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Oil Price Volatility and Unemployment in Nigeria

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***Abstract*— This study examined the effect of oil price volatility on unemployment in Nigeria for the period of 1981 to 2016. The study employed Non-Linear Autoregressive Distributed Lags model (NARDL) to analyse the effect of oil price volatility on unemployment in Nigeria while Exponential Generalised Autoregressive Conditional Heteroscedasticity (EGARCH) was used to compute oil price volatility. The pass-through effect of oil price volatility on unemployment in Nigeria was however evaluated with the aid of a structural Vector autoregressive (SVAR) model. The study found that negative oil prices changes have a significant effect on unemployment rate in Nigeria in the short run. Also, the effect of oil price volatility is transmitted to GDP and subsequently to unemployment rate in Nigeria only in the long-run. The study concludes that oil price volatility has an indirect effect on unemployment in Nigeria. The study therefore, recommends that to minimize the problem of unemployment in Nigeria, it is necessary to cut dependence on oil and explore other alternatives to achieving economic growth and job creation in Nigeria.**

***Index Terms*— oil price volatility, unemployment.**

I. INTRODUCTION

1.0. Background

Oil has been the world's major commercial energy source for many decades and the consensus view is that it will maintain this leading role well into the 21st century. The pre-eminence of oil has run in parallel with the massive economic advances made in the 20th century and on into the 21st century. It is estimated that oil accounts for around 40% of the world energy mix (Maizar, 2004). This is because of its unique combination of attributes such as sufficiency, accessibility, versatility, low costs in many areasand ease of transportation.

In Nigeria crude oil was first discovered in 1956 by Shell D'Arcy, at Oloibiri in the Niger Delta area (Agbede, 2013). After 1964, several oil fields were discovered by Shell and the oil output also grew steadily thereby making Nigeria a member of the oil producing nations. Nigeria later joined the Organisation of Petroleum Exporting Countries (OPEC) in 1971, after the end of the protracted civil war. The discovery of crude oil in Nigeria was anticipated to be a blessing to the Nigerian economy, but as Olaokun (2000) pointed out, events did not go this way; on the contrary as oil price slump overtook the global economy and the years between 1978 and 1982 witnessed the deepest global recession ever since the 1930's. Also, Nigeria's oil wealth has not been efficiently tapped to launch her onto economic heights; rather, she suffers from what Robinson, Torvik and Verdier (2006), described as a resource curse – a paradox of poverty amidst plenty resources. This according to Alley, Asekomeh, Mobolaji, and Adeniran (2014), is as a result of the structural economic imbalance resulting from poor management of oil revenue in the country.

Although the discovery of crude oil in Nigeria has led to an increase in government revenue, one of the major challenges facing the Nigeria economy is that of unemployment which has maintained a rising trend over the years. As impressive as the country's Gross Domestic Product (GDP) growth figures may appear, the increasing proportion of employment growth is inadequate to absorb labour market entrants. This according to Aiyedogbon and Ohwofasa, (2012) reflects the failure of the government to make use of available resources to provide employment opportunities and foster economic growth in Nigeria. The National Bureau of Statistics – NBS (2014), equally confirm the spate of unemployment which was 12.6% in 2002 but rose to 19.7% and 23.9% in 2008 and 2011 respectively. Furthermore, unemployment rose to 24.7% and 25% in 2013 and 2014 respectively. These periods were also characterized by increasing oil price volatility, inflation, exchange rate volatility and wide spread poverty in the country (Oduwole, 2015).

Since Nigeria became an oil dominant economy, one major issue the country has to contend with as a member of the global economy is the increasing spate of fluctuations in the price of oil in the world market. Global oil price which was stable below $3 per barrel in 1972 rose to an average of $12 per barrel by the end of 1974 and from $14 per barrel in 1978 to $35 per barrel in 1981 following the Arab oil embargo of 1973 – 1974 and Iran – Iraq war of 1979 – 1980 respectively, (New York Mercantile Exchange, 2010). The global oil price enjoyed stability from 1981 – 1985 following the output cut by OPEC member countries but suddenly, declined to $13.53 per barrel in 1987 as a result of a decision by Saudi Arabia and some of its neighbours to increase their share of the oil market (OPEC, 2017). Also, following the Asian crisis and the US invasion of Iraq in 2001 - 2006, global oil output fell steeply thereby forcing the oil price to go above the mark of $40 per barrel (OPEC, 2017). The global financial crisis of 2007 – 2009 also created an elusive scenario in the global oil market hiking the price from $70 per barrel to $145 per barrel in July of 2007 (OPEC, 2017). However, by 2009 following the increase oil production by non OPEC member countries led to the oil price slumped to an average of $60.86 per barrel (OPEC, 2017). Equally, the oil glut which started in the last quarter of 2014 caused oil price to decline from an average of $110 per barrel to $49.49 per barrel in 2015 and further dropped to $29.78 per barrel in January of 2016, (OPEC, 2017).

As highlighted above, the varying impact of oil price volatility on economic activities is widely reported in

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different countries considering the enormous significance of crude oil to the world economic growth and development. However, this could vary from country to country depending on whether it is an importing or exporting country. Nigeria is a net exporter of oil and it depends on oil export for 95% of foreign exchange and 75% of government revenue (Ndubuisi, 2017). This means that the impact of oil price volatility could transmit to nearly all economic activities considering its important role to Nigeria's economy. This could largely affect either the supply or demand size of the Nigerian economy.

Firstly, decrease in global oil prices may lead to decline in the output level, because oil is considered as the major supplier of foreign exchange earnings for the importation of consumer goods and basic input for production (Odularu, 2008). As the price of oil declines, it may leads to higher cost of imported inputs which would result to increase cost of production and declined output level. High production costs make it infeasible for the firms to continue production at full or existing production level, hence resulting in lowering of production level and downsizing, which results in declined economic growth and increase unemployment level.

Equally, oil price volatility has the potentials of influencing government spending, private investment and consumptions. Government expenditure in Nigeria takes the form of payments of wages and salaries, payments to contractors, local purchases of goods and services, educational grants and scholarship awards, donations and subventions, and other minor social responsibilities. Apart from the direct stimulation given to the producers of these goods and services such injectionsequally exert secondary influences through the multiplier process on the level of output and employment in other related sectors of the economy (Odularu, 2008). The oil price decline in 2015 led to a situation where 27 out of 36 States struggled to pay salaries due to a drastic drop in Federation Account Allocation Committee (FAAC) disbursements, (BudgIT, 2017). This has led to decline consumption, increased deficit (domestic and external borrowing) financing. However, with the increasing cost of external debt servicing, government at all levels settled for domestic borrowing thereby pushing interest rate in an upward direction. The decline level of consumption and increase demand for domestic borrowing by government could trigger interest rate increase thereby crowding out private investment, decline output and increase unemployment.

Persistent oil price volatility could also fuel market speculations and increase vulnerability of the monetary policy errors in an oil dependent country. Whenever domestic inflation is caused by the oil price volatility, authorities try to control the inflation through deflationary monetary policies, resulting in a decrease long term output and higher unemployment rate, (Ahmad, 2013). High interest rate could encourage more savings and less investment because of the uncertainty associated with the aggregate demand and productivity. An increase interest rate in such situations becomes impediment to investors hence crowding – out private investments. Thus unemployment rate would rise; consumer consumption rate would fall, resulting in the further slowdown of the Gross Domestic Product (GDP) growth than the actual oil price decline.

Also the major input for the industries is capital that comes from the investments of local and foreign investors. When economic activities are at decline, as witness in times of oil price decline, investors withdraw their investments from the capital markets and take money out of the country and invest in higher profitable and growing economies, resulting in further lowering of production and economic activities in the country (Brown and Yucel, 2002). From the above, possible transmission channels of oil price volatilities to unemployment in Nigeria are limitless. It is against this backdrop that this research investigated the relationships and channels through which oil price volatility exert influence on unemployment in Nigeria since the country being an oil exporting country also has high unemployment level.

1.1. Statement of the Problem

Crude oil is one of the most important resources in the world economy and constitutes the largest commodity market in the world. Oil is probably one of the few or the only production input that can affect both positively and negatively economic growth, to an extent that it might even lead to a recession (González &Nabiyev, 2009). In Nigeria, crude oil is the major source of foreign exchange and government revenues. Oil and gas constitutes 98% of total exports, 80% of government revenues and around 20% of GDP (Riman, Akpan, &Ofong, 2013).

In spite of the huge economic potentials of oil to Nigeria, the country largely failed to live up to the ambitious growth projections that followed the first oil boom in the 1970s. Also, social indicators particularly employment have displayed no specific tendency towards improvement such that unemployment which was 12.6% in 2002 rose to 19.7% and 25% in 2008 and 2014 respectively (NBS, 2014). These periods were equally characterized by both negative and positive movement of oil prices in the global market (OPEC, 2017).

In view of the huge significance of oil resource to the economic development of Nigeria and the persistent oil price volatility in the global market, a lot of researchers have delved into the field to assess its potential impacts on economic activities in the country. Some of the previous studies generally arrived at a consensus that oil price volatility exerts a significant impact on economic activities in Nigeria both in the short run and long run. However, Ani, Ugwunta, Oliver and Eneje (2014) among others dispute these findings and assert that changes in the oil price have an insignificant influence on Gross Domestic Product (GDP) and other key macroeconomic variables in the short run.

Also, the previous studies on oil price volatility and unemployment concentrate on the developed oil dependent net importing nations like the USA, Canada, China and Germany among others with little or no literature covering the developing, oil dependent exporting countries like Nigeria, Angola, Libya and the Middle East Arab countries. This has made transnational organizations too often assume that the impact of oil price volatility is the same in both developed net importing and developing net exporting countries. This research therefore, provide a platform for transnational policy makers to consider the dialectical variations in these countries as it relates to oil price changes and unemployment for policy formulations.

1.2. Objectives of the Study

The main aim of this research is to assess the effect of oil price volatility on unemployment in Nigeria. While the specific objectives are to:

i. Examine the causal relationship between global oil price volatility and unemployment in Nigeria.
ii. Assess the effect of global oil price volatility on unemployment in Nigeria.
iii. Examine the pass–through effect of global oil price volatility on unemployment in Nigeria.

II. REVIEW OF RELATED LITERATURE

2.1. Conceptual Clarifications

2.1.1. Oil Price Volatility

The term oil price volatility has been given different definitions by different authors around the world. According to Routledge Dictionary of Economics (2002), volatility is the fluctuations in the value of a variable, especially a price. It can be historic, implied (based on a model) or forecast. It can be cyclical, persistent or reverting to the mean. It is measured by the average range (high low) of a price for a given time period. On the other hand, Institute for 21st Century Energy (2012) refers to oil price volatility as the degree to which prices of oil rise or fall over a period of time. In an efficient market, prices reflect known existing and anticipated future circumstances of supply and demand factors that could affect them. Changes in market prices therefore, tend to reflect changes in what markets collectively known or anticipate.

The analysis of oil price volatility became popular after a spate of supply shocks that hit the global economy during the seventies as the result of oil output cut by OPEC countries. Oil price volatility is principally defined as the price fluctuations resulting from changes in either the demand side or supply side of the international oil market (Hamilton, 1983, Wakeford, 2006). These changes according to Akpan (2013) have been traditionally traced to supply side disruptions such as OPEC supply quotas, political upheavals in the oil-rich Middle East, unregulated behaviours of non OPEC oil producing countries and activities of militant groups in the Niger Delta region of Nigeria. Oil price volatility could either be high or low.

Crude oil price volatility metric uses measures of the annual change in crude oil price measured in terms of the real cost per barrel of crude. The measure of price volatility for any given year is arrived at by averaging the change in that year and the changes in the previous two years. So the measure of volatility in 2000, for example, is the measure of the average annual change in the years' 1998, 1999, and 2000 (Institute for 21st Century Energy, 2012).

From the above, oil price volatility therefore, measures the changes in oil price within a period of time, such as a day, a month or a year. Over the years, most of the major fluctuations in oil prices are caused by exogenous political events such as the OPEC oil embargo of the 1970s and demand-supply disequilibrium (Hamilton, 1985, Barsky& Kilian, 2004). Kilian (2009), also, assert that the source of fluctuation is critical in determining its effect on macroeconomic performance. For the purposes of this analysis, therefore, oil price volatility could be seen as a significant change in the price of oil and the resultant impact on the macroeconomic performance of an economy, despite occurring outside of it.

2.1.2. Unemployment

At the early stage of the development of economic science, unemployment was viewed to be as the result of slow adjustment of money wages - wage rigidity. This according to the classical economists, unemployment was a temporary phenomenon until price flexibility restores an economy to full employment. However, John Maynard Keynes repudiated this viewpoint as misleading. Keynes argued that cutting money wages will not lead to full employment because with the fall in money wages, the income of workers will also falls. This according to Keynes will reduce aggregate demand which will eventually leads to more unemployment. Also, even if the money wages fall, real wages may not reciprocate as the classicalists claim.

Brunner and Meltzer, (1978) therefore, defined unemployment as the difference between the amount of employment demanded and supplied at each real wage or as the difference between actual and equilibrium employment. The concept of unemployment is viewed by Routledge Dictionary of Economics (Second Edition, 2002), as a state of being part of the labour force, wanting to work, but without a job. This could be as a result of disequilibrium phenomenon arising from inflexible prices. Unemployment can take many forms e.g. voluntary, involuntary, frictional, structural, technological, Cyclical or seasonal.

According to Udu and Agu, (2005) unemployment is a situation in which persons capable and willing to work are unable to find suitable paid employment. Similarly the International LabourOrganisation, (2007) viewed unemployed workers as those who are currently not working but are willing and able to work for pay, currently available to work and have actively searched for work. However, in a developing economy like Nigeria this is arguable as some unemployed do not search because they are discouraged, and these non-searching according to Byrne and Strobl, (2001) are more deprived than the searching unemployed.

The Nigerian Bureau of Statistics – NBS (2016), defined unemployment to include persons (aged 15–64) who are currently available for work, actively seeking for work but are without work. NBS emphasized that an employed person is someone who engaged in the production of goods and services, thereby contributing to the Gross Domestic Product (GDP) in a legitimate manner, which is a component of the national accounts and receives any form or amount of compensation for that activity. This by implication means that any form of illegitimate activity one engages in with a financial gain does not constitute employment. Rotheim (2007) therefore, pointed out that unemployment is a key measure of the economic health of a nation. It is a major factor in determining how healthy an economy is; if the economy maximized efficiency, everyone would be employed at some wage. An individual unemployed is both unproductive and a drain on society's resources. The working definition of unemployment in this dissertation therefore, accommodate all the economically active population (labour force) who are able, searching and even not searching but willing to work but is unable to find suitable paid employment.

2.2. Origin and Causes of Oil Price Volatility

Since 1970, oil price volatility has been a recurring

decimal in the global oil market (Baumeister and Peerman, 2009). This is because, over the years, oil has been used as a political instrument to determine political control and relations with other nations. Also the natural bias in the regional distribution of the oil resource which is predominantly in the Middle East greatly contributed to oil price volatility. Equally, the institutional controls and cartels like that of the Organization of Petroleum Exporting Countries (OPEC) which accounts for the largest oil supplies block give it huge powers to influence the supply and price of oil in the global market. According to Alessandro (2011), the price-fixing methods, taking reference from the Brent spot market to index supply contracts, have themselves promoted the rule of financial speculation and the rampant instability in the oil market. This is evidenced in 1973 when OPEC decided to cut oil production which resulted in almost a tripling of its price which sent the developed countries like the United State of America (USA) into recession (Bade and Parkin, 2003).

Also, the world growing economies and increasing population around the world, for example, China and India have put even greater pressure on oil demand than ever before. An average person in China and India consumes 1.7 and 0.7 barrels per person and day of oil (Hannes and Markus, 2007). The expanding demands together with political influences are among the principal factors not to be dispensed with when discussing the issue of oil price volatility around the globe.

Although many researchers focus on the economic factors, Mabro (1991), as reported by Giraud (1995), stated that the day-to-day prices of oil may be determined by free market forces, but the sharp shifts in oil price level are essentially motivated by political factors, an example of which is the politically motivated civil strives and unrests in the Middle East from where the bulk of crude oil supply emanate. In the same disposition, Hamilton (2009) agrees with Mabro (1991), that supply interferences are a substantial factor of oil price volatilities.

Governments' interventions both internally and externally have also influenced the production and supply of oil that ultimately helps in driving price volatility around the world and this had some important consequences for the behaviour of oil price movement. Tracing the historical and political undertone in the Middle East, such as the Yom Kippur War in 1973, Iranian Revolution in 1978, Iraq's invasion of Iran in 1980, Iraq's invasion of Kuwait in 1990, USA invasion of Iraq in 2003 and international sanctions against Iran in 1979 which was expanded in 1995 have all influenced oil price movements around the world. Conspicuously, in July 2012, Iran was forced to shut down some of its oil wells, and overall oil production dropped to about 2.6 million barrels per day (mbd) from the level of nearly 4.0 mbd at the end of 2011, (Wikipedia, 2017). The cost of funding these wars and the growing market power of the oil-producing countries all contributed to the oil price crisis around the world.

The inelastic nature of demand and supply of crude oil products equally contributed in explaining the persistent oil price volatilities around the world. The oligopolistic oil market and its implications has led to oil prices been greatly in excess of costs and with no justification in terms of difficulties of supply and this aggravated the extreme variability of oil prices and also discouraged investment in alternative energy sources., (Alessandro, 2011). Hamilton (2008) and Fattouh (2007) agreed that crude oil price elasticity is very low especially in the short run. This is due to technology lock-up; that is, it takes some time before energy-consuming appliances/capital stocks are replaced with more energy-efficient substitutes. However, substitution takes place in the long run and price elasticity is thus much larger (Alley, Asekomeh, Mobolaji, and Adeniran 2014). Baumeister and Peerman (2009) further explain that the demand function is recently getting less elastic (probably due to increasing growth in demand from emerging economies, relative to the availability of substitutes such as biofuels and other green energies), and this explains higher volatilities of oil market around the world.

Similarly, the supply of crude oil is price inelastic. This results from the time lag between exploration and production activities, making supply less responsive to price changes (Fattouh, 2007). Besides the decreasing elasticity of crude oil demand function, Baumeister, and Peerman (2009) further suggest that shifts in demand for oil explain some of the price volatility. These shifts result from economic growth in oil-importing countries, but Kilian (2006) as reported by Alley et al (2014), noted that the shifts in global oil demand and consequent surges in oil price in the past few decades have been mostly due to shocks/changes in inventory/speculative demand by oil importers.

From the foregoing, the fact that flow supply disruptions historically have had small effects on the real price of oil does not mean that political events in the Middle East do not matter because such events may also affect the real price of oil by shifting expectations about future shortfalls of oil supply relative to oil demand. Equally, the shifts in expectations about the future scarcity of oil are not observable and taken into considerations. The central idea is that anyone expecting the real price of oil to increase in the future will have an incentive to store oil for future use, which in turn provides incentives to curb current oil consumption and stimulates additional oil production (Kilian & Lee, 2013). Also, a speculative purchase of crude oil comes as a result of an expectation of the future rising oil prices. This could be as a result of expectations in a scarcity of oil supply relative to oil demand. Kilian and Murphy (2014) explained that swings in expectations, both supply and demand speculative pressures, played an important role during many of the oil price changes previously experienced.

As highlighted in the preceding paragraphs, the origins of oil price volatilities have been traced to many sources or origins. Understanding these origins and impacts will help in planning, policy formulation against oil price changes as it affects macroeconomic performance especially unemployment in Nigeria.

2.3. Oil Price Volatility and the Nigerian Economy

An oil price increase, other things being equal, should be considered good news to oil exporting countries and bad news to oil importing countries, while the reverse should be expected when the oil price decreases, (Aii, 2011). As a mono-economy, Nigeria is dependent mainly on the income from oil exportation to finance its annual budgetary expenditures. The available literature has not been silent over the possible transmission channels of the impact of oil price

changes on macroeconomic indicators in Nigeria. As a net oil exporting country, rising oil prices lead to the increase in government revenue, decline in consumer prices, increase consumer spending, exchange rate and interest rate stability which eventually leads to the overall economic growth and development. Donwa, Mgbame, and Onyeokweni, (2015) noted that Nigeria's economy grew by an average of 7% and her GDP has shown very impressive growth with a growth rate of 7.43% in December 2011 and 6% in 2012. On the other hand, the decline in oil prices directly affects manufacturing and service industries as a result of exchange rate crisis and declining government revenues. According to Obasi, (2016) falling oil prices impacted on the Nigerian economy through rising inflation, investment decline, job loss and Naira depreciation.

As highlighted above, unemployment is one of the most important macroeconomic issues that all governments and economies face around the world. It has both social and economic implications for all economies. An unemployed person is both unproductive and a drain on society's resources. Since the switch from agricultural based economy to an oil-based economy in the 1970s, unemployment has been on the increase as revealed in the available literature. The NBS figures reveal that unemployment rate in Nigeria in 2000 was 18.1%, 13.7% in 2001, and 12.2% in 2002 and further dropped to 11.9% in 2005. However, following the financial crisis of 2007/2008 and the subsequent slump in the oil price in the preceding year, the unemployment rate rose to 21.1% in 2010, 23.9%, 24.3% in 2011 and 2012 respectively (National Bureau of Statistics, 2012). This could be as a result of Nigeria being a developing country that depends heavily on the revenue from the oil sector for the funding of critical infrastructure like roads, electricity generation, education, health etc. Decline oil prices have also made it difficult for the government to fulfil its statutory obligation to the workers with the government. The impact of government deficit financing has transmitted to the private sector through increase domestic borrowing by the public sector and high interest rate (BudgIT, 2017). This over the years contributed to the crowding-out of private investments and hence retrenchment of workers in the private sector.

The trend of oil price slide across the globe has undoubtedly taken a toll on the macroeconomic performance of many oil exporting nations including Nigeria. According to Englama, Duke, Ogunleye, and Isma (2010), the absolute dependence on oil export revenue has made the level of Nigerian economy vulnerable to sudden oil price movements more noticeable. In affirmative, in the second quarter of 2016, Nigeria was reported been in recession with the Gross Domestic Product (GDP) declined by -2.06%. This is clearly the evidence of increased unemployed population draining on the nation's resource as Okun's law emphasized that when unemployment goes up by 1%, GDP drops by 2%. In the same period, inflation figures rose to 17.1% in July from 16.5 percent in June, and food inflation rose to 15.8% from 15.3% (NBS, 2016). Nigeria's external reserves have also been depleted from $34.5 billion in January 2015, to $24.6 billion as at November 2016, (CBN, 2016).

Crude oil contributes over 90% of foreign exchange earnings in Nigeria (Adedipe, 2004; Adenikinju, and Falobi, 2006). Ogwumike and Ogunleye (2008) are also of the same opinion that the sector dominates other sectors in contributing to export revenues. For instance, it was responsible for over 98% of total export from the country in 2005. Accordingly, naira to dollar exchange rate has witnessed a great level of relative depreciation from 1980 till date. Its continued depreciation, however, is well noticeable and may have implications for the level of real sector development in the country. The Naira which traded at an average of N0.55 to US$1.00 in 1980 depreciated to N1.75 in 1986 when oil price dwindled from US$35.5 p/b in 1980 to US$13.5 p/b in 1986. Oil price and Nigeria's exchange rate continued to show strong correlation as during the aftermath of global financial crisis of 2007/2008 when the crisis took its toll on Nigeria following the crash of global oil price and the nation's stock market, average naira exchange rate to a dollar depreciated from N118.6 in 2008 to N148.9 in 2009. In the same period, average oil price depleted from US$94.1p/b in 2008 to US$60.9 p/b in 2009. Also, the periods of 2014 and 2015 were not favourable for Nigeria as the price of oil continued to drop in the international market. In 2014, the average oil price was US$96.3 p/b, while average exchange rate was N158.6. However, 2015 saw average oil price slump further to US$49.5 p/b thereby pushing average naira exchange rate further to N192.4 in 2015, (World Development Indicators, 2017). The situation became worse when global oil price declined to US$30 p/b in 2016, while naira to dollar exchange rate depreciated to a record of N500 to a dollar in the same period.

The oil price volatilities have also impacted the Nigerian financial sector in a number of ways. The financial sector is responsible for the financing of other sectors of the economy. The falling oil prices cause a serious financial problem for the telecommunication, capital market and other sectors of the economy due to the linkage of these sectors. The failure of most companies indebted to the banks to repay back their loans advanced to them has led to retrenchment of workers in the banking sector thereby adding more unemployment into the already clustered Nigerian unemployed workforce. Zenith Bank and Access Bank retrenched over 2800 workers in 2015 alone. These two banks, in addition to Guaranty Trust Bank, were the ones been indebted to by the telecommunication giant Etisalat network in the original sum of U.S. $1.2 billion and a total outstanding sum of about U.S. $574 million when the oil price crash began, (Agbebiyi, 2018). The shake off of staff strength was witnessed in all the registered commercial banks in Nigeria as of December 2016.

There are several factors that affect the economic activities of any country particularly unemployment level. However, as an economy like Nigeria that is heavily dependent on oil as a major source of revenue and foreign exchange, the current dwindling of oil price has taken its toll on the overall performance of the country's economy. Investigating the relationship and channels of transmission of oil price Volatility on economic activities particularly unemployment will further shed more light on the oil price volatility and its impact in the country.

2.4. Oil Price Volatility and Employment in Nigeria

Prior to oil boom in the 1970s, agriculture was the backbone of the Nigerian economy, employing over 70% of the active working population. According to Lawal (1997), as

reported by Olukoya (2007), agriculture contributed about 60% to GDP at independence in 1960. However, this share declined over time to only about 25% between 1975 and 1979, which could be attributed to over-reliance on crude oil and the disincentives policies created by the government. Olukoya, (2007) re-echoed that agricultural sector suffered neglect during the hey-days of the oil boom in the 1970s.

As earlier stated, oil price volatility could affect nearly all macroeconomic indicators including employment generations. Sharp changes in oil prices, however, affect countries differently, depending on whether the country in question is net exporting oil or a net importing nation. The rise in the price of oil will leads to rises in the cost of production and hence can lead to (cost-push) inflation, lower economic growth, and even recession (Sauter&Awerbuch, 2003, Barsky& Kilian, 2004, Mordi&Adebiyi, 2010). On the contrary, positive oil price changes will be beneficial to oil exporting countries as export receipts from a given quantity of oil increases (Deaton, 1999). However, negative oil price changes may hurt net exporting countries in terms of decline in government revenues, economic recession, and sometimes trade union dispute as a result of nonpayment of salaries.

According to Goldsmith (2008), an estimate of 75% of all state government employment is linked to the oil and gas industry; 33% of jobs in the finance and real estate sector in Alaska (oil-dependent state in the United State of America) depend on the petroleum industry; and so do 27% of the jobs in the construction industry. Thus, about one-third of all jobs in Alaska are in some way connected to the oil industry. These findings can be safely be related to Nigeria given the linkage of oil sector to nearly all sectors of the economy and complete dependence of federal, state and local governments on the proceeds from the oil and gas sector.

Also, the Alaska's situation can be loosely compared to Nigeria as evident in the study conducted by National Bureau of Statistics (2016) that over 4.58 million jobs were lost in 2016 alone following the downturn in economic activities as a result of fallen oil prices. The study reveals further that in the first quarter of 2016, the total number of employment generated was 79,469 jobs, representing a sharp decline of 83.1% (389,605) year on year and 84.1% (420,056) from the previous quarter. This sharp decline in employment generation in the first quarter of 2016 is strongly correlated to the weakening economic output within that period, which is coincided with the dwindling global oil prices. This negative effect is replicated to nearly all macroeconomic indicators thereby leading to a negative growth of -0.36% in the same period.

Furthermore, as the declining oil revenue and increasing government deficit financing in 2015 and 2016, jobs created in the formal sector recorded a 34.6% (14,426) decline in the fourth quarter when compared to the third quarter of 2015 and 80.3% (110,780) decline when compared to the fourth quarter of 2014. The first quarter of 2016 further recorded a decline in formal sector employments, declining by 21.2% quarter on quarter and by 83.6% year on year. As a result, the public sector just like in the fourth quarter of 2015, recorded a negative figure of -3.038 (NBS, 2016). This drop was visible across almost all the economic activities and could be a reflection of the slowing down of economic activities due to global oil price fluctuations.

2.5. Theoretical Review

2.5.1. Demand and Supply Theory

The phrase "demand and supply" was first used formally by James Denham-Steuart in his "Inquiry into the Principles of Political Economy", published in 1767. However, the analogy of the concept has been concomitantly used by several philosophers like Ibn Taymiyyah in the fourteenth Century, John Lock's writings of 1691 among others, (Wikipedia, 2018). The theory of demand and supply was further expanded by Adam Smith in his 1776 book "The Wealth of Nations" and David Ricardo's 1817 " The Principles of Political Economy and Taxation". Over the years, the principles of demand and supply have been further developed by successive economists with wide range of applications in the field of economics.

The demand and supply relationship underlie the forces behind the allocation of resources in any society. In market economic theories, demand and supply theory tries to allocate resources in the most efficient way possible. However, unlike the demand relationship, supply relationship is dependent on time. Time is an important factor in the supply of oil because producing countries cannot always react quickly to a change in demand or price. This is because producing nations needs time to vary capital and labour inputs necessary to influence oil supply.

Over the years, increased oil prices have greatly influenced its supply. The increase in oil prices also increase the input expenses and decreased earning for producers in an oil importing economy. Oil is also used in the energy sector (electricity) and transport sector. Consequently, when oil price rises, it also increases the electricity bills and transportation cost which may lead to increase inflation and unemployment. However, for the net oil exporting countries like Nigeria oil price decrease could leads to decline government revenue and expenditure which will in turn impact negatively on the overall economic performance of such countries.

The continued oil price increase decreases non-oil demand and lower speculations in net oil-importing countries. Lower speculative spending will decrease the employment and productivity and decrease actual wealth and overall spending. Moreover, tax revenues go down and the financial statement deficit goes up owing to the inflexibility in government expenditures. For net exporting countries where government grant subsidies to the oil sector, decrease oil prices will add up to the weight on government budgets and growing political and social tensions (Barsky and Kilian 2004). The rise in budget deficit would then induce interest rates in an upward way thereby crowding-out firms and creating an acute unemployment situation.

2.5.2. The Asymmetry-in-effects theory

Asymmetry in effects means that oil price increases have a clear negative impact on economic growth while oil price declines do not affect economic activity significantly. As reported by Papapetrou, (2009), Oriakhi and Iyoha, (2013), that the correlations between crude oil prices decrease and economic activities in an economy are significantly different and perhaps zero. Members of this school of thought such as Mark, Olsen and Mysen (1994), in a study of some African countries, confirmed the asymmetry in effect of oil price

volatility on economic growth. Ferderer (1996), another member of this school of thought explained the asymmetric mechanism between the influence of oil price volatility and macroeconomic performance by focusing on three possible ways: Counter-inflationary monetary policy, sectoral shocks, and uncertainty. He found a significant relationship between oil price increases and counter-inflationary policy responses. Balke (1996) supports Federer's position/submission. He pointed out that monetary policy alone cannot sufficiently explain real effects of oil price volatility on real GDP.

2.5.3. Okun's Law

Okun's law describes one of the most famous empirical relationships in macroeconomics. The law was proposed by Arthur Okun in 1962. Okun's law is usually referred to as "Okun's rule of thumb" because of its analysis of the relationship between GDP and unemployment using empirical observations rather than economic theory based.

Okun's law investigates the statistical relationship between a country's unemployment rate and the growth rate of its economy. The law states that if GDP grows rapidly, unemployment rate will declines, but if growth is very low or negative unemployment rate rises. However, if GDP growth equals potential, unemployment rate remains unchanged. The law explained that for every 1% increase in unemployment rate, a country's GDP will decline 2% lower than its potential GDP. The idea behind Okun's law is that output depends on the amount of labor employed in the production process, so there is a positive relationship between output and employment and a negative relationship between output and unemployment.

Fonteijne (2014) algebraically explained Okun's Law using growth rate of GDP (g) and the changes in unemployment (Δu) as stated below;

$g = \frac{\Delta y}{y} = k - c\Delta u$ ---------- (2.1)

Where;

g is the growth rate of GDP

y is actual output

Δy is the change in actual output from one year to the next

k is the average annual growth rate of full-employment output

c is the factor relating changes in unemployment to changes in output

Δu is changes in unemployment.

The above illustration of Okun's law implies that for any increase in the level of productivity, real GDP have to increase up to the rate of growth of its potential in order to hold the unemployment rate steady. More specifically, to achieve a 1% decline in unemployment rate, real GDP must grow approximately 2% faster than the rate of growth of potential GDP over that period. So, for illustration, if the potential rate of GDP growth is 2%, Okun's law says that GDP must grow at about 4% rate for one year to achieve a 1% reduction in the rate of unemployment (Furhma, 2016).

Although, some economists raised reservations about Okun's law regarding the closeness of the relationship between GDP and unemployment. It is however, invaluable to note that over the years, Okun's law has held up reasonably well in many countries of the world. GDP growth has been close to many estimates of potential and the unemployment rate. For instance, after the global financial crisis in 2007/2008, and decline in GDP growth in Nigeria, unemployment equally increased within the same period. The situation was similar in 2014/2015 when unemployment increased following declined in the country's GDP growth rate. It is therefore, convincing to imply that for unemployment rate to be reduced in any country, the economy must grow at a pace above its potential.

2.5.4. Keynesian Unemployment Theory

The Cyclical or deficient-demand theory of unemployment was developed by John M. Keynes during the great depression of the 1930s. According to the theory, quantity of goods and services produced in any economy is dependent on the level of labour employed. Keynes theory explained that employment results in production, production creates income and income results in demand for products, that is, other things being equal, larger employment will bring about larger demand for products.

Algebraically, a normal Production function is represented as

$Q = f(K,L)$----------*(2.2)*

Where Q is total output, K is capital and it is fixed in the short run while L is labour and it is variable both in the short and long run.

On the other hand, Aggregate Demand function is represented as;

$AD = C + I + G + NX$----------*(2.3)*

Where, AD is aggregate demand, C is total consumption, I is aggregate investments, G is aggregate government expenditure while, NX is net export.

From equation 2, it can be deduced that consumption is dependent on income and is represented as

$C = C(Y)$----------*(2.4)*

Therefore, since consumption depends primarily upon income and consumer demand is constrained by income that is, $Y \leq \bar{Y}$, if investment demand is deficient, then aggregate demand will be less than aggregate supply (AD < AS), and inventories may pile up, with unemployment becoming a natural outcome.

From the above illustration, unemployment occurs when there is not enough aggregate demand in the economy to provide jobs for everyone who wants to work. As earlier noted, 27 out of 36 States in Nigeria cannot pay salaries due to a drastic drop in Federation Account Allocation Committee (FAAC) disbursements, (BudgIT, 2017). This has created a sharp fall in the nation's aggregate demand for goods and services. When demand for most goods and services falls, less production is needed and consequently, fewer workers are needed. According to Keynes, wages are sticky and do not fall to meet the equilibrium level, hence mass unemployment results in a time of demand deficiency.

The cyclical or deficient-demand theory derived its name from the frequent shifts in the business cycle or fluctuations in economic activities. With cyclical unemployment, the number of unemployed workers exceeds the number of job vacancies, so that even if full employment is to be attained and all open jobs are to be filled, some workers would still remain unemployed, (Wikipedia, 2017). Some associate cyclical unemployment with frictional unemployment because the factors that cause the friction are partially caused by cyclical variables. For example, a surprise decrease in the price of oil and subsequent decrease in government spending

in Nigeria may shock rational economic factors and suddenly inhibit aggregate demand thereby creating unemployment.

The Keynesian economists, therefore, recommended for government interventions to resolve unemployment problem. This according to them could be in the form of deficit spending and expansionary monetary policies to stimulate aggregate demand to resolved unemployment.

2.6. Empirical Review

From the time when Hamilton, (1983) published his article on Oil and the macroeconomic variables after the American recession of 1973–75 using U.S.A data, several researchers have delved into the field of oil price volatility and its economic implications. Hamilton's study established that there is a positive relationship between an increase in the price of oil and recessions in the U.S.

Investigating Employment and Wage Effects of Oil Price Shocks: a Sectoral Analysis in the U.S.A, Keane and Prasad (1991), employed Ordinary Least Square (OLS) estimates and concluded that oil price increases substantially leads to decline in real wages for all workers but rise in the relative wage of the skilled workers in the U.S. They also found out that oil price shocks induce substantial changes in employment shares and relative wages across industries. Similarly, Davis and Haltiwanger, (1999) conducted a study on the Sectoral effects of oil price changes and other shocks on the creation and destruction of U.S. manufacturing jobs from 1972 to 1988. They employed Vector Autoregression (VAR) and revealed that oil price volatitlities account for about 20-25% of the cyclical variability in employment growth in the U.S. They equally discovered that employment growth shows a sharp asymmetric response to oil price fluctuations. In assessing the effects of oil price shocks for Nigeria, as an Oil-Dependent Emerging Economy for the period 1975-1992, Ayadi, Chatterjee and Obi, (2000) employed the VAR technique and found that output responds positively to positive oil production for Nigeria.

In another study, Herrera and Karakiy, (2005) examined the Effects of Oil Price Shocks on Job Reallocation in the U.S. using simultaneous equation model to test symmetric and asymmetric responses. They found no evidence of asymmetry in the response of job flows to positive and negative oil price changes. However, they discovered that positive oil price changes lead to a decline in net employment and an increase in job reallocation which they explain could be as a result of search and matching issues.

Cunado and de Gracia, (2005) examined how oil price volatility affected the growth rate of output in the developed countries. Employing alternative regime switching models, their result revealed that positive net oil price increases have affected output growth and employment in the investigated countries. However, Jimenez and Sanchez (2005) empirically assessed the effect of oil price volatility on the real economic activity of industrialized countries using both linear and nonlinear models and established evidence of a nonlinear impact of oil price volatility on real GDP for the selected countries.

In another study, Olomola and Adejumo, (2006) investigated Oil Price Shock and Macroeconomic Activities in Nigeria using VAR model. Their study found out that oil price shock does not affect output and inflation in Nigeria but significantly affect other macroeconomic variables. Equally, Akide, (2007) steered an empirical study on the impact of oil price volatility on economic growth indicators in Nigeria using quarterly data from 1970 to 2000. He agreed with Olomola and Adejumo, (2006) that oil price shocks does not affect output and inflation in Nigeria, but significantly influenced the real exchange rate.

Examining how the price of oil affects unemployment in Sweden, Mellquist and Femermo, (2007) employed linear regression analysis and Granger causality tests, concluded that there is a strong relationship between the price of oil increase and unemployment in Sweden. However, their findings remains silence on whether an increase in the price of oil will cause a positive or negative effect on unemployment.

Omisakin, (2008) investigated the impacts of oil price shocks on macroeconomic performance in Nigeria using Vector Autoregression (VAR). In forecasting error variance decomposition using data from 1970 – 2005, he revealed that oil price shocks significantly contribute to the variation in oil revenue and output. This according to Omisakin greatly impacted negatively on the macroeconomic performance of Nigeria.

Applying nonlinear approach, Zhang (2008) examined the relationship between oil price changes and economic growth in Japan, found an indication of nonlinearities in the relationship, and in particular, the result shows that oil price increase tend to have a larger impact on output growth than oil price decrease do. Agreeing with Zhang (2008), Lardic and Mignon (2008) and Cologni and Manera (2009) employed asymmetric co-integration methodology and Markov-switching analysis to examine the long-run relationship between oil prices and economic activities in the G-7 countries. Evidence from their separate studies shows an asymmetric co-integration between oil prices and GDP. Their findings put forward the significance of oil price shocks on macroeconomic performance and an explanation for an oil price motivated recessionary incidences over time around the world.

Ángel and Pablo, (2009) employing t-ratios to analysed Oil Prices and its Effects on Potential Output in Spain, concluded that oil price shocks affect productivity, capital stock, and structural unemployment. Their analysis suggests that a permanent increase in oil prices can significantly reduce potential output hence create structural unemployment. Their investigation further recommended that when competition in the product markets is low or when wage indexation is high, there should be reforms to increase competition and improve wage-setting mechanisms in order to reduce the negative effects of high oil prices on long-run economic growth.

According to Burbidge and Harrison, (1984) as reported by Papapetrou, (2009), regarding the impact of oil price volatility on some macroeconomic variables in the U.S.A., Canada, U.K., Japan, and Germany. Using VAR models, he revealed that the oil embargoes of 1973-74 explain substantially the behaviour of industrial production in each of the countries examined. They reached the same conclusions as in Hamilton's 1983 work. However, for the oil price changes in 1979-80, they find little evidence that the changes in oil prices have an effect on industrial production. Guo and Kliesen (2005) as cited by Evangelia (2009) all agreed that oil price shocks significantly shows the negative effect on

future GDP growth. This finding is in harmony with those of Hamilton's work (1996) and Huang, Hwang, and Peng (2005).

Löschela and Oberndorferb, (2009) examined Oil and Unemployment in Germany using vector autoregression (VAR) framework. They analysed monthly data from 1973 to 2008 and revealed that oil price increases induce a rise in unemployment in the German labour market. Also, Papapetrou (2009) wrote a similar paper on the relationship between oil prices and economic activity in Greece from 1982 to 2008. Adopting a regime-switching model (RSR) and a threshold regression modelling founds evidence suggesting a degree of negative correlation between oil prices and economic activities in Greece during the reviewed period.

Ordóñez, Sala and Silva, (2010) examined the impact of real oil price changes on labour market flows in the U.S.A. Employing Smooth Transition Regression (STR) models analysed to what extent oil prices can be considered as a driving force of labour market fluctuations. The study revealed that oil price volatility is an important driving force of job market flows and job finding probability is the main transmission mechanism of such shocks. They concluded that shocks in oil prices cannot be neglected in explaining cyclical labour adjustments in the U.S.A.

Adopting vector autoregressive (VAR) analysis along with the Granger causality test, generalized impulse response functions and generalized variance decompositions, Salim and Rafiq (2011) empirically investigated the impact of oil price volatility on six major emerging economies of Asia, namely China, India, Indonesia, Malaysia, Philippines, and Thailand. They found that oil price volatility impacts output growth in the short run in China. However, for India and the Philippines, oil price volatility was found to impact both GDP growth and inflation.

In another study, Usman, Mohsin, Nawaz, and Qayyum, (2011) examined the impact of oil price volatility on macroeconomic variables of Pakistan employed the Glosten, Jagannathan, and Runkle (GJR) and Vector Autoregressive (VAR) models. The empirical outcome of their research revealed an asymmetric effect of oil price shock on conditional variance. Equally, the Impulse Response Functions (IRFs) shows a hostile effect on the employment and the output of Pakistan. The study also reported less severe effect of oil price on consumption, trade deficit and consumer price index rise due to negative oil price shock in the long run.

Adopting the Generalised Autoregressive Conditional Heteroscedasticity (GARCH) and Exponential GARCH (EGARCH), Adeniyi, Omisakin, Yaqub and Oyinlola, (2012) estimated the influence of oil price on the nominal exchange rate in Nigeria using monthly data from January 2009 to September 2010. The study found an increased in the price of oil culminates in an appreciation of the Nigerian currency against the US dollar. The study also established evidence of the asymmetric effect of positive and negative oil price changes on exchange rate volatility in Nigeria.

Shaaria, Hussainb, and Rahima, (2013) examined the effects of oil price and exchange rate on unemployment in Malaysia. The study employed Johansen VAR-based co-integration technique found that there is no long run relationship between exchange rate, oil price and unemployment. However, the vector error correction model showed that a short run dynamics are influenced by the estimated long run equilibrium. Also the result from the Granger causality revealed that oil price does not affect unemployment but exchange rate has an influence on unemployment.

Apere and Ijeoma, (2013) conducted an empirical study on the impact of oil price volatility on macroeconomic activity in Nigeria using Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH), impulse response function and lag-augmented VAR (LA-VAR) models. They found a unidirectional relationship between interest rate, exchange rate, and oil prices. However, a significant relationship between oil price volatility and real GDP was not found. They concluded that oil price volatility is an important determinant of real exchange rates in the long run, while exchange rate rather than oil price volatility affects output growth in Nigeria. Hence, they found evidence that international oil price influenced economic growth in Nigeria within the sample period.

Agbede, (2013) applying multiple regression of the ordinary least square technique investigated the growth implications of the crude oil price shock in Nigeria from 1970 to 2010. His study revealed that a little shock in the price of crude oil in the global oil market is capable of producing a long–term effect on economic growth in Nigeria. Similarly, Akinleyeand Ekpo (2013), examines the macroeconomic implications of symmetric and asymmetric oil price and oil revenue shocks in Nigeria, using the vector autoregressive (VAR) estimation technique. The study finds that both positive and negative oil price changes influence real government expenditure in the long run rather than in the short run.

Examining the consequences of oil price volatility on the growth of the Nigerian economy from 1970 to 2010, Oriakhi and Iyoha, (2013), employed the VAR methodology. Their findings revealed that oil price volatility impacted directly on real government expenditure, real exchange rate and real import. This implies that oil price changes determine government expenditure level, which in turn determines the macroeconomic performance and specifically, unemployment in Nigeria.

Akpan, (2013) investigated the dynamic relationship between oil price shocks and major macroeconomic variables in Nigeria by applying the VAR approach. The asymmetric effect of oil price shocks; both positive as well as negative oil price shocks significantly increase inflation and also directly increase real national income through higher export earnings. The study equally reveals a strong positive relationship between positive oil price changes and real government expenditures.

On the other hand, Alley, et al (2014), employing the general method of the moment (GMM) examined the Impact of Oil Price Shocks on the Nigerian Economy from 1981 to 2012. After appropriate robustness checks, they concluded that oil price shocks insignificantly retards economic growth while oil price itself significantly improves it. The significant positive effect of oil price on economic growth confirms the conventional wisdom that oil price increase is beneficial to an oil-exporting country like Nigeria. Shocks, however, create uncertainty and undermine effective fiscal management of

crude oil revenue; hence the negative effect of oil price changes.

Also, Ftiti, Guesmi and Teulon (2014) assesses the impact of oil prices on economic growth of the four major OPEC countries (United Arab Emirates, Kuwait, Saudi Arabia and Venezuela) from 2000 – 2010. Employing evolutionary co-spectral analysis, the study revealed that oil price volatilities during fluctuations of the global business cycle like the 2008 financial crisis have a significant impact on the relationship between oil and economic growth in oil-exporting countries.

Ani, Ugwunta, Oliver and Eneje (2014), investigated the causal relationship between oil price changes and key macroeconomic variables in Nigeria in a multivariate framework using times series data from 1980 to 2010. They employed Granger causality and the ordinary least squares respectively and found that in the short run, changes in the oil price has an insignificant influence on Gross Domestic Product (GDP) and key macroeconomic variables.

Adopting the efficiency wage model of Carruth, Hooker, & Oswald, (1998), Aminifard and Bahadorkhah (2014) investigated the relationship between unemployment rate, crude oil prices and real interest rate in Iran between 1973 and 2012. Employing Error Correcting Model (ECM) and asymmetric Autoregressive Distributed Lag (ARDL) model discovered a strong relationship among all the selected variables. In another similar study, Senzangakhona and Choga (2015) using vector auto-regression (VAR) reveals that unemployment in South Africa has a close relationship with oil prices in the short run and the long run.

Most of the available studies on the oil price shock and unemployment have shown inconsistent outcomes. Ebele (2015) investigated the impact of crude oil price volatility on economic growth in Nigeria from 1970 to 2014 using Engel-Granger cointegration test and Granger Representation Theorem. The study found that oil price volatility (OPV) has a negative impact on the economic growth while other variables such as crude oil price, oil revenue, and oil reserves have the positive impact on the Nigerian economy.

Agreeing with Oriakhi and Iyoha, (2013) Uma and Ikpe (2015) investigated the Interaction between Oil Price Shocks and Nigeria's non-Oil Macroeconomy associations. Adopting the linear, nonlinear variants of oil price and multivariate Vector Autoregressive (VAR) and Vector Error Correction (VEC) models respectively founds that oil price account for remarkable changes in real exchange rates, but the transmission effects of these variations on non-oil export and import are found to be negative.

Similarly, Ozturk (2015), in his study on the impact analyses of oil price fluctuations on the selected macroeconomic variables in Turkey from 1990 – 2011 using Vector Autoregression (VAR) models and bivariate Granger causality tests agreed that both symmetric and positive oil price changes decrease industrial production, money supply, and imports while the negative oil price changes increase imports. His Granger causality analysis demonstrates that asymmetric and positive oil price changes Granger-cause industrial production and imports in Turkey.

In addition, oil price volatility strongly influence employment generation across the globe as established in many empirical findings. Studies conducted by Uri (1996), Carruth, Hooker and Oswald, (1998) and Aminifard and Bahadorkhah, (2014) as cited by Booklet, (2016) supported these findings. In testing for both short-run asymmetric and long-run equilibria, Uri (1996) and Carruth et al (1998) propose an error correction model (ECM). Uri's findings (1996) appear unclear and the results fail to show a relationship between oil price volatility and unemployment rate for the U.S. On the other hand, Carruth et al. (1998) employing Error Correction Model (ECM) estimation proves integration among unemployment rate, interest rate and oil prices in the United States.

Obi, Awujola, and Ogwuche, (2016) examined the effects of oil price changes on macroeconomic performance in Nigeria using yearly data from the year 1979 to 2014. The paper adopted unrestricted Vector Auto Regression model by Sims (1980). The models estimated the relationship between oil price changes, inflation rate, Gross Domestic Product and real exchange rate. Unit root tests, Johansen co-integration technique, variance decomposition test, granger casualty test and Vector Auto Regression Mechanism was used to examine the speed of adjustment of the variables from the short run dynamics to the long run. It was observed that a proportionate change in oil price leads to a more than proportionate change in real exchange rate, interest rate and Gross Domestic Product in Nigeria.

Kitous, Saveyn, Keramidas, Vandyck, Los Santos, and Wojtowicz, (2016) in an investigation of the Impact of low oil prices on oil exporting countries using descriptive statistics and descriptive statistics and General Equilibrium Model (GEM-E3) analyses, agreed with Ftiti, Guesmi and Teulon (2014), that oil exporting countries' GDP and government revenue is found to be closely correlated to the oil price. This clearly explained why government deficit financing and unemployment in these countries continued to go up during periods of oil price fluctuations. A typical example is the continuous rise of Consumer Price Index (CPI), rising unemployment, declining GDP and increases government deficit financing in Nigeria from 2015 to 2016 as a result of the fallen oil prices in the global market. Empirical evidence has shown strong effects of short run and long run adverse effects of the oil price volatility on macroeconomic performance around the world. However, the direction of the effects appears in either positive or negative directions.

III. METHODOLOGY

3.1. Research Design

The research adopted the ex post facto design with a quasi-experimental study examining how an independent variable, presented prior to the study, affects a dependent (unemployment) variable. A confirmatory analysis is conducted to test and confirm the research hypothesis whether the findings supported theories of demand and supply, Okun's law and Keynesian unemployment established in chapter two. The study made use of secondary data obtained from the publications of National Bureau of Statistics (NBS), Central Bank of Nigeria (CBN) bulletins and World Development Indicators. Econometrics models are built to capture the causal relationship between dependent and independent variables. The research equally adopted descriptive tools like tables, charts and graphs along with relevant econometrics techniques for appropriate analysis

using E-View 9.0.

3.2. Theoretical model

From the demand and supply theory established in chapter two, increase or decrease oil price influences oil production (demand and supply) over the years. Oil price decrease could lead to decline government revenue and expenditure which will in turn impact negatively on the overall economic performance of oil exporting countries. In situations where government grant subsidies to the oil sector, decrease oil prices will add up to the weight on government budgets and growing political and social tensions (Barsky and Kilian 2004). The rise in budget deficit would then induce interest rates in an upward way thereby crowding-out firms and creating an acute unemployment situation. This means that a decline in the oil prices leads to unemployment in the oil net exporting countries such that

UNr = f(OPS)……(3.1)

Where UNr is unemployment rate and OPS is oil price volatility.

Also, following the Keynesian theory of unemployment, it is established that quantity produced is a monotonously increasing function of employment level which is captured as labour. Thus the level of output (Q) is determined by the employment of capital (K) and labour (L). That is;

Q = f(K,L)……(3.2)

Keynesian unemployment theory equally established that unemployment occur when there is not enough aggregate demand in the economy to provide jobs for everyone. On this basis when aggregate demand is less than aggregate supply, inventories may pile up with unemployment becoming a natural outcome. This means that quantity produced is dependent on aggregate demand.

Hence Aggregate demand function isgiven as;

AD = C+I+G+NX……(3.3)

Where, AD is aggregate demand, C is private consumption expenditure, G is government expenditure and NX is net export.

Therefore, output (Q) is equal to Aggregate Demand (AD) equal to GDP.

3.3. Model Specification

This study is essentially built on the determinants of unemployment following the demand and supply theory and the Keynesian model of unemployment. According to the demand and supply theory, oil price volatility affect unemployment as well as economic growth as stated in equation 3.1 and 3.3.

Drawing from the demand and supply and the Keynesians theory, the level of unemployment (UNr), is a function of oil price volatility (OPS), output (Q),and aggregate demand.

Taking unemployment (UNr) function and superimposing iton aggregate demand (AD) function,

UNr = f(OPS, C, I, G, NX)……(3.4)

But since according to Keynes, the level of output depends on the extent of employment of labour and capital, taking gross fixed capital formation (GFCF) for capital investment, and incorporating it to the unemployment function,

UNr = f(OPS, C, I, G, GFCF, NX)……(3.5)

More so, incorporating the other determinants of unemployment into the function,

UNr = f(OPS, GDP, FDI, Ir, GEX, GFCF, EXr, HHC)……(3.6)

Where,

UNr is unemployment rate, OPS is oil price volatility, GDP is Gross Domestic Product, OPw is global oil price, FDI is Foreign Direct Investment, Ir is lending interest rate, GEX is Government Expenditure, GFCF is Gross Fixed Capital Formation, EXr is real exchange rate and HHC is household consumption.

Taking the natural logarithms and expressing equations (3.6) in functional forms, the model for this study become;

$lnUNr_t = f(lnOPS_t, lnOPw_t, lnGDP_t, lnFDI_t, lnIr_t, lnGEX_t, lnGFCF_t lnEXr_t, lnH$ …… *(3.7)*

Converting equation (3.7) to a probabilistic mathematical form, it can be restated as:

$$lnUNr_t = \beta_0 + \beta_1 lnOPS_t + \beta_2 lnGDP_t + \beta_3 lnFDI_t + \beta_4 lnIr_t + \beta_5 lnGEX_t + \beta_6 lnGFCF_t + \beta_7 lnEXr_t, + \beta_8 lnHHC_t \ldots (3.8)$$

3.3.1 Non-Linear Autoregressive Distributed Lags Model (NARDL)

To ascertain the existence of direct impact of oil price volatility on unemployment in Nigeria, equation 3.8 was estimated using non-linear modelling (Non-linear Autoregressive Distributed Lags Model, NARDL). The choice of NARDL was precipitated by the fact that positive and negative volatility in oil prices are expected to exert separate effects on unemployment in Nigeria. Based also on the asymmetry-in-effect theory, the asymmetric model can be specified in NARDL(p, q_1, q_2, q_3, q_4, q_5, q_6, q_7, q_8, q_9) as follows- where p is the maximum lag for $lnUNr_t$ and $q_{1\text{-}10}$ are the maximum lags for the explanatory variables respectively.

$$\begin{aligned}\Delta lnUNr_t = {} & \alpha + \beta lnUNr_{t-1} + \gamma lnOPS^{+}_{t-1} + \delta OPS^{-}_{t-1} \\ & + \tau lnGDP_{t-1} + \eta lnFDI_{t-1} + \theta lnIr_{t-1} \\ & + \vartheta lnGEX_{t-1} + \lambda lnGFCF_{t-1} \\ & + \mu lnEXr_{t-1} + \xi lnHHC_{t-1} \\ & + \sum_{i=1}^{p} \pi_i \Delta lnUNr_{t-i} + \sum_{i=0}^{q_1} \varpi_i OPS^{+}_{t-i} \\ & + \sum_{i=0}^{q_2} \rho_i OPS^{-}_{t-i} + \sum_{i=0}^{q_3} \omega_i \Delta lnGDP_{t-i} \\ & + \sum_{i=0}^{q_4} \varrho_i \Delta lnFDI_{t-i} + \sum_{i=0}^{q_5} \sigma_i \Delta lnIr_{t-i} \\ & + \sum_{i=0}^{q_6} \varsigma_i \Delta lnGEX_{t-i} + \sum_{i=0}^{q_7} \varphi_i \Delta lnGFCF_{t-i} \\ & + \sum_{i=0}^{q_8} \phi_i \Delta lnEXr_{t-i} \sum_{i=0}^{q_9} \psi_i \Delta lnHHC_{t-i} \\ & + \varepsilon_t \ldots (3.9)\end{aligned}$$

Where i = 1,2,…,N.

3.3.2 Structural Vector Autoregressive Model (SVAR)

The effect of oil price volatility on unemployment in Nigeria through economic growth (GDP) was examined using Structural Vector Autoregressive Model (SVAR). SVAR is preferred in this case because of its advantage over standard VAR by allowing for contemporaneous effect of a shock in oil revenue on capital formation through the relevant channels. By using a multivariate specification, the study allows for a variety of volatility in addition to the oil shock

that is considered a focal point in the study process. The study identifies oil price volatility by assuming that unexpected variations in the nominal price of oil are exogenous relative to the coinciding values of the remaining macroeconomic variables included in the SVAR.

The asymmetry-in-effect theory links changes in output GDP) is a function of oil price volatility. The Okun's law on the other hand states that the level of employment in the economy depends directly on the level of output such that unemployment rate (UNr) is a function of output (GDP).

Thus, the effect of oil price volatility on unemployment in Nigeria through GDP can be expressed symbolically as:

$$OPS_t \longrightarrow GDP_t \longrightarrow UNr_t$$

Assuming (p) as optimal lag length, a generic SVAR(p) model can be expressed as:

$$A_0 Y_t = A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t \text{ - (3.10)}$$

Where A_0 is a matrix of contemporaneous coefficients.

To capture the contemporaneous effect, the SVAR(p) model can be specified as follows;

$$\begin{aligned} UNr_t &= \Pi_{11}^1 UNr_{t-1} + \Pi_{12}^1 GDP_{t-1} + \Pi_{13}^1 OPS_{t-1} \\ &+ \Pi_{11}^2 UNr_{t-2} + \Pi_{12}^2 GDP_{t-2} + \Pi_{13}^2 OPS_{t-2} \\ &+ \cdots + \Pi_{11}^p UNr_{t-p} + \Pi_{12}^p GDP_{t-p} \\ &+ \Pi_{13}^p OPS_{t-p} + \Pi_{12}^0 GDP_t + \Pi_{13}^0 OPS_t \\ &+ \varepsilon_{1t} \ldots\ldots . \text{(3.11)} \end{aligned}$$

$$\begin{aligned} &GDP_t \\ &= \Pi_{21}^1 UNr_{t-1} + \Pi_{22}^1 GDP_{t-1} + \Pi_{23}^1 OPS_{t-1} + \Pi_{21}^2 UNr_{t-2} \\ &+ \Pi_{22}^2 GDP_{t-2} + \Pi_{23}^2 OPS_{t-2} + \cdots + \Pi_{21}^p UNr_{t-p} \\ &+ \Pi_{22}^p GDP_{t-p} + \Pi_{23}^p OPS_{t-p} + \Pi_{21}^0 UNr_t + \Pi_{23}^0 OPS_t \\ &+ \varepsilon_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.12)} \end{aligned}$$

$$\begin{aligned} OPS_t &= \Pi_{31}^1 UNr_{t-1} + \Pi_{32}^1 GDP_{t-1} + \Pi_{33}^1 OPS_{t-1} \\ &+ \Pi_{31}^2 UNr_{t-2} + \Pi_{32}^2 GDP_{t-2} \\ &+ \Pi_{33}^2 OPS_{t-2} + \cdots + \Pi_{31}^p UNr_{t-p} \\ &+ \Pi_{32}^p GDP_{t-p} + \Pi_{33}^p OPS_{t-p} + \Pi_{31}^0 UNr_t \\ &+ \Pi_{32}^0 GDP_t \\ &+ \varepsilon_{3t} \ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.13)} \end{aligned}$$

Equations 3.11, 3.12 and 3.13 are rearranged to obtain equations 3.14-3.16 as stated below.

$$\begin{aligned} &UNr_t - \Pi_{12}^0 GDP_t - \Pi_{13}^0 OPS_t \\ &= \Pi_{11}^1 UNr_{t-1} + \Pi_{12}^1 GDP_{t-1} \\ &+ \Pi_{13}^1 OPS_{t-1} + \Pi_{11}^2 UNr_{t-2} + \Pi_{12}^2 GDP_{t-2} \\ &+ \Pi_{13}^2 OPS_{t-2} + \cdots + \Pi_{11}^p UNr_{t-p} \\ &+ \Pi_{12}^p GDP_{t-p} + \Pi_{13}^p OPS_{t-p} \\ &+ \varepsilon_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.14)} \end{aligned}$$

$$\begin{aligned} &-\Pi_{21}^0 UNr_t + GDP_t - \Pi_{23}^0 OPS_t \\ &= \Pi_{21}^1 UNr_{t-1} + \Pi_{22}^1 GDP_{t-1} \\ &+ \Pi_{23}^1 OPS_{t-1} + \Pi_{21}^2 UNr_{t-2} \\ &+ \Pi_{22}^2 GDP_{t-2} + \Pi_{23}^2 OPS_{t-2} + \cdots \\ &+ \Pi_{21}^p UNr_{t-p} + \Pi_{22}^p GDP_{t-p} \\ &+ \Pi_{23}^p OPS_{t-p} \\ &+ \varepsilon_{2t} \ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.15)} \end{aligned}$$

$$\begin{aligned} &-\Pi_{31}^0 UNr_t - \Pi_{32}^0 GDP_t + OPS_t \\ &= \Pi_{31}^1 UNr_{t-1} + \Pi_{32}^1 GDP_{t-1} + \Pi_{33}^1 OPS_{t-1} + \Pi_{31}^2 UNr_{t-2} \\ &+ \Pi_{32}^2 GDP_{t-2} + \Pi_{33}^2 OPS_{t-2} + \cdots + \Pi_{31}^p UNr_{t-p} \\ &+ \Pi_{32}^p GDP_{t-p} + \Pi_{33}^p OPS_{t-p} \\ &+ \varepsilon_{3t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.16)} \end{aligned}$$

The matrix form of the SVAR(p) model for the pass-through analysis is given below.

$$\begin{aligned} &\begin{bmatrix} 1 & -\Pi_{12}^0 & -\Pi_{13}^0 \\ -\Pi_{21}^0 & 1 & -\Pi_{23}^0 \\ -\Pi_{31}^0 & -\Pi_{32}^0 & 1 \end{bmatrix} \begin{bmatrix} UNr_t \\ GDP_t \\ OPS_t \end{bmatrix} \\ &= \begin{bmatrix} \Pi_{11}^1 & \Pi_{12}^1 & \Pi_{13}^1 \\ \Pi_{21}^1 & \Pi_{22}^1 & \Pi_{23}^1 \\ \Pi_{31}^1 & \Pi_{32}^1 & \Pi_{33}^1 \end{bmatrix} \begin{bmatrix} UNr_{t-1} \\ GDP_{t-1} \\ OPS_{t-1} \end{bmatrix} \\ &+ \begin{bmatrix} \Pi_{11}^2 & \Pi_{12}^2 & \Pi_{13}^2 \\ \Pi_{21}^2 & \Pi_{22}^2 & \Pi_{23}^2 \\ \Pi_{31}^2 & \Pi_{32}^2 & \Pi_{33}^2 \end{bmatrix} \begin{bmatrix} UNr_{t-2} \\ GDP_{t-2} \\ OPS_{t-2} \end{bmatrix} + \begin{bmatrix} \cdots \\ \ddots \\ \cdots \end{bmatrix} \\ &+ \begin{bmatrix} \Pi_{11}^p & \Pi_{12}^p & \Pi_{13}^p \\ \Pi_{21}^p & \Pi_{22}^p & \Pi_{23}^p \\ \Pi_{31}^p & \Pi_{32}^p & \Pi_{33}^p \end{bmatrix} \begin{bmatrix} UNr_{t-p} \\ GDP_{t-p} \\ OPS_{t-p} \end{bmatrix} \\ &+ \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \ldots\ldots\ldots 3.17 \end{aligned}$$

Following the recursive approach, which is prominently applied in empirical literature, $-\Pi_{12}^0$, $-\Pi_{13}^0$, and $-\Pi_{23}^0$ will be restricted to zero for savings channel SVAR(p) model to be identified. Thus, the recursive SVAR(p) model for the savings transmission channel to achieve capital formation in Nigeria can be stated below;

$$\begin{aligned} &UNr_t \\ &= \Pi_{11}^1 UNr_{t-1} + \Pi_{12}^1 GDP_{t-1} + \Pi_{13}^1 OPS_{t-1} + \Pi_{11}^2 UNr_{t-2} \\ &+ \Pi_{12}^2 GDP_{t-2} + \Pi_{13}^2 OPS_{t-2} + \cdots + \Pi_{11}^p UNr_{t-p} \\ &+ \Pi_{12}^p GDP_{t-p} + \Pi_{13}^p OPS_{t-p} \\ &+ \varepsilon_{1t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.18)} \end{aligned}$$

$$\begin{aligned} &-\Pi_{21}^0 UNr_t + GDP_t \\ &= \Pi_{21}^1 UNr_{t-1} + \Pi_{22}^1 GDP_{t-1} + \Pi_{23}^1 OPS_{t-1} + \Pi_{21}^2 UNr_{t-2} \\ &+ \Pi_{22}^2 GDP_{t-2} + \Pi_{23}^2 OPS_{t-2} + \cdots + \Pi_{21}^p UNr_{t-p} \\ &+ \Pi_{22}^p GDP_{t-p} + \Pi_{23}^p OPS_{t-p} \\ &+ \varepsilon_{2t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.19)} \end{aligned}$$

$$\begin{aligned} &-\Pi_{31}^0 UNr_t - \Pi_{32}^0 GDP_t + OPS_t \\ &= \Pi_{31}^1 UNr_{t-1} + \Pi_{32}^1 GDP_{t-1} + \Pi_{33}^1 OPS_{t-1} + \Pi_{31}^2 UNr_{t-2} \\ &+ \Pi_{32}^2 GDP_{t-2} + \Pi_{33}^2 OPS_{t-2} + \cdots + \Pi_{31}^p UNr_{t-p} \\ &+ \Pi_{32}^p GDP_{t-p} + \Pi_{33}^p OPS_{t-p} \\ &+ \varepsilon_{3t} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots . \text{(3.20)} \end{aligned}$$

In matrix form, the recursive model is expressed as:

$$\begin{aligned} &\begin{bmatrix} 1 & 0 & 0 \\ -\Pi_{21}^0 & 1 & 0 \\ -\Pi_{31}^0 & -\Pi_{32}^0 & 1 \end{bmatrix} \begin{bmatrix} UNr_t \\ GDP_t \\ OPS_t \end{bmatrix} \\ &= \begin{bmatrix} \Pi_{11}^1 & \Pi_{12}^1 & \Pi_{13}^1 \\ \Pi_{21}^1 & \Pi_{22}^1 & \Pi_{23}^1 \\ \Pi_{31}^1 & \Pi_{32}^1 & \Pi_{33}^1 \end{bmatrix} \begin{bmatrix} UNr_{t-1} \\ GDP_{t-1} \\ OPS_{t-1} \end{bmatrix} \\ &+ \begin{bmatrix} \Pi_{11}^2 & \Pi_{12}^2 & \Pi_{13}^2 \\ \Pi_{21}^2 & \Pi_{22}^2 & \Pi_{23}^2 \\ \Pi_{31}^2 & \Pi_{32}^2 & \Pi_{33}^2 \end{bmatrix} \begin{bmatrix} UNr_{t-2} \\ GDP_{t-2} \\ OPS_{t-2} \end{bmatrix} + \begin{bmatrix} \cdots \\ \ddots \\ \cdots \end{bmatrix} \\ &+ \begin{bmatrix} \Pi_{11}^p & \Pi_{12}^p & \Pi_{13}^p \\ \Pi_{21}^p & \Pi_{22}^p & \Pi_{23}^p \\ \Pi_{31}^p & \Pi_{32}^p & \Pi_{33}^p \end{bmatrix} \begin{bmatrix} UNr_{t-p} \\ GDP_{t-p} \\ OPS_{t-p} \end{bmatrix} \\ &+ \begin{bmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \end{bmatrix} \ldots\ldots\ldots (3.21) \end{aligned}$$

To avoid cross-error correlations or spill-over volatility, and remove the possibility of autocorrelations, we set

$$A_0 Y_t = \mathrm{B} U_t \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3.22)$$

Where Y is the matrix of endogenous variables, B is variance matrix, and U is the matrix of error terms. This can be presented in matrix form as follows;

$$\begin{bmatrix} 1 & 0 & 0 \\ -\Pi_{21}^{0} & 1 & 0 \\ -\Pi_{31}^{0} & -\Pi_{32}^{0} & 1 \end{bmatrix} \begin{bmatrix} UNr_t \\ GDP_t \\ OPS_t \end{bmatrix} = \begin{bmatrix} \delta_1 & 0 & 0 \\ 0 & \delta_2 & 0 \\ 0 & 0 & \delta_3 \end{bmatrix} \begin{bmatrix} U_{1t} \\ U_{2t} \\ U_{2t} \end{bmatrix} \quad \ldots\ldots\ldots\ldots\ldots (3.23)$$

This implies that

$A_0 E_t = BU_t$ ------ (3.24)

Where E is the matrix of initial impulses (i.e., initial volatility in the endogenous variables). This can be represented in matrix form as stated in equation 3.25.

$$\begin{bmatrix} 1 & 0 & 0 \\ -\Pi_{21}^{0} & 1 & 0 \\ -\Pi_{31}^{0} & -\Pi_{32}^{0} & 1 \end{bmatrix} \begin{bmatrix} e_t^{UNr} \\ e_t^{GDP} \\ e_t^{OPS} \end{bmatrix} = \begin{bmatrix} \delta_1 & 0 & 0 \\ 0 & \delta_2 & 0 \\ 0 & 0 & \delta_3 \end{bmatrix} \begin{bmatrix} U_{1t} \\ U_{2t} \\ U_{2t} \end{bmatrix} \quad \ldots\ldots\ldots\ldots\ldots (3.25)$$

Thus, to compute initial responses, we can set

$E_t = A_0^{-1} BU_t$ ---------- (3.26)

That is;

E = SU ---------- (3.27)

Where $S = A_0^{-1}B$

This can be presented in matrix form as;

$$\begin{bmatrix} e_t^{UNr} \\ e_t^{GDP} \\ e_t^{OPS} \end{bmatrix} = \begin{bmatrix} a & 0 & 0 \\ b & c & 0 \\ d & e & f \end{bmatrix} \begin{bmatrix} U_{1t} \\ U_{2t} \\ U_{2t} \end{bmatrix} \text{ ------- (3.28)}$$

Where

a = initial response of unemployment to own shock;
b = initial response of GDP to unemployment shock;
c = initial response of GDP to own shock;
d = initial response of oil price to unemployment shock;
e = initial response of oil price to GDP shock; and
f = initial response of oil price to own shock.

3.3.3. Capturing Oil Price volatility

The exponential generalized autoregressive conditional heteroscedastic (EGARCH) framework is adopted to explain the volatility of oil price in the global market. Speculations seem to increase the volatility of oil price in the global market. Large changes follow the large changes and smaller changes follow the small changes in the global oil price. Negative volatilityhave a much larger effect on oil exporting countries, than positive volatility of the same magnitude. The negative shock has a long lasting impact, causing the downturn in economic activities to take a long time to recover to the initial level. This shows that symmetric distribution or normal distribution is not always a realistic assumption. The EGARCH model was proposed by Nelson (1991) and Nelson and Cao (1992) argue that the non-negativity constraints in the linear GARCH model are too restrictive. The GARCH model imposes the nonnegative constraints on the parameters, α_1 and Υ_j, while there are no restrictions on these parameters in the EGARCH model. In the EGARCH model, the conditional variance,h_t, is an asymmetric function of lagged disturbances ε_{t-i}.

The representation of the EGARCH variance takes the form:

$$\text{Log}(\delta_t^2) = \omega + \sum_{j=1}^{q} \beta_j log\left(\delta_{t-j}^2\right) \sum_{i=1}^{p} \propto_i \left|\frac{\mu_{t-1}}{\delta_{t-1}}\right| + \sum_{k-1}^{r} \lambda_k \frac{\mu_{t-k}}{\delta_{t-k}} \quad \text{(3.29)}$$

Where δ_t^2 is the conditional variance of the oil price,ω, β, α, and λ are parameter estimates. β measures the persistence in conditional volatility. When β is relatively large, volatility takes a long time to die out. μ_{t-1}andμ_{t-k} are the residuals which are measures of information about volatility in the previous period. δ_{t-j}^2 is the GARCH term representing the last period's forecast variance. Predicted values of log (δ_t^2) are applied as an estimate of oil price volatility (Alexander, 2009).

3.3.4. Granger – Causality Test

Granger causality is used to determine the unidirectional, bidirectional relationship or independence between variables. This model aims to decide whether the past value of independent variables (X), helps in predicting the value of explanatory variable (Y_{t+1}), then X granger causes the Y. Before testing the granger causality, integration and co-integration of the time series is checked. The integration is done to check the stationarity of the series through unit root tests, (Fowad Ahmad, 2013). The structure of each variable in a VAR model is a linear function of past lags of itself and past lags of the other variables. In this study therefore, a bivariate Granger causality tests will be performed between real oil prices and macroeconomic variables to determine the absence of Granger causality. Let the following equations generate the *nx1* dimensional vector constituting the level of the variables used in the study;

$Y_t = a_1 Y_{t-1} + \ldots \ldots a_p Y_{t-p} + b_1 X_{t-1} + b_p X_{t-p} + \mu_t$ ---------- *(3.30)*

$X_t = c_1 Y_{t-1} + \ldots \ldots c_p Y_{t-p} + d_1 Y_{t-1} + d_p Y_{t-p} + v_t$ ---------- *(3.31)*

In testing the null hypothesis of H_0: $b_1 = b_2 = \ldots\ldots = b_p = 0$, is a test that *X* does not granger – cause Y. on the other hand, test the null hypothesis of H_0: $d_1 = d_2 = \ldots\ldots = d_p = 0$, is a test that Y does not granger – cause X. the rejection of the null hypothesis in any case will indicates that there is granger – causality.

3.3.5. Unit Root Tests

It is important to determine whether the relationship between economic variables is true or spurious in nature. This is because oftentimes the macroeconomic variables appear to possess a stochastic trend that can be removed by differencing once. Also, the regression models involving time series data are often used for forecasting, hence, the validity of such forecast is dependent on whether the time series are stationary or not. The recent and popular method for testing the stationarity of the time series is the Unit Root Test. Considering the following equations;

$Y_t = Y_{t-1} + \mu_t$ ---------- *(3.32)*

Where μ_t is the stochastic error term, which can be refers to as white noise error term and is nonautocorrelated.

$Y_t = {}_pY_{t-1} + \mu_t$ ---------- *(3.33)*

$\Delta Y_t = (p\text{-}1)\, Y_{t-1} + \mu_t$ ---------- (3.34)

If we run the regression and finds that $p = 1$, then it implies that the stochastic variable Y_t has a unit root. While Δ, is the first – difference for the process. However, if the variables are difference once and the differenced series is stationary. The variables that are classified as non-stationary in levels and become stationary after differencing ones are integrated of order 1, or I(1). Similarly, variables may be stationary I(0) or trend-stationary, or they may require repeated differencing to achieve stationarity (I(d), d>1). The unit root test is thus, important to examine the time-series properties of the

variables.

In this study, the Augmented Dickey-fuller (ADF) unit root test would be employed to investigate the response of the variables in the models to the changing impact of oil prices volatility.

$\Delta Y_t = \delta Y_{t-1} + \mu_t$ ---------- (3.35)

$\Delta Y_t = \beta_1 + \delta Y_{t-1} + \mu_t$ ---------- (3.36)

$\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + \mu_t$ ---------- (3.37)

Where *t* is the time or trend variable. In each case the null hypothesis is that δ=0, that is there a unit root. If the error term ε_t isautocorrelated, the following equation which include a constant and trend term would be applied.

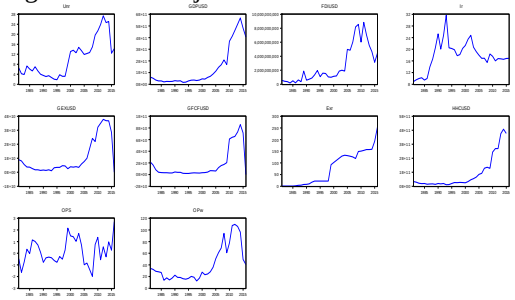
$\Delta Y_t = \beta_0 + \beta_1 Y_{t-1}\ \alpha_j + \beta_2$ trend $+ \sum_{j=1}^{p} \propto_j \Delta Y_{t-1} + \mu_t$ ------- (3.38)

Where ΔY_t indicate the first difference of Y_t and *p* is the lag length of the augmented terms for Y_t. The null hypothesis *p=1* indicates the presence of unit root in Y. this means that Y is nonstationary when applying Dickey-Fuller (ADF) test to *equation 3.38*.

IV. DATA ANALYSIS AND DISCUSSIONS

1) *4.1 Descriptive Analysis*
2) *4.1.1Trend Analysis*

The behavioural patterns of the variables considered in this study are analyzed using trends. The aim is to explain the nature and behaviouralpatterns of the variables for better appreciation. Therefore, the trends of unemployment rate (UNr), gross domestic product (GDP), foreign direct investment (FDI), interest rate (IR), government expenditure (GEX), gross fixed capital formation (GFCF), exchange rate (EXR), oil price volatility (OPS) and world oil price (OPw) have been discussed. The trending patterns are presented in Figures 4.1a – 4.1j.



Figures 4.1a – 4.1j: Trends of Variables used in the Study

Figure 4.1a shows that unemployment rate had a low fluctuating trend from 1981 to 1999. There was a somewhat sharp shock, however, in the trend in 2000, unemployment was 13.1%, oscillated to 13.6% in 2001, rose again to 14.8% in 2003, but declined to 11.9% in 2005. Between 2005 and 2006, unemployment rate remained somewhat static. However, due to downturn of economic activities in 2007 to 2009, the rate of unemployment in Nigeria drastically increased steadily to 21.4% in 2010 and has since then remained high with unsteady slow downward trends between 2011 and 2015.

The trend of GDP is presented in Figure 4.1b. The trend indicates that gross domestic product, presented in US Dollars has had a steady and smooth upwards trend during the period under consideration. Between 1981 and 2000, gross domestic product maintained a near static movement without any obvious fluctuations. However, from 2001 to 2014, the gross domestic product exhibited steady increase until the fall in oil prices in 2015 which prompted it to fall in 2016.

Foreign direct investment had steady fluctuations throughout the study period. Figure 4.1c reveals that between 1981 and 2004, FDI exhibited low fluctuations. However, in 2005, because of oil booms and improved economic conditions in Nigeria (occasioned by steady GDP growth and improvement in purchasing power parity), there was a spontaneous rise in foreign direct investment, with little fluctuation between 2005 and 2015.

In a similar way, interest rate in Nigeria between 1981 and 2015 maintained unsteady movements through the period under consideration. The trend of interest rate is presented in Figure 4.1d. From 1981 to 1985, there was a constant movement in interest rate which was pegged at less than 10%. Between 1986 and 1990, interest rate rose to as high as 26%, with the apex recorded in 1996. Between 1997 and 2015, however, there was a downward unsteady trend in interest rate, though a seemingly constant trend was recorded from 2013 to 2015. Inflation and high exchange rate are some of the factors responsible for this fluctuation. Stable interest rate presents good signs for investment, which is capable of reducing the rate of unemployment in the economy.

The behavioral pattern of government expenditure in Nigeria assumed a convex shape from 1981 to 2012 as presented in Figure 4.1e. The trend was characterized with a long period of stable constant movement from 1981 to 2004. From 2005 to 2014, government expenditure recorded drastic rise due to boost in oil prices that brought about increase in government revenue. However, the fall in oil prices due to global oil demand shortage. This brought about sudden fall in government expenditure in 2015 and 2016.

Gross fixed capital formation assumed a similar trend with government expenditure during the period under study. Figure 4.1f shows that gross fixed capital formation started decreasing from 1981 to 1984. There was a prolonged constant trend in the variable between 1985 and 2003. Like government expenditure, favourable economic conditions prompted rapid response in gross fixed capital formation between 2004 and 2014 which eventually assumed a declining trend in 2015 as a result of fall in oil revenue.

The period between 1981 and 2015 recorded steady but unstable upward swings in exchange rate. As contained in Figure 4.1g, from 1981 to 1985, exchange rate in Nigeria maintained a constant movement with slight insignificant changes. In 1986, the structural adjustment programme (SAP) stirred a sharp increase in exchange rate up to 1992. The exchanged rate as recorded in 1992 was maintained at constant trend up to 1999 when it rose drastically through unstable fluctuation until 2015. This is due to continuous management of exchange rate by the Central Bank of Nigeria towards curtailing unfavourable economic conditions in the country.

Figure 4.1h shows the trend of household consumption expenditure in Nigeria from 1981 to 2015. The figure indicates that from 1981 to 2000, household consumption expenditure maintained stable constant movement and was generally low throughout this period. However, from 2001 to 2015, the trend of household consumption expenditure had been steadily rising with minimal oscillations.

Oil price volatility (which happens to be the prime variable for this study), computed with the aid of General Autoregressive Conditional Heteroskedasticity (GARCH) technique, had the most fluctuating behavioral pattern during the period under study. Figure 4.1i shows that the trend of oil price volatility in Nigeria between 1981 and 2016 was highly

unstable and unpredictable. The trend shows that the period 1981 to 1984 experienced high oil price volatility. This period was followed by a period of moderate oil price volatility between 1985 and 1990. There was a long period of low oil price volatility spanning 1991 to 2007. Between 2008 and 2016, world price of oil experienced high volatility as shown in Figure 4.1i.

The trend of world oil price from 1981 and 2015 in Figure 4.1j was similar to that of foreign direct investment presented in Figure 4.1c. The trending pattern indicates that oil price movement in the global market from 1981 to 2015 was generally unstable and erratic. The trend was characterized by long period of low fluctuations from 1981 to 2000, and long period of high fluctuations from 2001 to 2015.

These trending/behavioral patterns reveal that during the period under study, oil price volatility and the rate of unemployment in Nigeria were highly unstable. This therefore presents the need to empirically examine the possible impact of oil price volatility on unemployment in Nigeria through the related macroeconomic variable (GDP).

1) 4.1.2Descriptive Statistics

In addition to the trend analysis presented in this section, the descriptive statistics of the variables used in this study are analyzed. This is to gain more understanding and a clearer picture of the behavioral characteristics of the variables under study. The descriptive statistics reported in this study include mean, maximum, minimum, skewness, kurtosis, and Jarque-Bera statistic and its probability value. Summary of descriptive statistics is presented in

Table 4.1: ***Descriptive Statistics***

	UNR	GDPUSD	FDIUSD	IR	GEXUSD	GFCFUSD	EXR	HHCUSD
Mean	10.35000	1.36E+11	2.70E+09	17.77905	1.04E+10	1.69E+10	76.46667	8.92E+10
Maximum	27.40000	5.68E+11	8.84E+09	31.65000	3.78E+10	8.57E+10	253.4923	4.08E+11
Minimum	1.800000	1.58E+10	1.89E+08	8.916667	-11.36296	-2.527322	0.617708	1.11E+10
Skewness	0.790906	1.414778	1.047189	0.193133	1.307577	1.696288	0.426107	1.664513
Kurtosis	2.567154	3.453300	2.783421	3.520835	3.115068	4.268540	1.991859	4.436157
Jarque-Bera	4.034226	12.31780	6.649991	0.630706	10.27840	19.67815	2.613925	19.16975
Probability	0.133039	0.002115	0.035973	0.729531	0.005862	0.000053	0.270641	0.000069

Source: *Researcher's Computation*

Results of the descriptive statistics revealed that between 1981 and 2015, the average values of unemployment rate, gross domestic product, foreign direct investment, interest rate, government expenditure and gross fixed capital formation in Nigeria were 10.35%, USD136 billion, USD 2.7 billion, 17.78%, USD10.4 billion and USD16.9 billion respectively. Similarly, exchange rate, household consumption, oil price volatility and world oil price averaged NGN76.47/USD, USD89.2 billion, 0.15 and USD40 pb respectively from 1981 to 2015. The maximum values of the variables were 27.4% for unemployment rate which occurred in 2012, USD568 billion in 2014 for gross domestic product, USD8.84 billion for foreign direct investment in 2011, 31.65% for interest rate in 1993 and USD37.8 billion for government expenditure in 2012. The maximum values for gross fixed capital formation, exchange rate, household consumption expenditure, oil price volatility and world oil price occurred in 2014, 2016, 2014, 2016, and 2012 respectively.

Results of the skewness statistic, which shows the direction of movement of time series, indicate that all the values are positively skewed to the right indicating that the data for the series are all tilted towards large values. However, for the fact that all the series are not substantially skewed to the right, the series do not necessarily differ from a normal distribution.

The peakedness of the distribution usually assumed to normal is measured by the kurtosis statistic. Apart from a normal distribution (mesokurtosis for k=3), a distribution can be relatively flat (platykurtosis for k<3) or relatively high (leptokurtosis for k>3). The kurtosis result shows that UNr, FDI, EXR and OPS have platykurtic shapes (that is, have a flat distribution compared to a series with normal distribution. IR, GFCF and HHC have leptokurtic shapes (highly peaked distribution compared to normal) while GDP, GEX and OPW have mesokurtic shapes (that is, exhibit characteristics of a normal distribution). The results of the kurtosis suggest that only gross domestic product, government expenditure and world price of oil have normal distributions.

The Jarque-Bera test is frequently applied in order to test normality of distributions. Introduced by Jarque and Bera, (1997), it is a test statistic for testing whether series are normally distributed as established earlier. It measures the differences of the skewness and kurtosis of the series with those from the normal distribution. The reported probability is the probability that a Jarque-Bera statistics exceed (in absolute terms) the observed value of a specific level of significance (say, 5%). Hence, if at 5% significance level the Jarque-Bera statistic is less than or equal to X^2 (that is, 5.991), then there are no grounds to reject the null hypothesis that the series are subject to normal distribution. On the basis of the multivariate Jarque-Bera normality test for this study, the probability values of the Jarque-Bera statistics for GDP, FDI, GEX, GFCF, HHC, and OPW indicate cases of multivariate non-normality. This is because, by virtue of the probability of the Jarque-Bera statistics, the null hypotheses that series are subject to normal distribution were rejected. On the other hand, UNr, IR, EXR and OPS have exhibited the characteristics of series with normal distribution. This is because by virtue of the probability values of the Jarque-Bera statistics, the null hypotheses could not be rejected.

4.1.3Assessing the Presence of Volatility in Oil Price

Using exponential general autoregressive conditional heteroskedasticity (EGARCH) model, the presence or not of volatility in oil price is analyzed in this sub-section.

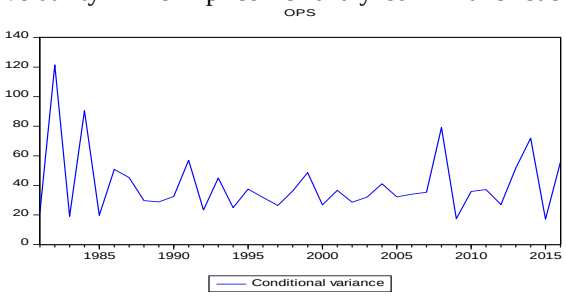


Fig. 2: Results of the EGARCH model

The presence of volatility in oil price is confirmed by the parameters of the variance equation. Since the probability values of the parameters of the variance equation are all statistically significant, it can be asserted that volatility exists in the world oil price. The presence of volatility in oil price is

justified by the presence of heteroskedasticity in the EGARCH model. This is represented by the non-significance of the probability value of the F-statistic in the ARCH heteroskedasticity test. These results show that world oil price is actually volatile.

4.1.4Analysis of Stationarity

In order to ascertain the level of stationarity of the series under consideration in this study, the Augmented Dickey-Fuller (ADF) test was employed. The ADF test is also use to determine the most appropriate estimation technique for examining the relationship between oil price volatility, economic growth and unemployment in Nigeria from 1981 to 2016. Results of the unit root test are presented in Table 4.2.

Table 4.2: Results of Unit Root Test

Variable	ADF	5% critical Value	Prob.	Order of Integration	Stationary
UNr	-5.524968	-2.951125	0.0001	I(1)	Stationary
GDP	-4.673811	-2.951125	0.0006	I(1)	Stationary
OPS	-5.689085	-1.951000	0.0000	I(0)	Stationary
FDI	-7.094837	-2.951125	0.0000	I(1)	Stationary
IR	-5.132115	-2.954021	0.0002	I(1)	Stationary
GEX	-6.051664	-2.954021	0.0000	I(1)	Stationary
GFCF	-4.024022	-2.954021	0.0038	I(1)	Stationary
EXR	-3.644593	-2.951125	0.0099	I(1)	Stationary
HHC	-5.396184	-2.954021	0.0001	I(1)	Stationary

Source: *Researcher's Computations Using Eviews*9.0

The unit root results presented in Table 4.2 reveal mixed order of integration of the series. Specifically, apart from oil price volatility which was stationary at level, that is integrated of order 0, all the other variable became stationary after the first difference, that is integrated of order 1. This is based on the probability values of the ADF statistics at the respective levels of stationarity. Based on the results of the unit root, the non-linear autoregressive distributed lag (NARDL) technique of estimation was employed for the analysis of the impact of oil price volatility on unemployment in Nigeria through economic growth.

4.2 Analysis of the Direct Effect of Oil Price Volatility on Unemployment in Nigeria

The direct effect of oil price volatility on unemployment in Nigeria was examined using non-linear auto regressive distributed lags model (NARDL). This was due to perceived discrepancy between positive and negative volatility in oil prices. The analysis presented in this section therefore covers the asymmetric effect of positive and negative oil price volatility on unemployment in Nigeria.

4.2.1Asymmetric Bounds Cointegration Test

To examine the existence or not of long-run relationship among the variables used in this study (especially between positive and negative oil price volatility and unemployment), the asymmetric bounds testing procedure for cointegration was adopted. The results are presented in Table 4.3.

Table 4.3: Results of the Asymmetric Bounds Cointegration Test

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	3.230526	10%	1.8	2.8
k	9	5%	2.04	2.08
		2.5%	2.24	3.35
		1%	2.5	3.68

Source: *Researcher's Computations using Eviews 9.0*

The asymmetric bounds cointegration test examines the null hypothesis that there is no levels relationship between positive and negative oil price volatility and unemployment in Nigeria. Table 4.3 indicates that the null hypothesis of no cointegration cannot be accepted at 5% level of significance. This is because the F-statistic is greater than the upper critical value bound at 5% level. This implies that there is long-run cointegrating relationship among the variables considered in this study. Thus, there is a direct long run relationship between positive and negative oil price volatility and unemployment in Nigeria. This suggests the short-run asymmetric effect of oil price volatility on unemployment in Nigeria is not the same with the asymmetric effect in the long-run.

4.2 Direct Impact of Oil Price Volatility on Unemployment in Nigeria

Due to the existence of a cointegrating relationship among the variables considered in this study, the asymmetric effect of oil price volatility on unemployment in Nigeria in the long-run was analyzed separately from the short-run effect. The asymmetric short-run results are presented in Table 4.4.

Table 4.4: Asymmetric Short-Run Effect of Oil Price Volatility on Unemployment in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OPS_NEG)	0.062151	0.013718	4.530785	0.0002
D(LGEX)	3.273915	1.062439	3.081508	0.0059
CointEq(-1)*	-0.285609	0.039120	-7.300937	0.0000
R-squared	0.644055			
Adjusted R-squared	0.620325			
Durbin-Watson stat	2.574747			

Source: *Researcher's Computations using Eviews 9.0*

Table 4.4 reveals that only negative oil price volatility and government expenditure have significant short-run effect on unemployment in Nigeria. Negative oil price shock has positive direct effect on unemployment in Nigeria in the short-run. This shows that fall in oil prices leads to increase in unemployment rate in Nigeria. This is because oil price falls send negative signals to the economy, and being the biggest foreign exchange earner in Nigeria; negative oil price volatility has negative effect on the macroeconomic indicators, especially employment. Negative oil price shock was partly responsible for the most recent recession in Nigeria.

Government expenditure has positive effect on unemployment in Nigeria in the short-run. Table 4.4 shows that increase in government expenditure by 1% will raise unemployment rate by 3.27% in the short-run. This is because a greater portion of government revenue in Nigeria is channeled to recurrent expenditure. The recurrent expenditure based fiscal expansion hinders investment which in turn lowers the chance of employment. On the other hand, government capital expenditure is likely to exert crowding out effect on the economy. This will therefore lead to rise in involuntary unemployment.

The error correction term is negative and statistically significant at 5% significance level. This confirms the existence of levels asymmetric relationship between oil price volatility and unemployment in Nigeria. The error correction term indicates the speed of adjustment at which the error between short-run and long-run relationship will be automatically corrected each year. Given the magnitude of -0.285609, the error correction term shows that about 28.6% of the discrepancy between short-run and long-run asymmetric relationship between oil price volatility and unemployment rate in Nigeria will be automatically corrected each year. Thus, the speed of adjustment between short-run and long-run equilibrium is 28.6%. The short-run and long-run disequilibrium will therefore be automatically corrected in 3 years and 5 months.

The short-run results are quite robust with high R-squared and R-squared adjusted. The Durbin-Watson statistic is also within the tolerable threshold, depicting the absence of autocorrelation. This implies that the short run estimates are reliable for policy formulation and execution.

Table 4.5: Asymmetric Long-Run Effect of Oil Price Volatility on Unemployment in Nigeria

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPS_POS	0.489997	0.299131	1.638069	0.1170
OPS_NEG	0.484096	0.284116	1.703866	0.1039
LGDP	-35.81067	8.748224	-4.093479	0.0015
LFDI	-2.135796	0.677666	-1.980748	0.0679
IR	0.376225	0.718053	0.523951	0.6061
LGEX	20.86991	13.14535	1.587628	0.1281
LGFCF	15.50810	11.58280	1.338891	0.1956
EXR	0.109973	0.094378	1.165241	0.2576
LHHC	0.154338	19.65574	0.007852	0.9938
C	101.7444	222.9242	0.456408	0.6530

Source: *Researcher's computations using Eviews 10.0*

Positive and negative oil prices have no significant effect on unemployment rate in Nigeria in the long-run. This is predicated by the probability values of the coefficients of positive oil prices and negative oil prices, which are not statistically significant at 5%. Similarly, interest rate, government expenditure, gross fixed capital formation, exchange rate and household consumption are not significant determinants of unemployment rate in Nigeria in the long-run. This suggests that oil price volatilityare not strong predictor of unemployment rate in Nigeria in the long-run.

However, gross domestic product and foreign direct investment have significant long-run effect on unemployment rate in Nigeria. The coefficient of GDP is significant at 5% significance level, while FDI is significant at 10%. This indicates that only GDP (economic growth) has significant effect on unemployment rate in Nigeria in the long-run. Increase in GDP by 1% will lead to fall in unemployment rate by 35.8%. This means that in the long-run, GDP has negative effect on unemployment rate in Nigeria. This is because GDP increase signifies increase in

aggregate demand in the economy. The increase in aggregate demand propels increase in investment, which leads to production expansion. The desire to produce more output pushes up demand for labour. The demand for labour creates employment, and consequently leads to fall in unemployment rate.

Table 4.6: Diagnostic Tests

Test Statistic	F-Statistic	Probability
Wald Test	7.630436	0.0034
Breusch-Godfrey serial correlation LM test	3.333993	0.0836
Breusch-PaganGodfreyHeteroscedascity	16.96821	0.1228
Ramsey RESET Test	1.456835	0.2422

Source: *Researcher's computations using Eviews10.0*

The Wald test examines the null hypothesis that there is no asymmetric effect of oil price volatility on unemployment in Nigeria, that is, positive and negative oil prices have the same effect on unemployment in Nigeria. The Wald test null hypothesis therefore sets the coefficients of positive and negative oil prices equal to zero. The decision concerning the acceptance or otherwise of the null hypothesis is determined by the probability value of the F-statistic. Table 4.6 indicates that the null hypothesis that the coefficients of positive and negative oil prices are both equal to zero cannot be accepted. This means that there exists asymmetric effect of oil price volatility on unemployment in Nigeria. Thus, the effect of positive oil price and negative oil price on unemployment in Nigeria is not the same.

The Breusch-Godfrey test of serial correlation andBreusch-Godfrey-Pagan test of heteroskedasticity show that the residuals of the model are free from auto correlation (or serial correlation), and are homoscedastic (i.e., the residuals have the same constant variance). The Ramsey regression equation specification error test (RESET) shows that the non-linear autoregressive distributed lags modelis correctly specified.

4.3 Analysis of Granger Causality

To explore the empirical suitability of the relationship between oil price volatility and unemployment in Nigeria under the vector autoregressive (VAR) framework, the three variables of interest (UNr, GDP and OPS) were subjected to Toda-Yamamoto test of causality. The Toda-Yamamoto granger causality/block exogeneitywald test examines the interdependence between oil price volatility and unemployment in Nigeria. The results showing whether a causal relationship exists between oil price volatility and unemployment in Nigeria are presented in Table 4.7.

Table 4.7: Granger Causality/Wald Exogeneity Test

	Chi-Square	df	Prob.	Causality
GDP→UNr	0.763917	1	0.3821	Uni-causality
UNr→GDP	3.966085	1	0.0464	
OPS→UNr	0.052896	1	0.8181	No causality
UNr→OPS	0.933082	1	0.3341	
OPS→GDP	4.405691	1	0.0358	Uni-causality
GDP→OPS	0.766983	1	0.3812	

Source: *Researcher's Computations using Eviews 10.0*

Table 4.7 reveals a one directional causality GDP and unemployment in Nigeria. The causal relationship however runs from unemployment rate to GDP. This shows that there is no feedback relationship between GDP and UNr in Nigeria. Similarly, there is a one-way causal relationship between oil price volatility and GDP in Nigeria. The causal relationship runs from oil price volatility to unemployment. No causal relationship has been established between oil price volatility and unemployment in Nigeria. The lack of causal relationship between global oil price volatility and unemployment in Nigeria depicts the fact that there is no direct link between oil price volatility and unemployment in Nigeria, especially in the long-run. This further justifies the pass-through effect of oil price shock on unemployment in Nigeria as presented in this study.

4.4 Analysis of the Pass-through Model (Structural VAR)

4.4.1Lag Length Criteria (SVAR)

Despite the fact that empirically only a uni-causal relationship was found between oil price volatility and unemployment rate in Nigeria, the pass-through effect was analyzed based on theoretical postulations. Also, inasmuch as GDP and UNr only became stationary at first difference, they were re-specified in their first difference form so as to achieve level stationarity. GDP and UNr were therefore estimated in their first difference form.For the purpose of conducting forecasts using the structural vector autoregressive model (SVAR), the Akaike information criterion (AIC) was adopted for model selection. Results of the SVAR model selection summary are presented in Table 4.8.

Table 4.8: SVAR Model Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-307.0390	NA	52253.67	19.37744	19.51485	19.42298
1	-262.8454	77.33877*	5814.724*	17.17784*	17.72749*	17.36003*
2	-258.4171	6.919125	7875.388	17.46357	18.42546	17.78241
3	-251.6548	9.298280	9458.534	17.60342	18.97755	18.05891

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Source: *Author's computation using Eviews 9.0*

Table4.8 shows that the Akaike information criterion selected lag 1 for the SVAR model considered in this study. This means that lag 1 is the optimal lag for the pass-through model, and thus, our recursive model for the analysis of the pass-through effect of oil price volatility on unemployment in Nigeria through GDP is SVAR(1) model.

4.4.2Structural VAR Estimates

Based on theoretical postulations, restrictions were recursively imposed on the upper elements of the matrix of contemporaneous effects. The restrictions imposed on the recursive matrix indicated that oil price volatility and GDP have no contemporaneous effects on unemployment rate in Nigeria. The high dependency on imports for domestic consumption, together with high cost of capital goods, occasioned by high exchange rate, is capable of preventing such contemporaneous effect. However, we assume contemporaneous effect of unemployment on GDP and oil price volatility. This can be justified on the basis of employment multiplier which assumes the effect of employment on income and all the sectors of the economy.

Table 4.9a: VAR Lag Order Selection Criteria

Endogenous variables: UN GDPR OPS
Exogenous variables: C
Date: 10/19/18 Time: 18:33
Sample: 1981 2016
Included observations: 32

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-372.8800	NA*	3200861.*	23.49250*	23.62991*	23.53805*
1	-368.9739	6.835614	4417938.	23.81087	24.36052	23.99307
2	-365.5123	5.408880	6356208.	24.15702	25.11891	24.47586
3	-362.8334	3.683490	9853480.	24.55208	25.92621	25.00757

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

Table 4.9b: Structural VAR Estimates

Date: 01/06/18 Time: 22:05
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments
Estimation method: Maximum likelihood via Newton-Raphson (analytic derivatives)
Convergence achieved after 24 iterations
Structural VAR is just-identified

Model: Ae = Bu where E[uu']=I

A =

1	0	0
C(1)	1	0
C(2)	C(3)	1

B =

C(4)	0	0
0	C(5)	0

0	0	C(6)		
	Coefficient	Std. Error	z-Statistic	Prob.
C(1)	-0.012786	0.013118	-0.974726	0.3297
C(2)	-3.373987	1.053956	-3.201259	0.0014
C(3)	-64.60116	13.59085	-4.753282	0.0000
C(4)	3.186552	0.386426	8.246210	0.0000
C(5)	0.243732	0.029557	8.246210	0.0000
C(6)	19.31516	2.342308	8.246210	0.0000
Log likelihood	-236.8086			

Estimated A matrix:

1.000000	0.000000	0.000000
-0.012786	1.000000	0.000000
-3.373987	-64.60116	1.000000

Estimated B matrix:

3.186552	0.000000	0.000000
0.000000	0.243732	0.000000
0.000000	0.000000	19.31516

Estimated S matrix:

3.186552	0.000000	0.000000
0.040743	0.243732	0.000000
13.38344	15.74536	19.31516

Estimated F matrix:

3.299475	0.054582	-0.030871
0.115250	0.239718	-0.066062
18.37039	17.41066	13.98124

From the results presented in Table 4.9 C(1), C(2), and C(3) are the contemporaneous coefficients. C(1) represents the immediate response of GDP to volatility due to unemployment rate, C(2), represents the contemporaneous response of oil price volatility to volatility due to unemployment rate, while C(3) is the contemporaneous response of oil price volatility to volatility due to GDP. Results from matrix A of the SVAR(1) estimates indicate that increase in unemployment rate in Nigeria by 1% will not have significant contemporaneous effect on GDP. This is because the contemporaneous response of GDP to volatility in unemployment is not statistically significant at 5%.However, a 1% increase in unemployment rate and GDP will lead to instant positive volatility in oil prices by 3.374% and 64.601% respectively. Though oil price changes are exogenous to the Nigerian economy, general rise in unemployment is capable of inhibiting oil exploration. This may cause oil supply shortage and raise the global price of oil.

The estimated matrix S represents short-run impulse responses. These are the responses of unemployment rate, GDP and oil price volatility to sudden changes in the same variables respectively in the short-run. Matrix S reveals that in the first period (short-run), unemployment rate in Nigeria responds to its own volatility by 3.187% but does not respond to sudden changes in GDP and oil price volatility. GDP responds to short-run volatility in unemployment rate and itself by 0.04% and 0.24% respectively in the short-run. If there is a shock to unemployment rate, this will lead to positive shock in global oil prices by 13.38% in the short-run. Shock due to GDP will lead to positive volatility in global oil prices by 15.74% in the short-run, while about 19.32% of the response in oil price volatility is due to unexpected changes in itself in the short-run. The short-run impulse responses assume that the pass-through effect of oil price volatility on unemployment rate in Nigeria using GDP as the pass-through variable is only a long-run phenomenon. This is due to restrictions imposed in earlier paragraphs.

The structural VAR estimates further indicate that the contemporaneous effect of GDP on unemployment rate in Nigeria is not statistically significant, C(2) to C(6) which indicate other contemporaneous effects and initial variances are statistically significant. This implies that while oil price volatility do not have contemporaneous effect on unemployment rate in Nigeria, the initial effect of unemployment rate on GDP in Nigeria is not significant. This is because Nigeria's GDP is largely influence by other factors such as oil revenue and not unemployment rate.

4.4.4VAR Impulse Responses

Oil price volatilityare expected to have impact on unemployment rate through GDP in Nigeria in the long-run (or at least in the periods other than contemporaneous). The impulse response function traces out the responses of the endogenous variables from one-time volatility on the current future values of the endogenous variables.

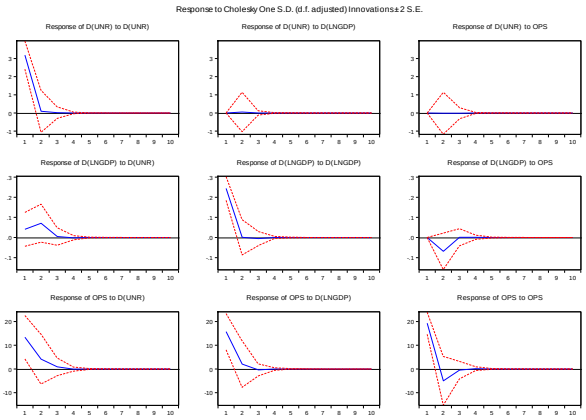


Fig. 4.3: VAR impulse responses

Unemployment rate responds positively to its own volatility at 3.2% in the first period and 0.1% in the second period. The response however declines throughout the forecast horizon. This indicates that the response of unemployment to its own volatility is temporary as the response declines from 3.2% in the first period to 0.0% in the third period. This implies that unemployment rate does not have permanent effect on itself in Nigeria.

Unemployment rate does not respond to sudden changes in GDP in the first period. In the second period, the response of unemployment rate to GDP rises to 0.1%. However, the response of unemployment rate to shock in GDP reverts to zero. This shows that though the response of unemployment rate to shock in GDP is positive, it is however temporary. This is because the response line turns back to zero after the second period. This implies that in Nigeria, unemployment rate is not strongly influenced by GDP. This is quite evident in the fact that even during periods of high, stable and steadily rising GDP, the rate of unemployment in Nigeria remained at high. Thus, other factors apart from GDP might be better predictors of unemployment rate in Nigeria.

Unsurprisingly, the rate of unemployment in Nigeria does not respond to oil price volatility throughout the forecast period. This is because the response line has been placed at zero from the first period to the tenth period. This justifies the theoretical and empirical points of view that oil price volatility do not directly affect the rate of unemployment in Nigeria.

In the first period, a one-time shock in oil prices does not elicit response from GDP. This is because, in the first period, the line depicting the response of GDP to oil price volatility in Nigeria is placed at zero. In the second period, however, GDP responds negatively to sudden change in oil price volatility. However, the response of GDP to unexpected change in oil price volatility is not permanent as the response line turns to zero after the second period and remains so throughout the remaining periods during the forecast horizon. This means that oil prices volatility alone lack the capacity to permanently influence gross domestic product in Nigeria.

4.4.5Forecast Error Variance Decomposition

The forecast error variance decomposition distributes the total fluctuations on the endogenous variables in a VAR framework, unlike the impulse response function which traces the effect of an innovation on the residuals of a variable on the other endogenous variables in the VAR framework. Results of the forecast error variance decomposition are presented in Appendix 7.

In the first period, 100% of the variations in unemployment rate in Nigeria are accounted by its own volatility. In the second period, variations in unemployment rate in Nigeria are decomposed into 99.967% own volatility, 0.030% volatility in GDP and 0.002% volatility in oil prices. Thevariance decomposition of unemployment rate to own changes further declines, same as the variance decomposition to volatility in GDP in the third period, while the contribution of oil price volatility to variations in unemployment rate in Nigeria in the third period rises. This distribution of the total fluctuations in unemployment rate in Nigeria in the third period however remains the same up to the tenth period. By magnitude of contribution, however, apart from own volatility, GDP accounts for more variations in unemployment rate in Nigeria than oil price volatility.

Gross domestic product accounts for 97.282% of its own variations in the first period. The remaining variations (2.718) are accounted for by changes in unemployment rate. The contributions of unemployment rate and oil price volatility to variations in GDP increases in the second period to 9.458% and 6.633% respectively, while own contribution declines. In the third period, the contribution of unemployment rate to variations in GDP increases while own contribution and contribution of oil price volatility falls. In the fourth and fifth periods, the influences of unemployment rate and oil price volatility on changes in GDP rise to 9.488% and 6.632% respectively while own influence fades. These contributions remain slightly the same throughout the forecast horizon. This implies that both unemployment rate and oil price volatility will contribute significantly to variations in GDP throughout the forecast period.

4.4.6Discussion of Findings

This section presents discussion of findings in line with the objectives set in the introductory part of this study. The first objective of the study was set to ascertain the direction of causality between oil price volatility and unemployment in Nigeria. This objective was achieved through Toda-Yamamoto Granger Causality test. The study found no causal relationship between oil price volatility and unemployment in Nigeria. However, a unidirectional relationship was found between GDP and unemployment rate in Nigeria. On the other hand, the study found a uni-directional causal relationship running from oil price volatility to GDP.

There is no direct causal relationship between oil price volatility and unemployment rate in Nigeria because, the price of oil is exogenously determined such that both variables are not related. Thus, oil price volatility and unemployment rate have no direct relationship in Nigeria, especially in the long-run. This is evident in the asymmetric analysis, and further reveals that only a pass-through effect of oil price volatilityon unemployment through GDP suffices in Nigeria. GDP and unemployment are related in a bi-causal relationship because in as much as the rate of unemployment depends on the level of economic growth of Nigeria, economic growth on its part depends on quality labour force. Thus, there is a reactional relationship between GDP and unemployment in Nigeria. The study found a unidirectional relationship between oil price volatility and GDP in Nigeria which runs from OPS to GDP. This is because oil and oil products account for about 87.7% of Nigeria's foreign

exchange earnings, and account for about 10% of the GDP. Thus any change in the global oil price is expected to transmit to gross domestic product. This finding goes in line with theoretical and empirical postulations of the non-existence of a direct relationship between oil price volatility and unemployment. The findings thus agree with Chimanani, Bhutto, Butt, Sheikh, and Devi, (2012) that oil price volatility does not influence unemployment but it is being influenced by the variations in other macroeconomic variables as a result of oil price volatility.

The second objective of the study assessed the effect of oil price volatility on unemployment in Nigeria. This objective was analyzed using asymmetric approach. The study found that, in the short-run, only negative oil price volatilityhas significant effect on unemployment in Nigeria. In the long-run, however, oil price volatilityhas no significant effect on unemployment rate in Nigeria.Negative oil price volatilitydepletes government earnings and may cause decline in investment. This is possible if the government resorts to borrowing to make up for the drop in revenue due to oil price fall, leading to crowding out effect. Crowding out of investment consequently leads to rise in involuntary unemployment rate, hence, rise in unemployment rate in Nigeria.Thus, assuming that all other factors are held constant, negative oil price volatilityare likely to bring about fall in the rate of unemployment in Nigeria. This finding is in agreement with the earlier result obtained by Davis and Haltiwanger, (1999) that oil price volatility greatly influence the cyclical variability in employment growth in the U.S. They discovered that employment growth shows a sharp asymmetric response to oil price fluctuations. However, considering Nigeria as a monoculture economy and its propensity to import, negative oil price volatility will increase the cost of imported inputs and consumer goods as a result of the shortage of exchange rate supply. This in turn will leads to increase cost of production, decline output level and subsequently laying off of workers.

Thirdly, the pass-through effect of oil price volatility on unemployment in Nigeria was analyzed using Structural vector autoregressive model (SVAR). With the aid of impulse responses, the study found that unemployment rate in Nigeria responds positively to sudden change in GDP in Nigeria. Similarly, oil price volatility has no permanent influence on unemployment rate in Nigeria as the negative response in the second period peters out throughout the forecast horizon. This is because even in the times of oil booms and constant rise in GDP, the rate of unemployment in Nigeria remained high. This indicates that there is more to the rate of unemployment in Nigeria than oil price volatility and economic growth. Thus, oil price volatilityexert temporary effect on GDP in Nigeria, which also influences changes in unemployment only on temporary basis. This finding confirms the findings of Oluwatomisin and Adeyemi, (2013) that oil price volatility do not have a significant impact on GDP, but oil price volatility influence other variables that significantly influence GDP like investment and savings.

4.5. Conclusion

Over the years, crude oil served as the catalyst of economic transformation in Nigeria. As earlier established, crude oil is the major source of government revenue in Nigeria. Positive oil price changes will positively influences the Nigerian economy and reduces unemployment while revise will be the case. However, an economy cannot grow and attain sustainability with only one commodity, hence economic diversification should be pursue rigorously as a panacea to sustainable employment generations. The empirical findings of this study will therefore, enable policy makers to better appreciate the effects of oil price volatility on unemployment in Nigeria as a net exporter of crude oil.

4.6. Recommendations

From the findings of this research, the following recommendations are put forward to better enhance the decision-making process of policy-makers in Nigeria as a net exporter of crude oil. This is to ensure that appropriate policies suitable to the dynamics of oil price volatility and unemployment in Nigeria is implemented. These include;

i. Policy makers should implement policies that could stimulate GDP growth and FDI inflows to induce employment generations at a larger scale in Nigeria. This is because the study found that GDP and FDI have a significant long-run effect on unemployment rate in Nigeria.
ii. Nigeria is a mono-cultural economy with oil being the major supplier of foreign exchange. Government should therefore holistically pursue economic diversifications in order to boost foreign exchange earnings and revenue generations.
iii. Government at all levels should implement policies that will improve the investment climate, such as stabilization of interest rate and other indicators that favours the ease of doing business in Nigeria should be urgently improve upon to encourage investment and inflows of more FDI in Nigeria.
iv. The study found out that positive and negative oil price changes have no significant effect on unemployment rate in Nigeria hence the researcher recommend for a further study into the actual causes of unemployment in Nigeria.

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