
International Journal of Economics and Financial Research
ISSN(e): 2411-9407, ISSN(p): 2413-8533
Vol. 2, No. 2, pp: 33-40, 2016
URL: http://arpgweb.com/?ic=journal&journal=5&info=aims

# Impact of Oil Price Volatility on Macroeconomic Variables and Sustainable Development in Nigeria

**Eneji Mathias Agri*** Department of Economics, University of Jos; China-Africa Science and Technology Foundation, Beijing
**Mai-Lafia Dimis Inusa** Department of Economics, University of Jos, Nigeria
**Nnandi Drenkat Kennedy** Department of Economics Education, University of Jos, Nigeria

**Abstract:** The main objective of this study is to determine the impact of oil price volatility on macroeconomic variables and sustainable development in Nigeria. The significant role of oil in the Nigerian economy cannot be overestimated. Though there are studies by other researchers on oil prices and macroeconomic variables, their findings are contentious and country-specific. Our literature review and methodology shade lights on these positions. We used secondary time series data in a vector auto regression analysis. We found that fluctuations in oil prices do substantially affect the real GDP, exchange rates, Unemployment, Balance of payments and interest rates in Nigeria. Negative shocks in the international oil market, have significant impact on price fluctuations. Due to increased imports in the Nigerian economy, inflationary pressures are inevitable and are pronounced. Government revenues and expenditures have decreased significantly. We recommend diversification of the economy and energy sources for sustainable development in Nigeria.
**Keywords:** Exchange rates; Unemployment; Inflation; Balance of payments; Real GDP; Government revenue; Sustainable development.

## 1. Introduction

Nigeria is an open economy that has no real influence on the world price of oil, whereas, it is greatly impacted by the effect of global oil price volatility as an importer of refined petroleum products. The prices of petroleum products have been increased for about thirteen occasions between 1974 and 2002 from 16.8 kobo to N26 per litter. The effect of oil prices on the macro-economic variables has been the subject of many studies. Most of these studies are concerned with the developed economies while few have recently showed concern with the developing country. Nigeria is faced with a more complicated situation in the sense that it sells its crude oil to foreign refiners, in which a general agreement on price set of exchange is reached beyond her control. After the oil is refined into premium spirit, gasoline, and kerosene, it is sold back to Nigeria pegged to the price of wholesale gasoline on an exchange. The inability of Nigeria to refine most of her crude domestically place the country more on the importing side, making the macroeconomics extremely vulnerable to external oil price shocks. Oil price volatility is like an airborne disease which Nigeria cannot avoid; this is because it affects every aspect of the Nigerian economy. For example, when there is an increase in the price of fuel, transportation would increase for the core poor and small scale entrepreneurs. This leads to an increase in the cost of goods and services, employment becomes difficult, because employers would not want to employ since production costs are very high and employees would agitate for an increase in salaries and wages due to the increased cost of living. In addition to higher petrol prices, the costs of producing electricity from petrol-powered generators have been too high, with black market operators. The impact of oil price volatility on Nigeria's economy is quite complicated to analyze because oil has been the life wire of all economic activities in Nigeria. Oriakhi and Osazel (2013) examined the consequences of oil price volatility on the growth of the Nigerian economy within the period 1970 to 2010. Using quarterly data and employing the VAR methodology. Their study finds that, of the six variables employed, oil price volatility impacted directly on real government expenditure, real exchange rate and real import, while impacting on real GDP, real money supply and inflation through other variables, notably real government expenditure. This implies that oil price changes determine government expenditure level, which in turn determines the growth of the Nigerian economy. Total dependence of Nigeria on oil production for income generation obviously has serious implications for the economy. Since agriculture was abandoned for oil, oil became the major source of Nigeria's revenue and it was expected to bring about substantial economic growth and development. However, there have been series of fluctuations in oil price since the last four decades, thereby hampering the macro-economic objectives of Nigeria, (CBN, 2008). There is no doubt that the total dependence on oil, its attendant corruption and constant volatility in oil price are the major causes

*Corresponding Author

of poverty and under-development in oil producing African Countries. This paper is structured in eight sections; section 1 is the introduction, followed by statement of the problem in section 2, objective of study in section 3, literature review is in section 4. The methodology, discussion of findings, conclusion and recommendations are in sections 5, 6, 7 and 8, respectively.

## 2. Statement of the Problem

The most important problem confronting Nigeria today is the price of oil and its attendant consequences on economic wellbeing of its citizen. This is because Nigeria does not have control over oil product, as a result of her inability to independently refine its crude oil into petroleum products. For instance, the major reason for the fuel shortage is the collapse of the country's four oil refineries in Portharcourt, Warri and Kaduna. Though the government claims that it has spent a whooping sum on their repairs, yet the country still relies mainly on importation of refined fuel. In fact, a cartel has developed in the elite class which makes millions of dollars of profit from fuel importation and artificial scarcity of petroleum products. Nigeria's inability to attain sustainable development, certain level of full employment, poverty reduction, solve the unfavorable balance of trade, inflation and high debt ratio, are all linked to its high dependence on oil as it major source of revenue, and negligent of agriculture and other sectors in a comprehensive and sincere diversification policy. The elasticity of a change in oil price on macroeconomic variables is so perfect that economy response to even mere speculations. Thus persistent oil shocks could have severe macroeconomic implications like fluctuation in the GDP which may induce challenges with respect to policy making. In addition, the revenue from oil is the pivot for government budgets and subsidies. In spite of oil price volatility and fall in revenues in recent times, the attempts by government to continue with petroleum subsidy is still a source of challenge in terms of budget deficit. Hence, it appears that oil price volatility poses a significant problem to macroeconomic stability and sustainable development in Nigeria. The problem is compounded by decades of corruption in the oil sector, poverty, unemployment, processing and distribution costs, social conflicts in oil-producing areas resulting to pipeline vandalism, oil theft, kidnapping of expatriate oil workers, disruption in petroleum product supply and demand.

## 3. Objective of Study

The main objective of this study is to determine the impact of oil price volatility on macroeconomic variables and sustainable development in Nigeria. The significant role of oil in the Nigerian economy cannot be overestimated. The study also sets out to clearly and objectively expose the vulnerability of Nigeria's economy to oil dependence and proffer solutions in economy diversification. The studies conducted by other researchers did not actually exhaust the macroeconomic variables that are representative of the Nigerian economy. Our study fills the gap by using directly effective macroeconomic variables, more so the link between oil price fluctuation and some key macroeconomic variables is contentious. Some found the relationship positive while others found it negative. Our literature review and methodology shade lights on these positions.

## 4. Literature Review

The effect of oil prices on macroeconomic variables has been the subject of many studies. According to World Bank (1994), the collapse of the oil prices between 1981 and 1980 led to a decline in GDP per capita by almost half in real terms. There have been diverse effect of oil price volatility on productivity which has affected growth seriously (Abeysinghe, 2001; Cunado and Degracia, 2006; Lardic and Mignon, 2006). Empirically, the bigger the oil-price increase and the longer higher prices are sustained, the bigger the macroeconomic impact (Majidi, 2006). Hamilton (1996), Gisser (1985), Godwin (1985), Hooker (1986) and Laser (1987) postulated that volatility in GNP growth is driven by oil price volatility. Papapetrou (2001) explained the dynamic relationship among oil price changes, real sector prices, interest rates, real economic activity and employment for Greece. He used both industrial production and employment as the measure of economic activity and found that the oil price shocks have negative effect on industrial production and employment. Hooker (1986), after rigorous empirical studies demonstrated that between 1948 and 1972 oil price level and its changes exerted influence on GDP growth significantly. The petroleum sector is doubtlessly the pivot which steers the wheels of the Nigerian economy since the 1970s, (Oyama, 2000). Madueme and Nwosu (2010) Investigated effects of oil price shocks on the Nigerian macroeconomic performance from 1970 – 2008, Using Engle Granger (EG) and Augmented Engle –Granger (AEG) test. Their findings show that the variables (CAP) Capital expenditure and COP (Crude oil prices) showed a positive sign indicating that crude oil prices during the period under review contributed positively to the Nigerian economic growth Nigeria is known for both import and export of oil, this is because it exports crude oil and imports refined petroleum products. With respect to this, the impact of oil price volatility on macroeconomic variables in Nigeria is quite complicated. A steep increase in oil price, depresses the real stock returns in Nigeria. An increase in the price of fuel leads to a general increase in the price of goods and services. Nigerians have been continuously made to pay more for fuel with frequent changes annually and even between weeks and days. The trend in most advanced countries of the world has been the exact opposite with consumers having to pay comparatively lower prices over the years in these countries. For example, in the United States of America (USA) in 1981 a liter of petrol sold for 35 cents, while the same liter of petrol sold for 31 cents in 2002. In Canada a liter of petrol in 1990 sold for 47 cents while same was sold for 35 cents in 1998, in Japan in 1990 a liter of petrol was 79 cents while in 1998 it sold for 71 cents, the same thing goes for Taiwan where a liter of petrol sold for 62 cents in 1990 and 48 cents in 1998. In

Nigeria on the other hand, a liter of fuel which stood at 151 kobo as at 1981 had, by 1990, gone up to N16 and by 1999 became N20 per liter. By 2000, the price of petrol had gone to N70 per liter, N65 in 2009, N141 by 2010 and N150 in 2015-2016 (though the government promised N86.50k in 2016). On the revenue side, Nigeria's revenue earnings have been deeply impacted by global oil price volatility: a US$1 increase in oil price in the early 1990s increased Nigeria's foreign exchange earnings by about US$650 million (2 percent of GDP) and government revenues by US$320 million a year (Akpan, 2009) . Again, in 2000 the world oil price averaged over three times higher than that of 1999 and excluding the Gulf war period, it reached a 15 year high in both real and nominal terms (IMF, 2000). With the outset of the Asian crisis in 1997, as well as shadow economic activities in Japan and Europe, global consumption of oil fell significantly short of production and the Fund's indicator price for oil fell progressively from about $20 a barrel in early 1997 to below $11 in 1999 (Aliyu, 2009; Isemede, 2013; Umar and Abudlhakeem, 2010). Hamilton (1996) stated that an oil price shock is equal to the difference between the current oil price and the maximum prices in the past four (4) or twelve (12) quarters. If the difference is positive or is equal to zero, then there is price volatility or absence of price volatility, respectively. Theoretically, this study is anchored on the resource curse theory. First coined the natural gas boom tragedy in the Netherland in the 1970s as Dutch Diseases, it refers to the negative effects on the rest of the economy as a result of natural resource windfalls accompanied by the appreciation of exchange rates (John, 2010), in this case, natural gas in the Netherland. Exchange rates appreciation from oil boom receipts can render the non-natural resource tradable sectors such as tourism, agricultural, and industrial sectors less competitive, thus generating de-industrialization, reducing exports, increasing imports, creating unemployment, inflation, macroeconomic instability and poverty. The main perception behind the resource curse theory is that natural and environmental resources such as tin, oil and gas abundance generate negative development outcomes. According to (John, 2007;2010) these outcomes include poor economic performance, macroeconomic instability, and growth collapse, high level of corruption, ineffective governance and greater social and political violence. Countries like Nigeria, Angola, and Sudan Venezuela have all suffered from these resource curse problems.

However, in the literature, some researchers have pointed out that rents from natural resources when appropriated by the government can ease common resource constraints growth such as savings, investment in non-oil sectors, foreign exchange and reducing fiscal constraints. (Blomstroom and Kokko, 2007; Gelb, 2008; Wright and Gelusta, 2007).

# 5. Methodoly

This study adopts the Ordinary Least Squares (OLS) technique. In models that explain the dependent and independent variables, we used the multiple regression method of data analysis. Secondary data on the key macroeconomic variables of analysis were aggregated over the years to test the impact of oil price volatility for a period 1990-2015. The data characteristics are suitable for time series analyses. This justifies the use of the OLS technique. Impulse response analysis is used widely in the empirical literature to uncover the dynamic relationship between macroeconomic variables within vector-autoregressive (VAR) models. Impulse responses measure the time profile of the effect of a shock, or impulse, on the (expected) future values of a variable. This is in line with Sim (1980), (Saini, 1986;1988), Saint *et al.* (2000), Litterman (1979), Ford (2006), Ran and Dillion (2005); they used impulse response to appraise the dynamic effects of fluctuations in oil prices/oil revenue on other macroeconomic variables. Also, Nyong (2001) in his study used five variables namely; Per Capita Consumption (PCNC), Per Capita real GDP (PCRGDP), Per Capita Savings (PCS), Per Capita Gross Domestic Investment (PCDI) and Per Capita Oil Revenue (PCOR). In spite of the similarity in the pattern of responsiveness to Cholesky shocks from oil revenue, the results of the five macroeconomic variables differ in magnitude of their responsiveness.

## 5.1. Model Specification

This study adopts the Multiple Regression Analysis which is suitable for time series data. Data for regression is found in the appendix, table 3. Vector Auto Regression (VAR) Models are being formulated to analyze the impulse response and variance decomposition.

The models are stated as:

OIL P = f (EXCHR, BOP, INFLAR, UNEMR, RGDP) ---------- (1)

Where

OILP = International Oil Price, (capturing Oil Price Volatility).

EXCHR = Exchange Rate

BOP = Balance of Payment

INFLAR = Inflation Rate

UNEMR= Unemployment Rate

RGDP= Real Gross Domestic Product

Transformed into multiple regression model of VAR form, we obtain the following:

$OILP_t = \alpha 0 + \alpha 1 EXCHR_{t-1} + \alpha 2\ BOP_{t-1} + \alpha 3\ INFLAR_{t-1} + \alpha 4\ UNEMR_{t-1} + \mu t\ \alpha 5 RGDP\ t\text{-}1 + \mu t\text{-}1$ -----(2)

Where: $\alpha 0$ = intercept

t = present time impact

t – 1 = lag or previous time impact

$\alpha 1 - \alpha 5$ = coefficients or parameters

$\mu t$ = Error term at present time

Equation (2) can be re-written with respect to real gross domestic product, inflation, unemployment and oil revenue and exchange rate, respectively to account for the impact of international oil prices volatility.
Thus:

$RGDP_t = \beta o + \beta 1\ INLAR\ t\text{-}1 + \beta 2\ UNEMR t\text{-}1 + B3OILREV\ t\text{-}1 + \beta 4\ EXCHR t\text{-}1 + \mu 2t$ ----- (3)

βo=intercept
t=time
t-1=lag
β1-β4=coefficients or parameters
OILREV= Oil Revenue
μ= error term

$OIL\ REVt = \lambda o + \lambda 1\ RGDPt\text{-}1 + \lambda 2 OILPt\text{-}1 + \lambda 3 UNEMRt\text{-}1 + \lambda 4 EXCHRt\text{-}1 + \mu 3t$ ----- (4)

$EXCHRt = \pi o + \pi 1 RDGPt\text{-}1 + \pi 2 OILPt\text{-}1 + \pi 3 UNEMRt\text{-}1 + \pi 4 OILREVt\text{-}1 + \mu 4t$ ----- (5)

The apriori expectations of the model is as follows

$\alpha 1 > o,\ \alpha 2 < o,\ \alpha 3 > o,\ \alpha 4 > o,\ \alpha 5 < 0$
$\beta 1 < o,\ \beta 2 < o,\ \beta 3 > o,\ \beta 4 < o$
$\lambda 1 > o,\ \lambda 2 > o,\ \lambda 3 < o,\ \lambda 4 < o$
$\pi 1 < o,\ \pi 2 > o,\ \pi 3 > o,\ \pi 4 < o$

## 5.2. Summary of Estimation Results

The ADF Unit Root Test is used for testing the stationarity of the time series data. This is done to avoid spurious regression results.

**Table-1.** ADF Unit Root Test Results.

| Variable | ADF | Critical Value | Order of Integration |
|---|---|---|---|
| OILP | -4.543026 | 1% =- 3,769597<br>5% = - 3.00484<br>10% = - 2.642242 | 1(1) |
| INFLAR | -7.419477 | 1% = - 2.674290<br>5% = - 1.957204<br>10% = - 1.608125 | 1(1) |
| EXCHR | -3.542280 | 1% = -2.699769<br>5% = - 1.961409<br>10% = - 1.606610 | 1(1) |
| UNEMR | -4.563133 | 1% = - 3.752946<br>5% = - 2.998064<br>10% = - 2.638752 | 1(1) |
| RGDP | -5.364201 | 1%= -2.4460031<br>5% = -3.7538520<br>10% = -2.546933 | 1(1) |

The unit root test results in table 1 indicate that international oil prices (OILP) data were found not to be stationary at level, but found to be stationary at first difference of order 1 (1) as indicated in the second row. Inflation rate (INFLAR) has a unit root at level which implies that oil output is not stationary. However, Exchange Rate (EXCHR) was found to be stationary at first difference of order 1(1) at 1%, 5% and 10% respectively. Stationarity result revealed that Real Gross Domestic Product (RGDP) also has a unit root at level but was found to be stationary at first difference of order 1 (1).

**Table-2.** Estimated VAR Results

| Variables | Lag interval | coefficient | S.E | t-statistic |
|---|---|---|---|---|
| OILP | 1 | 0.5554 | 0.2863 | 1.9396 |
| | 2 | 0.1997 | 0.2751 | 0.7261 |
| INFLAR | 1 | -0.2497 | 0.2103 | -1.1870 |
| | 2 | -0.0778 | 0.2138 | -0.3637 |
| UNEMR | 1 | 0.9177 | 0.2713 | -1.3761 |
| | 2 | -0.3549 | 0.3883 | 0.0314 |
| EXCHR | 1 | 1.2862 | 0.1573 | 8.1755 |
| | 2 | -0.4659 | 0.1364 | -3.4184 |
| RGDP | 1 | 0.2657 | 2.0355 | 4.8823 |
| | 2 | 1.6344 | 2.0026 | 3.1195 |

R 2 = 0.9380
R2- adjusted = 0.8025
S.E = 0.1018
F- Statistic= 26.4659

The VAR result is presented in table 2. The VAR model is used due to the appearance of the lagged values of the independent variables on the right hand. It also deals with a vector of two or more variables. This method enables the measurement of the impact of oil price volatility on macroeconomic variables such as inflation rate (INFLAR), Exchange rate (EXCHR), Unemployment rate (UNEMR) and Real Gross Domestic Product (RGDP). These results confirm the statistical significance of the impact of oil price volatility on macroeconomic variables in Nigeria. The R2 and R2-adjusted are the coefficients of determination or explanability of the direction of causality, implying that about 90% and 80% respectively, of the changes in macroeconomic variables in Nigeria are caused by oil price volatility.

In line with the VAR technique, the signs and magnitudes of the parameters for the four multiple regression models' estimates are obtained thus:

OILP = -1.1997+0.5554INFLARt-1 +0.19974UNEMRt-2+0.0589EXCHRt-1 + 0.0369RGDPt-2 + 0.1226OILREVt-1 - ---------- (1)

RGDP = 11.4497–0.2498INFLARt-1–0.0778UNEMRt-2–1.5390UNEMRt-1 +1.6219EXCHRt-2 – 0.1210OILREVt-1 – 0.3412OILREVt-2 – 4.1067RGDPt-1 + 3.8623RGDPt-2 ---------- (2)

OILREV = 4.2662 +0.9176OILPt-1– 0.3546INFLARt-2 – 1.0804INFLARt-1 +1.1092EXCHRt-2– 0.2883EXCHRt-1 – 0.1651RGDPt-2+0.3195 RGDPt-1 +0.2518UNEMRt-2 ----------(3)

EXCHR = -0.1911 +1.2862INFLARt-1 -0.4659INFLARt-2 +0.0698UNEMRt-1 – 0.0349UNEMRt-2 +0.0486RGDPt-1-0.0224RGDPt-2 – 0.0302OILPt-1 +0.0449OILPt-2 ---------(4).

## 6. Discussion of Findings

In Nigeria, there is a significant relationship between oil price volatility, sustained growth and macroeconomic stability. Oil price volatility over the years has influenced macroeconomic policies. Macroeconomic policies are broadly divided into monetary policy and fiscal policy; other forms of macroeconomic policy include income policy, exchange rate policy and administrative policy. These policies are used in any country to achieve certain macroeconomic objectives which include; relative price stability, or the attainment of moderate rate of inflation, full employment, and favorable balance of payment, income growth, low interest rate and exchange rates stability. The price that matters most is the import price which includes freight charges, and is relatively higher than crude export prices. The import price of petroleum products is the one that determines the pump price, the pump price has been volatile as there are official market rate pumped at filling stations and black market prices as well. It has led to subsidy regimes and subsidy removal or deregulation of the downstream oil sector, with multiple effects on the economy. The differences in these prices have created balance of payment burden/problem. Artificial scarcity has also significantly caused changes in oil price in Nigeria. Globally, since petroleum fuels world industries, economic depression or recession affects allocative and distributive efficiencies even at national level. As observed in this study, oil price volatility has significant impact on macroeconomic variables namely: inflation rate, Unemployment rate, exchange rate and real gross domestic product. This explains why the behaviors of these macroeconomic variables are unstable. These Macroeconomic variables fluctuate resulting from a fall in world oil price followed by reduction in oil revenue for Nigeria. In the literature review, the government relies heavily on oil revenue as the bulk of government revenue in the annual budget estimates. Prolonged fall in oil prices and total oil revenue calls for structural adjustment or some austerity measures. The dependency of the Nigerian economy on oil makes price changes to have significant impact on macroeconomic variables, hence the need look deeply inward for alternative sources of revenue, such as agriculture and manufacturing. The Nigerian public sector is very vulnerable to oil prices volatility; it negatively affects consumption, employment, investment and sustainable growth.

## 7. Conclusion

Nigeria is adjusting to lower commodity prices. The Nigerian economy is highly vulnerable to oil price fluctuation because almost all industries in Nigeria make use of oil due to our inadequate power supply. However, oil exporting countries with credible governance can avoid the resource curse associated with volatile real exchange rate. Nigeria can overcome the air-borne diseases of oil price volatility that is crippling her macroeconomic activities. Volatility in oil prices has led to fluctuations in macroeconomic variables, hence disrupted economic development, commodity prices and revenue from natural resources tends to be fluctuating and has translated into macroeconomic instability and a highly volatile real exchange rate. Nigeria suffers deficits in the balance of payment position; the bulk of her oil is exported in crude form, at low prices, while refined petroleum products are imported at high prices. Also, deficit arose out of the huge imports expenditure incurred on low domestic food production and lack of adequate supply of industrial products and raw materials, as well as consumer goods, leading to huge deficits in balance of payments.

The characteristics and potential of political, institutional, social and economic development in Nigeria are tied to crude oil price and its volatility in the international market. It affects government revenue, economic development, real wages, exchange rate, employment, production and consumption. It has positive impact on unemployment and inflation. Oil price volatility has significant negative impact on the objectives of macroeconomic policy and aggregate economic and political activities resulting to shadow economic performance. It deters capital investment. Global oil price fluctuations have resulted in exogenous factors over which domestic policies in Nigeria are yet to have a full control. It has had serious consequences on Nigeria's economic development. On the export earnings side, it has created uncertainty in the economic and political climate. The development planning has been rendered difficult and costly under a situation of volatility and fluctuations in oil revenue. The foreign reserves and balance of

payments are not sustainable with steady increase in debt profile. These are in sympathy with gross reduction in government revenue. On the private sector, there is the purposeful avoidance of long-term capital investment. Private domestic capital tends to shun industrialization and goes into speculative motives. Maintaining fiscal and monetary stability has become a costly objective with negative multiplier effects on development projects at local, state and federal government levels. There is a highly significant reduction in Nigeria's capacity to import capital goods. This has been further worsened by inadequate inflow of foreign capital and exchange rate fluctuations. The balance of payments problem resulting has led to series of import restrictions with consequent inflationary effects on prices of goods and services while government is struggling to pay the fixed minimum wage. The fall in aggregate income has generally led to a fall in government revenue and the resultant inability to finance much-needed capital projects for sustainable development. Producers, farmers, entrepreneurs and wage earners are further impoverished, leading to mass suffering and shrink consumption. There is need for structural transformation of Nigeria's pre-industrial economy into industrially diversified, technologically-based economy, with myriads of transformation agenda in infrastructure agriculture and manufacturing. Consequently there is need for relative stability in macroeconomic variables. A study of this kind, investigating the impact of oil price volatility on macroeconomic stability and sustainable development is at the right time. Nigeria needs fiscal prudence, reform in budgetary operations, export diversification, revival of the non-oil sector of the economy, accountability and corporate governance. It must be stressed that the domestic measures (fiscal and monetary policies) aimed at stabilizing the economy are yet to yield positive impacts. The deficit budget of N6.08 trillion for 2016 is no news, as budget deficit is a norm in Nigeria over the decades. The assumptions of the Keynesian multiplier theory underlying fiscal policy are yet to be effective in this context. Nigerians would have to tighten their belts for much longer suffering and better economy in the end. Given Nigeria's endowments, oil dependency is a problem Nigeria needs not to have, and it is cheaper not to. Nigeria can end oil dependency forever.

# 8. Recommendations

Ending Nigeria's oil dependency is the best thing that could happen to the economy. There is need to insulate the economy from international oil price volatility with home-made solutions. Nigeria needs a set of policy package that could reverse the shadow macroeconomic situation. There is a strong need for policy makers to focus on policy that will strengthen/stabilize the macroeconomic structure of the Nigerian economy with specific focus on; alternative sources of government revenue (reduction of dependence on oil proceeds), reduction in monetization of crude oil receipts (fiscal discipline), aggressive saving of proceeds from oil booms in order to withstand vicissitudes of oil shocks in the future. Government's intervention using policy instruments (effective monetary and fiscal policy) is aimed at achieving price stability, full employment, and healthy balance of payment position, exchange rate stability and rapid economic development. The Central Bank of Nigeria (CBN) needs more appropriate inflation and exchange rate modeling in a way that will translate into real sector, non-oil exports, and employment benefits for sustainable development. The kind of diversification Nigeria needs is that which will lessen export-import dependence through import substation with domestic refineries, the provision of a significant proportion of goods and services previously imported from expanded domestic production. Diversification through emphasis on agro-industrial and tourism development is sustainable. The significant diversification efforts are yet to be fruitful in terms of real gross domestic product, foreign exchange earnings, capital formation, employment generation and improved standard of living. Smart government and CBN's financing of SMEs and infrastructure projects could empower the youths to create, make and innovate domestically. Entrepreneurship development and skills acquisition programs will gainfully engage the youths to participate and contribute to sustainable development. Economic policies should be market-oriented and innovation-driven. Nigeria should diversify energy sources to include modern biofuels such as biogas technology to replace another 20% of Nigeria's oil needs. New ways to convert poultry and cattle dumps, maize and other woody plant residues into ethanol can yield twice as much fuel as today's corn-into ethanol fuel as in developed countries, cheaper than nuclear energy, and available for rural development. Biofuels are a major new product line that leverages existing distribution and retail infrastructure, replacing fossil fuel, and can attract billions of investment from the private sector. This along with solar energy and hydropower can build Nigeria's industrial capacity before 2045. Ending Nigeria's oil dependency (upstream and downstream), is the best thing that could happen to the economy. It will create and safe jobs, improve standard of living, reduce income inequality and drastically reduce poverty incidence. Decades of refined oil imports will end with reinvestment in development projects. There will be flows of foreign exchange to farmers producing not only biofuels but all other crops such as cocoa, cotton, rubber, groundnut, fruits, vegetables, oil palm etc. Government revenue from taxes will increase for the provision of more public goods. By 2025, Nigeria's oil imports could be gone and Nigeria's economy flourishing. A more effective military can refocus on protecting Nigerian citizens rather than oil facilities and foreign oil supplies from theft and bunkering. Carbon dioxide emissions will shrink, federal government deficits will decrease substantially leading to more effective fiscal and monetary policies and macroeconomic stability. The petroleum industry bill (PIB) and the Gas Master Plan (GMP) are a good platform. We recommend diversification of energy sources for Nigeria, and energy-saving hybrid cars that use solar energy should be encouraged. Our seaports should be free of scraps that are shipped to Nigeria as a dumping ground. Automobile companies should be encouraged to come to Nigeria to invest here and produce "made in Nigeria" cars with at least 80% local contents. Fixing the power sector could also reduce the demand for petrol by at least 40%, and will revitalize strategic industrial subsectors including manufacturing.

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# APPENDIX

**Table-3.** Macroeconomic variables used for estimating the model

| Year | Inflation Rate | Exchange Rate | %RGDP | Balance of Payments | Unemployment Rate | International Oil Prices$ |
|---|---|---|---|---|---|---|
| 1990 | 7.50 | 9.6 | 2.6 | -3.3 | 3.50 | 22.26 |
| 1991 | 13.00 | 13.4 | 1.6 | -1.4 | 3.10 | 18.62 |
| 1992 | 44.50 | 20.3 | 0.78 | -1.6 | 3.40 | 18.44 |
| 1993 | 57.20 | 36.2 | 2.1 | -1.4 | 2.70 | 16.33 |
| 1994 | 57.00 | 59.9 | 4.1 | -0.5 | 2.00 | 15.53 |
| 1995 | 72.80 | 83.7 | 2.9 | -0.7 | 1.80 | 16.86 |
| 1996 | 29.30 | 83.1 | 2.8 | -0.6 | 3.40 | 20.29 |
| 1997 | 8.50 | 84.8 | 0.47 | -0.2 | 3.20 | 18.86 |
| 1998 | 10.00 | 87.8 | 5.3 | -0.4 | 3.10 | 12.28 |
| 1999 | 6.60 | 99.1 | 4.4 | -2.5 | 4.70 | 17.44 |
| 2000 | 6.90 | 110.5 | 21.3 | -2.2 | 4.20 | 27.60 |
| 2001 | 18.90 | 133 | 10.2 | -2 | 3.00 | 23.12 |
| 2002 | 12.90 | 137.8 | 10.5 | -2.1 | 14.8 | 24.36 |
| 2003 | 14.00 | 141.4 | 6.5 | -1.7 | 13.4 | 28.10 |
| 2004 | 15.01 | 145.36 | 6.0 | -1.8 | 11.9 | 36.05 |
| 2005 | 17.86 | 148.4 | 6.4 | -1.2 | 14.6 | 50.59 |
| 2006 | 8.22 | 156.32 | 6.8 | -2.3 | 12.7 | 61.00 |
| 2007 | 5.41 | 150.44 | 10.5 | 10.7 | 14.9 | 69.04 |
| 2008 | 11.58 | 158.21 | 6.3 | 9.0 | 19.7 | 94.10 |
| 2009 | 12.54 | 160.63 | 6.9 | 5.1 | 21.4 | 60.86 |
| 2010 | 13.72 | 160.8 | 7.8 | 3.9 | 23.9 | 77.38 |
| 2011 | 10.84 | 166.45 | 7.4 | 3.0 | 24.0 | 107.46 |
| 2012 | 12.27 | 170.15 | 6.4 | 4.4 | 23.0 | 109.45 |
| 2013 | 8.48 | 164.22 | 6.8 | 3.6 | 23.5 | 105.87 |
| 2014 | 8.06 | 168.06 | 7.2 | 0.2 | 22.0 | 96.29 |
| 2015 | 8.6 | 200.00 | 5.6 | -1.8 | 20.0 | 37.48 |

**Sources:** CBN Major Economic Financial and Banking indicators (2008); World Economic and Financial Surveys, (IMF,2015); Office for National Statistics,(UK,2015); CBN Money and Credit Statistics, (2015), CBN Annual Report (various issues) ,CBN Statistical bulletin (2012); UN/DESA, based on data from the United Nations Statistics Division and Individual Sources. Weights applicable are based on GDP in 2005 prices and exchange rates.