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IMPACT OF CRUDE OIL PRICE CHANGES ON ECONOMIC GROWTH IN NIGERIA (1980-2014)

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ABSTRACT
This study examined the impact of crude oil price changes on economic growth in Nigeria. The study sets out to examine the causal and both short and long-run relationship between crude oil price changes and economic growth in Nigeria. The underpinning theoretical framework dwells in Harrod-Donor theory of economic growth, the theory of employment, interest and money and Kaldor theory of economic growth. The study employed the annual time series data from 1980 to 2014 for the following variables: Crude Oil Prices (COP), Capital Formation (CF), Real Gross Domestic Product (RGDP), Market Capitalization (MCAP), Foreign Reserves (FR), Inflation Rate (INF) and Exchange Rate (EXR), using descriptive statistics and normality test, regression analysis, unit root test of ADF, Johansen co-integration, error correction model and causality test. The results revealed significant relationship between the variables. The causality test result also indicates that a causality relationship runs from crude oil prices to all the indicators of economic growth. The implication is that any change in the prices of crude oil will have effect on the growth of the Nigerian economy. Based on the significant relationship between crude oil prices and various economic growth indicators used in the study, Nigerian government should implement policies that will eradicate oil theft and corrupt practices in the NNPC so as to take maximum advantage of crude oil price increases.
Keywords: Crude oil prices, capital formation, foreign reserves, real gross domestic product and market capitalization.

1.1 Background to the study

The Nigerian economy is currently facing a lot of challenges and most economic analysts attributed this to the fluctuating prices of crude oil in the international market. Crude oil price changes in the international market could have an impact on any economy due to the link between crude oil and all economic activities all over the world; (Odularu, 2008).

Over the years the prices of crude oil fluctuate in the international market. The prices of crude oil oscillated between $33 and$140 in 2008, $38 and $77 in 2009, $66 and $90 in 2010, $89 and $120 in 2011, $88 and $124 in 2012, $96 and $114 in 2013, $52 and $110 in 2014 and $34 and $63 in 2015 and $26 and $52 from $26 and $51.29 in 2016 and $45.13 and $64 in 2017, and between 60 and 68.46 from January 2018 and February 2018 (Nelson, Yebimodei and Angonimi 2018).

Monetary and fiscal policy are all aimed at achieving desirable economic trends such as price stability, full employment, exchange rate stability, economic growth and balance of payment equilibrium. It is observed that, the nation's economy has been largely unstable, consequence of the heavy dependence on crude oil revenue and the changes of the crude oil prices. The Local Government Areas, the States and the Federal Government of Nigeria are depending greatly on the crude oil proceeds. As a result, oil dependence has exposed Nigeria to oil price changes which could result in systematic shocks.

The global oil price has continued to fluctuate for several reasons. From the mid-late 2014 to last quarter 2016, the prices of crude oil continued to fall steadily from $110 to as low as $26.19, but today (April 20, 2018, sold at

$70.96). And different scenarios, analysis had to the postulation as to why oil prices might still fall to $20 per barrel or even lower because, while OPEC member countries are strategizing to cut crude oil production and supply in order to increase the prices of the product, the non OPEC members are against this strategy by increasing the production and supply of crude oil in the international market. Another reason is the issue of oil theft by bunkering operations, thereby blooding the market beyond the target. If measures are not put in place, benefits that could come from the high prices of crude oil would be hampered.

There are some empirical studies to this effect most of which were carried out in developed economies (Haung, Hwang and Peng 2005;Khuram, Liu, Zahra, Javed and Amna, 2015; Sidra and Abdul 2014; Dogah 2015;Qianqian, 2011;Peplin and Mubaris, 2013;Katsuya, 2008); whose results cannot be fully relied on in the Nigerian economic environment which is a developing economy. Even if we are to some extent rely on these studies, their results and conclusions differ.

The results from (Haung, Hwang and Peng 2005; Khuram, Liu, Zahra, Javed and Amna, 2015; Katsuya, 2008;) revealed positive significant impact, while the results from (Qianqian, 2011; Sidra and Abdul 2014; Dogah 2008;Peplin and Mubaris 2013;) shows negative impact and that of Cherifa and Hussein 2012 shows no significant impact.

Some studies have been conducted in Nigeria (Alley,Asekomeh, Mobolaji and Adeniran 2014; Gunu, 2010; Philip, 2006; Oriakhi and Iyoha, 2013; Edesiri, 2014; Asaolu and Ilo, 2012; Akin and Babajiode, 2011; Apere and Ijeoma, 2013; Ani, Ugwunta, Oliver and Eneje, 2014; Akin and Babajide, 2012;). There results and conclusions also differas to the impact of crude oil price changes on economic growth. The results from (Alley, Asekomeh, Mobolaji and Adeniran 2014; Gunu, 2010; Oriakhi and Iyoha, 2013; Edesiri, 2014;) shows positive significant impact, the results from (Philip, 2006; Ani, Ugwunta, Oliver and Eneje, 2014; Akin and Babajide, 2012; Apere and Ijeoma, 2013;) shows no impact and that from Asaolu and Ilo 2012 shows negative impact.

In other words, there is lack of scholarly consensus on the impact of crude oil price changes on economic growth for both developed and developing economies including Nigeria. Also, the market capitalization which is one of the key economic sectors, to the best of our knowledge have not been measured by previous studies in Nigeria.

This study, therefore, intend to use longer span and more recent data as well as varied economic growth indicators to verify the various positions taken in earlier studies. This study will focus on the Nigerian economic environment and measure some vital economic indicators that to the best of my knowledge other studies have not measured in Nigeria.

1.2 Objectives of the study

The general objective of this study is to examine the impact of crude oil price changes on the growth of the Nigerian economy. To achieve this general objective, the following specific objectives are vital for the study:

(a) To determine if crude oil price changes have any significant impact on real gross domestic product in Nigeria.
(b) To assess if there exists any significant relationship between crude oil price changes and capital formation.
(c) To find out the extent to which crude oil price changes affect market capitalization in Nigeria.
(d) To investigate if there exists any significant relationship between crude oil price changes and Nigerian foreign exchange reserves.

2.1 Conceptual framework

Crude oil is an oily bituminous liquid, consisting of a mixture of many substances mainly the elements of carbon and hydrogen, and thus known as hydrocarbon. It also contains a very small amount of non-hydrocarbon element, chief amongst which are sulfur, nitrogen, and oxygen, though some good crude oil such as Bonny light is free from sulfur.

Crude oil is a naturally occurring, unrefined petroleum product composed of hydrocarbon deposits. Crude oil can be refined to produce usable products such as gasoline, diesel and various forms of petrochemicals. Crude oil is traded in a global market. Prices of many crude oil streams produced globally tend to move closely together, although there are persistent differentials between light-weight, low-sulfur (light-sweet) grades and heavier, higher-sulfur (heavy-sour) crudes that are lower in quality (Olutoye, 2005).

The price of crude oil is generally refers to the spot price of a barrel of benchmark crude oil. The price of a barrel of crude oil is highly dependent on its grade, determined by factors such as its specific gravity, its sulfur content, and its location.

In addition, the prices of energy intensive goods and services are linked to energy prices, of which crude oil makes up the single most important share. The price of oil is linked to some extent to the price of other fuels (even though crude oil is not fully substitutable for natural gas, coal, and electricity, particularly in the transportation sector). For these reasons, changes in the price of crude oil have wide-ranging impact for both crude oil exporting countries and importing countries. (ThankGod, Jacob, Sixtus and Hubbert, 2014).

The term crude oil price changes refer to the rise or fall (change), volatility, instability or fluctuation in the crude oil prices in the international oil market. "Price volatility" refers to the extent at which prices fluctuate over a period of time. When market prices tend to change a lot over a relatively short time, the market is said to have high volatility. When relatively stable prices prevail, the market is said to have low volatility. Akpan (2012) opined that the changes of the prices of crude oil have been traditionally traced to supply disruptions such as OPEC supply quotas, political upheavals in the oil-rich Middle East and militancy operations in the Niger Delta Region.

Economic growth, according to Jhingan (2005) is a quantitative and sustained expansion in the nation's per capita output or income accompanied by expansion in its human resources, consumption, capital and volume of trade. Growth implies an increase in real GNP per unit of labor input. This refers to changes in labor productivity over time. Economic Growth is conventionally measured as the rate of increase in Gross Domestic Product (GDP).Growth is usually calculated in real terms (netting out the effect of inflation on the prices of the goods and services). Growth improves the standard of living of the people in a country. Real gross domestic product, capital formation, market capitalization and external reserves are used as proxies of economic growth indicators.

Real gross domestic product: It is a macroeconomic measure of the value of economic output adjusted for price changes (i.e. inflation or deflation). It is a measurement of economic output minus the effects of inflation or deflation. It measures gross domestic product by considering the values of inflation or deflation. The real gross domestic product as a result of that gives more realistic assessment of growth. Otherwise it might seem, a country is producing more while its actual prices are going up. It therefore explains how much the economy is producing. The real gross domestic product will explain the sector of the economy that is producing more.

Capital formation: There are basically two types of capital. These are physical capital and human capital. The physical capital includes plants, machines, business assets and cash which can be used for further production. The human capital refers to the stock of human expertise, accumulated by workers and value for its productive capacity of income earning potentials (Pizzey, 1980). It is the human element that will manipulate the physical assets to make it function. It is in this regard that Harbison (1973) stated that human element occupies the major part for a nation's wealth. Nwikina (2000) stated that capital formation is the conscious process of accumulating and increasing the stock of capital assets of a nation.

Market capitalization: Market capitalization captures the market intensity and the expansion of the stock traded in the market (Nzotta 2014). It is an indicator of the trends in economic activities and the direction of such economic activities.

External reserves: Foreign exchange forms a major component of a nation's official reserves. Uche (2008) opines that external reserves of a nation refer to all foreign assets over which the monetary authorities of the nation can exercise direct and effective control and which can be mobilized for use with ease and certainty. If the foreign assets a country can exercise direct control over a period is increasing, it shows that that nation's economy is growing.

Economic activities are always link to petroleum resources as transport, electricity, etc depend largely on petroleum resources to function. Therefore anything that can have affect on crude oil could affect economic activities all over the world.

2.2 Theoretical framework

The following theories are reviewed in the study: The Harrod-Domar theory of economic growth by Roy F. Harrod (1939) and Evsey Domar (1946), the general theory of employment, interest and money by Keynes, J.M. (1936), and Kaldor theory of economic growth (1956).

Harrod-Domar theory is used to explain economic growth. Harrod and Domar sought to know the rate of income growth needed for the smooth and uninterrupted running of the economy. The model showed that growth is directly related to savings and indirectly related to the capital/output ratio. According to the model, growth (*G*) can be written symbolically as:

G= s/k,

Wherek- incremental capital-output ratio and;

s- The average propensity to save.

The model indicated that saving affect growth directly, while the incremental capital/output ratio affects growth indirectly or inversely. The theory also explained that investment is capable of creating income and capital stock, therefore, if investment activities are increasing, real income and output will continue to expand. If crude oil price increases, the crude oil exporting country will earn more income and if the received income is retained and channeled to investment, that will create more income and capital stock and continue to expand output.

The Keynesian theory opposed the classical theory basically because it discards the view that there is a proportional relationship between the quantity of money and prices. Rather, the reformulated theory establishes an indirect and non-proportional relationship between the quantity of money and prices, working through the interest rates. Jhingan (2005) posited that in establishing such a relationship, Keynes theory integrates the monetary theory on one hand and the theory of output and employment through the interest rates on the other hand.

Thus, when the quantity of money increase, the rate of interest falls, leading to an increase in the volume of investment and aggregate demand, thereby raising output and employment. The increase in income leads to an increase in investment and employment which leads to greater output.

Crude oil price volatility could visibly have a significant impact on the economies of the world. Theoretically, crude oil price increase leads to a transfer of income from importing countries to exporting countries through a shift in the terms of trade, Majidi (2006). In economic reasoning, the higher the crude oil price increase and the longer higher prices are sustained, the higher the macroeconomic impact. In net crude oil-importing countries, higher crude oil prices lead to inflation, reduce real gross domestic product, reduce employment and unfavorable exchange rate. Tax revenues fall and the budget deficit increases, due to complexity in Government expenditure, which drives interest rates up. Given the resistance to real declines in wages, crude oil price increase typically leads to upward pressure on nominal wage levels, thereby stimulating wage pressures with far reaching implications which manifest possibly in all the postulated channels (Wakeford, 2006).

This is to show that in an oil exporting countries, higher crude oil prices lead to increase in GDP, increase in employment, favorable exchange rate, and increase in tax revenue, budget surplus, low interest rate and moderate inflation rate. Crude oil price increase then have a positive effect on crude oil exporting countries, that is income and wealth increases in oil exporting countries, because importing countries pays more and if the exporting countries utilize income in home country then investment will be more in countries and increase employment in the society.

Keynesian views which support the view that so long as an economy has not reached the level of full employment, any increase in money supply or the price would exhaust itself in raising the level of employment and output and not the general price level in the economy, Nigeria being a country that has not attained full employment will not experience high inflation as a result of crude oil price increase, rather it increases money supply in the society and currency appreciates in this regard.

Kaldor's economic growth theory also agree with the Keynesian growth theory that whenever an economy has not attain full employment level, the amount of money in the system will not be proportional to the price level, rather as the money increases in the system, it will lead to increase in the economic activities. In this case, as the income increases, investment will increase and that leads to increasing output.

Kaldor postulates "the technical progress function" which is a joint product of two tendencies: growth of capital and growth of productivity. Crude oil is related to almost all economic activities, be it production, transportation, etc. therefore rising price of crude oil could lead to price rise in all other inputs. Rising crude oil prices leads to higher energy costs and lower usage of crude oil. It is generally argued that for net crude oil exporting countries, a price increase directly increases real national income through higher export earnings; though part of this again would be later offset by losses from lower demand for exports, generally due to the economic recession suffered by trading partners.

2.3 Empirical review

This section presents the various studies done and the results obtained.

Osuji (2015) examined the international oil prices and exchange rate in Nigeria for the period 2008 to 2014 using OLS by considering exchange rate and foreign reserves as economic indicators. The results revealed that crude oil prices on a relative basis affect foreign reserves and exchange rate. In another development, Akinleye and Ekpo

(2013) employed VAR model to investigate crude oil price shocks and macroeconomic performance in Nigeria covering 1970 to 2010, using oil price shocks, oil revenue, real gross domestic product, inflation rate and external reserves as variables. The results show that neither positive nor negative shocks changed external reserves but impacted significantly on real gross domestic product.

Audu, Husseini and Ejiemenu (2015) also investigated the impact of crude oil price shocks on external reserves, exchange rate, gross domestic product, inflation rate, international trade and money supply in Nigeria with quarterly data from 2000 to 2014 using GARCH and VAR model. The results revealed that crude oil price fall do negatively affect external reserves and international trade. But crude oil shocks did not pose significant inflationary threat to Nigerian economy at the short run, rather it improves the gross domestic product.

Rano (2009) studied the impact of oil price shocks and exchange rate volatility on economic growth, using Johansen VAR base co-integration techniques. The result shows that both oil price shock and exchange rate volatility cause real changes in GDP, and a long run stable equilibrium exists between crude oil price, exchange rate and GDP in Nigeria. Onoja, (2015) investigated the link between real exchange and real oil prices in Nigeria from 1981 to 2009. Using ECM, the results revealed that real exchange rate is positively related to the oil prices. Obioma and Charles (2015) investigated the integration of crude oil price, consumer price level and exchange rate in Nigeria using the VAR model. A monthly data between January 2007 and February2015 were used for the analysis. The analysis showed that all the variables were integrated of order one and no long-run relationship existed among them. The work also revealed that a shock on crude oil price had a negative impact on exchange rate, and a shock on exchange rate had a negative effect on consumer price level. Jebbin and Osu (2012) examined the oil prices and exchange rate fluctuation in Nigeria between 1986 to 2010 using VAR-based co-integration and ADF. The study found out that real exchange rate fluctuation in the Nigeria is significantly influenced by oil price fluctuations. Oluwatomisin, Paul and Adeyemi (2014) examined the oil price and exchange rate volatility in Nigeria, using the Johansen co-integration and Vector correlation mechanism for the period 1970 to 2011. The result showsa proportionate change in oil price leads to a proportionate change in exchange rate. Khuram, Liu, Zahra, Javed and Amna, (2015) identified the impact of exchange rate volatility and oil prices fluctuations on economic growth in France, using co-integration technique and the results open to us that the link between oil price, Exchange rate and GDP is significant both at the short and long run.

Ogbonna and Ebimobowei (2011) investigated the impact of petroleum revenue and the Nigeria economy, employing ordinary least square model from 1970 to 2009, with oil revenue, inflation rate, gross domestic product and per capita income. The study showed that petroleum revenue affects per capita income and gross domestic product positively, while inflation was affected negatively. Mohmmadreza, Ali and Zahra (2013) assessed the effect of oil price shocks on economic growth in 26 oil exporting countries by employing GLS model, the relationship between capital formation, gross domestic product, employment rate and oil prices revealed that positive shocks affected all the variables positively and negative shocks affected all the variables negatively.

Terfa (2016) assessed the impact of crude oil price movement on the Nigerian stock market and the role of exchange rate as a plausible counter cyclical policy tool in Nigeria between two periods, 2008 to 2009 and 2012 to 2015 using daily data set on crude oil prices, stock returns and exchange rate using ADL model. The results revealed that crude oil fluctuation has significant impact on stock performance. Huang, Hwang and Peng (2005) used monthly data on US, Japan and Canada for the time period from 1970 to 2002 and employed the threshold test; they found that the price change has better descriptive power to explain the economic activities than oil price volatility. On the other hand, oil price volatility has better explained the stock return than a change in industrial production. Anthony (2012) examined the relationship between oil price shocks and stock market behavior in Nigeria from 1985 to 2009 through Johasen co-integration test, A bi-variate model and granger causality test on oil price shocks on stock returns and the result showed that oil price shocks affects stock returns positively at the short run and negatively at the long run. Asaolu and Ilo (2012) accessed the relationship between the Nigerian stock market and crude oil prices in Nigeria by employing VECM from 1984 to 2007 and on the contrary when prices of crude oil is increasing, that is when the stock returns were declining. Uwubanmwen and Omorokunwa (2015) also examined oil price volatility and stock price volatility in Nigeria from 1990 to 2012 by using ECM and GARCH model to access the relationship between oil price volatility, stock prices and real exchange rate. The results revealed that oil price volatility stimulates stock price changes in Nigeria, increasing oil prices lead to increase in stock prices.

Dogah (2015) investigated the impact of crude oil price shocks on macroeconomic activities in Ghana by employing a restricted VAR model and Johansson Co-integration test. The findings reveal that crude oil price shocks have significant negative impact on output and economic activities in Ghana. He further employed a non linear crude oil price shocks specification to account for asymmetric effects and find that negative crude oil price exist between oil shocks and macroeconomic variables in Ghana. Kapoor (2011) identified the relationship between economic activities and oil price shocks. He find that the relationship between net oil price increase and real GDP growth are statistically significantly for Turkey for the period 2000:1-2009:4. Peplin and Mubaris (2013) accessed the impact of crude oil price changes on output growth by employing ordinary Least Square Method on a monthly time series data from 1990:1-2012:3. The results show that crude oil price increases have clear negative effects on output growth, the impact of crude oil price decline is significant, and similarly, crude oil price increases have positive and significant effects on inflation in Turkey which is a crude oil importing nation. This implies that the reverse will be the case for Nigeria as a crude oil exporting nation.

Bushraand Muhammad (2014) analyzed the impact of oil price and real GDP growth of Pakistan from 1980-2012. Utilizing Johnson Co-integration and error correction method to check long-run and short-run relationship, the results showed that oil price influence GDP negatively in Pakistan. Rafiq, Salim and Bloch (2009) find the unidirectional causality runs from oil price volatility in investment, unemployment rate, interest rate and trade balance in the case of Thailand. The results of the VAR model show that the oil price volatility has significant impact on growth, employment and investment. Qianqian (2011) investigated the long run link between oil price and output, CPI, net exports and the monetary policy for the Chinese economy. Rising oil prices cause the net exports and the real GDP to decline and CPI to rise. It has a negative impact on the actual money supply. Umar and Abdulhakeem (2010), examined the impact of oil price volatility on real GDP, money supply, unemployment and consumption price index by using VAR model. The results show that oil prices had a significant impact on real GDP, money supply and unemployment but an insignificant impact on consumer price index.

Cherifa and Hussein (2012) examined the impact of oil prices distortion on Algerian macroeconomic during the period 1980 to 2011, using a Vector Error Correlation model. Five macroeconomic variables (RGDP, Unemployment, inflation, m_2 and exchange rate) were examined. The results show that various oil prices have no important impact on four variables except that they have positive effects on inflation and negative effect on real effective exchange rate appreciation. Katsuya (2008) examined the effects of oil prices and monetary shocks on the Russian economy over the period 1997:1 to 2007:4 using the VEC model; the results show that an increase in oil prices contributes to real GDP growth, whereas, that of inflation. And the monetary shock through interest rate channel immediately affects real GDP and inflation.

Sidra and Abdul (2014) examined the Impact of Oil Price and Shocks on Economic Growth of Pakistan, using ADF, Johansen Maximum Likelihood method of co-integration and Granger causality test by applying restriction on dynamic model are used to test the order of integration, Long run and short run dynamics and causal relationship between variable using annual data from 1972-2011 in context of Pakistan. Through examining the results the long run and dynamic relationship has detected for all the variables except total and oil price variables for model has no short run impact on GDP. Oil prices impacting real GDP negatively in long run but positively in short run. Muhammed (2013) examined the impact of oil price volatility on the economic growth in Pakistan for the period 1973 to 2011 using linear regression analysis. The results indicate that oil price has significant impact on the GDP. Ran and Voon (2012) investigated the impact of oil price shocks on the small open economies by using panel data of Hong Kong, Singapore, South Korea and Taiwan. They used real gross domestic product, unemployment rate, gross price level, import price, interest rate and oil import consumption as main macroeconomic variables. They employed VAR/VECM and did not found significant impact of oil price shocks on macroeconomic variables, where as they found significant positive impact on the unemployment after three time lags. Raguindiu and Reyes (2005) examined the effects of oil price shocks in Philippine economy over the period of 1981 to 2003. Their impulse response functions for the linear transformation of oil prices shows that an oil price shock leads to a prolonged reduction in the real GDP of Philippines. Conversely, in the non-linear VAR model, oil price decreases play a greater role in each variables fluctuation than oil price increase.

Considering the impact of crude oil price on real gross domestic product, the following studies were carried out with Nigerian data. Ochoche (2015) examined the effects of oil price volatility on economic activities in Nigeria

from 1985Q_2 to 2014Q_3 by using GARCH and multivariate VAR model. The results revealed oil price shocks have immediate and prolonged effect on real gross domestic product, unemployment and M_2. Alley et al (2014) examined the impact of oil price shocks on the Nigerian economy, using data from 1981 to 2012. Using the general methods of movement (GMM), the result show significant positive effect of oil price on economic growth confirms the conventional wisdom that oil price increase is beneficial to oil-exporting country like Nigeria. Gunu (2010) investigated the impact of crude oil price changes on four key macroeconomic variables in Nigeria over the period 1970-2008, by using VAR; the results show that oil prices have significant impact on real GDP; money supply, and unemployment. It's impact on consumer price index is not significant. Olomola (2006) examined the effect of oil price shock on aggregate economic activities (output; inflation; the real exchange rate and money supply) in Nigeria using quarterly data from 1970-2003; using VAR model. The results shows contrary opinion to previous findings that oil price shocks does not affect output and inflation in Nigeria. However, oil price shocks do significantly influence the real exchange rates.

Umar and Abdulhakeem (2010), examined the impact of oil price volatility on real GDP, money supply, unemployment and consumption price index by using VAR model. The results show that oil prices had a significant impact on real GDP, money supply and unemployment but an insignificant impact on consumer price index. Matthew and Adegboye (2014) examined the impact of oil price shock and real exchange rate instability on real economic growth in Nigeria on the basis of quarterly data from 1986 to 2012. The Johansen VAR- based co-integration was used, and also VEC model. Findings of the study show that oil price shock and appreciation in the level of exchange rate expert positive impact on real economic growth in Nigeria. Oriakhi and Iyoha (2013) examined the consequences of oil price volatility on the growth of the Nigerian economy for the period 1970 to2010. Using quarterly data and employing the VAR model, the study finds that, the six variables employed, oil price volatility impacted directly on real government expenditure, real exchange rate and real import, while impacting on the real money supply and inflation through other variables, notably real government expenditure.

Edesiri (2014) examined oil price volatility and economic growth in Nigeria linking oil price volatility, crude oil prices, oil revenue and gross domestic product. Using quarterly data from 1980 to 2010 and using VAR model for analysis, the study revealed that oil price volatility has significantly influenced the level of economic growth in Nigeria. But the influence was a negative one, a negative impact. Ani, Ugwunta, Oliver and Eneje (2014) examined whether there is prediction between oil prices and macroeconomic indicators (inflation rate, interest rate, exchange rate and gross domestic product) in Nigeria from 1980 to 2010. The study employed Granger causality and the OLS model. The result suggest that in the short run, changes in the gross domestic product is not influenced by oil price volatility, nor do they find evidence of influenced on key macroeconomic variables. Also, overall oil prices have no significant impact on real GDP and exchange rate in Nigeria. Apere and Ijeoma (2013) examined the impact of oil price volatility on macroeconomic activities in Nigeria between 1970 and 2009. Using EGARCH and VAR model; the results find unidirectional relationship between interest rate, exchange rate and oil prices. However, a significant relationship between oil prices and real GDP was not found.

Akin and Babajide (2011) conducted an empirical analysis of the effects of oil price shocks on a developing country oil-exporter (Nigeria). The study found that oil price shocks do not have a major impact on most macroeconomic variables in Nigeria over the period 1985: Q1 to 2007: Q4.The results of the Granger-causality tests, impulse response functions; and variance decomposition analysis all showed that different measures of linear and positive oil shocks have not caused output; government expenditure; inflation; and the real exchange rate.

2.4 Summary of empirical review

Close scrutiny of the foregoing review of previous studies, indicates that a research gap still remains which this present work intends to fill. The following carried out their studies in developed economies but ends with conflicting results. The results from (Haung, Hwang and Peng 2005; Khuram, Liu, Zahra, Javed and Amna, 2015; Katsuya, 2008;) revealed positive significant impact, the results from (Qianqian, 2011; Sidra and Abdul 2014; Dogah

2008; Peplin and Mubaris 2013;) shows negative impact and that of Cherifa and Hussein 2012 shows no significant impact. This work takes into consideration the peculiar nature of Nigerian economic environment.

Though Alley, Asekomoh,Mobolaji and Adeniran, 2014;Gunu, 2010; Philip, 2006;Audu, Husseini and Ejiemenu, 2015;Rano, 2009;Onoja, 2015;Oriakhi and Iyoha, 2013;Edesiri, 2014;Asaolu and Ilo, 2012; Akin and Babajiode, 2011;Apere and Ijeoma, 2013; conducted their studies using Nigeria data, but ends with conflicting results and conclusions. The results from (Alley, Asekomeh, Mobolaji and Adeniran 2014; Gunu, 2010; Oriakhi and Iyoha, 2013; Edesiri, 2014;) shows positive significant impact, the results from (Philip, 2006; Ani, Ugwunta, Oliver and Eneje, 2014; Akin and Babajide, 2012; Apere and Ijeoma, 2013;) shows no impact and that from Asaolu and Ilo 2012 shows negative impact. Majority of the related studies considered in this review concentrated on gross domestic product as proxy of economic growth to measure with crude oil prices. This does not give accurate picture of crude oil price changes on the economic growth of Nigeria, because gross domestic product does not cover all the sectors of the economy, also cannot give a true picture of economic growth (Robert, Maureen, Stephen, and John 2009). Gross domestic product alone does not reflect economic realities; we need economic indicators that promote truly sustainable growth-growth that improves the quality of human lives, as recent economic growth trend seeing from gross domestic product does not reflect realities (Sodipe, and Ogunrinola 2011).

Thus, it is necessary to investigate the relationship between crude oil price changes on economic growth in Nigeria to capture capital formation, market capitalization, real gross domestic product, and foreign exchange reserves in order to verify the previous claims and to give clear picture of economic realities in various sectors with updated data to cover the current issues.

METHODOLOGY

3.1 Research design

This study employed ex-post facto and investigative econometric research as it is meant to investigate and analyze the relationship among variables namely crude oil price changes and economic growth. This research is designed specifically to measure the relative effect of crude oil price changes on economic growth in Nigeria.

3.2 Sources of data/data collection method

This study collected data from secondary sources. Secondary data were collected from the Central Bank of Nigeria Statistical bulletin, OPEC basket list on the internet, as well as journal publications.

3.3 Model specification and variable definition

Model specification is the expression of a relationship into precise mathematical form. Economic theory does not indicate the functional form of any relationship. This means that economic theory does not state whether a relationship will be expressed in linear form, quadratic form or in a cubic form. However, the specification of any relationship will be guided by existing theory or empirical evidence from previous studies. (Koutsoyiannis,1977).

This study adopted the model used by Jawad (2013) using a linear regression as follows:

$GDP = \beta_0 + \beta_1 OPV + \beta_2 PRS + \beta_3 PS + \beta_4 TB + \varepsilon$

Where;

GDP = Gross domestic product (proxy for economic growth)

OPV = Oil price volatility

PRS = Private Sector Investment

PS = Public sector investment

TB = Trade balance

On the strength of the above, this study has derived from Jawad (2013) four models to express the relationship between each of the dependent variables (capital formation, market capitalization, foreign reserves, and real GDP) representing economic growth; and the independent variable crude oil prices, while using inflation rate and exchange rates as control variables. The mathematical function of these relationships is as follows:

RGDP = f(COP, EXR, INF) 1

CF = f(COP, EXR, INF) 2

MCAP = f(COP, EXR, INF) 3

FRES = f(COP, EXR, INF) 4

These above functions are transformed into the following explicit econometric models in line with Jawad (2013) by carrying its parameters/coefficients

$RGDP = \beta_0 + \beta_1 COP + \beta_2 EXR + \beta_3 INF + \mu$ 5

$CF = \Omega_0 + \Omega_1 COP + \Omega_2 EXR + \Omega_3 INF + \mu$ 6

$MCAP = \overline{\Gamma}_0 + \overline{\Gamma}_1 COP + \overline{\Gamma}_2 EXR + \overline{\Gamma}_3 INF + \mu$ 7

$FRES = \text{Ƙ}_0 + \text{Ƙ}_1 COP + \text{Ƙ}_2 EXR + \text{Ƙ}_3 INF + \mu$ 8

Where;

$\beta_0, \Omega_0, \overline{\Gamma}_0, \text{Ƙ}_0$, = intercepts (constants)

β_1- β_3;Ω_1-Ω_3;$\overline{\Gamma}_1$- $\overline{\Gamma}_3$; and Ƙ_1- Ƙ_3 = coefficients to be estimated

RGDP = real Gross Domestic Product (proxy as economic growth).

COP = Crude Oil Price

EXR= Exchange Rate

MCAP= Market Capitalization

FRES= Foreign Reserves

INF = Inflation rate

CF = Capital formation

μ - Stochastic variable

f - Functional notation

The a priori expectations are as follows:

$\beta_0>0$, $\beta_1>0$ $\beta_2>0$, $\beta_3<0$ this means that in the first model, the study is expecting a positive connection among RGDP, COP, and EXR and expects negative connection with INF.

$\Omega_0>0$, $\Omega_1>0$ $\Omega_2>0$, $\Omega_3<0$ this means that, in the second model, the study is expecting a positive connection among CF, COP, and EXR and expects negative connection with INF.

$\overline{\Gamma}_0>0$, $\overline{\Gamma}_1>0$ $\overline{\Gamma}_2>0$, $\overline{\Gamma}_3<0$ this means that in the first model, the study is expecting a positive connection among MCAP, COP, and EXR and expects negative connection with INF.

$\text{Ƙ}_0>0$, $\text{Ƙ}_1>0$ $\text{Ƙ}_2>0$, $\text{Ƙ}_3<0$ this means that in the first model, the study is expecting a positive connection among FRES, COP, and EXR and expects negative connection with INF.

Elasticity is zero if a given percentage change in price induces no change in quantity. Consumers are willing to pay any price for the existing quantity, here the crude oil which is essential to every sector of business but has no substitute.

Crude oil price increase in this case is a positive reception to the crude oil exporting nation, as crude oil price increase lead to income increase.

Theoretically, whenever an economy has not attain full employment level, the amount of money in the system will not be proportional to the price level, rather as the income increases, it will lead to increase in investment which in turn lead to increase in output.

From the economic theory postulation, Economic Growth (RGDP) depends on Crude Oil Price (COP), Exchange Rate (EXR) and Inflation Rate (INF).

RGDP = f(COP, EXR, INF).

Given that the theory does not specify the mathematical form of the model, we start our investigation by assuming that the relationship between RGDP, COP, EXR and INF is linear.

$RGDP_i = \beta_0 + \beta_1 COP_i + \beta_2 EXR_i + \beta_3 INF_i$ $(_i = 1,2,3,\ldots\ldots n)$

This is an exact relationship, meaning the variations in the RGDP are fully explained by changes in COP, EXR and INF. But due to other factor omitted from the function and other types of error, if plot on a graph, we will obverse that not all of the observations will lie on a plane. The influence of such factors may be taken into consideration by introducing a random variable μ, in the model.

$RGDP_i = \beta_0 + \beta_1 COP_i + \beta_2 EXR_i + \beta_3 INF_i + \mu_i$

On a priori grounds we would expect the coefficient β_1 to have a positive sign, coefficient β_2 to have positive sign, but expect coefficient β_3 to have a negative sign since demand for crude oil is inelastic and price increase leads to more income which leads to increase in economic activities, leading to a favorable exchange rate and lower interest rates. This same is applicable to model 2 to 4.

The functional models above are further transformed into their logarithms for standardization since all the data on the variables are not in the same units of measurements and their magnitudes vary widely. Apart from minimizing the differences in the magnitudes of different variables, transformation also brings out the coefficient of variation better; that is, it aids better interpretation of results in the form of elasticity. It also enables a much easier understanding of results devoid of complications of measurement units; and more importantly, the impact of explanatory variables on

the dependent variable is better explained. (Alley, Asekomeh, Mobolaji and Adeniran, 2014; Dimitrios and Stephen, 2007).

The log form models are as below:

$LRGDP = \beta_0 + \beta_1 LCOP + \beta_2 LEXR + \beta_3 LINF + \mu$ 9

$LCF = \Omega_0 + \Omega_1 LCOP + \Omega_2 LEXR + \Omega_3 LINF + \mu$ 10

$LMCAP = \overline{\Gamma}_0 + \overline{\Gamma}_1 LCOP + \overline{\Gamma}_2 LEXR + \overline{\Gamma}_3 LINF + \mu$ 11

$LFRES = \kappa_0 + \kappa_1 LCOP + \kappa_2 LEXR + \kappa_3 LINF + \mu$ 12

Where: LRGDP = Log Real Gross Domestic Product; LCF = Log Capital Formation; LMCAP = Log Market Capitalization; LFRES = Log Foreign Reserves; LCOP = Log Crude Oil Price; LEXR = Log Exchange Rates; and LINF = Log Interest Rate.

3.4 Data analysis method

Different econometric analysis tools have been employed in this study to analyze the impact of crude oil price changes on the Nigerian economic growth.

3.4.1 Descriptive statistics and normality test

The study also employed descriptive statistics for the calculation of means, frequencies, variances, and standard deviations. The Jarque-Bera was used to test the normality of the residuals for skewness and kurtosis. These served as a means of describing the overall distribution and character of the data.

3.4.2 Simple regression analysis

The Linear Regression is an econometric technique which correlates the changes in the variable (the series data that reappear again at permanent intervals) to other variable or variables. The demonstration of the association is described as linear regression model. It is identified linear because the association is linearly preservative.

The simple regression was used to analyze the impact on each of the dependent variables (capital formation, market capitalization, foreign reserves, and real GDP) representing economic growth of the various independent variable crude oil prices as well as the control variables (inflation rate and exchange rates).

The Ordinary Least Squares (OLS) approach was used in the estimation of the parameters. The choice of OLS techniques of regression is not only as a result of its simplicity, but as a result of its optimal properties of linearity, unbiasedness, minimum variance, zero mean (Koutsoyiannis, 1977).

3.4.3 Unit root test

Unit root test is used to check the stationarity of the data. It has been established that macroeconomic data usually exhibit stochastic trend that can be removed through only differencing (Jawad, 2013). To examine the existence of stochastic non-stationarity in the series, the study establishes the order of integration of individual time series through the augmented Dickey-Fuller (ADF) test. The ADF contains three types of situation for every time series. First, random selection process includes intercept (c) and trend (t). Second, random selection process includes intercept (c) but no trend (0). Third, random selection process includes lag length. The essence is to correct spurious regression results and to ensure that the variables fit into the estimation techniques (Khuram, Liu, Zahra, Javed, and Amna, 2015).

3.4.4 Co-integration

Having established the order of integration of our series in the preceding section, the next task is to determine the number of long run equilibrium relationships or co-integrating vectors among the variables. A vector of variables integrated of order one is cointegrated, if there exists linear combination of the variables, which are stationary. Following the approach of Johansen and Juselius (1990), two likelihood ratio test statistics, the maximal eigenvalue and the trace statistic, were utilized to determine the number of cointegrating vectors. The cointegration tests were performed allowing for both the presence and absence of linear trends. (Johansen, 1988, 1991; Johansen and Julius, 1990).

3.4.5 Error Correction Mechanism

The purpose of the error correction mechanism (ECM) is to measure the speed of adjustment of the dependent variables to changes in the independent variables on the short-run and to their equilibrium levels. This study expects a negative coeficient of the ECM, which suggests an automatic adjustment mechanism and that the economy responds to deviations from equilibrium in a balancing manner (Matthew and Adegboye, 2014).

3.4.6 Causality test

The causality test is to investigate the causal relationship between oil price changes and economic growth using the Granger-causality test. The purpose of this test is to determine the direction of causation between the dependent and the independent variables.

3.8 Testing of Hypotheses

The above hypotheses will be tested at 5 percent or 0.05 level of significance.

The F- Test and T-Test

The T-test is used to test whether the individual variables included on the model are significant or not in determining the impact of crude oil price changes on economic growth in Nigeria. The F-tests used to test the overall adequacy of the regression line.

Degree of freedom

Degree of freedom (df) = (K-1), (N-K)

Where K = 4, N = 35, $v_1 = K - 1$, and $v_2 = N-K$

So, df = (4-1), (35-4)

Therefore, degree of freedom (df) = $v_1 = 3$, and $v_2 = 31$

Decision Rule:

Reject the Ho, if the calculated F-statistics (f-value) is greater than critical or tabulated using 5 percent level of significance, the f-critical or tabulated = 2.48.

4.1 Data presentation

The data for this study is attached as appendix 1 to this work. It shows the variables used for this study on yearly basis from 1980 to 2014. COP represents Crude oil price, RGDP represent Real GDP, CF represents Capital Formation, FRES represents Foreign Reserves, MCAP represents Market Capitalization, EXR represents Exchange Rate, while INF represents Inflation Rate.

4.2 Descriptive Statistics

Table 4.1 below shows the descriptive statistics of the data presented in table 4.1.

Table 4.1 Descriptive Statistics

	COP	RGDP	CF	FRES	MCAP	EXR	INF
Mean	39.91829	69.60336	10696.57	1871262.	602.6666	66.83200	19.24286
Median	27.60000	13.41937	6693.541	158094.4	91.09182	21.89000	11.60000
Maximum	109.4500	573.5818	45354.65	6941263.	3600.000	188.5500	72.80000
Minimum	12.28000	0.466235	2068.546	161.5700	10.68152	0.550000	2.200000
Std. Dev.	30.60118	128.4649	10117.39	2595047.	1096.584	65.39616	17.37590
Skewness	1.225062	2.379183	2.049367	0.978011	1.735834	0.334652	1.563910
Kurtosis	3.080742	8.379374	7.382912	2.198951	4.347625	1.413270	4.534378
Jarque-Bera	8.764034	75.22041	52.51390	6.515398	20.22499	4.324952	17.70063
Probability	0.012500	0.000000	0.000000	0.038477	0.000041	0.115040	0.000143
Sum	1397.140	2436.118	374380.0	65494175	21093.33	2339.120	673.5000
Sum Sq. Dev.	31838.70	561109.5	3.48E+09	2.29E+14	40884904	145406.3	10265.35

Observations	35	35	35	35	35	35	35

Source: Eviews 9.0 output.

The descriptive statistics on table shows that crude oil price (COP) has a mean value of $39.92/barrel, while the maximum and minimum values are $109.45/barrel and $12.28/barrel respectively. Real gross domestic product (RGDP) has a mean value of $69.60million, while the maximum and minimum values are $573.58 million and $0.46 million respectively. Capital formation (CF) has a mean value of $10,696 million, while the maximum and minimum values are $45,354.65 million and $2,068.55 million respectively. Foreign Reserves (FRES) has a mean value of $1,871,262 million, while the maximum and minimum values are $6,941,263 million and $161 million respectively. Market Capitalization (MCAP) shows a mean value of $602.66 million, while the maximum and minimum values are $3,600.00 million and$10.68 million, respectively. Exchange rate (EXR) shows a mean value of N67.27 per US dollar, while the maximum and minimum values are N167.8 and N0.55 per US dollar respectively. Finally, inflation rate (INF) has a mean value of 19.53 percent, while the maximum and minimum values are 72.8 percent and 5.4 percent respectively.

The Jarque-Bera statistic indicates that only exchange rate (EXR) is normally distributed with a p-value of 0.12; while all the remaining variables are not normally distributed with the following p-values: crude oil price (COP = 0.01), real gross domestic product (RGDP=0.00), capital formation (CF=0.00), foreign reserves (FRES=0.04), market capitalization (MCAP=0.00), and inflation rate (INF=0.00).

4.3 Correlation matrix

Table 4.2 – Correlation matrix

	LCOP	LRGDP	LCF	LFRES	LMCAP	LEXR	LINF
LCOP	1.000000	-0.220649	0.770574	0.580246	-0.478376	0.478957	-0.449463
LRGDP	-0.220649	1.000000	0.086776	-0.861362	0.923624	-0.923406	0.053625
LCF	0.770574	0.086776	1.000000	0.273653	-0.175125	0.175784	-0.397336
LFRES	0.580246	-0.861362	0.273653	1.000000	-0.970226	0.970327	-0.313489
LMCAP	-0.478376	0.923624	-0.175125	-0.970226	1.000000	-1.000000	0.193419
LEXR	0.478957	-0.923406	0.175784	0.970327	-1.000000	1.000000	-0.193754
LINF	-0.449463	0.053625	-0.397336	-0.313489	0.193419	-0.193754	1.000000

Source: eview9.0 output

The correlation matrix on table 4.2 shows the correlation among the variables. LCOP is shown to have a weak negative correlation of 0.220649 with LRGDP, 0.478376 with LMCAP, and 0.449463 with LINF; but, a strong positive correlation 0.770574 with LCF and 0.580246 with LFRES; but weak positive correlation of 0.478957 with LEXR. LRGDP has weak negative correlation of 0.220649 with LCOP, strong negative correlation of 0.861362 with LFRES, and0.923406 with LEXR; but, a weak positive correlation of 0.086776 with LCF and0.053625 with LINF, a strong positive correlation of 0.923624 with LMCAP. LCF is seen to have a positive correlation of 0.770574 with LCOP, 0.086776 with LRGDP, 0.2736653 with LFRES, and 0.175784 with LEXR; but negative correlation of 0.175125 with LMCAP and 0.397336 with LINF. LFRES has positive correlation of 0.580246 with LCOP, 0.273653 with LCF, and 0.970327 with LEXR; but negative correlation of 0.861362 with LRGDP, 0.970226 with LMCAP and 0.313489 with LINF. LMCAP has a negative correlation of 0.478376 with LCOP, 0.175125 with LCF, 0.970226 with LFRES, and 1.000000 with LEXR; but positive correlation of 0.923624 with LRGDP and 0.193419 with LINF. LEXR is positive correlation of 0.478957 with LCOP, 0.175784 with LCF, and 0.970327 with LFRES; but negative correlation of 0.923406 with LRGDP and 1.000000 with LMCAP. Finally, LINF is seen to have negative correlation of 0.449463 with LCOP, 0.397336 with LCF, 0.313489 with LFRES, and 0.193754 with EXR; but positive correlation of 0.053625 with LRGDP and 0.193419 with LMCAP.

4.4 Regression estimation and results

Level series regression was used to test the impact of the independent variables on the dependent variables to enable us accept or reject the null hypotheses. In all cases, we regressed the independent variable – crude oil prices as well as the control variables (inflation rate and exchange rate) on each of the dependent variables as indicators of economic growth, namely – real gross domestic product, capital formation, foreign reserves and market capitalization.

The results of the Durbin Watson statistics indicate strong positive autocorrelation in all the models. This indicates that there could be some degree of time dependence in the level series which could lead to spurious regression results, suggesting the need for more rigorous analysis of the stationarity properties of the level series data. Table 4.3 below is the summary of the ordinary least squares results. (See appendices for the details).

Table 4.3 Ordinary Least Squares (OLS) Test Results Summary

Mo-del	Variables		F-statistic		Durbin-Watson Statistic	Auto-correlation
	Dependent variable	Independent variables	F-statistic	Probabi-lity		
1	LRGDP	LCOP, LEXR, LINF	114.26	0.00	1.39	Present
2	LCF	LCOP, LEXR, LINF	18.76	0.00	0.91	Present
3	LMCAP	LCOP, LEXR, LINF	57084.39	0.00	0.96	Present
4	LFRES	LCOP, LEXR, LINF	287.91	0.00	1.38	Present

Source: Author's compilation from short run static regression results (eviews 9.0 output)

4.5 Unit root test results

Having ascertained the presence of autocorrelation, we used unit root test to test for the stationarity of the individual variables. This test is carried out to ensure that our t-statistics are valid on account of the stationarity of the data; and secondly, in order to rule out serial correlation. The summary of the Augmented Dicky-Fuller unit root tests are presented on table 4.4 below (See details in the appendices).

Table 4.4Augmented Dicky-Fuller unit root test results summary

Variable	ADF - Test statistic at first difference	Critical Values	Order of integration
LCOP	-3.742999	1% -4.284580 5% -3.562882 10% -3.215267	1(1)
LRGDP	-4.406374	1% -4.284580 5% -3.562882 10% -3.215267	1(1)
LCF	-3.825608	1% -4.284580 5% -3.562882 10% -3.215267	1(1)
LFRES	-4.485585	1% -4.284580 5% -3.562882 10% -3.215267	1(1)
LEXR	-3.642094	1% -4.284580 5% -3.562882 10% -3.215267	1(1)
LMCAP	-3.642094	1% -4.284580 5% -3.562882 10% -3.215267	1(1)
LINF	-4.343480	1% -4.284580 5% -3.562882 10% -3.215267	1(1)

Source: Author's compilation from ADF Unit Test Results (See Appendices detail reports)

Table 4.4 above presents the summary results of the ADF unit root tests. The results show that the null hypotheses of a unit root test for first difference series for all the variables (LCOP, LRGDP, LCF, LFRES, LEXR, LMCAP, and LINF can be rejected at all the critical values indicating that the level series which is largely time-dependent and non-stationary can be made stationary at the first difference and maximum lag of one. Thus, the reduced form models follow an integrating order of 1(1) process, respectively; and are, therefore, stationary at order one. It also reveals that the test of stationarity in the residuals from the level series regression is significant at all lags. Furthermore, this indicates that the regression is no more spurious but real. That is to say, all the variables are individually stationary and stable. At this level, all the t-statistic became significant at 5 percent. Also, Durbin-Watson reported values of between 1.9 and 2.0 indicating absence of autocorrelation.

Having established the stationarity of the individual variables, it is also important to establish the stationarity of the linear combination of the variables as to whether there could be a long-run or equilibrium relationship between the dependent variables and the independent variables (that is they are co-integrated). We, therefore, tested for co-integration to establish long-run stationary or stable relationship using the Johansen Co-integration test.

4.6 Co-integration test results

Having established the stationarity of the individual variables, it is also important to establish the stationarity of the linear combinations of the variables as to whether there could be a long-run or equilibrium relationship between the dependent variables and the independent variables (that is, whether they are co-integrated). The study, therefore, tested for co-integration to establish long-run stationary or stable relationship using the Johansen Co-integration test. The results are presented below.

4.6.1 Oil price changes and real gdp

Table 4.5.1 Unrestricted Cointegration Rank Test (Trace)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.624473	55.73223	47.85613	0.0077
At most 1	0.400846	23.41124	29.79707	0.2265
At most 2	0.145471	6.507453	15.49471	0.6355
At most 3	0.039202	1.319696	3.841466	0.2506

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

Table 4.5.2 Unrestricted Cointegration Rank Test (Max. Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.624473	32.32099	27.58434	0.0114
At most 1	0.400846	16.90379	21.13162	0.1766
At most 2	0.145471	5.187757	14.26460	0.7180
At most 3	0.039202	1.319696	3.841466	0.2506

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

Both tables 4.5.1 (trace test) and 4.5.2 (Maximum Eigenvalue test) indicate that there is one co-integrating equation existing between the dependent and independent variables. This reveals that there is a long-run equilibrium relationship between the dependent and independent variables.

4.6.2 Oil price changes and capital formation

Table 4.6.1 Unrestricted co-integration rank test (trace)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.625992	67.59792	47.85613	0.0003
At most 1 *	0.515331	35.14317	29.79707	0.0110
At most 2	0.249374	11.24166	15.49471	0.1971
At most 3	0.052386	1.775668	3.841466	0.1827

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

Table 4.6.2 Unrestricted Cointegration Rank Test

(Max. Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.625992	32.45475	27.58434	0.0109
At most 1 *	0.515331	23.90151	21.13162	0.0198
At most 2	0.249374	9.465993	14.26460	0.2494
At most 3	0.052386	1.775668	3.841466	0.1827

Max-eigenvalue test indicates 2 cointegratingeqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Both tables 4.6.1 (trace test) and 4.6.2 (Maximum Eigenvalue test) indicate that there are two co-integrating equations existing between the dependent and independent variables. This reveals that there is a long-run equilibrium relationship between the dependent and independent variables.

4.6.3 Oil price changes and market capitalization

Table 4.7.1 Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None	0.569116	43.19135	47.85613	0.1280

At most 1	0.248171	15.40813	29.79707	0.7531
At most 2	0.165828	5.995008	15.49471	0.6961
At most 3	0.000351	0.011583	3.841466	0.9141

Trace test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 4.7.2 Unrestricted Cointegration Rank Test
(Max. Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.569116	27.78322	27.58434	0.0472
At most 1	0.248171	9.413125	21.13162	0.7978
At most 2	0.165828	5.983425	14.26460	0.6153
At most 3	0.000351	0.011583	3.841466	0.9141

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

Tables 4.7.1 and 4.7.2 above show that exist zero (0) and one (1) co-integrating equation trace test and maximum eigenvalue, respectively. This indicates that there is a long-run equilibrium relationship between the dependent and independent variables.

4.6.4 Oil price changes and foreign reserve

Table 4.8.1 Unrestricted co-integration rank test (trace)

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.625500	58.55960	47.85613	0.0036
At most 1	0.342971	26.14819	29.79707	0.1243
At most 2	0.276409	12.28730	15.49471	0.1437
At most 3	0.047641	1.610827	3.841466	0.2044

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

Table 4.8.2 Unrestricted Cointegration Rank Test

(Max. Eigenvalue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

None *	0.625500	32.41141	27.58434	0.0110
At most 1	0.342971	13.86089	21.13162	0.3766
At most 2	0.276409	10.67647	14.26460	0.1712
At most 3	0.047641	1.610827	3.841466	0.2044

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

Both tables 4.8.1 (trace test) and 4.8.2 (Maximum Eigenvalue test) indicate that there is one co-integrating equation existing between the dependent and independent variables. This reveals that there is a long-run equilibrium relationship between the dependent and independent variables.

4.7 Parsimonious error correction model test results

The establishment of stationarity and co-integrating equations now paves the way to establish a link between short-run relationships of the dependent and independent variables to the long-run by estimating an error correction model (ECM). The ECM is written in such a way that the first difference of each variable is related to both the current and the lagged variables, as well as incorporating the error correction coefficient. This was done by relating the current and the lagged values of both the dependent and independent variables to the dependent variables in order to determine both the current and the lagged effects of the independent variables on the dependent variables.

Each of the variables (both independent and independent) was lagged three periods. Thereafter, insignificant parameters (redundant variables) were successively deleted one after the other using the Akaike Information Criteria (AIC) and Schwarz Criteria (SC), a parsimonious representation of the models containing only parameters that are relatively statistically significant were obtained. The Ordinary Least Square (OLS) estimation method was used as it is an essential component of the most other estimation techniques. Furthermore, the OLS remains one of the most commonly used methods in econometric investigations involving large models.

Estimates of the preferred specifications were obtained from the over parameterized results using general-to-specific method, and were used to test the hypotheses formulated in this study as presented below. Estimates of the over-parameterized regression results are attached as appendices.

4.7.1 Impact of crude oil price changes on real gross domestic product in Nigeria.

Tables 4.9 below shows the results of the parsimonious error correction for the impact on real gross domestic product of the combined effect independent variable and control variables, namely crude oil price change (cop), exchange rate (exr), and inflation rate (inf), all in their log forms, and each lagged three periods.

Table 4.9 Parsimonious error correction results for model 1

Dependent Variable: DLOG(RGDP)
Method: Least Squares
Date: 10/28/16 Time: 14:54
Sample (adjusted): 1984 2014
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.018774	0.147672	0.127131	0.9001
DLOG(RGDP(-1))	-0.454244	0.338267	-1.342856	0.1944
DLOG(RGDP(-2))	-0.300751	0.266538	-1.128362	0.2725
DLOG(COP)	0.423707	0.172408	2.740218	0.0378
DLOG(COP(-3))	0.756892	0.506716	1.493720	0.1509
DLOG(EXR)	-0.900866	0.324747	-2.774051	0.0117
DLOG(EXR(-1))	-0.313286	0.463136	-0.676445	0.5065
DLOG(EXR(-3))	-0.196578	0.445423	-0.441329	0.6637
DLOG(INF)	-0.110966	0.136112	-0.815260	0.4245

ECM1(-1)	-0.407466	0.150832	-2.161426	0.0491

R-squared	0.588219	Mean dependent var	-0.090515
Adjusted R-squared	0.382329	S.D. dependent var	0.662750
S.E. of regression	0.520869	Akaike info criterion	1.804786
Sum squared resid	5.426087	Schwarz criterion	2.313620
Log likelihood	-16.97418	Hannan-Quinn criter.	1.970653
F-statistic	12.856954	Durbin-Watson stat	2.044009
Prob(F-statistic)	0.021907		

Source: E-views 9.0 output

The Parsimonious Error Correction results (table 4.9 above) on the impact of crude oil change on real gross domestic product show that changes in crude oil prices (lcop) has a coefficient of 0.4237 meaning that one percentage change in crude oil prices leads to .4237 percent change in real gross domestic product in Nigeria. This indicates that there is a moderate response of real gross domestic product to changes in crude oil prices in the positive direction. The results further show that r-squared is 0.588while adjusted r-squared is 0.3823 indicating that 38.23 percent of changes in real gross domestic product are attributable to the combined effect of the crude oil price changes, exchange rate, and inflation rate. Also, from the table, we see that the changes in oil prices (lcop) has a t-statistic of 2.74 with a probability of 0.03 which is statistically significant indicating that it has a statistically significant impact on real gross domestic product. The table further reveals that both exchange rates (lexr) and inflation rate (linf) have t-statistics of -9.006 and -0.1109, respectively, and probabilities of 0.01 and 0.4245, which are also statistically significant and insignificant, respectively, at 5 percent.

On the long run, the results reveal that none of the explanatory variables has a significant impact on the explained variable (real gross domestic product).

Overall, the results show that F-statistic is 12.86 with a probability of 0.02 indicating that the combined impact of the independent variables on economic growth represented by real gross domestic product is statistically significant in both the short-run and the long run.

The Durbin-Watson statistic shows 2.04 indicating the absence of serial or autocorrelation among the variables.

Furthermore, the Error Correction Co-efficient is appropriately signed with a value of -0.4074 with a probability of 0.04, which is significant at 5% level of significance. The co-efficient indicates that the model has a 40.74 percent speed of adjustment from equilibrium position on the long run.

4.7.2 Impact of crude oil price changes on capital formation in Nigeria.

Tables 4.10 below shows the results of the parsimonious error correction for the impact on capital formation of the combined effect independent variable and control variables, namely crude oil price change (lcop), exchange rate (lexr), and inflation rate (linf) each lagged two periods.

Table 4.10 Parsimonious error correction results for model 2

Dependent Variable: DLOG(CF)
Method: Least Squares
Date: 10/28/16 Time: 15:17
Sample (adjusted): 1984 2014

Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.084273	0.069204	1.217740	0.2382
DLOG(CF(-1))	0.218218	0.129558	1.684323	0.1085
DLOG(CF(-3))	0.604176	0.199662	3.025990	0.0069
DLOG(COP)	0.204952	0.184406	1.111418	0.2803

DLOG(COP(-1))	-0.746145	0.287904	-2.591643	0.0179
DLOG(EXR)	-1.184355	0.189964	-6.234627	0.0000
DLOG(EXR(-3))	0.813187	0.242042	3.359692	0.0033
DLOG(INF)	-0.129613	0.074547	-1.738673	0.0983
DLOG(INF(-1))	-0.261114	0.071573	-3.648226	0.0017
DLOG(INF(-2))	-0.091198	0.081689	-1.116409	0.2782
DLOG(INF(-3))	-0.105515	0.074219	-1.421674	0.1713
ECM2(-1)	-0.518831	0.157337	-3.297584	0.0038

R-squared	0.827248	Mean dependent var	0.045571
Adjusted R-squared	0.727233	S.D. dependent var	0.447531
S.E. of regression	0.233733	Akaike info criterion	0.215368
Sum squared resid	1.037989	Schwarz criterion	0.770460
Log likelihood	8.661788	Hannan-Quinn criter.	0.396315
F-statistic	8.271268	Durbin-Watson stat	2.085446
Prob(F-statistic)	0.000039		

Source: E-views 9.0 output

The Parsimonious Error Correction results (table 4.10 above) on the impact of crude oil change on capital formation show that changes in crude oil prices (lcop) has a coefficient of 0.20495 meaning that one percentage change in crude oil prices leads to .2 percent change in capital formation. This indicates that there is a low response of capital formation to changes in crude oil prices in the positive direction. The results further show that r-squared is 0.83, while adjusted r-squared is 0.727 indicating that 72.7 percent of changes in capital formation are attributable to the combined effect of the crude oil price changes, exchange rate, and inflation rate. Also, from the table, we see that the changes in oil prices (lcop) has a t-statistic of 1.1114 with a probability of 0.2803, which is statistically insignificant indicating that it has a statistically insignificant impact on capital formation.

The table further reveals that both exchange rates (exr) and inflation rate (inf) have t-statistics of -6.2346 and -1.7387 respectively, with probabilities of 0.000 and 0.09, which are both statistically significant and insignificant, respectively, at 5 percent. However, inflation rate is significant at 10 percent.

On the long run relationships, the results reveal that capital formation has a significant impact on itself only in period three; whereas changes in crude oil price do not have any significant impact on capital formation in period one.

Overall, the results show that F-statistic is 6.27 with a probability of 0.000 indicating that the combined impact of the independent variables on economic growth represented by capital formation is statistically significant, but only on the short-run.

The Durbin-Watson statistic shows 2.08 indicating the absence of serial or autocorrelation among the variables.

Furthermore, the Error Correction Co-efficient has a negative value of -0.518831 and is significant at 5% level of significance with a probability of 0.0038. The co-efficient indicates that the model has a 51.88 percent speed of adjustment from equilibrium position on the long run.

4.7.3 Impact of crude oil price changes on market capitalization in Nigeria.

Tables 4.11 below shows the results of the parsimonious error correction for the impact on market capitalization of the combined effect independent variable and control variables, namely crude oil price change (lcop), exchange rate (lexr), and inflation rate (linf) each lagged two periods.

Table 4.11 Parsimonious error correction results for model 3

Dependent Variable: DLOG(MCAP)
Method: Least Squares
Date: 10/28/16 Time: 15:31
Sample (adjusted): 1984 2014
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.

C	0.039523	0.061955	0.637936	0.5311
DLOG(MCAP(-3))	0.324629	0.192819	1.683591	0.1086
D(COP)	-0.005886	0.000690	-2.255026	0.0247
D(COP(-1))	0.006788	0.006084	1.115650	0.2785
D(COP(-2))	0.009363	0.004825	1.940541	0.0673
D(COP(-3))	0.015916	0.004582	3.473714	0.0025
D(EXR)	-0.024311	0.004496	-5.407198	0.0000
D(EXR(-1))	0.006366	0.004068	1.564945	0.1341
D(EXR(-3))	0.011858	0.005659	2.095528	0.0498
D(INF)	-0.005061	0.003796	-1.333378	0.1982
D(INF(-2))	0.005619	0.003551	1.582221	0.1301
ECM3(-1)	-23.43405	10.73793	-2.249995	0.0253

R-squared	0.798331	Mean dependent var	0.045571
Adjusted R-squared	0.681576	S.D. dependent var	0.447531
S.E. of regression	0.252538	Akaike info criterion	0.370135
Sum squared resid	1.211733	Schwarz criterion	0.925227
Log likelihood	6.262907	Hannan-Quinn criter.	0.551081
F-statistic	6.837629	Durbin-Watson stat	2.169457
Prob(F-statistic)	0.000148		

Source: E-views 9.0 output

The Parsimonious Error Correction results (table 4.11 above) on the impact of crude oil change on market capitalization show that changes in crude oil prices (lcop) has a coefficient of -0.006 meaning that one percentage change in crude oil prices leads to .006 percent change in market capitalization. This indicates that there is a low and negative response of market capitalization to changes in crude oil prices. The results further show that r-squared is 0.79 and adjusted r-squared is 0.68 indicating that 68 percent changes in market capitalization are attributable to crude oil price changes, exchange rate, and inflation rate. Also, from the table, we see that the changes in oil prices (lcop) has a t-statistic of -2.255 with a probability of 0.0247, which is statistically significant indicating that it has a statistically significant impact on market capitalization.

The table further reveals that while the impact exchange rate (lexr) is significant on market capitalization (t-statistics = -5.407, prob.=0000), the impact of inflation rate (linf) on market capitalization is insignificant (t-statistics of -1.333 and probability of 0.1982, respectively).

On the long run relationships, the results reveal that changes in oil prices and exchange rate, respectively, have significant impact on market capitalization in period 2 and not beyond.

Overall, the results show that F-statistic is 6.637 with a probability of 0.0001, indicating that the combined impact of the independent variables on economic growth represented by market capitalization is statistically significant only on the short-run.

The Durbin-Watson statistic shows 2.16 indicating the absence of serial or autocorrelation among the variables.

Furthermore, the Error Correction Co-efficient has a negative value of -23.434 and is significant at 5% level of significance with a probability of 0.0253. The co-efficient indicates that the model has a 2343.41 percent speed of adjustment from equilibrium position on the long run.

4.7.4 Impact of crude oil price changes on Nigerian foreign reserves.

Tables 4.12 below shows the results of the parsimonious error correction for the impact on Nigerian foreign reserves of the combined effect independent variable and control variables, namely crude oil price change (lcop), exchange rate (lexr), and inflation rate (linf) each lagged three periods.

Table 4.12 Parsimonious error correction results for model 4

Dependent Variable: DLOG(FRES)

Method: Least Squares
Date: 10/28/16 Time: 15:40
Sample (adjusted): 1984 2014
Included observations: 31 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.338052	0.147918	2.285399	0.0333
DLOG(FRES(-1))	0.229451	0.161441	1.421265	0.1706
DLOG(FRES(-2))	0.294527	0.155883	1.889417	0.0734
DLOG(FRES(-3))	0.294573	0.133222	2.211145	0.0388
DLOG(COP)	-1.083536	0.095896	-2.736918	0.0127
DLOG(COP(-1))	-0.582561	0.478838	-1.216613	0.2379
DLOG(EXR(-2))	-0.144633	0.060495	-2.314082	0.0567
DLOG(EXR(-3))	-0.849530	0.335022	-2.535746	0.0197
DLOG(INF)	-0.378567	0.146791	-2.578961	0.0179
DLOG(INF(-1))	-0.069537	0.130548	-0.532653	0.6001
ECM4(-1)	-0.852310	0.203393	-4.190461	0.0005

R-squared	0.670713	Mean dependent var	0.338033
Adjusted R-squared	0.506069	S.D. dependent var	0.711638
S.E. of regression	0.500141	Akaike info criterion	1.723569
Sum squared resid	5.002819	Schwarz criterion	2.232403
Log likelihood	-15.71532	Hannan-Quinn criter.	1.889436
F-statistic	4.073723	Durbin-Watson stat	2.203489
Prob(F-statistic)	0.003650		

Source: E-views 9.0 output

The Parsimonious Error Correction results (table 4.12 above) on the impact of crude oil change on Nigerian foreign reserves show that changes in crude oil prices (lcop) has a coefficient of -1.0835 meaning that one percentage change in crude oil prices leads to 1.836 percent change in foreign reserve. This indicates that there is a high response of foreign reserves to changes in crude oil prices in the negative direction. The results further show that r-squared is 0.67while adjusted r-squared is 0.506 indicating that 50.6 percent of changes in Nigerian foreign reserves are attributable to the combined effect of the crude oil price changes, exchange rate, and inflation rate. Also, from the table, we see that the changes in oil prices (lcop) has a t-statistic of -2.7369 with a probability of 0.012 which is statistically significant indicating that it has a statistically significant impact on foreign reserves.

The long run relationships show that foreign reserves significant impact itself in periods 2 and periods 3 (at 5 percent and 10 percent significant levels respectively).

Overall, the results show that F-statistic is 4.0737 with a probability of 0.003 indicating that the combined impact of the independent variables on economic growth represented by Nigerian foreign reserves is statistically significant on both the short-run on the long run.

The Durbin-Watson statistic shows 2.2 indicating the absence of serial or autocorrelation among the variables.

Furthermore, the Error Correction Co-efficient has a negative value of -0.8523, which is appropriately signed; and significant at 5% level of significance with a probability of 0.0005. The co-efficient indicates that the model has 85 percent speed of adjustment from equilibrium position on the long run.

4.8 Test of hypotheses

Having established stationarity and concluded parsimonous error correction, the hypotheses are now tested for acceptance or rejection in their null states. All the hypotheses are tested at a degree of freedom of

4.8.1 Hypothesis 1

Ho_1: Crude oil price changes have no significant impact on the real gross domestic product in Nigeria

Table 4.13 Results for hypotheses 1

R^2	Adjusted R^2	f-value	f-critical	p-value	Decision on Ho
0.588219	0.3823429	12.856	2.84	0.021907	Rejected

Source: Author's compilation, 2016

Since the f-value (12.856) is greater than the tabulated value (2.84), the null hypothesis is therefore, rejected; and concludes that crude oil price changes have a significant impact on real gross domestic product in Nigeria.

4.8.2 Hypothesis 2

Ho_2: Crude oil price changes have no significant relationship with capital formation in Nigerian

Table 4.14 Results for hypotheses 2

R^2	Adjusted R^2	f-value	f-critical	p-value	Decision on Ho
0.827248	0.727233	8.271268	2.84	0.000039	Rejected

Source: Author's compilation, 2016

Since the f-value (8.271268) is greater than the tabulated value (2.84), the null hypothesis is therefore, rejected; and concludes that the crude oil price changes have a significant impact on capital formation in Nigeria.

4.8.3 Hypothesis 3

Ho_3: Crude oil price changes do not significantly affect market capitalization in Nigeria

Table 4.15 Results for hypotheses 3

R^2	Adjusted R^2	f-value	f-critical	p-value	Decision on Ho
0.798331	0.681576	6.837629	2.84	0.000148	Rejected

Source: Author's compilation, 2016

Since the f-value (6.837629) is greater than the tabulated value (2.84), the null hypotesis is therefore, rejected; and conclude that the crude oil price changes have a significant impact on market capitalization in Nigeria.

4.8.4 Hypothesis 4

Ho_4: Crude oil price changes has no significant relationship with Nigerian foreign reserves

Table 4.16 Results for hypotheses 4

R^2	Adjusted R^2	f-value	f-critical	p-value	Decision on Ho
0.670713	0.506069	4.073723	2.84	0.003650	Rejected

Source: Author's compilation, 2016

Since the f-value (4.073723) is greater than the tabulated value (2.84), the null hypothesis is therefore, rejected; and concludes that the crude oil price changes have a significant impact on Nigeria foreign reserves.

4.9 Causality test results

The study conducted a causality test using Pair-wise Granger Causality to determine the direction of causal relationship between the dependent and the independent variables. The results are shown in table 4.17 below:

Table 4.17 Granger causality test results

Pairwise Granger Causality Tests
Date: 10/18/16 Time: 22:42
Sample: 1980 2014

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
LCOP does not Granger Cause LRGDP	33	3.76474	0.0356
LRGDP does not Granger Cause LCOP		4.86848	0.0153

LEXR does not Granger Cause LRGDP	33	1.09164	0.3495
LRGDP does not Granger Cause LEXR		0.00121	0.9988
LINF does not Granger Cause LRGDP	33	0.33494	0.7182
LRGDP does not Granger Cause LINF		0.73498	0.4885
LCOP does not Granger Cause LMCAP	33	5.75078	0.0081
LMCAP does not Granger Cause LCOP		4.82449	0.0158
LEXR does not Granger Cause LMCAP	33	NA	NA
LMCAP does not Granger Cause LEXR		NA	NA
LINF does not Granger Cause LMCAP	33	1.81911	0.1808
LMCAP does not Granger Cause LINF		0.35626	0.7034
LCOP does not Granger Cause LCF	33	9.09346	0.0009
LCF does not Granger Cause LCOP		0.58493	0.5638
LEXR does not Granger Cause LCF	33	3.62259	0.0399
LCF does not Granger Cause LEXR		0.09929	0.9058
LINF does not Granger Cause LCF	33	0.92719	0.4075
LCF does not Granger Cause LINF		2.34768	0.1141
LCOP does not Granger Cause LFRES	33	0.35291	0.7057
LFRES does not Granger Cause LCOP		4.42131	0.0214
LEXR does not Granger Cause LFRES	33	3.04089	0.0638
LFRES does not Granger Cause LEXR		0.47218	0.6285
LINF does not Granger Cause LFRES	33	0.06903	0.9335
LFRES does not Granger Cause LINF		0.44484	0.6454

Source: E-views 9.0 output (Extract)

The causality results on table 4.17 reveal that the direction of causation between crude oil price changes and real gross domestic product is in both ways. That is to say that the both variables significant affect the behavior of each other. This same relationship exists between crude oil price changes and market capitalization. However, the causation is one-directional in the relationship between changes in crude oil prices and capital formation, exchange rate and capital formation, changes in crude oil prices and foreign reserves, as well as exchange rate and foreign reserves.

4.9 Discussion of findings

This study is on the impact of crude oil price changes on economic growth in Nigeria. Economic growth was proxied by real gross domestic product, capital formation, market capitalization and foreign reserves in formulation and testing of four hypotheses with crude oil prices and using exchange rate and inflation rate as control variables.

Hypothesis one examined the relationship between crude oil prices and real gross domestic product in Nigeria. The results from parsimonious error correction results from model 1 represented in table 4.9 above suggest that there is positive and statistically significant relationship between crude oil prices and real gross domestic product in Nigeria. The coefficient of regression indicated that, a percentage change in crude oil prices leads to .423707 percent change in real gross domestic product in Nigeria at the short run. This indicates that there is a moderate response of real gross domestic product to changes in crude oil prices in the positive direction at the short run. Changes in crude oil prices also has a coefficient of 0.756892 meaning that one percent change in crude oil prices leads to .756892 percent change in real gross domestic product in Nigeria. This indicates that there is a high response of real gross domestic product to

changes in crude oil prices in the positive direction at the long run. This implies that every unit change in real gross domestic product is stimulated by the predictor variable by 0.423707 and 0.756892 respectively for the short and long run. This result affirms the position of Umar and Abdulhakeem (2010) that crude oil price had a significant impact real gross domestic product in Nigeria. But this result is contrary to the affirmation of Ani, Ugwunta, Oliver and Eneje (2014) that crude oil price changes has no significant impact on real gross domestic product in Nigeria. Further, the causality result indicated a bi-directional causation between crude oil prices and real gross domestic product in Nigeria. This finding is supported by Matthew and Adegboye (2014) that there is a bi-directional causation between crude oil prices and real gross domestic product in Nigeria. This result is indicative of the huge contributions of the crude oil sector to real gross domestic product in Nigeria. National Bureau of Statistic in its third quarter report 2014 shows that crude oil contributed 10.45 percent to real gross domestic product in Nigeria. And this was the rebasing period. The report shows that, prior to the rebasing; crude oil contributes 40.86 percent in 2011, 33.01 percent in 2012, and 32.43 percent in 2013 respectively. And in June 2017, the contribution of crude oil to real gdp stood at 11 percent, a country which oil accounts for more than 90 percent of its exports and 80 percent of government total revenue. In June, Panic set in as crude oil price drop by $0.60 below Nigeria's $44.50 percent reference price for the 2017 budget. The reason could be that, trends in crude oil prices are not properly projected before making policy decisions.

The ECM term also shows approximately 41 percent speed of adjustment towards equilibrium. This implies that 41 percent of disequilibrium caused by exogenous shocks or short run fluctuations in the previous period is corrected in the current year. The coefficient of determination (R^2) shows that crude oil prices, exchange rates and inflation rates stimulate real gross domestic product (RGDP) by 59 percent. This implies that 59 percentage changes in RGDP in the 35 years considered in this study is as a result of the predictor variables.

Furthermore, the least square results for the reliability of the estimates shows that exchange rate is negative but statistically significant to real gross domestic product at the short run and also negative and not statistically significant in the long run. This means that exchange rate did not spur real gross domestic product in Nigeria. This is contrary to theoretical expectation but is in line with Austin, (2015) that exchange rate did not influence real gross domestic product positively in Nigeria; on like Ismaila, (2016) which result shows that exchange rate has direct and positive impact on real gross domestic product in Nigeria. It is a signal that the revenue received from the crude oil sector is not properly channel to other investments that can lead to more exports which further aid in appreciating the Nigerian currency and raising the nation's real gross domestic product.

In line with theoretical expectation, the result further revealed that inflation rate is negative and not statistically significant to real gross domestic product in Nigeria. It shows that a unit change in inflation rate leads to .11 percent in the negative direction. And this result is in line with the findings of Babalola, Danladi, Akomolafe and Ajiboye, (2015); Hakeem, Rasaki, and Bolade, (2015) that inflation rates affect real gross domestic product in a negative direction, as contrary to Osuala, Osuala, and Onyeike, (2013) that there is a positive and statistical significant relationship between inflation rate and real gross domestic product in Nigeria.

Generally, our model suggests the existence of a significant relationship between crude oil prices and real gross domestic product in Nigeria using the F-statistics. The coefficient of determination (R^2) is 0.5888219, f-value is 12.856 which is greater than the tabulated value (2.84) and the p-value is 0.021907. The implication of this results validate the first objective of this study to be true on empirical grounds and further fill literature gap stated in chapter two above.

The findings of this study are in line with the empirical findings of Akinleye and Ekpo (2013), Audu (2015), Haung, Haung, and Peng (2005), Kapoor (2011), Alley, Asekomeh, Mobolaji and Adeniran ((2014), Muhammed (2013), Matthew and Adegboye (2014), Edisiri (2014), and Umar and Abdulhakeem (2010). All these researchers agreed that the prices of crude oil influences economic growth in Nigeria.

There must be consistent and proper projection on the trends of the crude oil prices and the proceeds from the sale of crude oil must be properly channeled to sectors that will boast the real gross domestic product in Nigeria.

Hypothesis two examined the relationship between crude oil prices and capital formation in Nigeria. The results from the parsimonious error correction results from model 2 represented in table 4.10 above suggest that there is positive but insignificant relationship between crude oil prices and capital formation in Nigeria at the short run. The coefficient of regression indicated that, a percentage change in crude oil prices leads to .204952 percent change in capital formation in Nigeria. Changes in crude oil prices also has a coefficient of -0.746145 meaning that one percent change in crude oil prices leads to -0.746145 percent change in capital formation in Nigeria. This indicates that there is

a high response of capital formation to the changes in crude oil prices in the negative direction at the long run. This implies that every unit change in real gross domestic product is stimulated by the predictor variable by 0.204952 and 0.756892 respectively for the short and long run. It is an indication that the proceeds from crude oil when the prices of crude oil was high, was not saved or accumulated. This could be the reason, immediately the prices of crude oil fall, it sent panic to all economic sectors. Policy makers should learn to save for the unexpected and not to spend all as crude oil income is earned.

The causality result indicated a unidirectional causation running from crude oil prices to capital formation in Nigeria. It means high prices of crude oil have the capacity to salvage the nation, if savings are properly made. All over the world, resource-rich countries like Nigeria that depend on revenues from natural resources to finance annual budgets plan early to insulate themselves from price instability in the international markets and eventful depletion of the resources. Many of these nations do so by setting up stabilization funds to save for the rainy day and for the future generation. The fund saved will also protect Nigeria against high dependence on the crude oil revenue.

The idea of saving 0.5 percent of oil and gas revenue came up in Nigeria, and this account was open in 1989. The purpose of the account was to support any state of the federation that suffers absolute decline in its revenue which circumstance is beyond control.

Investigations revealed that, the account was not prudently managed. The fiscal allocation and statutory disbursement audit report by Nigeria extractive industries transparency initiative, released in 2013, revealed that while ₦109.7bn was transferred into the account for the period between 2007 to 2011, the sum of ₦152.4bn was withdrawn from the account for the purposes other than the objective at which it was set up. The result was that the opening balance which stood at ₦41bn in January 2007 was further depleted to ₦36.1bn by December 2011. A recent occasional paper released by NEITI disclosed that as of May 31, 2017, only ₦29.02bn was found in the account. The reason could be that, there was no policy in establishing the account.

The ECM term also shows approximately 52 percent speed of adjustment towards equilibrium. This implies that 52 percent of disequilibrium caused by exogenous shocks or short run fluctuations in the previous period is corrected in the current year.

The coefficient of determination (R^2) shows that crude oil prices, exchange rates and inflation rates stimulate capital formation (CF) by 82 percent. This implies that 82 percentage changes in CF in the 35 years considered in this study is as a result of the predictor variables.

Furthermore, the least square results for the reliability of the estimates shows that exchange rate is negative but statistically significant to capital formation at the short run but positive and statistically significant in the long run. The long run result agrees with Jakob, (2016) that exchange rate has positive and significant correlation with capital formation. But this is not the case in the short run. It is a signal that the revenue received from the crude oil sector is not saved to meet routine issues that can lead to balance our currency.

In line with theoretical expectation, the result further revealed that inflation rate is negative and not statistically significant to capital formation both in short and long run in Nigeria. It shows that a unit change in inflation rate leads to .13 percent in the short run and 11 percent in the long run at the negative direction. And this result is in line with the findings of Christian, (2009) that inflation rates influence capital accumulation in the negative direction.

Generally, our model suggests the existence of a significant relationship between crude oil prices and capital formation in Nigeria using the F-statistics. The coefficient of determination (R^2) is 0.827248, f-value is 8.271268 which is greater than the tabulated value (2.84) and the p-value is 0.000039. The implication of this results validate the second objective of this study to be true on empirical grounds and further fill literature gap stated in chapter two above.

The findings of this study are in line with the empirical findings of Ogbonna and Ebimobowei (2011) that the prices of crude oil influences capital formation in Nigeria.

This essentially requires a deliberate policy put in place to set aside money earned from crude oil especially during periods of high prices to aid smoothen expenditure when prices fall.

Hypothesis three examined the relationship between crude oil prices and market capitalization in Nigeria. The results from the parsimonious error correction results from model 3 represented in table 4.11 above suggest that there is negative and statistically significant relationship between crude oil prices and market capitalization in Nigeria. The coefficient of regression indicated that, a percentage change in crude oil prices leads to -.005886 percent change in market capitalization in Nigeria at the short run. This implies that a percentage increase in crude oil price will reduce

market capitalization by 0.005886 percent in the short run. This short run result was confirmed by Asaolu and Ilo (2012) That oil price increase resulting to decrease in the stock market returns. Changes in crude oil prices also has a coefficient of 0.015916 meaning that one percent change in crude oil prices leads to .015916 percent change in market capitalization in Nigeria in the long run. This is an indication that crude oil price change has severe implication on market capitalization in Nigeria. The result indicated that every unit change in market capitalization is stimulated by the predictor variable by -0.005886 and 0.015916 respectively for the short and long run. The long run result also affirms the position of Terfa (2016), Uwubanmwen and Omorokunwa (2015) that crude oil price has an influence on market capitalization in Nigeria.

Further, the causality result indicated a bi-directional causation between crude oil prices and market capitalization in Nigeria. This finding is supported by Anthony (2012) that there is a bi-directional causation between crude oil prices and market capitalization in Nigeria. This result is indicative of the huge contributions of the crude oil sector to market capitalization in Nigeria. It was reported from the Financial Times (October 15, 2014) as oil price dropped from 88.46 to 87.74 per barrel within a week interval, the stock market recorded 14 gainers and 39 losers. While reacting to this, the managing director of Highgap security Ltd, Mr.DavidAjorin stated that, anytime the crude oil price falls, it has negative impact on the stock market operations. Government at this point need to look at opportunities in other sectors of the economy and also give attention to those sectors the same attention given to the oil sector, so as to stabilize the economy. Also there is need for government to revisit the stock market policies so that oil price shocks will not be an issue to crash the market operations.

The ECM term also shows approximately 2343 percent speed of adjustment towards equilibrium. This implies that 2343 percent of disequilibrium caused by exogenous shocks or short run fluctuations in the previous period is corrected in the current year.

The coefficient of determination (R^2) shows that crude oil prices, exchange rates and inflation rates stimulate market capitalization (MCAP) by 80 percent. This implies that 80 percentage changes in MCAP in the 35 years considered in this study is as a result of the predictor variables.

Furthermore, the least square results for the reliability of the estimates shows that exchange rate is negative but statistically significant to market capitalization at the short run but positive and statistically significant in the long run. This means that exchange rate did spur market capitalization in Nigeria. This is in line with theoretical expectation and is supported by the result of Abdulrasheed, (2013) that exchange rate did influence market capitalization in Nigeria.

In line with theoretical expectation, the result further revealed that inflation rate is negative and not statistically significant to market capitalization in Nigeria. It shows that a unit change in inflation rate leads to .005061 percent in the negative direction. And this result is contrary to the findings of Ozurumba (2012) that inflation rate has positive but insignificant impact on market capitalization in Nigeria. The difference could be the period of study or the method used.

Generally, our model suggests the existence of a significant relationship between crude oil prices and market capitalization in Nigeria using the F-statistics. The coefficient of determination (R^2) is 0.798331, f-value is 6.837629 which is greater than the tabulated value (2.84) and the p-value is 0.000148. The implication of this results validate the third objective of this study to be true on empirical grounds and further fill literature gap stated in chapter two above.

The findings of this study are in line with the empirical findings of Terfa (2016), Uwubanmwen and Omorokunwa (2015) and Anthony (2012). All these researchers agreed that the prices of crude oil influences economic growth in Nigeria.

Hypothesis four examined the relationship between crude oil prices and real gross domestic product in Nigeria. The results from parsimonious error correction results from model 4 represented in table 4.12 above suggest that there is negative and statistically significant relationship between crude oil prices and foreign exchange reserves in Nigeria. The coefficient of regression indicated that, a percentage change in crude oil prices leads to -1.083536 percent change in foreign exchange reserves in Nigeria at the short run. This implies that a percentage increase in crude oil price will reduce foreign exchange reserves by 1.083536 percent in the short run. Changes in crude oil prices also has a coefficient of -0.582561 meaning that one percent change in crude oil prices will reduce foreign exchange reserves by 0.0582561percent in the long run. This is an indication that crude oil price change has severe implication on foreign exchange reserves in Nigeria. The result indicated that every unit change in foreign exchange reserves is stimulated by the predictor variable by -1.083536 and -0.582561 respectively for the short and long run. This is contrary to theoretical expectation. It shows that, as Nigeria earned revenue from the sale of crude oil when prices are high, adequate amount

is not channeled as foreign reserves. This could be the reason nations currency devalue even when the country earns huge revenue. Nigeria has witnessed significant rise in external reserves from $3.40bn in 1996 to $28.28bn in December 2005, peaking at an all-time high of $62.08bn in September 2008 before declining to $39.07bn as at July 2014. The huge accretion to external reserves from 2000 to 2008 reflected favorable development in the oil market, including high oil prices. External reserves had been below $32bn since February 2015, from where it declined steadily to $23.89bn on October 19, 2017 as the Financial Vanguard revealed on October 19, 2017. The external reserves commenced a bumpy but steady upward trend, rising by $7.66bn to $31.55bn on October 16, 2017. There should be policy on external reserve management with respect to income earned from the sale of crude oil and these policies must be monitored properly to ensure compliance.

The ECM term also shows approximately 85 percent speed of adjustment towards equilibrium. This implies that 85 percent of disequilibrium caused by exogenous shocks or short run fluctuations in the previous period is corrected in the current year.

The coefficient of determination (R^2) shows that crude oil prices, exchange rates and inflation rates stimulate foreign exchange reserves (FRES) by 67 percent. This implies that 67 percentage changes in FRES in the 35 years considered in this study is as a result of the predictor variables.

Furthermore, the least square results for the reliability of the estimates shows that exchange rate is negative but statistically significant to foreign exchange reserves in Nigeria. This means that exchange rate did spur foreign reserve in Nigeria. This result agrees with Umeora, (2013), that exchange rate did not influence foreign reserves in Nigeria.

In line with theoretical expectation, the result further revealed that inflation rate is negative and has statistically significant relationship with foreign reserves in Nigeria. It shows that a unit change in inflation rate leads to .0378567 percent in the negative direction. And this result is contrary to the findings of Umeora (2013), that inflation rate has positive relationship with external reserves in Nigeria. The difference could be the period of study or the method used.

Generally, our model suggests the existence of a significant relationship between crude oil prices and foreign exchange reserves in Nigeria using the F-statistics. The coefficient of determination (R^2) is 0.670713, f-value is 4.073723 which is greater than the tabulated value (2.84) and the p-value is 0.003650. The implication of this results validate the forth objective of this study to be true on empirical grounds and further fill literature gap stated in chapter two above.

The findings of this study concur with the findings of Osuji (2015), Audi (2015) All these researchers agreed that the prices of crude oil influence external reserves in Nigeria.

5.1 Summary of findings:

The research work investigated the impact of crude oil price changes on economic growth in Nigeria from 1980 to 2014. The following findings were inferred from the study:

1. That economic growth represented by real gross domestic product was positive and significantly affected by crude oil prices on the short run; also positive but insignificant on the long run. Generally, our model suggests the existence of a significant relationship between crude oil prices and real gross domestic product in Nigeria using the f-statistics with particular reference to the period under review.
2. That economic growth represented by capital formation shows different results. That is; the impact of crude oil prices on capital formation was positive but insignificant on the short run; but negative and significant on the long run. Generally, our model suggests the existence of a significant relationship between crude oil prices and capital formation in Nigeria using the f-statistics.
3. That economic growth represented by market capitalization also shows different results. That is; the impact of crude oil prices on market capitalization was negative and significant on the short run; but positive and significant on the long run. Generally, our model suggests the existence of a significant relationship between crude oil prices and market capitalization in Nigeria using the f-statistics.
4. That economic growth represented by foreign reserves shows negative and significant impact on the short run; also negative but insignificant impact on the long run. Generally, our model suggests the existence of a significant relationship between crude oil prices and foreign reserves in Nigeria using the f-statistics.

The results of our econometric evidence are also in line with the findings of Umar and Abdulhakeem (2010), Ogbonna and Ebimobowei (2011), Terfa (2016) and Osuji (2015).

5.2 Conclusion

The study investigated the impact of crude oil price changes on economic growth in Nigeria. The variables used in the study include crude oil prices (COP) as the independent variable, while the dependent variables which represents economic growth include real gross domestic product (RGDP), capital formation, market capitalization (MCAP), foreign reserves (FRES). The study also used inflation rate (INF) and exchange rate (EXR) as control variables.

The relationship between crude oil price changes and economic growth is found to be significant; the causality test result also indicates causality relationship runs from crude oil prices to all the indicators of economic growth used in the study.

This empirical relationship followed fairly closely to what economic theory will have suggested. Harrod-Donor theory of economic growth which specified real income and output expansion as a function of net investment, as increase of crude oil prices will lead to higher income which leads to more investments and in turn leads to expansion of output. The results suggest that for a significant economic growth, the focus of policy and strategy should be on measures to promote economic growth by always monitoring the trends in crude oil prices and proper utilization of funds earned from the sale of crude oil. Over the years, the prices of crude oil in the international market have been unstable due to several reasons. These include flooding the international market with stolen crude oil, government intention to supply more to earn more income, corrupt practices from authorities in the NNPC, etc. If authorities can check mate these and other factors affecting the sector, the prices will continue to rise, which will in turn lead to economic growth.

5.3 Recommendations

Based on the relationship found between crude oil prices and the various economic growth indicators used in this study;

1. Nigerian government should make policies that will eradicate crude oil theft in order to boast real gross domestic product in Nigeria.
2. There must be a deliberate policy and proper monitoring by policy makers to set aside fund earned from crude oil especially when prices are high so as to help smoothen expenditure when crude oil prices are down.
3. There is need for regulatory framework in the Nigerian stock market that will monitor the dimension of the changes in the international crude oil prices in order to promote the market operations.
4. Government should continue to put measures in place to stop corrupt practices in the NNPC.

5.6 Suggestions for further studies

The study looked at the impact of crude oil price changes on economic growth in Nigeria from 1980 to 2014 using descriptive statistics and normality test, regression analysis, ADF unit root tests, Johansen co-integration, error correction model and causality test. Further studies could increase the time bound (scope) or employ other economic growth indicators as dependent variables, or still, utilize other statistical techniques.

This will enable comparison and increase reliance on and robustness of the results of this study. This will also confirm the validity of the findings of this study, since different methods, variables and time horizons will be used. It will also widen the body of existing literature on the subject matter. Also, further study should be conducted on the impact of crude oil export and effects on the growth and stability of the Nigerian economy.

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Appendix 1

Obs	COP	RGDP	CF	FRES	MCAP	EXR	INF
1980	35.52	315.47	11431.10	1064.00	4.46	0.55	9.9
1981	34.00	205.22	11594.00	1489.38	5.00	0.61	20.9
1982	32.38	199.69	9804.00	698.34	5.00	0.67	7.7

1983	29.04	185.60	7479.00	161.57	5.70	0.72	23.2
1984	28.20	183.56	4257.00	539.68	5.50	0.76	39.6
1985	27.01	201.04	5126.00	1475.53	6.60	0.89	5.5
1986	13.53	205.97	7734.00	5729.93	6.80	2.02	5.4
1987	17.73	204.81	9605.10	30168.45	8.20	4.02	10.2
1988	14.24	219.88	9391.20	23740.11	10.00	4.54	38.3
1989	17.31	236.73	18424.10	22521.91	12.80	7.39	40.9
1990	22.26	267.55	31126.80	36513.26	16.30	8.04	7.5
1991	18.62	265.38	35623.90	41119.56	23.10	9.91	13.0
1992	18.44	271.37	58940.30	26894.75	31.20	17.30	44.5
1993	16.33	274.83	81398.10	31522.46	47.50	22.05	57.2
1994	15.53	275.45	85314.40	197209.40	66.30	21.89	57.0
1995	16.86	281.41	114827.30	35267.20	180.40	21.89	72.8
1996	20.29	293.75	172491.00	74511.59	285.80	21.89	29.3
1997	18.86	302.02	250099.00	158094.40	281.90	21.89	8.5
1998	12.28	310.89	283292.40	155583.20	262.60	21.89	10.0
1999	17.44	312.18	231661.70	502751.90	300.00	92.68	6.6
2000	27.60	329.18	331056.70	1333859.00	472.30	142.11	6.9
2001	23.12	356.99	327135.70	1149299.00	662.50	111.94	18.9
2002	24.36	433.20	499681.50	929182.70	764.90	120.97	12.9
2003	28.10	477.53	865876.50	966032.00	1359.30	129.36	14.0
2004	36.05	527.58	863072.60	2093945.00	2112.50	123.50	15.0
2005	50.59	561.31	804400.80	3737078.00	2900.10	132.15	17.9
2006	61.00	595.82	1546525.70	5441652.00	5120.90	128.65	8.2
2007	69.04	634.25	1915348.80	6459250.00	13181.70	125.83	5.4
2008	94.10	674.89	2030510.00	6284253.00	9563.00	118.57	11.6
2009	60.86	716.95	2184828.76	6310753.00	7030.80	148.90	11.5
2010	77.38	820.75	2403311.64	4860266.00	9918.20	150.29	13.7
2011	107.46	1255.75	2650542.66	5021957.00	9672.20	153.86	10.8
2012	109.45	1783.17	2868222.60	6872610.00	14800.90	156.80	12.2
2013	105.87	2673.91	7452222.00	6941263.00	19077.40	162.00	8.5
2014	96.25	2938.03	8043899.00	5745724.00	16875.10	167.80	8.1

Source: Author's compilation

The appendix 1 above COP represents Crude oil price, RGDP represent Real GDP, CF represents Capital Formation, FRES represents Foreign Reserves, MCAP represents Market Capitalization, EXR represents Exchange Rate, while INF represents Inflation Rate.