government made no effective move as inflation soared to realign the real effective exchange rate by adjusting the nominal rate. Insteadit turned more to various types of quantitative import restrictions. In effect this strategy redistributed part of the oil revenues from government to favor importers and to contain certain other agents and activities and so severely aggravated the fiscal problem caused by falling oil revenues.

Nigeria's prices moved more and more out of line with those of its trading partners. The result was a vicious cycle of rising distortion, declining efficiency, falling non oil output, fiscal deficit inflation and disruptive cuts in public spending in all the countries in the sample (Algeria, Indonesia, Trinidad and Tobago, and Nigeria Ecuador Venezuela). Nigeria experienced the most severe economic contraction after 1981.

Barnett and Ossowski (2003) argued that the dependence on oil proceeds which are volatile unpredictable and exhaustible, significantly complicates fiscal management in the short and long runs. A number of studies highlighted the costs of a volatile macroeconomic environment for investment and growth. The disappointing growth and weak economic performance of oil producers has raised the attention of the global economy.

Oil exporting countries have tended to grow slower than resource poor countries. Ossowski and others (2003) affirmed that a key policy factor contributing to the disappointing economic performance of many oil producing countries have been the procyclicality of government expenditures, evidenced in expansionary and contractionary fiscal impulses associated with fluctuations in oil revenues (Gelb, 1988 Auty and Gelb 2001).

International experience suggests that fiscal volatility can be destabilizing for real effective exchange rate and real out put. In the case of oil producing countries, oil shocks can affect the level and volatility of the real exchange rate through several channels. While disposable income and wealth effects are prominent factors, a key transmission channel of external volatility to the real exchange rate is procyclical government spending on non tradable. In this case the variability of oil receipts can carry over to the real effective exchange rate. The volatility in turn has been shown to be damaging to the non oil sector and capital formation. World Bank studies suggest that the degree of variability of the real exchange rate is as important as its level of development of a diversified non traditional tradable sector (World Bank, 1993).

Hoffmaister and Roldos (1997) and (2001) and Ahmed (2003) conducted empirical studies using Vector Auto Regressive (VAR) model to determine the source of macroeconomic fluctuations in small open developing countries. These authors used the relative importance of external shocks-terms of trade, world income, international interest rates and domestic shocks supply and demand to explain volatility, In order to perform impulse response analysis and variance decomposition, the structural residuals associated with external supply and demand shocks are recovered, from the estimated residuals of VAR. In both cases the authors found evidence suggesting that domestic shocks are the most important source of output growth variability in the emerging economies analyzed.

Ayadi, Chatterjee and Obi (2000) provided an economic analysis using Vector Autoregressive (VAR) model to analyze the impact of oil dependent emerging economies like Nigeria. They used eight variables (namely; exchange rate, crude oil exports, oil output, industrial production, consumer price index, discount rate, external assets and money supply). Impulse response and variance decomposition were used to forecast errors in a given variable to self shock. They found that energy sector exerts a significant influence on the Nigerian economy by acting as a primemover. More importantly, Nigeria seems to find itself in a vicious circle of poverty because of its inability to exercise control over the price of its main exports and its imports, among other factors. It conclude that an oil shock in the form of a decrease in the oil price will lead to a decrease in external reserve, flow of foreign exchange, money supply and industrial production.

Hoffmaister, Roldos and Wickham (1997) used structural vector autoregressive model to find the sources of macroeconomic fluctuations in sub Saharan Africa. They found that external shocks, especially terms of trade shocks, appear to have greater influence on fluctuations of output and real exchange rate in CFA franc countries.

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.

3.2 SOURCES OF DATA AND MEASUREMENT.

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.

The study adopts time series data. Time series is a combination of set of observations on the set of values that a variable takes at a different times. It is concerned with estimation of difference equations containing stochastic components. Such data may be collected at a regular time intervals, such as daily, weekly, monthly, quaterly, or

annually. In this work quaterly observations for the period 1970: I – 2009: IV. This period is chosen because it captures the 1st, 2nd and recent oil booms of the 1970s up to mid 2000 respectively. Quaterly series are preffered as it reveals more information than the annual data. The level of frequency is higher in the quaterly data than annual data. It also incresases the degrees of freedom. Similarly, it is used for solving a difference equation. The solution will determine whether a variable has a stable or explosive time path (Enders, 2004).

3.3 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.

3.4.1MODEL 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, OP, OE) .....(3.1)

Thismodel express GDP as dependent variable and is a function of Exchange Rate(EXG), Oil Price (OP), and Oil Exports(EXP).

Log GDP$_t$

$$\alpha + \beta_1 \log OR_t + \beta_2 \log OP + \beta_3 \log EXG + \beta_4 \log OE + \varepsilon_t \text{ -----} (3.2)$$

=

Where, α is the intercept, $\beta_1, \beta_2, \beta_3$ are the slope coefficients of the model

Log GDP is the log of gross domestic product (millions of Naira),

Log OR is the log of oil revenue (millions of Naira)

Log of OP is the log of oil price (US dollar per barrel converted to Naira),

Log EXG is the log of exchange rate (in Naira),

Log of OE is the log of total oil exports, and

E_t **- White noise or error term.**

The vector autoregressive model (VAR) is presented as

$$y_t = \mu + \sum_{k=1}^{p} \Pi_k \, y_{t-k} + \varepsilon_t \text{ ----------} \quad \textbf{(3.3)}$$

Where μ is a vector of constants, and ε_t is a g-vector of white noise residuals at time t with zero mean and constant variance. For this study , the regression model has n = 4 variables with 3 independent variables and 1 dependent variable.

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 Π **matrix. Meaning that** $\Pi = \alpha\beta^1$ α **= error correction adjustment (shortrun equilibrium) and** β **= longrun equilibrium. Thirdly, a**fter determining cointegration, the vector error-correction 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..

4.0 Analysis and Presentation of Result:

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 (EXG)	0.981	0.285	-11.013***	-11.007***
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 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 4.2 Lag Length Selection from VAR Estimates.

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-963.3286	NA	11.79261	13.81898	13.90303	13.85313
1	-353.0443	1176.977	0.002424	5.329204	5.749439*	5.499975*
2	-331.0654	41.13187	0.002227	5.243792	6.000214	5.551179
3	-310.1030	38.03187*	0.002078*	5.172900*	6.265510	5.616904
4	-302.0037	14.23157	0.002332	5.285767	6.714565	5.866388
5	-295.9246	10.33443	0.002699	5.427495	7.192480	6.144732
6	-287.9014	13.18105	0.003044	5.541448	7.642621	6.395302
7	-281.8597	9.580426	0.003541	5.683709	8.121070	6.674180
8	-275.9180	9.082333	0.004136	5.827399	8.600948	6.954486

Source:Researcherscomputation,E-views6.0,2011.

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

Table 4.2 shows Lag length selection by different criterias in model one. The E views soft ware regards Lag three as the optimal lag length for the model of this study based on on Akaike Information Criteria, LR statistics and Final prediction error. The Schwarz Information criteria and HQ information criteria preffered lag two. Theoretically, a lag is a period of time between one event and a related event, or the past values of the forcing processes.

4.3 Unrestricted Cointegration Test

The test is based on trace statistics and maximum eigenvalue statistics at a given level of significance. It should be noted however that the first column indicates the number of cointegrating equations , the second column the maximum eigenvalues, the third column trace statistics , the fourth clomn critical values at 0.05 level. This indicate there is both shortrun and longrun relationship between the dependent variable and the independent variable. If the trace test is higher than the critical values it indicates that there is one cointegration at 0.05 level. Which denotes the rejection of null hypothesis and accept the alternative.

Table 4.4 Johansen – Juselius Cointegration Test Based on Trace Statistics.

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.201381	64.98569	63.87610	0.0402
At most 1	0.119809	32.60417	42.91525	0.3565
At most 2	0.052167	14.22743	25.87211	0.6388
At most 3	0.044217	6.512379	12.51798	0.3981

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

From the above and below table, the normal criteria to find the result of trace test, is to compare the trace value with the critical value If the trace value is higher than the critical value it means there is cointegration This method of analysis suggest that there is existence of longrun relationship between GDP, as dependent variable and EXG, OP, and OE as independent variable. This indicates that there is only one cointegration at 5%. From the results of the table trace statistics of 64.98569 is higher than the critical value of 63.87610. while at other ranks such as 1,2,3,4 and 5 the Mackinon-Haug-Michelis critical values are at 5% greater than both the trace value and maximum eigen value.

Table 4.5 Johansen- Juselius Cointegration test Results Based on the Maximum Eigen value Statistics.
(Model One)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.201381	32.38152	32.11832	0.0464
At most 1	0.119809	18.37674	25.82321	0.3490
At most 2	0.052167	7.715052	19.38704	0.8462
At most 3	0.044217	6.512379	12.51798	0.3981

The maximum eigen value and trace statistics are two sides of the same coin. The maximum eigen value as in the trace test compares the maximum eigen value with the critical value at 5% level. From the above table 4.4 it shows that the variables behave in the same direction i.e the maximum eigen value statistics according to rule is suppose to be higher than the than the critical values in the number of hypothesized cointegrating variables. The result showed that at none hypothesized number of cointegrating equations 32.38152 is higher than 32.11832. This means that rejecting the null hypothesis at 0.05 level and accept the alternative hypothesis since there is only one cointegration among the variables at 0.05% .while the remaining cointegrating equations 1, 2, 3, 4 and 5 critical values are higher than the maximum eigen value.

4.4 Vector Error Correction Result.

Vector Error Correction technique has been used to ascertain the short-run effects or dynamics of the variables. This is because it has been observed that while some variablesmay have longrun effects on other variables , they may also have a shortrun effect with different consequences.

Table 4.8 presents the result of longrun cointegrating vector coefficients of the model, where LGDP is used as dependent variable. All the variables are statistically significant at 1% and at 5% level of significance. The log of oil price is statistically significant as it carries a negative sign. Meaning that a percentage increase in the price of oil will increase the GDP by 48%, a sign that is appriori to expectations.

Table 4.8 Cointegration Equation Normalised With Respect to LGDP

LGDP	EXG	LOE	LOP	Error correction adjustment coefficient(α)
1.000000	0.033126	4.509032	-2.727163	-0.013101 (0.02097)
	(0.01017)	(1.52784)	(0.48460)	[-2.62463]

Source: Researchers computation using Eviews.2011

From the above table, the longrun GDP equation can be written as
LogGDP =.-0.099965 -0.033126log EXG – 4.509032 log OE + 2.727163 log OP (4.1)
The cointegration equation above shows that the Gross domestic product is negatively related to exchange rate, also negatively related to log oil exports and positively related to oil price. The above relationship shows that

theoretically some are not true. For instance, it is assumed that GDP and exchange rate are positively related. An appreciation in domestic currency will lead to an increase in oil revenue since the transaction is in US currency. Similarly, depreciation of the domestic currency will favor importers more than exporteres due to a fall in the value of currency. At the sametime oil export is suppose to be positively related to GDP. Because the higher the exports the higher the revenues that will be recieved and vice versa. It was however found that oil price has a positive relationship with the GDP. This shows that when there is increase in the price of oil, Nigeria tends to benefit more from` the increase through higher revenues from the sale of oil and this transmitt positively to GDP. This satisfy the theoretical expectations.

The coefficient of oil price shows that one percentage increase in the price of oil will increase the GDP by 2.72%. while a 1% increase in exchange rate will decrease Nigerias GDP by 0.033% (33%). This country is suffering from high appreciation of the dollar, while the naira is at low price. From the exchange rate index $1 is equivalent to N152 at the end of 4th quater of 2009. This clearly shows that the economy favours importers more than exporters. Therefore exchange rate has a negative impact on the GDP. Similarly log of oil exports is negatively related to GDP. Meaning that a percentage increase in oil exports reduces the GDP by 4.5%. this voilates the theoretical assumption that an increase in oil exports will lead to increase in GDP.

The error correction adjustment in this case shows that it will take 1.3% to restore the GDP back to equilibrium per quater. Meaning that for an economy to be restored back to equilibrium from volatility of oil prices and revenue it may take about one hundred quaters i.e about 25 years to be at 100% equilibrium. Therefore the adjustment rate is too slow for the economy.

Table 4.4 Johansen – Juselius Cointegration Test Based on Trace Statistics.

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 maximum eigen value and trace statistics are two sides of the same coin. The maximum eigen value as in the trace test compares the maximum eigen value with the critical value at 5% level. From the above table 4.4 it shows that the variables behave in the same direction i.e the maximum eigen value statistics according to rule is suppose to be higher than the than the critical values in the number of hypothesized cointegrating variables. The result showed that at none hypothesized number of cointegrating equations 32.38152 is higher than 32.11832. This means that rejecting the null hypothesis at 0.05 level and accept the alternative hypothesis since there is only one cointegration among the variables at 0.05% .while the remaining cointegrating equations 1, 2, 3, 4 and 5 critical values are higher than the maximum eigen value.

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Vector Error Correction technique has been used to ascertain the short-run effects or dynamics of the variables. This is because it has been observed that while some variablesmay have longrun effects on other variables , they may also have a shortrun effect with different consequences.

Table 4.9 presents the result of longrun cointegrating vector coefficients of the model, where LGDP is used as dependent variable. All the variables are statistically significant at 1% and at 5% level of significance. The log of oil price is statistically significant as it carries a negative sign. Meaning that a percentage increase in the price of oil will increase the GDP by 48%, a sign that is appriori to expectations.

Table 4.9 Cointegration Equation Normalised With Respect to LGDP

LGDP	EXG	LOE	LOP	Error correction adjustment coefficient(α)
1.000000	0.033126	4.509032	-2.727163	-0.013101 (0.02097)
	(0.01017)	(1.52784)	(0.48460)	[-2.62463]

Source: Researchers computation using Eviews.2011

From the above table, the longrun GDP equation can be written as

LogGDP =.-0.099965 -0.033126log EXG – 4.509032 log OE + 2.727163 log OP (4.1)

The cointegration equation above shows that the Gross domestic product is negatively related to exchange rate, also negatively related to log oil exports and positively related to oil price. The above relationship shows that theoretically some are not true. For instance, it is assumed that GDP and exchange rate are positively related. An appreciation in domestic currency will lead to an increase in oil revenue since the transaction is in US currency. Similarly, depreciation of the domestic currency will favor importers more than exporteres due to a fall in the value of currency. At the sametime oil export is suppose to be positively related to GDP. Because the higher the exports the higher the revenues that will be recieved and vice versa. It was however found that oil

price has a positive relationship with the GDP. This shows that when there is increase in the price of oil, Nigeria tends to benefit more from` the increase through higher revenues from the sale of oil and this transmitt positively to GDP. This satisfy the theoretical expectations.

The coefficient of oil price shows that one percentage increase in the price of oil will increase the GDP by 2.72%. while a 1% increase in exchange rate will decrease Nigerias GDP by 0.033% (33%). This country is suffering from high appreciation of the dollar, while the naira is at low price. From the exchange rate index $1 is equivalent to N152 at the end of 4th quater of 2009. This clearly shows that the economy favours importers more than exporters. Therefore exchange rate has a negative impact on the GDP. Similarly log of oil exports is negatively related to GDP. Meaning that a percentage increase in oil exports reduces the GDP by 4.5%. this voilates the theoretical assumption that an increase in oil exports will lead to increase in GDP.

The error correction adjustment in this case shows that it will take 1.3% to restore the GDP back to equilibrium per quater. Meaning that for an economy to be restored back to equilibrium from volatility of oil prices and revenue it may take about one hundred quaters i.e about 25 years to be at 100% equilibrium. Therefore the adjustment rate is too slow for the economy.

Table 4.10 Grangers Causality Test Result

Null Hypothesis:	F-Statistic	Prob.
EXG does not Granger Cause LGDP	0.35403	0.7025
LGDP does not Granger Cause EXG	0.49784	0.6089
LOE does not Granger Cause LGDP	0.99353	0.3728
LGDP does not Granger Cause LOE	1.25748	0.2875
LOP does not Granger Cause LGDP	1.84383	0.1620
LGDP does not Granger Cause LOP	0.04424	0.9567
LOE does not Granger Cause EXG	0.41230	0.6629
EXG does not Granger Cause LOE	1.74231	0.1789
LOP does not Granger Cause EXG	0.89338	0.4116
EXG does not Granger Cause LOP	3.51130	0.0325
LOP does not Granger Cause LOE	0.80389	0.4496
LOE does not Granger Cause LOP	2.00807	0.1381

Source: Researchers Computation, E-views, 2011.

After having one cointegration among the variables, the Grangers causality test is used. First, the Pairwise Grangers causality test with LGDP as the dependent variable is tested. Then Grangers causality test for EXG, followed by OP, and OE as the dependent variable is tested as well. The F statistics result show that the significance of the shortrun causal effects while there is no longrun or lagged error correctionterm among the variables. It shows that log of oil price Granger Cause exchange rate in the shortrun. This is theoretically acceptable that for Nigeria to benefit from oil price increment the exchange rate should be favourable to the inflow of oil wealth.

Table 4.11 Longrun Causality/ Weak Exogenelity Test Result

Null hypothesis (Ho)	**Chi square (x^2)**	**P- Value**
A (1,1) = r	0.320175 (1)	0.571503
A (2, 1)	0.768177 (1)	0.380782
A (3, 1)	0.006728 (1)	0.934628
A (4, 1)	13.94095 (1)	0.000189

Source; Researchers computation using E-views , 2011.

Note; if pv < 0.05 reject null hypothesis. If pv > 0.05 accept null hypothesis.

From table4.11, the null hypothesis Ho is statistically significant if the probability is greater than 0.05. in this work the first variable GDP is statitically significant since the p value is 0.0571503. the second variable is not statistically significant at 0.380782 as such no relationship is established between the GDP and EXG, therefore reject the null hypothesis. The third variable OP oil price has unidirectional relationship between oil price and the GDP. Oil price p value is statistically significant as Ho is greater than) 0.05. the p value is 0.0934628. meaning that an increase in oil price will add to GDP. But any addition to GDP may not necessarily affect the oil price, that is why it is called unidirectional relationship. Lastly, the fourth variable is represented as OE i.e

exports has no any relationship with other variables therefore regarded as insignificant and reject the null hypothesis.

5.0 Conclusion

The paper reviews the relationship between the model used in the paper VAR and the Nigerian economy. It was also found that there is no significant relationship between GDP and EXG and OE. Meaning that no any shortrun or longrun relationship. EXG is negatively related to GDP and OE. This according to the researcher has a policy implication interms of either collection of the revenue.The economy favours importers than more than exporters. At the same time the appreciation of the dollar as a standard currency world wide, the Naira has low value in the international market exchange. At the sametime Nigerian government policy favors importers into the country than encouraging exports due to failure in the provision of basic infrastructures and power needed for production.

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