IJISET - International Journal of Innovative Science, Engineering & Technology, Vol. 8 Issue 10, October 2021
ISSN (Online) 2348 – 7968 | Impact Factor (2020) – 6.72
www.ijiset.com

Effect of Oil Price Shocks on the Nigerian Economic Growth.

Atayi Abraham Vincent,[1] Ibukun Felix Olusegun[2](PhD)and Ogunbiyi Ayoola Olayinka[3](PhD) and Charles-Akpunne Covenant Chiemala[4]

[1, 4] Department of Economics, Afe Babalola University, Ado Ekiti, Nigeria.

[2, 3]Department of Banking and Finance, Afe Babalola University, Ado Ekiti.

ABSTRACT

This study dealt with the effect of oil price shock on Nigerian economic growth from the period 1986-2019. The variables used include gross domestic product (GDP), government expenditure, total reserves, oil price and exchange rate were analyzed using co-integration and error correction model to understand the relationship among the variables. The results shows that At least there is one co-integrated equation, the ECM was also found to be negative and significant. As a result, the long-term rate of return on the variables were reasonable, and variables predicted positive behavior in the model, which served as a stimulant for domestic investment. The study recommend among other things that Nigeria government should diversify their sources of foreign exchange earnings in order to avoid becoming almost entirely reliant on crude oil for economic survival and hence promoting economic growth.

Keywords: Oil Price, economic growth, ECM and co-integration

I. Introduction

Crude oil has become one of the most important indices of global economic activity due to its critical role in meeting the world's energy demands. Oil price swings, according to a substantial body of research, have significant effects on economic activity ranging from exchange earnings, for example, the crude oil price dropped from $110 to less than $60 per barrel in 2014, and then dropped to less than $40 per barrel in 2015. (CBN, 2015). Crude oil price fluctuation is a typical occurrence in the global oil market, since the world economy has seen a number of variations in crude oil prices over time. Organizations like the Organization of Petroleum Exporting Countries (OPEC) can impact these price shifts. According to 2018 figures, OPEC owns about 80% of the world's oil reserves, making it the biggest influencer of oil price swings. To meet global demand, the consortium assigns production quotas to member countries and can affect the price of oil (gas) by raising and lowering production. However, as evidenced by the failure to sustain the price of oil over $100 per barrel, which saw it fall to $50 per barrel in mid-2014, this strategy may prove unsuccessful.

The determination (stability) of oil price is also influenced by supply and demand dynamics in the oil market. This is because, due to the rules of supply and demand, commodity prices are predicted to fluctuate. Prices tend to decline when supply exceeds demand, and vice versa when demand exceeds supply. According to Sanya (2015), oil prices reached an all-time high in 2008 when it was sold at $140 a barrel; this was the highest price ever recorded in the oil industry due to high demand. The second half of 2014, on the other hand, saw the start of yet another oil price

shock. Lower demand for oil in Europe and China, combined with a stable supply of oil from OPEC, caused the price of oil to drop from $100 to $50 by mid-2014.

By 2015, the price of crude oil had decreased by more than half compared to the previous year, with significant ramifications for countries around the world. The immediate cause of this drop was a market imbalance caused by oil producing countries' surplus crude oil supply to the market. However, the global demand for crude oil has plummeted as a result of the corona virus (COVID-19) epidemic. By April 2020, the OPEC basket had dropped from an average price of $65.11 in January 2020 to an average price of $17.93. Nigeria, an OPEC member, faces operational, regulatory, and infrastructure challenges that hinder its ability to quickly ramp up output. Despite the fact that non-oil GDP growth has improved in recent years, oil exports remain account for over 90% of Nigeria's foreign exchange earnings.

The Nigerian economy has experienced large fluctuations (fall and rise) in crude oil prices in the international oil market throughout the years, with attendant implications on the economy in terms of macroeconomic variable performance, creating important policy issues.

Different oil producers are affected by the present global oil crisis in different ways. Oil-producing countries, both traditional and developed, are much more connected into global markets, and their economies are experiencing major shocks. However, collective initiatives, such as OPEC's organizational framework and well-established sovereign wealth funds, can partially buffer their responses. Many producers in the global south, on the other hand, lack such buffers, as well as inadequate governance, limited diversity, and little capacity to mobilize resources from alternative sources. The issue is also one of politics.

A price increase is typically claimed to improve real national income for net oil-exporting countries through increased export revenues, however some of this gain would be reversed later by losses from weaker demand for commodities in general due to trading partners' economic crisis. Higher oil prices, on the other hand, contribute to inflation, higher input costs, lower non-oil demand, and weaker investment in net oil-importing countries. Due to rigidities in government expenditure, tax revenues fall and the budget deficit rises, driving interest rates up. An increase in oil prices often leads to upward pressure on nominal wage levels due to resistance to real wage decreases. In the short term, wage pressures combined with decreasing demand likely to lead to higher unemployment. These impacts are amplified by the impact of rising costs on consumer and corporate confidence, which is larger the more abrupt and acute the price increase (Majidi, 2006).

II. Literature Review

Africa's crude oil production accounted for 12.4% of global crude oil output in 2010, while crude oil exports accounted for over 20% of global crude exports. This was because to a lack of refining capacity on the continent, as well as perhaps low oil demand. In the same year, though, Africa possessed 8.8% of the world's proved oil reserves. Nigeria plays a larger role in crude oil production than it does in crude oil consumption (Akinlo & Apanisile, 2015).

Nigeria's proven oil reserves have increased by nearly 120 percent in the last few decades, from 57 billion barrels in 1980 to 124 billion barrels in 2012. According to the Energy Information Administration (EIA, 2010), Nigeria's proven oil reserves increased by nearly 120 percent in the last few decades, from 57 billion barrels in 1980 to 124 billion barrels in 2012. However, it is anticipated that there are approximately 100 billion barrels of oil waiting to be discovered

offshore. Furthermore, Nigeria's confirmed natural gas reserves have increased by almost 140 percent from 210 trillion cubic feet in 1980 to 509 in 2012. Nigeria, with 2,5 million barrels per day (bpd), is the world's largest oil exporter (CBN,2019). Nigeria is Africa's largest oil producer and has the world's second-largest oil reserves, with a reserve of over 28.2 billion barrels and a daily capability of over two million barrels. As of 2020, Nigeria produces roughly 1.8 million barrels. Nigerian oil and gas provide for about 95% of export earnings, 9% of GDP, and over 80% of fiscal revenue when combined. As a result of this predicament, Nigeria's economy is more exposed to fluctuations in crude production and oil prices.

Gross Domestic Product and Oil Price Fluctuation

There are documented negative and significant correlations between oil price changes and future GDP growth, according to Gunu, Umar, Kilishi & Abdulhakeem, (2010). Hamilton (1983), and many others. However, data after 1986 shows that this result is no longer valid (Hooker, 1996). The instable link could be due to Hamilton's linear definition implicitly assuming a symmetric effect of oil shocks. As a result, rising (falling) oil costs decreases (increases) future GDP growth. This statement is consistent with several of the transmission routes used by oil shocks to influence macroeconomic activity (Rasche and Tatom, 1977). In other words, when a daily increase in crude oil future price has a negative and significant influence on oil future GDP, it is called a symmetric effect of oil price shock. However, the effect can be asymmetric; a drop in oil prices may actually reduce future GDP growth through other pathways, leading to an increase in price uncertainty in the future (volatility). Several research have been undertaken on the analysis of crude oil price volatility and its link with macroeconomic variables. Kim (2010) recently characterizes the nonlinear link between oil price fluctuation and GDP growth using panel data from various industrialized countries. The findings imply that the nonlinear oil-macroeconomic relationship can be observed across a wide range of industrialized countries, and that using the nonlinear function of oil price change to anticipate GDP is a good idea. Andersen and Benzoni (2010) give an overview of a broad class of models aimed to capture stochastic volatility in financial markets, along with examples of how these models might be applied to real-world financial situations. Engelmann, (2010) investigate if oil price shocks enhance the likelihood of recession in a variety of nations. For the 1948-72 era, Hamilton (1983) claimed that the association between oil price evolution and economic production was not a historical coincidence. Slower output growth followed an increase in oil prices three to four quarters later, with a recovery beginning after 6-7 quarters. These findings are also applicable to the years 1973-1980. In inflationary times, the negative effect is more pronounced. On the basis of historical output, price, or money supply conditions, these declines in real GNP growth could not have been predicted.

Asymmetry in effects indicates that rising oil prices have a demonstrable negative influence on economic growth, while falling oil prices have no impact on economic activity. Mork (1989) looked at the asymmetric response to oil price fluctuations by breaking them down into real price rises and decreases. The investigation revealed that the association between price declines and the US economy is significantly different, and possibly nonexistent.

For other OECD nations, Mork, Olsen, and Mysen (1994) corroborated the imbalance in effects. Oil price hikes appear to be slowing economic growth in the United States in comparison to other countries, despite the fact that this country is less reliant on imported oil than Germany,

France, and Japan. Lee et al. (1995) also looked at the stability of asymmetric effects before and after 1985, as well as if it was affected by other variables.

Balke et al. (2002) explain the asymmetric impact of oil price shocks on macroeconomic activity in a similar way. The real consequences of oil price shocks on real GDP cannot be explained only by monetary policy. They also come to the conclusion that interest rates appear to be an essential mechanism for influencing economic output when it comes to oil prices. Anticipation of asymmetric real consequences and Ferderer's idea of investment uncertainty are two possible causes.

Oil and the Global Economy

Because of its importance in our lives, petroleum, also known as crude oil, is one of the world's treasures. It has a wide range of applications, all of which are beneficial. Diesel fuels, fuel oils, gasoline, jet fuel, kerosene, Liquid Petroleum Gas (LPG), and natural gas are all produced from crude oil and are used to power engines and automobiles. These lack a functional group and are described as having a ""backbone"" made completely of carbon, hydrogen, and other bound compounds. To find petroleum, oil wells are sunk as deep as six miles into the ground. Drilling these wells can be costly in the millions of dollars, yet it is necessary because petroleum is a precious natural resource. Although petroleum is mostly utilized as a fuel (gasoline, jet fuel, and heating oil), petroleum and natural gas are also frequently used to generate power. A handful of the many uses of petroleum in our daily lives will be discussed below. Plastic, for example, is created entirely of petroleum and is found practically everywhere: in vehicles, houses, toys, computers, and clothing. The asphalt used in road construction, as well as the synthetic rubber used in tires, are both petroleum products. Fertilizers, pesticides, herbicides, detergents, phonograph records, photographic film, furniture, packaging materials, surfboards, paints, and artificial fibers used in clothing, upholstery, and carpet backing all come from petroleum. Along with petroleum, oil wells create helium, sulphur, and other useful materials. Petroleum is mostly used to make gasoline and lubricating oils. The average person only realizes the importance of these commodities when they are restricted or threatened.

Economic growth

Oil demand rises as countries develop due to industrialization, rapid urbanization, and higher living standards (Dunlap, Swan, and Fowler 2009). Currently, oil demand growth is highest in developing countries, with the world's transportation sector almost entirely reliant on petroleum products like gasoline and diesel fuel (Dunlap, Swan, and Fowler 2009). For heating, cooking, and generating electricity, many countries rely significantly on petroleum fuels. Crude oil and other hydrocarbon liquids are used to make petroleum products, which account for about a third of total global energy use. Despite this, the US remains the world's greatest oil consumer. Transportation accounts for two-thirds of all oil consumed in the United States, according to the US Energy Information Agency (EIA). China is the world's second-largest oil consumer. In 2011, China's oil consumption rise accounted for half of global consumption growth (EIA). Power generation, transportation sector movements, economic growth and trade, and refining capacities all contribute to China's oil consumption. This shows that these economies are addicted to oil. In fact, their addiction is partially explained by their industrial needs, rather than

by their need for transportation. The demand for oil is influenced by industrial need for chemicals, polymers, and electricity generation. Because most advanced economies have a large industrial sector and rely significantly on internal combustion engines for transportation, they have higher oil consumption than less industrialized economies. Finally, variables like population growth, subsidies, taxes, and other regulations influence overall petroleum demand. Oil demand is also influenced by investors, traders, hedgers, and speculators.

Keynesian Four Sector Growth Model (Theory)

This is the Keynesian macroeconomic model, which incorporates the household, business, government, and foreign sectors. In the three-sector model, this Keynesian variant adds the foreign sector to the three domestic sectors (household, business, and government). This model depicts the macroeconomy in its entirety, including the export-import relationship between the home and foreign economies. The point where the C + I + G + (X - M) line intersects with the 45-degree line is called equilibrium.

The inclusion of the role of overseas trade, or net exports, in the equilibrium analysis is made possible by adding the foreign sector to the three domestic sectors. To put it another way, adding the foreign sector to the three-sector Keynesian model is as simple as adding a new layer called "net exports" to the aggregate expenditures stack. Households, corporations, and governments based in other nations are all part of the foreign sector. Exports and imports are how the domestic economy trades with the rest of the world. This international trade is a continuation of typical market activity, with the exception that the buyers and sellers are from different nations. The contribution of the foreign sector to aggregate expenditures is calculated by subtracting imports from exports.

Between 1970 and 2009, Ogbonna and Ebimobowei (2012) looked at the impact of oil revenue on the Nigerian economy. They analyzed main and secondary data using Pearson correlation and descriptive statistics to explain evidence and events. The findings of the study show that oil revenue has a positive impact on Nigeria's gross domestic product and per capita income. The relationship between petroleum revenue and inflation rate, on the other hand, was negative. They recommended that oil revenues be properly utilized and managed in order to achieve the country's long-term growth and development.

Olomola (2006) used quarterly data from 1970 to 2003 to examine the impact of oil price shocks on aggregate economic activity (output, inflation, real exchange rate, and money supply) in Nigeria. The findings revealed that, contrary to previous empirical findings, oil price shocks have little impact on Nigerian output and inflation. Oil price shocks, on the other hand, were found to have a significant impact on the real exchange rate. According to the author, oil price shocks can cause a wealth effect, which raises the real exchange rate and squeezes the tradable sector, resulting in the Dutch Disease.

The asymmetric effects of oil price shocks on the Nigerian economy are studied by Akpan (2009). Her research found a strong positive correlation between positive oil price changes and real government spending. Furthermore, with the observed significant appreciation of the real exchange rate, the impact of oil price shocks on industrial output growth was found to be marginal.

The price elasticity of crude oil, according to Hamilton (2009) is very low, especially in the short run. This is due to technology lock-up, which means it takes time for energy-guzzling appliances/capital stocks to be replaced with more energy-efficient alternatives, Akpan, (2009)

found a positive relationship between oil price increases and output growth in Nigeria (possibly because Nigeria is a net crude oil exporter).

Chuku et al. (2011) used a VAR model and a Granger causality test approach to investigate the linear and asymmetric effects of oil price shocks on the Nigerian economy for the period 1970 Q1-2008 Q4; they discovered that oil price shocks are not a major determinant of macroeconomic activity in Nigeria in the linear model, while Granger causality results indicate that world oil prices do not influence macroeconomic activity in Nigeria.

The influence of oil prices on the current account deficit and growth in the fragile-five nations was studied by Bayraktar et al. (2016). (Brazil, Indonesia, South Africa, India, and Turkey). The findings revealed that oil prices had a substantial association with both GDP and the current account deficit, with a positive correlation between GDP and oil prices and a negative correlation between oil prices and the current account deficit.

The influence of crude oil price volatility on the Nigerian economy was studied by Umar and Kilishi (2010). Except for the consumer price index, they discovered that crude oil prices have a considerable impact on GDP, money supply, and unemployment (CPI).

III. Methodology

The data used in this study included time series data from 1986 to 2019. It is based on secondary data from the World Bank Development Indicators, the National Bureau of Statistics, and the Nigerian Central Bank's statistics bulletins.

Johansen Co-integration Test

The Johansen co-integration test was used to examine the existence of long run relationship between the variables. The existence of co-integration implies that there is a long-run equilibrium relationship existing between the variables. This is to say that if a set of variables is co-integrated, the effects of a shock to one variable spread to the others, possibly with time lags, so as to preserve a long-run relationship between the variables.

Error Correction Model (ECM)

The Error Correction Mechanism is the most appropriate strategy to apply when they are all stationary at initial difference and co-integrated (ECM). The short-term and long-term dynamics of a variable around its stationary equilibrium value are detected using an error correction model (ECM). .

The model is specified to understand the impact of Oil price on economic growth;

GDP= F(OILP, GEX, RES, EXR)

Where; OILP = Oil price,

GEX = Government Expenditure,

TRES = Total Reserves

EXR = Exchange Rate

IV. Result and Discussion of finding

Table 1: Stationarity Test Result

Variable	*ADF Test Statistic*	*p-Value*	*Order of Integration*
Oil Price	-2.782863	0.0013	I(1)
`Govt. Exp	-2.836567	0.0032	I(1)
Ex. Rate	-2.591260	0.0034	I(1)
Total Reserves	-2.80131	0.0031	I(1)
GDP	-2.143024	0.0431	I(1)
Critical Value @ 5%	-2.878036		

Table 2: Johansen Co-integration Test

Date: 09/27/21 Time: 05:36
Sample (adjusted): 1986 2019
Included observations: 31 after adjustments
Trend assumption: Linear deterministic trend
Series: LNGDP LNGE LNEXR LNOILP LNRESERVE
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rak Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.720038	80.32958	69.81889	0.0057
At most 1 *	0.642441	51.04827	47.85613	0.0243
At most 2	0.431381	27.39381	29.79707	0.0924
At most 3	0.344119	14.40929	15.49471	0.0724
At most 4 *	0.185121	4.708461	3.841466	0.0300

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.720038	29.28131	33.87687	0.1604
At most 1	0.642441	23.65446	27.58434	0.1472
At most 2	0.431381	12.98451	21.13162	0.4537
At most 3	0.344119	9.700834	14.26460	0.2323
At most 4 *	0.185121	4.708461	3.841466	0.0300

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

Table 3: Error Correction Model Test Results

Dependent Variable: D(LNGDP)
Method: Least Squares
Date: 09/27/21 Time: 05:35
Sample (adjusted): 1986 2019
Included observations: 33 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.024969	0.094124	0.265279	0.8080
D(LNGDP(-1))	-0.023941	0.722183	-0.033151	0.9756
D(LNGDP(-2))	0.106800	0.760382	0.140456	0.8972
D(LNGDP(-3))	-0.305128	0.885658	-0.344522	0.7532
D(LNGDP(-4))	0.131849	0.961849	0.137079	0.8997
D(LNEXR(-1))	-0.050480	0.134045	-0.376591	0.7315
D(LNEXR(-2))	0.080828	0.210958	0.383146	0.7271
D(LNEXR(-3))	0.058699	0.155591	0.377265	0.7311
D(LNEXR(-4))	-0.103612	0.286708	-0.361387	0.7418
D(LNGE(-1))	0.304404	0.775449	0.392552	0.7209
D(LNGE(-2))	0.494284	1.069120	0.462328	0.6753
D(LNGE(-3))	-0.044105	0.910997	-0.048413	0.9644
D(LNGE(-4))	-0.038727	0.794822	-0.048724	0.9642
D(LNOILP(-1))	0.068303	0.283809	0.240665	0.8253
D(LNOILP(-2))	0.424769	0.265770	1.598259	0.2083
D(LNOILP(-3))	0.060352	0.250568	0.240862	0.8252
D(LNOILP(-4))	-0.191269	0.265234	-0.721131	0.5229
ECM(-1)	-0.224481	0.366364	3.157711	0.0004

R-squared	0.892031	Mean dependent var	0.101061
Adjusted R-squared	0.836198	S.D. dependent var	0.138316
S.E. of regression	0.114376	Akaike info criterion	-1.695765
Sum squared resid	0.039246	Schwarz criterion	-0.849392
Log likelihood	33.95765	Hannan-Quinn criter.	-1.530544
F-statistic	1.549114	Durbin-Watson stat	1.828149
Prob(F-statistic)	0.030024		

Source: Computation from E-view (2021)

Table 3 shows that, despite being negligible, all factors in the Nigerian instance are found to have a mixed association with GDP, the dependent variable. For government spending and oil prices, the lag periods 1-3 are positive, whereas the fourth lag period is negative. The first and fourth periods of the exchange rate are negative, whereas the second and third periods are positive.

The current period's oil price coefficient is 1.008667, and the corresponding probability value is 0.0001. This implies that oil prices have a positive and significant association with GDP in the current period. Oil prices have a negative association with gross domestic product in the lagged period. The link between the two is statistically insignificant.

In the current time, the exchange rate has a positive and statistically significant association with GDP. It has a value of 1.820898 as a coefficient. However, the exchange rate shows a positive and statistically insignificant association with gross domestic product in the lagged period, with a

correlation of 0.232833. Government spending, on the other hand, has a coefficient of 62.65591 and a probability value of 0.0476 in the current time. This indicates that gross domestic product has a positive and statistically significant association. Government spending has a negative and insignificant association with gross domestic output throughout the lagged period.

Furthermore, reserve has a positive and statistically insignificant relationship with gross domestic product in the current period with a coefficient of 0.210217, and reserve has a positive and statistically insignificant relationship with gross domestic product in the lagged period with a coefficient of 0.210217. The coefficient of gross domestic product, 0.416428, demonstrates that reserve has a positive association with GDP. The coefficients for the error correction model are presented with probability values of -0.243418 and 0.0001 0. This indicates that the ECM is negative and statistically significant at the 5% level. In the long run, it also indicates that the rate at which the variables return to equilibrium is fair. With an R^2 of 0.89132, the independent variables used may accurately predict changes in domestic investment. The F-statistic has a probability value of 0.004103, indicating that all independent variables are jointly significant in accounting for variations in domestic investment. Furthermore, the Durbin-Watson statistics are higher than the R^2 value, indicating that there is no autocorrelation.

V. Conclusion/ Recommendation

At least one equation co-integrated, according to the results of the co-integration test. The ECM was also found to be negative and significant. As a result, the long-term rate of return on the variables were reasonable, and it shows that variables also predicted positive behavior in the model, which served as a stimulant for domestic economic investment.

Given the current global unpredictability of oil prices, it is now necessary for oil-producing countries, like Nigeria, to diversify their sources of foreign exchange earnings in order to avoid becoming almost entirely reliant on crude oil for economic survival and that the vast majority of the proceeds from oil sales should be prudently use by government so as to achieve optimal welfare for the citizens.

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