

Oil Price and Macroeconomic Performance in Nigeria

Olufunke Chioma OGIOGWA  
LCU/PG/001121

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### **Certification Page**

This is to certify that Olufunke Chioma Ogiogwa with matriculation number LCU/PG/001121 carried out this research work titled “Oil price and Macroeconomic Performance in Nigeria” in the Department of Economics and Development Studies, Faculty of Management and Social Sciences, Lead City University Ibadan, Oyo State, Nigeria for the award of Master Degree (M.Sc.) under my supervision and that this has not been previously submitted.

-----  
Dr. Esther Aderinto  
(Supervisor)

-----  
Date

-----  
Dr. Olusola O. Ogunjimi  
(Head of Department)

-----  
Date

### **Dedication**

This research work is dedicated to The Almighty God, the One who gives wisdom, knowledge and understanding, who inspires me daily and has strengthened me to complete this work.

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### **Abstract**

Crude oil is one of the most important sources of energy in the world and it has a vital impact on the development in economy and the growth of these various economies. Crude oil price has witnessed intricate shocks, and this implies that for the performance of most of the macroeconomic variables, it poses many challenges, both monetary and fiscal) for making policies. Oil price fluctuations have macroeconomic outcomes in both oil importing and exporting nations, given that crude oil which is an integral source of income and contributes significantly to the economic wealth of countries. The scope of this study covers the effect of oil price on macroeconomic performance in Nigeria from 1980 to year 2020. This is so because this period witnessed different episodes of oil price changes. Time series data were sourced from the Central Bank of Nigeria (CBN) statistical bulletin and the world development index (WDI). The Neoclassical growth theory, which posits that the economic growth stability hinges on three major factors, which are the availability of Capital, availability of Labour and the availability and State of Technology was used. In analyzing the effect of oil price on macroeconomic performance in Nigeria, an Autoregressive Distributed Lag (ARDL) model framework is employed. The ARDL approach yields consistent estimates of the long-run coefficients that are asymptotically normal, irrespective of whether the underlying regressors are I (1) or I (0), and also works well with small samples.

**Keywords:** Crude Oil, Potential Growth, Exchange Rate, Inflation, Neoclassical growth theory

**Word count:** 250 words

	<b>Pages</b>
<b>Title Page</b>	<b>i</b>
<b>Certification</b>	<b>ii</b>
<b>Dedication</b>	<b>iii</b>
<b>Acknowledgment</b>	<b>iv</b>
<b>Abstract</b>	<b>v</b>
<b>Table of Contents</b>	<b>vi</b>
<b>List of Figures</b>	<b>x</b>
<b>List of Tables</b>	<b>xi</b>
<b>Chapter One: Introduction</b>	
1.1 Background to the Study	1
1.2 Statement of Problem	6
1.3 Research Hypothesis	6
1.4 Significance of the Study	7
1.5 Hypothesis	7
1.6 Significance of the Study	7
1.7 Scope of the Study	9
1.8 Operational Definitions of Terms	9
Endnotes	11
<b>Chapter Two: Review of Related Literature</b>	
2.1 Conceptual Review	13
2.1.1 Oil Price	14
2.1.2 Gross Domestic Product	16
2.1.3 Exchange rate	17
2.1.4 Inflation	19
2.1.5 Interest Rate	19
2.1.6 Relationship between oil price and macroeconomic variables in Nigeria	20
2.1.6.1 Oil Price and GDP	21
2.1.6.2 Oil Price and Exchange Rate	23
2.1.6.3 Oil Price and Inflation	26
2.1.6.4 Oil Price and Interest Rates	27
2.2 Empirical Review	28
2.3 Theoretical Review	41
2.3.1 The Renaissance Growth Theory	41
2.3.2 The Dutch Disease Theory	42
2.3.3 The Mainstream Theory	43
2.3.4 Rent Seeking Theory	43
2.3.5 Theory of Consumption Smoothing	44
2.3.6 Natural Resource Rent Theory	45
2.3.7 New Keynesian Theory	45
2.4 Gaps in Literature	46
2.5 Theoretical Framework	47
End notes	54
<b>Chapter Three: Methodology</b>	
3.1 Model Specification	68
3.1.1. Model I	68
3.1.2. Model II	69
3.1.3. Model III	69
3.2 Data Source and Definition	70
3.3 Pre-Estimation Tests	73
3.3.1 Unit Root Test	73

3.3.2 Co-integration Test	73
3.4. Estimation Technique	73
3.4.1 Auto-Regressive Distributed Lag Method (ARDL)	73
End notes	75
<b>Chapter Four: Results and Interpretation</b>	<b>76</b>
4.1 Preliminary Tests	76
4.1.1 Descriptive Statistics	76
4.2 Correlation Matrix	79
4.3. Unit Root Test	81
4.4. Bound Test for Linear Co-integration	84
4.5. ARDL Estimation Results	87
4.5.1. ARDL results to evaluate the effect of oil price on potential growth.	87
4.5.1.1 Post Estimation Diagnostic Test on Model I	91
4.5.1.1.1. Breusch-Godfrey Serial Correlation Test	91
4.5.1.1.2: Breusch-Pagan Godfrey Heteroskedasticity Test	91
4.5.2. ARDL results to estimate the effect of oil price on output gap	91
4.5.2.1. Breusch-Godfrey Serial Correlation Test	94
4.5.2.2 Breusch-Pagan Godfrey Heteroskedasticity Test	95
4.5.3. ARDL results to estimate the effect of oil price on inflation.	95
4.5.3.1 Post Estimation Diagnostic Test on Model III	98
4.5.3.2. Breusch-Godfrey Serial Correlation Test	98
4.5.3.3 Breusch-Pagan Godfrey Heteroskedasticity Test	98
4.6. Discussion of Findings	98
Endnotes	103
<b>Chapter Five: Conclusion</b>	
5.1 Summary	106
5.2 Conclusion	108
5.3 Recommendations	108
Contribution	110
References	111
Online Sources	124
Appendix	125
Bio Data	137
University Compliance Certification	138

## List of Tables

Table Title Page	
4.1 Descriptive Statistics	76
4.2 Correlation matrix	79
4.3.1 Unit root test result	81
4.3: Bound Test Result for Model I	83
4.4: Bound Test Result for Model II	84
4.5: Bound Test Result for Model III	85
4.6. ARDL Result for Model I	86
4.7: Breusch-Godfrey Serial Correlation Test	88
4.8: Breusch-Pagan Godfrey Heteroskedasticity Test	89
4.9. ARDL Result for Model II	89
4.10. Breusch-Godfrey Serial Correlation Test Model II	91
4.11. Breusch-Pagan Godfrey Heteroskedasticity Test Model II.	91
4.12. Effect of oil price on inflation	92
4.13 Breusch-Godfrey Serial Correlation Test	94
4.14 Breusch-Pagan Godfrey Heteroskedasticity Test.	94

## Chapter One

### Introduction

#### 1.1 Background to the Study

Crude oil is one of the most important sources of energy in the world and it has a vital impact on the development in economy and the growth of these various economies. Crude oil price has witnessed intricate shocks and this implies that for the performance of most of the macroeconomic variables, it poses many challenges, both monetary and fiscal) for making policies. Oil price fluctuations have macroeconomic outcomes in nations that import and export oil and it shows that crude oil which is an integral source of income contributes significantly to the economic wealth of countries.

A transmission channel mechanism has been created to explain how oil prices affect real economic activity. Notably, two channels, supply and demand have dominated the literature, whereas other proposed channels such as economic policy reaction, value and asymmetric response channels have been deemed unclear. The supply side effects are related to the fact that

crude oil is a basic component in production and therefore an increase in oil price increases production and distribution cost, thereby causing firms to reduce output. Oil price fluctuations have demand side consequences on consumption and investment. Changes in oil prices also affect foreign currency exchange markets, causing panics in the stock markets, interest rates appreciating, inflation, and ultimately financial and monetary instability.

In addition, higher oil prices result in the transfer of revenues from importing countries to exporting countries as a result of changing terms of trade. The magnitude of the direct effect of a given price increase depends on how much of the cost of oil the nation's economy depends on, how much oil is imported, and how easily consumers can reduce their consumption and change to other fuels. In countries that import oil, the higher oil prices can lead to inflation in costs for inputs like oil, reduced domestic needs, and reduced investment. Revenues gotten from taxes, decline and there is an increase in budget deficit as a result of government spending being rigid and driving interest rates up. Given the resistance to real wage decreases, an increase in the price of oil usually leads to there being on nominal wage levels a significant rising pressure, which stimulates pressures on wages and implications which are manifested tend to be far reaching as much as possible, in all the channels postulated namely: asymmetric response, supply, demand, valuation and economic policy reaction.<sup>1</sup>

Asymmetries in oil price became prominent in 1986, after the first major plunge in oil price. The different episodes of oil price increase (decrease) have taken its toll on different economies of the world, whether positively or negatively. Nigeria is an interesting case, particularly because she epitomizes a highly developing economy with a huge dependence on oil without a considerable level of diversification. Since its discovery in tradable quantities in 1956, oil has become the mainstay of the Nigerian economy, and has tended to dictate her economic direction as national budgets have always been hinged on the oil price benchmark. The importance of this product ensures that the market for oil is subject to the market forces of supply and demand, which in turn makes the price, fluctuate.

Following its discovery, crude oil has become major source of income and foreign exchange for Nigeria, thereby contributing to over 80% of the federal government's revenue<sup>2</sup>. Nigeria is significantly dependent on the international oil market, which can be volatile and unpredictable. Despite this, Nigeria is the sixth largest oil producer in the world. As a mono-product economy, where the main export commodity is crude oil, a fluctuation in oil price has implications for the Nigerian economy and, in particular, exchange rate movements. The latter is particularly important due to the twin dilemma of being an oil exporting and oil-importing country, a situation that emerged in the last decade.<sup>2</sup> Crude oil as known is one of the most important natural resources in the world and its commodity market in the world is unarguably the largest. Crude oil unlike other commodities can be said to be one of the few inputs of production in which its effects on economic growth can have both asymmetric and symmetric effects.

Between 1991 and 1994, oil price declined and the inflation rate increased from 13% in 1991 to 57% in 1994. The crisis from the Middle East of 2000-2001 also saw inflation in Nigeria rising from 6.9% in 2000 to 18.85% in 2001(CBN Statistical Bulletin, various editions).

Crude oil prices have risen on average from \$25 per barrel in 2002 to \$55 per barrel in 2004, with an increase in petroleum prices having a short-term contractionary effect on global demand and GDP. This dramatic increasing trend in the prices of crude oil in recent years has reached in the middle of the year 2005 a nominal record which is unusually high of US \$147.

The fluctuation in the oil markets witnessed by the fall in oil prices from the second quarter of 2014 was very devastating for the Nigerian economy. Oil price crashed from \$101/barrel in 2014 to \$44/barrel in 2016 and budget deficit also increased significantly from 835.68 billion naira in 2014 to 2208.22 billion naira in 2016. The decreasing price of oil also depreciated the country's current account balance by 69.3% from \$3.14 trillion in 2013 to \$964.6 billion in 2014 and this led the Central Bank of Nigeria to devalue the currency twice within a year. The devaluation of the naira and the rise of the dollar from the shock, led to an unfavorable foreign trade and this increased inflation from 8.1% in 2014 to 15.4% in 2016.<sup>2</sup> Also given the fact that Nigerian is an

import-dependent economy with minimal domestic production, the level of trade balance and exchange rate depreciation result in expensive imports, thus bringing about inflation. Since 2017, different seasonal fluctuations have been observed in crude oil price, varying between \$52.51 in 2017 to \$41.47 in 2020.

The existence of a sound macroeconomic environment is essential to promoting economic growth and development. The macroeconomic environment includes all of the policies that are put in place to affect all aspects of the economy. All aspects of fiscal, monetary, interest and exchange rate, pricing policy and measures to foster the development of private sector activities are important in the economy. The macroeconomic environment is a set of forces that affect the economy as a whole. There is evidence that enacting better policies can spur faster economic growth. There is evidence that successful economies maintain good policies, such as low inflation, prudent fiscal stance, and realistic exchange rates. This is important because it helps to keep prices stable and prevents hyperinflation.<sup>3</sup>

The macroeconomic environment in Nigeria is highly dependent on the oil sector, and on the behavior of the government which owns the oil sector. The government had a strong grip on the oil sector, which kept the price mechanism from working properly, resulting in widespread shortages in different markets. The government's lack of support for the private sector hindered its ability to contribute to development and growth. Within the 1980s to 2019 period, a lot of investment was created in response to the positive trade shocks that occurred earlier. The investment rate was larger than the savings rate, which led to increased foreign savings and a large current account deficit. The foreign borrowing used to finance the investment boom did not create the necessary macroeconomic environment for sustained income growth and economic development. Neither did the fiscal deficit, inflation, extra-budgetary expenditures, nor any other economic indicators improve.<sup>3</sup>

Nigeria economy doubles as a crude oil exporting country and also as an a country that imports refined petroleum products.<sup>4</sup> The volatile oil prices that are caused by outside forces, like the

OPEC which is the Organization of the Petroleum Exporting Countries have big implications for economic variables like GDP and inflation. This makes it difficult for policymakers to make good decisions.<sup>4</sup> The economy can be subject to external factors like oil prices and exchange rates and some in-built dynamics which can comprise of GDP volatility, inflation rates, interest rate and unemployment.<sup>4</sup> Managing these macroeconomic variables (exchange rate, inflation rate, and GDP) is done through monetary, fiscal, and trade policies. Some of these policies can complement each other and can work together, but others are conflicting and can lead to problems.

Oil price increases are generally thought to increase inflation and reduce economic growth. In terms of inflation, oil prices directly affect the prices of goods made with petroleum products. As mentioned above, oil prices indirectly affect costs such as transportation, manufacturing, and heating. The increase in these costs can in turn affect the prices of a variety of goods and services, as producers may pass production costs on to consumers.<sup>5</sup>

Conversely, an increase in oil prices may not translate into the expected economic advantage for the net importers of some refined petroleum products in Nigeria with local oil price subsidies which are regulatory due to difficulties in fiscal measures that limit the ability of government to finance imports and as well meet other obligations internationally. Nigeria has a of 7114.49 billion pounds deficit in 2017 and 8324.76 billion pounds deficit in 2018 on imports that are not oil products and spent about 2618.97 billion pounds in 2017 and 3833.82 billion pounds in 2018 on the importation of petroleum products<sup>6,7</sup>.

Trade and exchange rates are also affected by changes in the price of oil. When the prices of oil increase, the spending in total on the importations of oil increase and this demand is often inelastic. This mounts a lot of pressure on the exchange rates and devalues the local currency where-in as the value of currency which decreases may further reduce the economic performance.<sup>7</sup> For countries that export oil, producing oil normally accounts for a significant portion of the country's gross domestic product [GDP], and rising prices directly increase the

country's currency (total production increases because the value of oil production increases income). Thus, the overall impact of oil price fluctuations on performance of the economy depends primarily on what the producer of oil does with the revenue added. The volatility in oil prices that's been induced externally by the OPEC (Organization of the Petroleum Exporting Countries) and other giant in the international energy market has significant macroeconomic implications for variables, with in policy making challenges.<sup>8</sup>

## **1.2 Statement of the Problem**

The Nigerian economy relies heavily on export of crude oil to generate foreign exchange earnings and government revenues. This is particularly true as oil accounts for 95% of export earnings and 85% of government revenues. Its contribution to GDP in 2015 was 9% and 8 percent in 2016. Nigeria's oil statistics show that the country has an estimated 36.2 billion barrels of oil reserves which places the country as the second largest in terms of oil reserve on the African continent.<sup>9</sup> This estimates that Nigeria's effective oil production capacity is to be around 2.7 million barrels per day. Serious drop in oil production levels, which affected exports and the plummeting of world oil prices in some years, resulted in huge revenue gaps for the country. Equally, the country is exposed to oil price shocks through massive importation of refined petroleum products since the collapse of local refineries in the late 1980s.<sup>10</sup>

Given the fragile nature of the Nigeria macroeconomy and the heavy dependence on crude oil proceeds and since Nigeria's dependence on crude oil exports have significant consequences for the Nigerian economy, as oil prices can vary widely in the international oil market. It is important to study the effect of oil prices on the Nigerian economy. The impact of oil price changes on macroeconomic indicators is a big issue for countries that export oil, and understanding how these changes affect the Nigerian economy is important.<sup>11</sup>

Since the neoclassical economic mainstream considered that energy growth was exogenous, that is, they did not take energy flows into account as an explanation of the production process. They assumed that economic growth is perpetual and in equilibrium, Economic agents were assumed rational and able to process relevant information about the economic system. This led to a great confidence in markets: if there is a shortage of energy, the price will rise and the market will find an optimal solution in the Pareto sense.

### **Research Questions**

The research questions to be addressed by the study are as follows:

- I. What is the effect of oil price on the growth rate of potential output in Nigeria?
- II. To what extent does oil price affect output gap in Nigeria?
- III. How does oil price affect inflation in Nigeria?

### **1.4 Objectives of the Study**

The main objective of the study is to examine the effects of the price of oil on Nigeria's macroeconomic performance. The specific objectives are:

- i. to determine the effect of the price of oil on the growth rate of potential output in Nigeria,
- ii. to analyse the effect of oil price on output gap in Nigeria,
- iii. to examine the effect of oil price on inflation in Nigeria.

### **1.5 Research Hypothesis**

H1 Oil price has no effect on the growth rate of potential output in Nigeria.

H2 Oil price has no effect on output gap in Nigeria.

H3. Oil price has no effect on inflation in Nigeria.

### **1.6 Significance of the Study**

Even though oil accounts for more than 90% of the country's exports, 25% of the GDP and 80% of government total revenues and we can rightfully say that Nigeria is one of the major players in the world in crude oil generation, the amount the country has gotten over the years from

selling oil at the international market rates has not in any way helped improve the National economy. <sup>12</sup> Furthermore, the Nigerian government's annual budget has always been pegged to a specific amount of the international price of crude oil, thus, making both the government fiscal and monetary policy to be susceptible to fluctuation that may arise in crude oil price volatility which engenders the performance of the economy through the exchange rate.<sup>13</sup> and other variables like inflation and interest rate since the oil market has been and will continue to be an ever-changing arena. Nigeria relies more on revenues derived from the export of crude oil, and this has some impact on Nigeria's economy, and given the significant fluctuations of the prices of oil in the international market, it is very adequate to analyze the impact of these fluctuations on the macro economy of Nigeria.<sup>12</sup>

The research on how oil prices affect the economy has been a focus for economists for many years. The attention was mostly drawn to the extremely important way that oil prices act in the world economy and the linkage between oil price movements and the business cycle was observed. The crude oil industry is a major source of revenue for Nigeria, and it plays an important role in the economy as a whole. For instance, <sup>10</sup> According to the data, oil receipts accounted for 82.1 percent, 83 percent, and over 90% of Nigeria's earnings in foreign exchange in 1974, 2008, and 2010 respectively. Similarly, Nigeria's overall export revenue value in 2010 was US\$70.579 million, with petroleum export sales accounting for US\$61,804 million, or 87.6 percent of total export revenue. However, crude oil has one of the most variable prices, with a considerable impact on the macroeconomic behavior of many industrialized and emerging economies, according to empirical evidence.<sup>14</sup>

The volatility of oil prices is a major source of concern for economists in Nigeria because it can have a significant impact on overall economy. Macroeconomic analysis suggests that macroeconomic variables are susceptible to sudden changes in circumstances. Macroeconomic variables, such as gross domestic product, inflation, exchange rates, interest rates, etc., tend to be unstable and weak and subject to shocks. Many studies have been conducted in order to

investigate how crude oil price changes impact macroeconomic variables in Nigeria. There is no consensus on the crude oil price changes and its impact on the macroeconomy according to studies. Some studies suggest that oil price changes have a small impact on the economy, while other studies find that oil price changes have a larger impact.<sup>14</sup>

Most studies on crude oil price and macroeconomic performances particularly for Nigeria have been empirical, lacking solid theoretical basis, in which the results would seemingly depend on the empirical approach crucially. Different conclusions can be drawn in the identification of crude oil price 'shocks', depending on the estimation techniques, or the sample period. This study is a combination of theory and empirics, by in an open-economy adopting the neoclassical growth model as established by the two well known contributors to the neo-classical theory of growth which are the American economist Robert Solow, who won a Noble Prize in Economics and the British Economist, J. E. Meade.

The neoclassical growth theory was developed in the late 1950s and 1960s of the twentieth century as a result of intensive research in the field of growth economics. This neoclassical growth theory lays stress on capital accumulation and its related decision of saving as an important determinant of economic growth. Neoclassical growth model considered two factor production functions with capital and labour as determinants of output. Besides, it added exogenously determined factor, technology, to the production function.

This study differs from other studies conducted for Nigeria by adopting the neoclassical growth theory in order to investigate the importance of oil price on growth trends, GDP, and inflation,<sup>15</sup>.

### **1.7 Scope of the Study**

The scope of this study covers the effect of oil price on macroeconomic performance in Nigeria from 1980 to year 2020. This is so because this period witnessed different episodes of oil price changes.

### **1.8. OPERATIONAL DEFINITION OF TERMS**

#### **Oil Price**

This is the International crude oil price which is the spot price of a barrel which holds 159 litres of benchmark crude oil. This serves as the reference price for buyers and sellers. Oil prices are determined by global supply and demand, rather than any country's domestic production level.

### **Exchange Rate**

An exchange rate is the value of one nation's versus the currency of another nation or economic zone.

### **Inflation**

Inflation refers to an environment of generally rising prices of goods and services within a particular economy.

### **Gross Domestic Product**

Gross domestic product is the monetary value of all finished goods and services made within a country during a specific period.

### **Output Gap**

Is the measure of the economic difference between the actual output or GDP of an economy and its potential output or GDP. Just as GDP can increase or decrease, the output gap can be positive or negative.

### **Potential Output**

This refers to the highest level of GDP that can be sustained over a long period. The potential output shows the level that could be achieved when the economy is most efficient. It can also be termed as a given economy's production capacity.

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## Chapter Two

### Literature Review

The literature on crude oil price and macroeconomic performance is reviewed in this chapter. It covers a broad overview of oil price and macroeconomic performance, as well as theoretical and conceptual review that connects oil price and macroeconomic performance. The empirical studies that were pertinent to this research were examined.

#### 2.1 Conceptual Review

Oil exporting countries which include Nigeria have been having discussions about the fluctuating price of oil because the majority of them rely largely on crude oil export as a source of foreign revenue. Oil price fluctuations are synonymous with movements in oil prices and are defined as periods in which oil prices exhibit large variations for a long period. The different economic series tend to move positively or negatively up and down, but over time they tend to become more or less consistent. The cause of price volatility in the oil market is due to changes in demand or supply. This could be caused by the political turbulence in the Middle East which is rich in crude oil and in Asian countries where there is a growing demand for crude oil.

These alteration effects were more pronounced in countries that import oil. Nigeria has a lot of natural resources, such as oil, coal, and zinc. Nigeria has turned to the importation of refined petroleum products in the past because of the collapse of local refineries, which has caused problems with price fluctuations and exposed the economy to vulnerability to oil price changes.<sup>1</sup>

On the other hand, petroleum revenues include sales of the crude oil, taxes which are levied on companies that extract oil, and oil rentals. However, what matters most is crude in its raw form which is logically the result of oil prices and crude oil production quantities. Petroleum revenues could also be considered the overall amount of crude oil sales revenues in the country. Thus, in an oil-producing economy such as Nigeria, oil revenues are a source of funding for government projects. Therefore, it is anticipated that the product will help to promote the growth of the

economy and the welfare of the citizens. Real per capita gross domestic product (GDP) is used as a measure of economic well-being as a whole.<sup>2, 1, 3</sup>

For oil-exporting countries, the drop in oil prices can cause difficulties due to the impoverishing. A decline in profits or even losses will have an effect on incomes. Nigeria has many natural resources, such as fertile land and a talented population. These assets make the country a valuable place to live and work.<sup>1</sup> After seeing the positive economic growth and improved political system that have resulted from major reforms, and the political chaos caused by the rebellion and regional recovery for liberation, the currency's value has recently decreased, worsening widespread poverty. This has had a negative effect on the quality of life and costs for the vulnerable people who make up the majority of the population. Many countries struggle with how to react to oil price fluctuations, which can cause them to adopt bad policies. These price movements can have negative consequences on economic performance during the period.

### **2.1.1 Oil Price**

Crude oil and petroleum product prices can be affected by weather development and geopolitical events that can disrupt the flow of petroleum and products to the market. Events such as these can cause real disruption or create some uncertainties about demand or supply for the future and this can lead to greater price volatility. The volatility of crude Oil price is intrinsically related to the low or "inelastic" responsiveness of demand and supply to short-term changes in price. The capacity of petroleum produced and the equipments that use petroleum products as the main source of their energy are fixed in the short term relatively. It sometimes takes years for new supplies to develop or to have changes in production, and it is difficult for the end users to switch to other types of fuel or increase efficiency of fuels in the short term as prices increase. In such conditions, large changes in price may be useful because following a shock to the system there would be a need to rebalance physical supply and demand.

A lot of crude oil in the world is found within areas with a history of political upheaval or disruptions in the production of oil due to political events. Several of the major crude oil price

shocks have coincided with disruptions in supply caused by political events, including the embargo in 1973 on the Arab oil, the revolution in Iran, and the late 1970s war between Iran and Iraq and the Gulf War in the 1990s in Persia. Recently however, disruptions in supply (or limitations in the development of potential resources) due to political events have been of great concern and have been observed in Nigeria, Venezuela, Iraq, Iran and Libya.<sup>4</sup> Along these lines, crude oil price shocks might have outcomes macro economically in both oil exporting and importing nations. Since the previous years, oil has been an integral source of income and it is a significant contribution for economic wealth of the country. Notwithstanding and perhaps because of this common key significance, oil price is exceptionally unpredictable; much more than some other commodities.<sup>5</sup>

Investors are always watching for potential supply disruptions that could impact the market, and they are always assessing the potential consequences. They consider the size and duration of a potential disruption, the availability of crude oil stocks, and the ability of other producers to replace any potential supply loss. For example, if the market has a wide range of reserve production capacity to compensate for potential failures, the price impact may be lower than if the reserve production capacity is significantly lower. When there are concerns about potential disruptions, prices may be higher than they would be if only current demand and supply were considered. This is because forward-looking behavior adds a "risk premium" to prices.

The weather also can play an important role in the supply of oil. For example, in 2005 hurricanes stopped the production of oil and natural gas and the refineries. Because of this occurrence, the price of petroleum products rose sharply because there was a decrease in supplies to the market. In some cases the cold weather may strain product markets severely especially when the producers make an attempt to supply consumers with enough products. These products like heating oil, in a short time can lead to an increase in prices. Other events such as refining interruptions or pipeline problems can limit the flow of oil and products, leading to higher prices.

However, the effects of these factors on prices of oil is often a bit short-lived and once the problem is reduced and the flow of petroleum and products returns to normal, prices usually return to earlier levels.

Most politicians and the media are unaware of these complexities; they tend to view the oil world simply and stereotypically; However, this is often attributed to factors such as market forces of supply and demand, intermittent policies or civil unrest within and between oil-rich countries, artificial shortages arising from OPEC policies, countries' ability to discover new reserves, and other related factors. Like any commodity, fundamental factors are prevalent in the oil market. Forces interact to establish balance. However, equilibrium is rarely achieved in this market when prices rise or fall sharply. Supply also has a behavioral analogue, thus, to self-equilibrate; the oil market requires dramatic movements in price.<sup>5</sup> Oil price movements have been the subject of important considerations regarding their perceived role in the dynamics of macroeconomic variables. Shocks affected the global economy in the 1970s. The idea that the exchange rate is the most difficult macroeconomic variable to model empirically is still contested. Many articles suggest that oil prices can have a significant impact on exchange rates.<sup>5</sup>

### **2.1.2 Gross Domestic Product**

Like many other oil exporting countries, the government of Nigeria often uses estimated oil prices as a guideline for the country's annual budget, and this is the basis for planning government spending and other taxes. This indicative price is considered a reserve price. Unfortunately, maintaining this reserve as a buffer for the economy does not require financial discipline and political will. In addition, it is not uncommon for oil prices to fall below this calculated level during an uncharacteristically unusual fiscal year, as they have seen recently in 2015 and 2016.<sup>6</sup> In other words, the funds needed for government spending come from oil revenues, so fiscal and monetary policy depend on oil prices, in these countries, oil price fluctuations will practically be transmitted if preventive measures are not taken to get the adequate exchange rate. The rise or fall in oil prices is not permanent; changes in oil revenues

create instability for the economy, in this situation a so-called resource curse arises. When oil prices rise, the government has more money to spend; this means that, when trading conditions in a country are favorable, oil-dependent government spending can be easily financed by oil revenues. Wealth, but ineffective government spending and fiscal expansion leads to waste. This destructive strategy makes the economy more vulnerable to fluctuations in oil prices over time, especially when capital markets are imperfect. The flip side of the coin is worse because as crude oil prices decline, the public sector is not expected to be able to cut down on their spending immediately and in proportion so it may face a lot of deficits. An oil price decrease which follows fiscal imbalances can be devastating especially if the country is very dependent on revenues gotten from crude oil; which like Nigeria is the case in most countries that export oil. It is disappointing however as such falls are mostly not predictable.<sup>6</sup> Various large debts and projects that are not finished are the main factors that have been inherited from one period of results to the next. After some difficult experiences, being able to decouple the real sectors of the economy from crude oil price volatility is now ascertained as one of the most important government roles against a backdrop in which oil price volatility plays an important role in the oil-exporting countries macroeconomic fluctuations and major low-population, low-income oil economies. Oil is abundant, so studying this role and determining the impact of oil shocks on other macroeconomic indicators that matter is of great importance.

The fall in oil prices in 2014 which resulted in a drastic decrease in crude oil revenue for the Federal Government, this reduced Nigeria's external foreign reserves and caused the weakening of the naira against the dollar. The weakening of the Naira contributed to cost-push inflation resulting in recession.<sup>6</sup>

### **2.1.3 Exchange rate**

It is a critical macroeconomic variable in the international economy for policy formulation and a key price variable in which Governments are very active. The exchange rate is one of the most important pillars of an economy that trades in goods and services at the international level.

As a price measuring the market value of the common basket of international and domestic goods, the level and stability of the real exchange rate are essential elements of the macroeconomic adjustment and performance process.

Moreover, by influencing the distribution of productive resources among goods and services other than trade, the real exchange rate is a major factor in the country domestically, in external competitiveness and balance of payments. It can also be an indicator of the incentives used by economic agents in making decisions in the area of production and consumption options between domestic and foreign goods. Real exchange affects savings and investment decisions, and thus the formation and direction of international capital flows. Differences in real exchange rates directly affect imports and this affects the stability of commodity prices, factors, employment, government finance, income distribution and wealth, and the success of economic policies in general.

The real exchange rate can be defined as the nominal exchange rate that takes into account inflation differences between countries. It is known that the oil prices fell sharply internationally during the 2008 global economic crisis. This led to a decline in crude oil revenues and non favorable movements in the exchange rate for the economies that are major oil exporters, particularly those that are not well diversified.<sup>7</sup> This situation which had some very low levels of foreign reserves was worse for some of the OPEC (Organization of Petroleum Exporting Countries) economies. .

We recall that the drop in crude prices internationally that occurred in late 2014 affected the Dollar to Naira exchange rate to such an extent that the monetary authorities according to media reports, devalued the naira twice between September 2014 and June 2015 after it was no longer possible continuing to defend the local currency using the country's foreign exchange reserves.<sup>7</sup> Furthermore, the change in the exchange rate caused by the disadvantage of oil prices not only increases the risk in exchanging of companies, but in some cases may lead to an increase in costs of living especially when the economy is import dependent. The chain of complex

macroeconomic connections generates situations where cost-push inflation may lead to a lower real income and a lower living standard.<sup>8</sup>

#### **2.1.4 Inflation**

Low and stable inflation is thought to be good for long-term economic development and growth. It may be difficult however to achieve this at once in an environment plagued with uncertainties, coupled with the existing inflationary spiral and rational expectations. Therefore, policy makers, the central bank, have often placed more priority on the target price stability compared to a lot of objectives. Nigeria's economy has been growing rapidly since the Global Financial Crisis, typically ranging between 3.58% and 9.69% around 2008 and 2014.<sup>8</sup> However, the economy in 2015 slowed down, and then in 2016 slipped into a recession, which was due to some external shocks, which include plummeting oil prices, production and a slow global growth, coupled with the US normalization of their monetary policy. For a good part of the time being reviewed, inflation averaged 11.8%. However, there were two periods of lower inflation (2011 and between 2013 and 2015). There was a high level of headline inflation before the Global Financial Crisis in 2008, but it decreased after that event. Inflation got to its peak at 24.32% in 2005, but stayed at 7.8% and 15.6% between 2010 and 2015. The country experienced recession in 2017, resulting in a decrease in the GDP. However, it slowed down to 11.26% in October 2018.<sup>9</sup>

#### **2.1.5 Interest Rate**

Interest rates are the amounts charged for the use of assets to a borrower on top of the principal amount by a lender. Interest rate is the amount of interest due per period. It shows the deposited, or borrowed principal sum and the proportion on the lent amount. The principal sum, the compounding frequency, the length of time over which it is lent, borrowed determines the total interest on an amount lent or borrowed. Interest rates increase tends to bring down inflation and economic growth tends to be slower, though the currency will appreciate which make imports

cheaper and exports less competitive. This will also show the government the rising borrowing costs.

The interest rate is an important factor which affects and also has a major impact on a country's savings and investments. It is defined as the gain on lending or cost of borrowing. People are encouraged to save more with a rise in the interest rate as it leads to increased income. The cost of capital also raises an increase in the interest rate, which results in a reduction in investment within the economy.<sup>10</sup>

Interest rates vary according to

- ❖ How the government directs the Central bank in order to accomplish the economic goals.
- ❖ The collateral amount.
- ❖ The reserve requirements
- ❖ The terms of the investment maturity.
- ❖ The market demand and supply.
- ❖ The available compensating balance.
- ❖ The currency used in giving the principal sum borrowed or lent.<sup>10</sup>

#### **2.1.6. Relationship between oil price and macroeconomic variables in Nigeria**

The oil sector has been strongly associated with countries in Africa that produce oil and their macroeconomic performance, thus implying that the changes in crude oil prices make the continent's economy vulnerable. The downward spiral of global oil prices is a major concern for oil economies such as Nigeria, as rising oil prices or positive stability suggest a shift in wealth from importing to exporting countries. However, the price of crude oil has continued to fluctuate in recent years, which can be attributed to the discovery and exploration of deep-sea reservoirs in Europe and elsewhere outside Africa.<sup>11</sup> As a result, the dependence of European countries on Nigeria's crude oil supply has decreased, affecting crude oil prices. Oil prices have fallen significantly over the past years after getting to a high of \$105 per barrel in 2014 and

dropping low to \$37 per barrel in 2016, which was made possible when international sanctions against Iran were lifted. This has allowed Iranian oil to flood the market, and as a result, the price of oil has plummeted. Many oil-producing countries are still experiencing adverse effects from the fall in oil prices. In Nigeria, for example, output growth declined in December 2015 from 1.1 per cent, down to 1.2 per cent at the first quarter of 2016 and this trend went on until the third quarter.<sup>12</sup>

The Macroeconomic variables (Interest Rate, GDP, Exchange Rate and Inflation) play a vital role in the economic performance of any country and could be affected by oil price fluctuations. For the past three decades, evidence of key macroeconomic variables helping the nation's economic growth and stability are shown. Some of these variables are:

#### **2.1.6.1. Oil Price and GDP**

Crude oil has been a vital source of energy for over a century (since the 1800's), and it has been very important to the world economy. The importance of oil has been recognized by experts and is essential for the functioning of the global economy. Without it, many critical systems would fail, leading to a devastating economic collapse.<sup>13</sup> Crude oil the main source of earnings in foreign exchange and the source of income that dominates for the government Nigerian as its large adoption forms the basis on which the country determines what, budgeting, distribution of revenue and capital allocations are. Thus, oil price movement upwards or downwards has a combined double effect on crude oil and Nigeria's economic growth. The extreme dependence on oil is due to the high and declining growth rate of GDP in Nigeria. According to the Database of the World Development Indicators, the GDP growth rate was from 1980 to 1984. The price of oil was averaged at \$31.73 per barrel. The growth of GDP was negatively recorded during this period is largely related to the collapse of crude oil in the global market. Between 1985 and 1989, the price of oil fell to \$17.29 per barrel, but a positive growth rate of 0.57% was achieved. This

is due to the government adoption of the structural adjustment program (sap) and distribution of quotas.<sup>1</sup>

The real gross domestic product (GDP) is used per head as an overall indicator for economic well-being. Output per head is said to be a very good guide to living standards. This makes it possible to have qualitative factors such as literacy and health, although these are not directly covered. An improvement in the overall economic well-being is shown by an increase in the per capita real GDP. However, wellbeing and improvement is measured by per capita consumption which is another quantitative indicator.<sup>2</sup>

Quite a number of empirical works have shown that the rise in prices of crude oil has had a negative impact on real GDP growth significantly in countries that import oil; the rise in crude oil prices has had a positive impact in Nigeria on the country's output growth. The most thorough studies till date have found that a decline in output during the post-depressive period was mainly due to fluctuations in oil prices rather than monetary policy. Similarly, there is a positive relationship between oil prices and government expenditures, which is significant and has financial implications and linkages.<sup>14</sup>Hence;oil prices have had significant impacts on economic activities through supply and demand and transmission mechanisms. Crude oil from the supply side effects, serves as the basic production input, and a sudden rise in crude oil prices may result to a rise in production costs of firms, resulting to lower output. Therefore, crude oil price change affects consumption and investment from the demand side effects. Hence, through its positive relation with the amount of money that households have on hand for spending, consumption is affected indirectly and there have been accounts for saving after income taxes (i.e. disposable income). For example, a decline in oil prices took a significant toll on the Gross Domestic Product of the economy which slowed marginally to 6.36% from 6.49%.<sup>2</sup>

### 2.1.6.2. Oil Price and Exchange Rate

Crude oil is a major source of foreign exchange earnings and the main source of income for the Nigerian economy as it forms the basis on which government budgets, income distribution and capital allocations are determined. Oil price volatility is the movement of oil prices upward and downward around the world. Therefore, this statement means that these oil prices are exogenous, as they are driven by external influences that somehow constrain the Naira, and Nigeria cannot mitigate the causes of this oil price drops on the Nigerian economy. At the height of Nigeria's oil exports, the country has been allowed to increase its trade in goods and current account in recent years.<sup>2</sup> The interaction between the price of oil and the exchange rate in Nigeria has a huge impact on the Nigerian economy. As the backbone of the Nigerian economy in which the foreign exchange earnings and domestic exports is dominated by the oil sub- sector. One of the reasons for establishing a central bank is to protect the international value of legal money by maintaining foreign reserves. However, due to frequent changes in macroeconomic variables, such as the exchange rate values of the currencies of petroleum exporting economies, and sometimes due to swings in crude oil prices, this goal has recently been more difficult to attain.

Due to the suspected influence of crude oil prices, the floating exchange rate regime was sanctioned in 1973, and SAP was adopted in 1986.<sup>2</sup> Naira was allowed to flow and its value against the dollar was determined by the foreign exchange demand and supply forces, although government intervention was minimal. Interbank Foreign Exchange Market (IFEM), Second Tier Foreign Exchange Market (SFEM), Dutch Auction System (DAS), and Independent Foreign Exchange Market (IFEM) are among the procedures used to keep the Naira's exchange rate constant. It's worth noting that each policy's failure resulted in the adoption of a new one.

Over the past three decades, despite efforts by financial authorities to achieve stable exchange rates and avoid fluctuations in the value of the Naira, these crude oil prices have continued to fall due to fluctuations. The combined movement is reflected in crude

oil prices and exchange rates over the years. As crude oil prices changed, Naira depreciated against the dollar, remained stable from 1994 to 1998, and continued to decline until 2015.<sup>2</sup> The steep drop in crude oil prices from 105.87 dollars per barrel in 2013 to 96.29 dollars per barrel in 2014, for example, further depreciated the Naira exchange rate from N157.311 to N158.553 per dollar. This prompted the monetary authorities to devalue the Naira twice between September 2014 and June 2015, as the defense of the currency became unsustainable.

The exchange rate is one of the important channels for the international crude oil price shock to pass to the real economy and financial markets. The impact of international crude oil price fluctuation on the exchange rate of oil-importing countries has attracted more and more attention. The US dollar is the main invoice and settlement currency of the international oil market and these sales, denominated in U.S. dollars; account for more than 90 percent of Nigeria's foreign exchange.<sup>2</sup>

The change of the US dollar exchange rate will inevitably affect the international crude oil price. The transmission mechanisms through which oil prices influence the exchange rate include both supply and demand channels. On the supply side, oil prices are associated with the basic input in production and consequently, an increase in oil price leads to a rise in the cost of production, resulting in a reduction of the consumption capacity. As an oil dependent economy, Nigeria continues to be exposed to fluctuations in world crude oil prices. During periods of high oil prices driven by macroeconomic and political conditions in the international market, a country typically enjoys a favorable trade balance, an increase in foreign exchange reserves, and an appreciation of the exchange rate.

On the contrary, when crude oil prices are low due to developments in international markets, the consequences are exchange rate depreciation, a significant decline in foreign exchange inflows and depletion of reserves, often resulting in budget deficits and slower growth. The sharp drop in world oil prices in 2008 and 2015 from over \$100 to under \$40 is a big case, leading to exchange rate depreciation and a country's trade deficit. Similarly, the depreciation of the exchange rate

from US\$231 in the third quarter of 2016 to US\$1,305 was due to the fall in global oil prices.<sup>15</sup>

The increase of real exchange rates of the of countries that export oil following a positive oil shock is typical of what is called the Dutch disease in literature. The Dutch disease was first studied by Corden and Neary (1982).<sup>16</sup>

In most countries that export oil, the real exchange rates and oil prices tend to move in tandem around the world, including African oil producers. These countries' real exchange rates as a result of the higher prices often are overvalued and when the real exchange rate of their country is overvalued, the exports of other sectors like agriculture and manufacturing become much more expensive globally, which has repercussions for the growth. As a result, in most Sub-Saharan African oil exporting countries, the fundamental economic concern is the very unstable macroeconomic environment, which is frequently caused by variations in exchange values and oil prices and (Coleman et al, .2011).<sup>17</sup>

In the short term, an increase or fall in petroleum prices has a negative or expansionary effect on global demand and growth. As a result, as oil prices rise, the Naira appreciates versus other major currencies in Sub-Saharan Africa and around the world. This is because Nigeria is a net oil exporter, which means that when oil price are high, Nigeria's oil exports generate more revenue, strengthening the domestic currency (e.g. the Naira) in the foreign exchange market.<sup>1</sup>

The theory predicts that the oil exporters real exchange rates will tend to rise when prices of crude oil go up and fall when oil prices go down.<sup>1</sup>

Theoretically, an oil exporter may experience an appreciation or depreciation of its currency when oil prices rise or fall. Therefore, as mentioned above, oil price volatility could have an impact on rate of exchanges and other macroeconomic variables such as inflation, gross domestic product and money supply, while exchange rate volatility may have an impact on trade, balance of payments and economic growth.

### **2.1.6.3. Oil Price and Inflation**

Inflation is a continuous rise in general prices in an economy. It is of primary concern to all stakeholders. The shock of oil prices affects domestic inflation through direct and indirect channels: it affects domestic inflation directly through higher prices of the oil refined and which have visible impacts on the consumer price index (CPI), and through indirect changes in the prices of goods and services, which use oil or petroleum products as inputs into the production process.<sup>18</sup>The direct impact would depend, among others, on the expenditure share of households on refined oil products over total expenditure.

It has been established that the indirect impacts tend to exhibit lower pass-through to inflation than the direct impacts which exhibit higher. Meanwhile, inflationary pressures that emanate from rising oil prices through the first round effects channels may trigger behavioral responses from workers and firms, which may lead to inflation expectations being revised, increase in nominal wages, marginal increase in cost of production being transferred to the consumers and thus through the second round effects may bring further changes in the price level.

In order to corroborate this, higher oil prices may cause inflation in four ways: production costs going up, people expecting inflation, workers needing to be paid more to cover the increase in energy prices, and a shock to the economy if wages don't adjust quickly enough<sup>19</sup>. The effect of higher oil prices on the economy can be deflationary because they reduce disposable income, which in turn reduces consumption and investment. The importance of inflation is based on the fact that inflation can cause major distortions in domestic economic conditions, which can lead to economic decline. Inflation has a negative effect on the overall growth, financial sector development, and the vulnerable poor segment of the population. It also creates uncertainty, discourages savings, promotes consumption, and poses a serious threat to macroeconomic stability. This leads to high levels of debt and inflation.

Increasing geopolitical tensions, speculator activity, and a drop in the value of the US dollar, among other factors, drove up oil prices to an average of US\$75.4 a barrel between 2006 and

2010<sup>18</sup>. While it peaked at US\$90.69 per barrel in January 2008, in the second half of 2008 price fell sharply as a result of the global financial crisis and the resulting worldwide uncertainty.<sup>18</sup> As a result, during the years 2006-2010, the exchange rate remained largely stable, with an increment in oil prices leading to increased foreign exchange inflow and a higher external reserves position. Thus, a fall to 10.3% of the average inflation during this period occurred due to relative exchange rate stability, petroleum products price and supply, as well as a good and robust agricultural crops.

Within the 2011-2014 periods, the main rate of inflation fell to 9.9%. However, the commodity shocks that occurred globally from 2014- 2015 led to a significant drop in prices of oil, with average of 52 of US \$37 per barrel recorded by Brent in 2015. The price per barrel in 2016 pushed the increase in world supplies beyond US\$44.05. However, prices rose per barrel in 2018 to \$71.07, thus continuing due to the increased demand recovery in 2017.<sup>18</sup> The commodity shocks led to a significant decline in inflows of foreign exchange and external reserves to be accumulated in Nigeria, which led to the domestic currency depreciation thus making inflationary pressures heightened. The headline inflation rate increased steadily from 2015 to 2018, reaching 13.3 percent. Nigeria's inflation has been largely influenced by changes in the price of crude oil over the years. In previous analysis, the negative oil shock was followed by a decrease in inflation and reserves in foreign currencies, which later led to the instability of exchange rates and an increase in inflation pressure, while the increase in oil prices led to exchange rate stability and inflationary relief. This essentially indicates that positive and negative oil price shocks have a significant impact on inflation in Nigeria.<sup>18</sup>

#### **2.1.6.4 Oil Price and Interest Rates**

Oil price can have a great effect on inflation because if prices of energy rise, the price of fuel tends to increase, thus prices of goods and services rise as a result. Inflation more or less means higher rates. While there may not be a direct correlation, increases in oil prices can at times

affect interest rates. Thus, we can deduce that if oil prices continue to put pressure on inflationary trends, the interest rates will rise. On the other hand, if the prices of oil drop it can cause a downward pressure on the inflation trends and this may be harmful to oil producing countries with low economic capacity.<sup>20</sup>

## **2.2 Empirical Review**

There appears to be enormous work analyzing the direction between oil price shocks and the macroeconomy. As earlier mentioned, the consequences from these range of research are combined (while some advocate a negative relationship, others propose a positive association).

Under this area of study, we provide evaluation of the findings of the main research along with the current dimension into the relationship between oil price shocks and the macroeconomy.

In a study that investigated macroeconomic patterns, it showed that it had an impact on oil rate level and fluctuation in Nigeria from the period of 1970-2009 in order to capture the actual effect.<sup>21</sup>The researchers' findings showed that it's no longer the price of oil itself that affects the real change in price and interest rate in which alternatively its manifestation in real change and interest rate impacts the fluctuation in monetary activity and by proxy the GDP. The researchers concluded that oil shocks are an important determinant of the actual exchange rate and in the long-run interest rate, while it's the exchange rate rather than oil price shocks that affect output growth in Nigeria.

A researcher found that crude oil is a speculative commodity in the financial market contrary to the real commodity because of the financialisation of the oil market. This has been among the major sources of oil price volatility, thus an expected increase in supply initially reduces oil prices, slowing global economic activity. In the long run, however, increases in supply boost global economic activity. Similarly, an upward revision to expected demand for oil raises oil prices. In another view, Nigeria from experience has revealed that pump price adjustment of PMS has been on the increase (in an upward trend) since 1970. In 1990 however, the price of crude oil was 70k per barrel, compared to 20k in 1982. Between 1992 and 2013, it increased to

N97. The variation is further evidenced by the reduction in oil prices from \$114 to below \$50 in 2015, and then to \$35 in 2016. To support this allegation, the researchers stated that the rationalization for adjusting PMS products upwards for decades has been to reduce consumption of fuel subsidies through the free market system.<sup>23</sup>

While according to another research, innovations found in technology that have reduced liquid fuel consumption and affected the world's energy markets have led many oil-dependent countries to an economic crisis due to a decrease in oil demand in 2016.<sup>24</sup>

According to a researcher who from 1981 to 2013 using Structural Vector Auto Regression (SVAR) analyzed the fluctuation of crude oil price in the Nigeria economy, the research findings showed that exchange rate appreciated in the short run and tends to depreciate starting from seventh horizon as a result of crude oil price shock<sup>25</sup>

Another study adopted Structural Vector Auto Regression (SVAR) to examine the monetary transmission channel of oil price shock in Nigeria. The outcomes of the study revealed that crude oil price shocks result in long-term exchange rate appreciation. The impact of the shock on the consumer price index was negative and minor. This means that a price increase in crude oil is not inflationary.<sup>26</sup>

While adopting Threshold autoregressive (TAR) and MTAR to examine the exchange rate in Nigeria and crude oil price asymmetry, a study employed data ranging from 1986 to 2018. Findings showed that co integration was absent asymmetrically between the official oil price exchange rate. The author also examined further the effect of shocks on prices of crude oil on external reserves and exchange rates. Results from SVAR showed that after the fourth month the official exchange rate appreciates. When a similar check was run for the real effective exchange rate, it had a mild depreciation, followed by stronger appreciation beginning from the second horizon. The researchers acknowledged the structural break in 1998-1999 and then used nonparametric regression and Structural Vector Auto Regression (SVAR) to access how oil price and macroeconomic indicators differed for pre- and post-currency crisis of 1997.<sup>27</sup>

Here, the authors hypothesize that a rise in prices of crude oil will lead to increased business turnover and improved investment outcomes for oil industry firms. This correlation is likely due to the fact that high oil prices increase the profitability of oil production projects.<sup>28</sup>

A study analyzed the response of monetary policy variables of selected emerging economies to shocks in the crude oil market using traditional and Furier Toda Yamamoto. According to the findings, oil prices are sensitive to structural changes, and the causal link approach and the gradual movement of oil prices points to sharp fluctuations in oil prices which can affect the currencies of Indonesia and South Africa, also the interest rates in Brazil and India, and inflation in Turkey and South Africa .<sup>29</sup>

A group of researchers concluded from their study that oil price impacts on macroeconomic performance in Nigeria irrespective of the approach and going by the degree of impact, exchange rate can be considered is a conduit through which oil price influences other macroeconomic variables in the country.<sup>30</sup>

In a study, oil prices change (in contrast to the results of some previous studies) did not have a significant impact, but the oil prices themselves have an impact. Price rise has a positive economic impact through the contribution to export income (and government income), but oil prices rise trigger or worsen the economic uncertainty through the impact on financial instability and the vulnerability of budget execution. As this study revealed, this is not statistically significant, but has a negative impact on the economy.<sup>31</sup>

A work assessed the impact of oil revenue and exchange rate fluctuation of economic growth in Nigeria (1981-2015) the researchers study found that exchange rate and oil revenue play a complementary role in Nigeria economic growth and that oil revenue is constrained by the exchange rate. The study however recommended diversification of export-based revenue as a means of minimizing the over reliance of government revenue on crude oil and petroleum products, which will in turn encourage emerging entrepreneurs to develop new areas of production promoting employment, economic growth and development.<sup>32</sup>

Oil price fluctuations or variations are considered to be long-term and persistent fluctuations in oil prices, followed by a period of relative calm on the international market. This volatility is often caused by supply side and demand side of the international crude oil market, owing to political instability in the oil-Rich region of the Middle East and the increasing demand for oil in Asian countries.<sup>33</sup>

Some scholars used Generalized Autoregressive Conditional Heteroscedasticity (GARCH) and Exponential, Generalized, Autoregressive, Conditional Heteroscedasticity (EGARCH) models and showed that oil price increases lead to a depreciation of the exchange rate, while few among these studies like this scholars examined the implication of oil shock on the economy of the the United Kingdom.<sup>34</sup> Another group of scholars reported that macroeconomic performance is affected by the effect of oil fluctuations, most especially the GDP growth, unemployment rate, inflation and interest rate.<sup>35</sup>

An empirical analysis shows that the oil price strongly determines the exchange rates, credit costs and directly influences inflationary or deflationary trends in Nigeria. Oil price fluctuations were considered to disrupt the smooth flow of commodities in different markets.<sup>36</sup>

Some authors investigated the effect of oil price elasticity and oil price fluctuations on the economy using Structural Vector Auto Regression (SVAR). Their findings showed that supply and demand shocks were explained in the variation in oil prices and oil quantities.<sup>37</sup>

In another study, the researchers employed Johansen co integration test and the Granger Causality test using Nigerian time series data for the period between 1980 and 2010. The work showed in its findings from the implementation of Generalized Autoregressive Conditional Heteroscedasticity (GARCH) tests suggests persistence of the volatility between the real oil prices and the real effective exchange rate. The researcher opined that in the continued demand for crude oil by the developed nations, the oil-producing countries will benefit more, especially the Sub-Saharan African countries. Currently, oil demand growth in countries that are still

developing is highest. This is likely due to the increasing number of vehicles and other appliances being made with oil, as well as the growth in developing economies overall.<sup>36</sup>

In a study for a group of eleven European nations using the wavelet-based Markov switching methodology to assess the effect of oil price variations on inflation, they discovered that a 100% rise in oil prices resulted in a 1% to 6% increase in inflation units. However, they discovered that the influence of oil price changes on inflation was stronger over a longer time period, implying that short-term oil price increases had little impact on inflation; at least in the countries studied.<sup>38</sup>

Another group of researchers looked into if the time gap influences the impact of changes in oil prices on US GDP growth. With recent data up to 2016 Quarter 4, the analysis verified the empirical findings from prominent studies and discovered that there is a dissipating effect on proposed oil price measures.<sup>39</sup>

A study re-examined the problem and found evidence that lower oil prices have an impact on GDP growth when using a mixed data sample technique.<sup>39</sup> The researchers studied the relationship between oil prices, exchange rates and emerging markets stock prices via Structural Vector Auto Regression (SVAR) models over the 1988 to 2008 period. The authors studied the relationship between oil prices and exchange rates and offered limited support for the existence of such relationship between these variables. In addition the work findings showed that while responding negatively to a positive oil price shock, oil prices respond positively to a positive emerging market shock. The study's findings suggest that there is enough data to establish that oil price changes have a major impact on economic growth in the short run.<sup>40</sup>

An investigation was conducted which posited that the local main oil and gas corporations are having a difficult time as a result of the current drop in oil prices, in which the prices are lower than local production in Nigeria. Local oil companies while struggling to stay afloat as crude prices remain stable at \$20, this implies that Nigerian petroleum is being sold at a loss, despite the fact that demand for oil has fallen to its lowest level in more than a generation.<sup>41</sup>

A theoretical investigation carried out on macroeconomic impact of oil price volatility embarked on by some scholars showed an implication of the oil shock on the economy of the United Kingdom. The scholars said that macroeconomic performance is affected by the effects of oil fluctuations, especially the GDP, interest rate, unemployment rate and inflation.<sup>42</sup>

The relationship between economic development and oil price volatility in Nigeria was examined using Multiple Regression Techniques and Johansson Integration Test. The study shows that on general well being with oil price fluctuations there is no significant impact while with oil revenue there is a significant impact.<sup>43</sup>

On the contrary however, a study looked at the impact of oil price shock (OPS), exchange rate volatility (EXRV), and non-oil export (NOX) on Nigerian economic growth and using quarterly time-series data from 1981Q1 to 2018Q4, The effect was identified using structural vector autoregressive technique, with the Zivot -Andrews unit root test and Johansen co integration being used first to demonstrate stationary properties and long-run correlations of the variables. The study discovered that oil price shock (OPS), exchange rate volatility (EXRV), and non-oil export (NOX) have a considerable detrimental impact on Nigeria's economic growth. The research proposed that oil refineries be revived, the economy be diversified, and a determined program to promote NOX be implemented.<sup>44</sup>

It was opined that the most developed countries, such as Canada, Japan and others, and the continued demand for oil will deepen the fate of oil-producing countries further, particularly in sub-Saharan Africa. Currently, developing countries have the highest growth rate of oil demand. By implication the study shows that growth of the Nigerian economy is determined by the changes in oil price which in turn determines the expenditure of government.<sup>36</sup>

In another empirical analysis, the analysis of trends appears to cast some doubts on if crude oil volatility has made any contribution significantly to the Nigerian economy, and the researchers showed that oil price shocks is asymmetric in nature on output and prices while the impact of oil price decrease is significantly greater than oil price increase.<sup>45</sup> However, Pearson's function

coefficient attests to a large extent that there is a strong linear relationship between regressors and regressands. In particular, the individual results re-illustrated that only fluctuations in the price of a barrel in the short term have significantly improved the Nigerian economy. However, long-term fluctuations in the price of oil per barrel and fluctuations in the price of kerosene pumps both lead to a significant improvement in the Nigerian economy in the long run.<sup>45</sup>

Some researchers provided an analytical insight on modeling macroeconomics and oil price volatility in Nigeria. Quarterly data was employed within the Generalized Auto Regressive Conditional Heteroskedasticity (GARCH) model and it was concluded that oil price is a major source of shocks to macroeconomic variables in Nigeria. The results show that the like RGDP, interest rate, exchange rate, oil prices which are the macroeconomic variables considered are volatile.<sup>46</sup>In another development, reportedly, 80% of Nigeria's revenues gotten from energy go to the national government, where 16% covers the operational costs and investors get the remaining 4% as returns on their investment.<sup>47</sup>

An examination by a researcher on what impact the crude oil price volatility has on economic growth in Nigeria within the years 1980 and 2014 using the ordinary least square (OLS) technique, shows that there is a positive and significant relationship between oil price and economic growth of Nigeria.<sup>48</sup>

A study examined the effects fluctuations have of oil price on economic growth in Libya using 2000 to 2015 annual data. While observing the sharp movements in the prices of oil as a very important source of economic fluctuation in the world economy, the researcher employed VAR model and johansen cointegration technique to examine the effects of fluctuation on output. The work showed that between oil prices and economic growth there is no long run relationship. The researcher further reports however that oil price has a positive and statistical significant impact on economic growth in Libya.<sup>49</sup>

In another study, results from the Nonlinear Autoregressive Distributed Lag (NARDL) analysis show that over the long term, oil price volatility is related to economic growth in an

asymmetrical way. The regression analysis shows that the oil prices switch between being positively or negatively associated with economic growth at around \$48.263 per barrel. Whenever oil prices fall below a certain threshold, it has a negative effect on the country's economic growth.<sup>50</sup>

The ground-breaking work of a researcher which has been the foundation for considerable enquiry on the oil price- macroeconomics variables focused on the U.S. economy, with a primary intent to investigate the effect of oil price shock on the U.S. economic cyclical fluctuations. He found a negative connection between economic growth and oil price. His findings affirm that oil price increase was the cause of the U.S. recession as almost all U.S. recession since the Second World War had been preceded by oil price shocks.<sup>51</sup>

In a research for crude oil importing countries, it was discovered that oil price which increases negatively impacts economic activity in all cases, except Japan<sup>52</sup>. It was established that increases in oil prices have a positive and significant impact on industrial production and that declines in oil prices have a significant negative impact on the industrial production of Iran.<sup>53</sup> Another study showed an immediate and significant negative real stock returns to oil price shock.<sup>54</sup> While investigating the potential consequences of a crude oil price shock in Nigeria, using regression analysis, it was established that a small increase in the price of oil worldwide has a long-term impact on economic growth in Nigeria.

A researcher opined that the cause of oil price instability in Nigeria is attributed to widespread smuggling and diversions of product from their approved destination.<sup>55</sup> The study concludes that predominant position of oil product on the Nigerian economy, anything that is as such as instability in the price of oil product will affect the economy as whole in his study observed that there is need to reduce dependence of oil exporting countries on oil price fluctuation. The only alternative they should adopt is economic diversification should be their policy tool to make the economy as self-reliant.<sup>56</sup>

A study found that there is a positive relationship between a country's external reserves and the price of crude oil, while previous empirical findings from other countries have confirmed that oil price shocks have a significant impact on economic activity, including GDP, inflation rate, exchange rate, and money supply.<sup>57</sup>

While analyzing oil price shocks and Nigeria's economic activity, the evidence was employed from ARDL co-integration and VECM analysis. The result showed that oil price decreases affect most of the macro-economic indicators than increase specifically; oil price decreases affect trade balance, inflation, government revenue and exchange rate. The study suggests a relaxation of monetary policy during an oil price shocks fluctuation Era as a government has already through the central bank adopt an inflation targeting policy in other to protect the economy from possible outcome of a full-blown stagflation amongst others.<sup>58</sup>

A research examined the asymmetric impact of the oil price shocks on economic activity in Jordan due to the growth of industrial production. Data on the Jordanian IP volume index, which measures the real output of manufacturing, mining and quarrying, are taken from the Jordan Central Bank statistical database. This result suggest that positive crude oil price shocks have a negative impact on growth, while the fall in oil prices does not affect growth, which explains that a fall in oil prices in oil importing countries is not necessarily an incentive for industrial growth.<sup>59</sup>

The recently developed Panel Structural Vector Auto-regressive (P-SVAR) estimating technique was used to analyze the transmission processes of oil price shocks and how they affect economic performance within the monetary framework of Africa's net oil exporting states over the period 1980-2015. Inflation, bank rate, exchange rate, money supply, gross domestic product, unemployment, and oil price shocks were handled as exogenous factors in the experiments, whereas other variables were treated as endogenous variables. The study's findings revealed that oil price shocks are transmitted through the monetary medium.<sup>60</sup>

A study looked at how crude oil price shocks affect exchange rates, inflation and economic growth. The data used in this study was sourced from the Kenyan National Bureau of Statistics (KNBS) and World Bank sources. Several of these tests were conducted on the variables used, including normality tests, Augmented Dickey Fuller, Philip Perron, and co-integration tests were carried out. The analysis of the data showed that the crude oil prices have a short-term impact on inflation, economic growth and the rates of currency exchange in Kenya. Higher oil prices cause production costs to go up across the economy, which reduces productivity and increases the overall price level. This leads to high levels of inflation. The results show that when oil prices are raised, the economy suffers more in terms of overall performance. The positive effect of lower oil prices was evident.<sup>61</sup>

In analyzing whether the economies of the net-oil exporters are more sensitive to crude oil price shocks than other countries that export, a study examined 19 of such oil exporting countries, of which all of them are part of OPEC (Organization of Petroleum Exporting Countries). The data was taken from real gross domestic products and annualized world oil prices were deflated by the all urban consumer price index. The study used the Augmented Dickey-Fuller test, the Pasaran and Shin test, along with the bivariate vector autoregressive models. The study found that a 1% increase in oil prices will increase by 0.145% the GDP growth rates for countries under OPEC and for non-OPEC countries by 0.141%.<sup>62</sup>

A research was conducted on how the growth of output is affected by crude oil price shocks in selected Middle Eastern and North African countries who are either net oil exporters or net importers of oil, but are too small to have a significant impact on oil prices. The study selected 16 countries from the Middle East and North Africa whose real GDP figures were used for the econometric analysis from 1952 to 2005. The study's estimates suggest that increases in crude oil prices have a statistically significant and positive effect on the economic output of countries like Algeria, Iran, Iraq, Libya, Oman, Qatar, Kuwait, Syria, and the United Arab Emirates. However,

there is no evidence that there is a significant effect the crude oil price shocks have on the outputs of Bahrain, Djibouti, Jordan, Egypt, Israel, Morocco, and Tunisia<sup>63</sup>.

As oil supply shocks continue to have a negative impact on the economies of some of the later-developing countries, it is evident that oil demand shocks have a smaller but still observable effect on economic growth<sup>64</sup>. Some researchers studied how crude oil price shocks have affected the macroeconomic variables in the Ghanaian economy. This was achieved through the use of VAR (Vector Auto Regressive) and VECM (Vector Error Correction) models. The study found that oil price shocks have different effects on different macroeconomic variables. For instance, positive oil price shocks have a positive effect on economic growth, while negative oil price shocks have a negative effect. The Positive crude oil price shocks account for about 5% of imports, where 6% of industry value was added, 17% of inflation, and 2% of the real effective exchange rate over the long term. The crude oil price shocks which accounts for 8% of inflation, and 2% of the real effective exchange rate over the long term. <sup>65</sup>

The effect of crude oil price change on two primary key fiscal policy variables namely the government expenditure (GEXP), government revenue (GREV) money supply (MS2), and GDP are investigated using structural vector auto regression (SVAR) methodology. The findings revealed that oil prices had a substantial impact on Nigeria's budgetary strategy from 1980 to 2009. The study also discovered that an increase in oil prices first affects GREV and GDP before affecting the fiscal expenditure. The analysis strongly argues that economic diversification is required to reduce the impact of oil price variations on government revenue.

The researcher investigated Iran as a developing oil export based economy and the dynamic relationship between government expenditure and government revenues, and also to examine the government expenditure and revenue response to crude oil price (revenue) shocks. To reach the purpose of this study some helpful econometrics techniques such as vector auto-regression model (VAR), vector error correction model (VECM) and structural vector auto-regression

model (SVAR) have been used along with variance decomposition and impulse response functions as these are some of the very useful tools on these techniques. It was however revealed according to the data that the impact on government current spending is greater than on the capital expenditure because of the oil price shocks and the oil revenues.

Furthermore, almost 77 percent of fluctuations in the first quarter of government revenue were attributed to oil price shocks, indicating that government revenue was overly reliant on oil revenues.<sup>66</sup>

The effects of oil shocks (price and revenue) on the dynamic relationship between government revenues and government expenditures in Nigeria, as well as how it transmits effects on major macroeconomic variables, were investigated using structural VAR (SVAR) on key variables, as well as unrestricted VAR and Vector Error Correction (VEC) Models on a larger number of variables, using data from 1981 to 2014. The results of SVAR reveal that oil price shocks can't anticipate changes in government spending in the short run, but oil revenue shocks can, both in the short and long term. The Vector Auto Regressive (VAR) and Vector Error Correction Model (VECM) also support the findings of the SVAR and provide additional evidence that the short-run fiscal synchronization theory is supported between the two countries between the total government expenditures and oil revenues while between total expenditures and total revenues spend-tax hypothesis exists in the long-run.<sup>67</sup>

On the other hand, using a co-integration and an error correction mechanism on the empirical link between the external shocks and government revenues in Nigeria (ECM) were explored. The study's findings support the existence of a long-term relationship between government revenue and the explanatory variables (such as oil revenue, government expenditure, , terms of trade shock, tax revenue and exchange rate).<sup>68</sup>

External shocks have a significant negative impact on government revenue in Nigeria, as evidenced by their significance and negative sign. The significance of the oil revenue coefficient also indicates that oil money remains the primary source of government funding in Nigeria.

Focusing on the inflationary effects of oil price shocks, the impact of oil price variations on US inflation was examined, taking into consideration asymmetries, non-linearities, and structural break effects. According to the findings of the structural break study, changes in the crude oil price had a considerable impact on core inflation before 1980, but this influence reduced after that.<sup>69</sup>

Economic variables, according to a report, are to blame for oil price fluctuations and shocks. According to the study, these factors include oil production and consumption levels in the United States, including crude oil and product stock stockpiles, as well as Asia's unprecedented rate of industrialisation.<sup>70</sup> Also, storage costs and availability of insurance costs, interest rates, inflation rates, cost of transportation, currency rates, and market factors are no doubt responsible for oil price shocks.<sup>70</sup>

The effect of crude oil production shocks on a net oil exporting countries in which Nigeria belongs was examined. The impact responses show that positive oil production shocks were followed by a rise in output, reduction in inflation and domestic currency depreciation. With the same methodology and set of variables (except the fact that crude oil price replaces its level of production), following an oil price shock, negligible responses of output, inflation and the real exchange rate were found.<sup>71</sup>

However, it was discovered that oil price shocks could only explain a small amount of variability in the price level (i.e. inflation rates) implying that oil price shocks have little impact on inflation rates in Nigeria. Persistent crude oil price shocks might have serious macroeconomic consequences, including policy issues for fiscal and monetary policies.<sup>72</sup>

In this study using the 1970–2010 annual time series data for the period, it was discovered that there exists a long run relationship between oil prices, Treasury bill rate, inflation rate, real exchange rate, and interest rate in Nigeria, in which oil price impacts on inflation while using the SVAR, IRFs, and Forecast Error Variance Decompositions to examine the effects of crude oil

price changes on economic activity in Nigeria (FEVDs). The findings imply that inflation is caused by domestic policies rather than the oil boom.<sup>73</sup>

## **2.3 Theoretical Review**

There is a lack of consensus on theories that explains the relationship between oil price shocks and macroeconomic variables. However, different theories have been established to explain the relationship between specific variables without any established theory explaining the linkages between all the variables.

### **2.3.1 The Renaissance Growth Theory**

This is considered an extension or fall-out of the symmetric relationship theory of economic growth. The Renaissance growth theory attempts to examine the effect where relative of oil price changes or oil price volatility on the level of economic activity of a particular country during a given time frame. Along this line, it was concluded that change in crude oil price and oil price volatility both negatively affect economic growth, but the effect of changes in oil prices wears out immediately after a year.<sup>74</sup> Therefore it confirmed that the appreciable effect on economic growth may in the long run be attributed to the volatility in oil prices rather than the changes in the oil price level. The Renaissance changed the world. You might even say it created all of what we now know as modern life.<sup>74</sup>

The Renaissance growth model is a variation on the symmetric and asymmetry in effect schools of thought. Fluctuation is a measure of how much a given set of data varies from the average. She argued that both negative impacts on economic growth occur, but in different ways.<sup>74</sup> Fluctuation has a negative and significant impact on economic growth immediately, while the impact of oil price changes delays until after a year. It states that it is change in crude oil prices rather than oil price level that has a significant influence on economic growth.

### 2.3.2 The Dutch Disease Theory

This theory of economic growth posits that higher oil prices would generally alter the production structure of the countries that export oil to ensure that it concentrates more on oil production and exploration while ignoring the growth of the other sectors of the economy. The accruing increased levels of oil revenues would induce an increase in the country's taste for and import of consumer goods and make for the appreciation of the country's local currency. Consequently, the tendency for increased import of consumer goods would reduce the competitiveness and discourage the local producers. Therefore, the Dutch disease theory contends that an increase in oil prices will not eventually benefit the economy of a country exporting oil.<sup>75</sup> This theory opines that a country's exchange rate appreciates due to a natural resource boom, making its manufacturing export less competitive. According to this researcher, Dutch disease theory can be seen as a process of shrinking non-resource convertibility due to the boom in the natural resource sector.<sup>76</sup>

This process has also increased the of the natural resources sector specialization, thus making the economy more vulnerable to specific resource shocks. The impact of Dutch disease on the economy is divided by the scholar into two effects, specifically, the resource movement and the spending effect. The resource movement effect is the aspect of which the rise in the price of the discovered resources cause the marginal product of value of the resource to rise, which consequently increases the wage rates in the newly discovered resource sector. This causes the tradable sectors to possibly shrink in operations, while thereafter some of which might perhaps shut down. The spending effect can be seen as the increase in revenue accounted for by the natural resource which was discovered, mainly when its price increases dramatically. The huge income obtained paves way for imports to increase together with domestic absorption for both tradable and non-tradable. This phenomenon brings a well-being effect.<sup>77</sup>

### **2.3.3 The Mainstream Theory**

The mainstream theory on the other hand postulates that production prompts results from economic growth; and refers to transformation of matter in some way, and thus requires energy. The primary factors of production are Capital, labour and land; and energy resources such as oil and gas, coal and fuel are categorized as intermediate production inputs usually created during the production period and entirely used up during the production process. The mainstream theory in economic growth downplays the role of the energy resources.<sup>78</sup>

### **2.3.4 Rent Seeking Theory**

This theory provides a lot of support to the resource curse or Dutch disease theory. According to this researcher, rent-seeking means spending money and time on the production of real goods and services and also on trying to get the government to make business more profitable by changing the rules. This could be in form of subsidies on output, promotion of collusion or making compulsory the use of professional services<sup>79</sup>The term “rent-seeking” was introduced by the researcher and which has a long history in economics<sup>80</sup>. Dating back to the seminal work of models of rent seeking behaviour has been at the forefront of attempts made recently to explain the resource curse phenomenon<sup>81</sup>.

A common theme of these models is that, political institutions which find rent seeking conducive underlie the failures of such societies to realize some benefits from natural resource wealth like oil. To support this, some researchers offered circumstantial instances by using Venezuela and Nigeria as being consistent with the mindset that rent seeking by political elites is responsible for the resource curse<sup>82, 83</sup>. The 1979–1981 oil jump made Venezuela increase public spending on infrastructure and industrial policies which mainly benefit the political elites. The increase while so dramatic, ensured that Venezuela ran a current account deficit notwithstanding the favourable shifts in her terms of trade<sup>82</sup>. The suggested perspective may imply that the problem with natural

resource abundance is not only that it leads to irrational behavior on the part of political giants but that it provides them with opportunities to line their own pockets by engaging in rent seeking. This researcher<sup>84</sup> for instance argues that when the government gets an unexpected increase in revenue from a resource boom, rational political elites will take advantage of it in order to either seize the rents created by resource booms or gain control over the rights of allocation. This is what is referred to as rent seeking by Ross.

### **2.3.5 Theory of Consumption Smoothing**

This Consumption Smoothing theory supports the permanent income hypothesis which ensures that when the individual is not comfortable if the consumption pattern changes and therefore does not intend to give up some degree of happiness to avoid such changes. Therefore, ignoring the uncertainty of the income, in the optimal financial policy, it is often necessary to keep the level of consumption per person fixed over the long term. However, because there is uncertainty of the income, the current consumption level is equal to the permanent income and, in the expected or average, the consumption will become fixed with the passage of time. This suggests that the increase in the oil income should enable the consumption increase by the corresponding increase in the annual value of the wealth.

It was noted that in line with the consumption smoothing, an intuition under income uncertainty is that, government should react differently to temporal and permanent income shocks. A temporal income shock increases the consumption by the annuity value of the positive changes of the income (positive income shock). A permanent income, on the other hand, should be met by a one-on-one reduction in consumption. For example, the positive oil price shock that followed Iraq's invasion of Kuwait in August 1990 was only temporary. When the price of oil has returned to prior levels, the above rule can be utilized to spend the windfall created by the price increase.<sup>85</sup>

### **2.3.6 Natural Resource Rent Theory**

The economics of extracting resources from the earth are fundamentally different from the economics of producing crops, manufacturing goods, and providing services. The extractive industry relies on mineral resources that are finite and will eventually run out.<sup>86</sup> The economic rent is calculated on the amount paid for a fixed supply factor on the assumption that a natural resource such as oil is a stock of exhaustible resources.<sup>87</sup>

However, if consider the definition to cover any restricted variable in the same spirit, the payment was extended to a variable in fixed supply. This resource is natural. Economic rent is the result of the interaction of a fixed supply and a normal demand curve. On the other hand, rents for resources are high.<sup>88</sup> Holds similar view with<sup>89</sup> though the main difference between the two models is that the natural resource supply is not fixed in the 'free-market' model. This is because the price of the resource is affected by the level of extraction as well as other factors outside of the company's control.

### **2.3.7 Neoclassical Theory**

Among the short run implications of the model is that growth is affected only in the short-run as the economy converges to the new steady state output level. Furthermore, the rate of growth that converges to the steady state is determined by the rate of capital accumulation as the economy improves. Capital accumulation is determined by the savings rate which is the proportion of output used to rather than being consumed, create more capital and the rate of capital accumulation. In this model, the long-run rate of growth is determined outside the model that is, it is exogenously determined. A common prediction of the model is that an economy will always converge towards the rate of growth in a steady state. This however, depends only on the technological progress rate and the rate of labour force growth. The basic assumptions of the model are: constant returns to scale, diminishing marginal productivity of capital, exogenously

determined technical progress and substitutability between capital and labour. As a result, the model highlights the savings or investment ratio as important determinant of short-run economic growth.

The model predicts convergence in growth rates on the basis that poor economies will grow faster compared to rich ones.<sup>90</sup>

## **2.4 Gaps in Literature**

Although oil makes up more than 90% of Nigeria's exports, it accounts for only 25% of the country's GDP and 80% of government total revenues. Additionally, Nigeria has not benefited from high oil prices in the international market, as this money has not been used to improve the country's economy. The Nigerian government's yearly budget is based on the international price of crude oil, so its fiscal and monetary policies are susceptible to changes in the price of oil. This can affect the performance of the economy through the exchange rate. Other factors, like inflation and interest rates, can also be affected by the oil market's fluctuations. The Nigerian economy is impacted by the country's reliance on crude oil exports. This has some impact on the Nigerian economy, and it's important to consider this when looking at the country's overall stability.

It should be noted that only a few of these studies were devoted to the measurement of economic growth, as well as to the sharp decline in oil prices that has characterized price movements over the years. The behaviour of crude oil prices has been very relevant to the macroeconomic performance of countries that are oil-producing. This is so because, whenever they do so, they violate their political framework and, in most cases, face incorrect political ideas that may exacerbate a negative impact on these unique oil price changes on their macroeconomic performance during this period. While there have often been positive effects, studies have not given sufficient priorities to the negative shock or sharp decline that portend serious effects on the output performance of these oil-producing countries. Studies have not demonstrated the

impact of these shocks on the economy in both the short and long term. This study will therefore use techniques capable of measuring these sharp increases and decreases in oil prices and also absorbs the impact of negative shocks on oil prices.

Most economists are concerned about the volatility of oil prices, as it can have an impact on the overall economy. Macroeconomic analysis shows that macroeconomic variables are easily affected by changing circumstances. Macroeconomic variables such as gross domestic product, inflation, exchange rates, interest rates, etc. are usually unstable and weak and subject to shocks. There has been very little unexpected change in the economy, which is causing fluctuations in key economic indicators. This makes it difficult to predict how the economy will develop in the future. Many studies have been conducted to investigate the effect of oil price changes on macroeconomic variables in Nigeria. There is no clear evidence that oil price changes have a significant impact on the economy as a whole. Some studies suggest that small changes in oil prices have a minimal effect on the economy, while other studies find that large changes in oil prices have a more significant impact.

According to the neoclassical theory however, despite the fact that the capital accrued by a country is important to economic growth, the integration of technology as well as labor productivity are also crucial to achieving stable economic growth.

## **2.5 Theoretical Framework**

### **The Neoclassical growth theory**

The Neoclassical growth theory is an Economic model that posits that the economic growth stability hinges on three major factors, which are the:

- Availability of Capital
- Availability of Labour
- Availability and State of Technology

From 1956, the neoclassical growth theory which was introduced by Robert Solow and Trevor Swan has been the model for long-run economic growth. It maintains that a well-adjusted capital, labor and technology is important for stable economic growth. A temporary equilibrium is required for that to happen and this shows that for an economy to function adequately, appropriate labor, a proportional capital size coupled with adequate technology must be in place<sup>91</sup>

The economic growth enjoyed by a country and the equilibrium of the economy is determined by using the neoclassical growth theory. The formula used to estimate the neoclassical growth theory is;

$$Y = AF (K, L).$$

**Y** is the symbol that depicts the GDP of the country.

**L** is the level unskilled labor in an economy

**K** stands for share of capital

**A** symbolizes the level of technology.

Despite the fact that the capital accrued by a country and according to this theory, it is important to note that economic growth and the integration of technology as well as labor productivity are also crucial to achieving a stable economic growth. Also because of the dynamic relationship between labor and technology, an economy's production function is often re-stated as

$$Y = F (K, AL).$$

This states that technology is labor augmenting and that workers' productivity depends on the level of technology.

## Assumptions of the Neoclassical Growth Model

- **Capital subject to diminishing returns:** An important assumption of the neoclassical growth model is that provided the economy is a closed economy, capital (K) is subject to diminishing returns
- **Impact on total output:** Provided that labor is fixed or constant, the impact on the total output of the last unit of the capital accumulated will always be less than the one before.
- **Steady state of the economy:** In the short term, the economy converts into a “steady-state” economy, the rate of growth slows down as diminishing returns take effect and there the economy is steady, or in other words, in a relatively constant state. <sup>91</sup>

## Key Conclusions of the Neoclassical Model of Growth

- **Output as a function of growth:** The neoclassical growth model posits that total output is a function of economic growth in capital, labor, factor inputs, and technological progress.
- **Increased steady-state per capita income level:** While the rate of savings does not influence the steady-state economy growth rate of total output, it does result in an increase in the steady-state level of per capita income and, therefore, total income as well, as it raises the total capital per head.
- **Growth rate of output in steady-state equilibrium:** the growth rate of the population or labor force is equal to the growth rate of total output in steady-state equilibrium and is never influenced by the rate of savings.
- **Long-term growth rate:** The long-term growth rate of an economy is solely determined by technological progress or regress. <sup>91</sup>

However, the neoclassical theory explains the growth process using the above production function in its intensive form, that is, in per capita terms. To obtain the above production

function in per capita terms we divide both sides of the given production function by L, the number of labour force. Thus

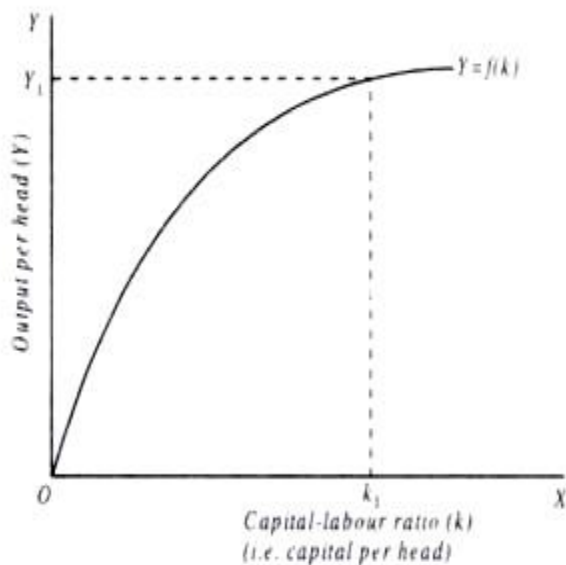
$$\begin{aligned} \frac{Y}{L} &= AF \left( K, L, \frac{L}{L} \right) = \\ &= AF \left( \frac{K}{L}, 1 \right) = AF \left( \frac{K}{L} \right) \dots \end{aligned} \quad (2)$$

To begin with we assume that there is no technological progress. With this assumption then equation (2) is reduced to

$$\frac{Y}{L} = F \left( \frac{K}{L} \right) \dots \quad (3)$$

The equation (3) states that output per head  $\left(\frac{Y}{L}\right)$  is a function of capital per head  $\frac{K}{L}$ . Writing y for  $\frac{Y}{L}$  and k for  $\frac{K}{L}$ , equation (3) can be written as

- $y = f(k) \dots \quad (4)$



**Fig. 45.1.** Production function relating output per head to output per head

Now, in Figure 45.1 we represent the production function (4) in per capita terms. It will be noticed from Figure 45.1 that as capital per capita (k) increases output per head increases, that is,

marginal product of labour is positive. But, as will be seen from Figure 45.1, the slope of the production function curve decreases as capital per head increases. This implies that marginal product of capital diminishes. That is, the increase in capital per head causes output per head to increase but at a diminishing rate. It will be seen from the Figure 45.1 that at capital-labour ratio (i. e. capital per worker) equal to  $k_1$  output per head is  $y_1$ . Similarly we can read from the production function curve:  $y = f(k)$  the output per head corresponding to any other capital per head.

### **Neoclassical Growth Theory: Fundamental Growth Equation:**

According to neoclassical theory, rate of saving plays an important role in the growth process of an economy. It considers saving as a constant fraction of income. Thus,

$$S = sY \dots \quad (5)$$

Where S = saving

Y = income

s = propensity to save

Since s is a constant fraction of income, average propensity to save is equal to marginal propensity to save. Further, since national income equals national product, we can also write equation (5) as

$$sY = sF(K, L)$$

As in neoclassical theory planned investment is always equal to planned saving, net addition to the stock of capital is  $(\Delta K)$ , which is the same thing as investment (I), can be obtained by deducting depreciation of capital stock during a period from the planned saving. Thus,

$$\Delta K = I = sY - D \dots \quad (6)$$

Where  $\Delta K$  = net addition to the stock of capital, I stands for investment and D for depreciation. Depreciation occurs at a certain percentage of the existing capital stock. The total depreciation (D) can be written as

$$D = dK$$

Substituting  $dK$  for  $D$  in equation (6) we have

$$\Delta K = sY - dK$$

$$\text{or } sY = \Delta K + dK \dots \quad (7)$$

Now dividing and multiplying the first term of the left hand side of equation (7) by  $K$  we have

$$sY = K \cdot \frac{\Delta K}{K} + dK \dots \quad (8)$$

We have seen above, for the steady state equilibrium, growth of capital ( $\frac{\Delta K}{K}$ ) must be equal to growth of labour force ( $\frac{\Delta L}{L}$ ), so that capital per worker and therefore income per head remains constant. If we denote growth rate of labour force ( $\frac{\Delta L}{L}$ ) by  $n$ , then in steady state  $\frac{\Delta K}{K} = n$ .

Substituting  $n$  for  $\frac{\Delta K}{K}$  in equation (8) we have

$$sY = K \cdot n + dK$$

$$\text{or } sY = (n + d)K \dots \quad (9)$$

The above equation (9) is a fundamental growth equation of the neoclassical growth model and states the condition for the steady state equilibrium when capital per worker and therefore income per capita remains constant even though population or labour force is growing.

Thus, for steady state growth equilibrium capital must be increasing equal to  $(n + d) K$ .

Therefore  $(n + d) K$  represents the required investment (or change in capital stock) which

ensures steady state when capital and income must be growing at the same rate as labour force (or population)

### **The Growth Process:**

From the growth equation (9) it is evident that if planned saving  $sY$  is greater than the required investment (i.e.  $(n + d) K$ ) to keep per capita income constant, capital for worker will increase. This increase in capital per worker will cause increase in productivity of worker.

As a result, the economy will grow at higher rate than the steady-state equilibrium growth rate. However, this higher growth rate will not occur endlessly because diminishing returns to capital will bring it down to the steady rate of growth, though at a higher levels of per capita income and capital per worker.

In order to graphically show the growth process the growth equation is conventionally used in intensive form, that is, in per capita terms. In order to do so we divide both sides of equation (9) by  $L$  and have

$$\frac{sY}{L} = (n + d) \frac{K}{L}$$

where  $\frac{Y}{L}$  represents income per capita and  $\frac{K}{L}$  represents capital per worker (i.e. capital-labour ratio)

Writing  $y$  for  $\frac{Y}{L}$  and  $k$  for  $\frac{K}{L}$  we have

$$sy = (n + d)k \dots \quad (10)$$

The equation (10) represents fundamental neoclassical growth equation in per capita terms. <sup>92</sup>

### **Key results of the neoclassical growth model:**

1. Neoclassical growth theory explains that output is a function of growth in factor inputs, especially capital and labour, and technological progress.
2. Contribution of increase in labour to the growth in output is the most important.

3. Growth rate of output in steady-state equilibrium is equal to the growth rate of population or labour force and is exogenous of the saving rate, that is, it does not depend upon the rate of saving.
4. Although saving rate does not determine the steady-state growth rate in output, it does cause an increase in steady-state level of per capita income (and therefore also total income) through raising capital per head.
5. Steady state rate of growth of per capita income, that is, long-run growth rate is determined by progress in technology.
6. If there is no technical progress, then output per capita will ultimately converge to steady state level.
7. A significant conclusion of neoclassical growth theory is that if the two countries have the same rate of saving and same rate of population growth rate and has access to the same technology (i.e. production function), their levels of per capita income will eventually converge that is they will ultimately become equal.

In this context it is worthwhile to quote Dornbusch, Fischer and Startz “The poor countries are poor because they have a less capital but if they save at the same rate as rich countries, and have access to the same technology, they will eventually catch up.”<sup>92</sup>

### **Sources of Economic Growth:**

An important issue in growth economics is what contributions of different factors, namely, capital, labour and technology make to economic growth. In other words, what is relative importance of these different factors as sources of economic growth? Robert Solow and Denison have attempted to study the relative importance of the various sources of economic growth by using the concept of production function.

The rate of economic growth in an economy and differences in income levels of different countries and also their growth performance during a period can be explained in terms of the increase in these sources of economic growth.

It will be recalled that the production function describes the amount of total output produced depends on the amount of different factors used and the state of technology. <sup>92</sup>

The neo-classical theory of economic growth suggests that increasing capital or labour leads to diminishing returns. Therefore, increasing capital has only a temporary and limited impact on increasing the economic growth. As capital increases, the economy maintains its steady-state rate of economic growth.

To increase the rate of economic growth in this theory we need:

- An increase in proportion of GDP that is invested – however, this is limited as higher proportion of investment leads to diminishing returns and convergence on the steady-state of growth
- Technological progress which increases productivity of capital/labour

It suggests poor countries who invest more should see their economic growth converge with richer countries.

### **Criticisms of this neo-classical**

- It doesn't explain why countries have different levels of investment as % of GDP
- Some developing countries don't attract higher levels of investment because of structural problems such as corruption, lack of infrastructure.
- It doesn't explain how to improve rates of technological progress. <sup>93</sup>

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### **Chapter Three**

#### **Methodology**

This chapter describes the methodology adopted in the study. It includes the model specification, data source and definitions, a-priori expectation, estimation technique and model evaluation.

### 3.1 Model Specification

#### 3.1.1. Model I:

The study proposes a simple macroeconomic model to evaluate the effects of oil prices on the economy by analyzing effects on potential output (supply side), the output gap (demand side), and inflation. A modified version of the new Keynesian macroeconomic model is adopted in assessing the effect of oil prices on potential (or trend) output growth. The model is therefore specified as:

$$PG = f(lab, HC, GFCF, OIP) \dots \dots \dots (3.1)$$

The econometric representation of the first model becomes

$$PG_t = \alpha_0 + \alpha_1 lab_t + \alpha_2 LNhc_t + \alpha_3 LNgfcf_t + \alpha_4 LNoip_t + \mu_t \dots \dots \dots (3.2)$$

where:

$PG_t$  = Potential output growth measured by the Hodrick-Prescott Filtered trend of Real GDP

$LAB$  = the labour force participation rate

$LNhc$  = the natural logarithm of human capital

$LNgfcf$  = the natural logarithm of gross fixed capital formation

$LNOIP$  = the natural logarithm of oil price

$\alpha_0$  = Constant of the regression model.

$\alpha_1$  = Coefficient of labour force

$\alpha_2$  = Coefficient of log of human capital

$\alpha_3$  = Coefficient of log of gross fixed capital formation

$\alpha_4$  = Coefficient of log of oil price

$\mu$  = Error term

### 3.1.2. Model II

The second channel through which oil prices can affect the economy is through the supply side, that is through the traditional Phillips curve. The model is therefore specified as:

$$INF=f(oip, exc, int, outputgap).....(3.3)$$

The econometric representation of the model becomes

$$INF_t = \beta_0 + \beta_1 LNoip_t + \beta_2 LNexc_t + \beta_3 int_t + \beta_4 outputgap_t + \mu_{2t}..... (3.4)$$

Where:

INF =inflation rate

LNoip = the natural logarithm of oil price

LNexc = the natural logarithm of exchange rate

int = interest rate

outputgap = the difference between potential output and real output

$\beta_0$ = Constant of the regression model.

$\beta_1$ = Coefficient of log of oil price

$\beta_2$ = Coefficient of log of exchange rate

$\beta_3$ = Coefficient of interest rate

$\beta_4$ = Coefficient of log of Output gap

$\mu_2$ = Error term

### 3.1.3. Model III

Lastly, oil prices can affect the demand-side. We allow for the possibility that all things being equal, higher oil prices shift the IS curve to the left. The output gap curve is a function of the real interest rate, the real exchange rate, and oil prices: The econometric representation of the model is:

$$OUTPUT\ GAP_t = \gamma_0 + \gamma_1 LNoip_t + \gamma_2 LNexc_t + \gamma_3 int_t + \mu_{3t}..... (3.5)$$

where:

$\gamma_0$  = Constant of the regression model.

$\gamma_1$  = Coefficient of log of oil price

$\gamma_2$  = Coefficient of log of official exchange rate

$\gamma_3$  = Coefficient of official interest rate

$\mu_3$  = Error term

### 3.2 Data Source and Definition

**Table 3.1: Data Sources and Definition**

S/N	Variables	Label	Description	Source
-----	-----------	-------	-------------	--------

1.	Dependent Variable	Potential Growth rate	The highest level of economic activity that can be sustained over the long term.	<b>HP Filtered trend of real GDP obtained from WDI</b>
2.	Dependent Variable	Output Gap	It is determined by the difference between potential and actual gross domestic product (GDP). The potential GDP cannot directly be observed and must, therefore, be estimated. The Hodrick-Prescott (HP) filter, as one statistical method suggested by Andersson et al. [2018], has been used to obtain the potential GDP.	<b>WDI</b>
3.	Dependent Variable	Inflation	Persistent rise in price of goods and services	<b>WDI</b>
4.	Independent Variable	Oil price	Spot price of bonny Light Crude oil	<b>Energy Information Administration (EIA)</b>
5.	Control Variable	Exchange Rate	This refers to the rate of exchange of one country's currency (naira)	<b>Central bank Statistical</b>

			to another country's currency (dollars)	<b>Bulletin</b>
<b>6.</b>	Control Variable	Interest Rate	This refers to annual official interest rate of Nigeria	<b>Central Bank of Nigeria Statistical Bulletin.</b>
<b>8.</b>	Control variable	Human Capital	The economic value of a person's abilities and the qualities of their labor that influence productivity. It is measured by government expenditure on education	<b>WDI</b>
<b>9.</b>	Control variable	Gross fixed capital formation	Defined as the acquisition of produced assets (including purchases of second-hand assets), including the production of such assets by producers for their own use	<b>WDI</b>
<b>10.</b>	Control variable	Labour Force	Refers to persons who fulfil the requirements for inclusion among the employed or the unemployed It is measured by labour force participation rate	<b>WDI</b>

*Source: Author's Illustration (2022)*

### 3.3. Pre-Estimation Tests

### **3.3.1 Unit Root Test**

The unit-root test will be adopted to test the time-series properties of the data. The Augmented-Dickey Fuller test is employed in testing the unit-root properties of the data.

### **3.3.2 Co-integration Test**

In order to investigate the cointegration relationship between the variables of interest, the Autoregressive Distributed Lag (ARDL) bounds test is applied. This cointegration approach, proposed has several key advantages: First, this method tests for cointegration between variables integrated of order zero i.e.  $I(0)$  and order one i.e.  $I(1)$ <sup>1</sup>. The Bound test for cointegration will be used to determine whether there is long-run relationship between the variables of interest. The co-integration test will be tested at 5% level of significance. It is based on the null hypothesis of no cointegration against alternative hypothesis of cointegration as set below which can be determined using the Wald or F-statistics. If co-integration is established, we can proceed to run an ARDL model.

## **3.4. Estimation Technique**

### **3.4.1. Auto-Regressive Distributed Lag Method (ARDL)**

In analyzing the effect of oil price on macroeconomic performance in Nigeria, an Autoregressive Distributed Lag (ARDL) model framework is employed. The ARDL approach yields consistent estimates of the long-run coefficients that are asymptotically normal, irrespective of whether the underlying regressors are  $I(1)$  or  $I(0)$ , and also works well with small samples.

Similarly, the test is based on a single ARDL equation, rather than on a VAR, thus reducing the number of parameters to be estimated. Finally, it estimates simultaneously the long-run and short-run parameters. Three ARDL models are estimated in analyzing the effect of oil price on

macroeconomic performance in Nigeria. If there is evidence in support of a long run relationship or cointegration among the variables, the long run models will be estimated as:

$$PG_t = \alpha_0 + \alpha_1 LAB_{t-1} + \alpha_2 LNHC_{t-1} + \alpha_3 LNGFCF_{t-1} + \alpha_4 LNOIP_{t-1} + \mu_{t-1} \dots (3.6)$$

$$INF_t = \beta_0 + \beta_1 LNOIP_{t-1} + \beta_2 LNEXC_{t-1} + \beta_3 INT_{t-1} + \beta_4 LNGDP_{t-1} + \mu_{2t-1} \dots (3.7)$$

$$OUTPUT\ GAP_t = \gamma_0 + \gamma_1 LNOIP_{t-1} + \gamma_2 LNEXC_{t-1} + \gamma_3 INT_{t-1} + \mu_{3t-1} \dots (3.8)$$

While the short run error correction ARDL model will be specified as:

$$\Delta PG_t = \alpha_0 + \alpha_1 \Delta LAB_{t-1} + \alpha_2 \Delta LNHC_{t-1} + \alpha_3 \Delta LNGFCF_{t-1} + \alpha_4 \Delta LNOIP_{t-1} + \alpha_4 ECM_{t-1} + \mu_{4t-1} \dots (3.9)$$

$$\Delta INF_t = \beta_0 + \beta_1 \Delta LNOIP_{t-1} + \beta_2 \Delta LNEXC_{t-1} + \beta_3 \Delta LNINT_{t-1} + \beta_4 \Delta LNGDP_{t-1} + \beta_5 ECM_{t-1} + \mu_{5t-1} \dots (3.10)$$

$$\Delta OUTPUTGAP_t = \alpha_0 + \alpha_1 \Delta LAB_{t-1} + \alpha_2 \Delta LNHC_{t-1} + \alpha_3 \Delta LNGFCF_{t-1} + \alpha_4 \Delta LNOIP_{t-1} + \alpha_4 ECM_{t-1} + \mu_{6t-1} \dots (3.11)$$

**Endnote**

1. Damodar N. Gujarati <http://www.abebooks.com/9780072478525/Basic-Econometrics-Gujarati-Damodar-N-0072478527/plp> (1995)

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## **Chapter Four**

## **Results and Interpretation**

### **4.1. Preliminary Tests**

Some preliminary tests are conducted to summarize the data, give information about the order of integration of the variables employed as well as test whether or not cointegration exists among the variables.

#### **4.1.1. Descriptive Statistics**

**Table 4.1.1: Descriptive statistics**

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	POTENTIAL	OUTPUT GAP	INF	LABOUR	GFCF	HUMANK	OILP	EXCH	GDP	INT
Mean	0.046056	-0.000634	19.82571	30.48222	8.46E+12	89.87472	53.72091	126.548	40184.48	22.92473
Median	0.037559	-0.003338	12.87658	30.95700	8.25E+12	89.7366	41.16000	125.8331	35020.55	13.50000
Maximum	0.082227	0.096556	72.8355	32.48300	1.40E+13	102.1081	117.7000	399.9636	71387.83	332.8657
Minimum	0.015058	-0.086659	5.388008	23.85500	5.67E+12	78.66348	13.62000	4.017942	15263.93	6.00000
Std. Dev	0.021969	0.039162	17.67764	1.979131	1.41E+12	6.499149	35.93168	108.7927	20799.06	54.06023
Skewness	0.355900	-0.017423	1.705816	-1.938762	0.174857	0.165233	0.481121	0.834963	0.343645	5.616577
Kurtosis	1.739345	3.376381	4.567476	6.234998	3.20304	2.232181	1.827308	2.983872	1.478556	32.71418
Jarque- Bera	3.056537	0.208362	2055698	37.18809	0.888778	1.019016	3.355797	4.067165	4.064607	1471.628
Probability	0.216911	0.901062	0.000034	0.00000	0.641216	0.600791	0.186766	0.130866	0.131033	0.00000

Source: Author's Computation (2022)

This is done to summarize the basic features of the data. The results are presented in Table 4.1.1. From the summary statistics presented above; it is evident that all the variables except output gap have positive mean values. Gross Domestic Product (GDP) has the highest mean value of 40184.7.68, while output gap has the lowest mean value. The table also shows some variables are exemplified by a marked disparity, given their maximum and minimum values, Inflation, human capital, oil price, exchange rate, GDP and interest rate, all have high values in some years and abysmally low values in other years.

In terms of their disparity from the average points, the standard deviation values are relatively low for potential output, output gap, labour force participation and gross fixed capital formation. The table also presents the result of other statistics like the skewness, Kurtosis and Jarque–Bera tests. Skewness is a measure of asymmetry of the distribution of the series around its mean. The skewness of a normal distribution is zero, while positive and negative skewness imply long right tails and long left tails respectively. The skewness test shows that all the variables, except output gap and labour force are positively skewed. For the kurtosis test, it measures the presence of outliers in the dataset. The results indicate that most of the variables are not normally distributed as they failed to comply with the benchmark of 3.0 for the Kurtosis statistic. Exchange rate is almost normally distributed, while potential output, human capital, oil price and GDP are statistical distributions less than 3 (platykurtic) and other variables are statistical distributions which are greater than 3 (leptokurtic).

## 4.2. Correlation Matrix

The correlation matrix shows the association between variables. It explains the degree of association existing among the variables, whether positive or negative. It is also used to know the level of multicollinearity in the model analyzed and to summarize data for analysis that are more advanced.

There are quite a number of reasons for computing the correlation matrixes, among them are:

- They are used to check other analysis.
- To structure, explore and confirm data which can be added to other analysis.
- It helps to adequately give a summary of large data especially when patterns are to be seen showing the variables correlating.

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Table 4.2.: Correlation matrix

	OUTPUT									
	POTENTIAL	GAP	INF	LABOUR	GFCF	HUMANK	OILP	EXCH	GDP	INT
POTENT	1									
OUTPUT	-0.3723	1								
INF	-0.3270	0.1740	1							
LABOUR	-0.0105	-0.1662	0.3207	1						
GFCF	-0.1893	0.0413	-0.4662	-0.4329	1					
HUMANK	0.5871	-0.2217	-0.0790	-0.2077	-0.0022	1				
OILP	0.0197	0.1418	-0.4582	-0.5617	0.6351	0.0105	1			
EXCH	-0.2178	-0.1847	-0.4152	-0.2732	0.7840	0.0129	0.6574	1		
GDP	-0.2260	0.0935	-0.4469	-0.5195	0.8304	-0.0673	0.8648	0.9006	1	
INT.	-0.2596	-0.1523	-0.0028	0.1371	0.1921	-0.1022	0.0845	0.4161	0.2257	1

Source: Author's Computation (2022)

The correlation analysis explains the level of association between the variables employed in the study. There is a mixed order of correlation among the variables. While some variables exhibit positive correlation, others show negative correlation.

#### **4.3. Unit Root Test**

The unit root test is essential in order to ensure that the variables are estimated in their stationary forms to avoid spurious result. To do this, the Augmented Dickey-Fuller (ADF) is employed. The essence is to test the null hypothesis of unit root or non-stationary stochastic process. To reject this, the ADFstatistic must be more negative than the critical values at 5% significance level.

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Table 4.3.1: Unit root test result

Variable	ADF Test Statistic at level (I <sub>0</sub> )	ADF Test Statistic at first difference (I <sub>1</sub> )	Decision Value
EXCHANGE RATE	-0.174	-4.455	*
GFCF	-5.703	-----	**
HUMAN CAPITAL	-2.298	-4.871	*
INFLATION	-4.587	-----	**
INTEREST RATE	-3.313	-----	**
LABOUR	-3.615	-----	**
OIL PRICE	-2.364	-7.766	*
OUTPUT GAP	-2.674	-4.934	*
POTENTIAL GROWTH	-3.638	-----	*
CRITICAL VALUES			
1%	-3.615	-3.621	
5%	-2.941	-2.943	
10%	-2.609	-2.610	

Source: Author's Computation (2022)

Note: \*\* and \* indicate statistic at level I(0) and level at first difference I(1) respectively

Table 4.3.1 shown above reports unit root test for all our variables using the ADF Test. Gross fixed capital formation, interest rate, inflation, labour force participation and potential growth are integrated of order zero  $I(0)$ , while exchange rate, human capital, oil price and output gap are integrated of order one  $I(1)$ . This justifies our choice of ARDL methodology as variables exhibit a mix of integration order  $I(0)$  and  $I(1)$ .

#### 4.4. Bound Test for Linear Co-integration

In this study we test the null hypothesis by means of F-statistics, given that:

Null Hypothesis  $H_0: \phi_1 = \phi_2 = \phi_3 = \phi_4 = 0$

Alternative Hypothesis  $H_1: \phi_1 \neq \phi_2 \neq \phi_3 \neq \phi_4 \neq 0$

The F-statistic value is compared against the two critical value bounds (upper and lower bounds). The upper bound applies when all the variables are integrated of order one,  $I(1)$  while lower bound assume all the variables are integrated of order zero,  $I(0)$ . If the calculated F-statistics value exceeds the upper bound, then the null hypothesis of no cointegration is rejected. If the calculated F-statistics value is lower than the lower bound critical value, then the null hypothesis cannot be rejected. However, conclusive inference with regards to cointegration cannot be reached if the calculated F-statistics falls within the critical bounds.

The bounds test is more efficient for a small sample size and is applicable even when variables show any signs of endogenous properties as it makes corrections for any residual serial correlation.

**Table 4.3: Bound Test Result for Model I:**

F-Statistic	9.19***		
Critical Values	1%	5%	10%
Lower Bound	3.29	2.56	2.2
Upper Bound	4.37	3.49	3.09

*Source: Author's Computation (2022)*

Note:\*\*\* indicates significance and rejection of the null hypothesis of no co-integration at 1% significance level.

Table 4.3.reported above shows the Bound-Test for linear co-integration for the first analyzed model. This approach is used for testing whether or not there is long-run relationship (co-integration) between the variables employed. The criterion for rejecting the null hypothesis of no co-integration is that the F-Statistic should be greater than the lower and upper bound at 5%. Since the calculated F-Statistic (9.19) is greater than the upper bound at 5%, we therefore establish long-run relationship between the variables.

**Table 4.4: Bound Test Result for Model II:**

F-Statistic	5.1722***		
Critical Values	1%	5%	10%

Lower Bound	3.65	2.79	2.37
Upper Bound	4.66	3.67	3.20

Source: Author's Computation (2022)

Note:\*\*\* indicates significance and rejection of the null hypothesis of no co-integration at 1% significance level.

Table 4.4.reported above shows the Bound-Test for linear co-integration for the second model. This approach is used for testing whether or not there is long-run relationship (co-integration) between the variables employed. The criterion for rejecting the null hypothesis of no co-integration is that the F-Statistic should be greater than the lower and upper bound at 5%. Since the calculated F-Statistic (5.17) is greater than the upper bound at 5%, we therefore establish long-run relationship between the variables.

**Table 4.5: Bound Test Result for Model III:**

F-Statistic	9.45***		
Critical Values	1%	5%	10%
Lower Bound	3.29	2.56	2.20
Upper Bound	4.37	3.49	3.09

Source: Author's Computation (2022)

Note:\*\*\* indicates significance and rejection of the null hypothesis of no co-integration at 1% significance level.

Table 4.5.reported above shows the Bound-Test for linear co-integration for the third model. This approach is used for testing whether or not there is long-run relationship (co-integration) between the variables employed. The criterion for rejecting the null hypothesis of no co-integration is that the F-Statistic should be greater than the lower and upper bound at 5%. Since the calculated F-Statistic (9.45) is greater than the upper bound at 5%, we therefore establish long-run relationship between the variables.

#### **4.5. ARDLEstimation Results**

##### **4.5.1. ARDL results to evaluate the effect of oil price on potential growth.**

The short and long-run estimates for all variables are presented using the ARDL framework.

Table 4.6. ARDL Result for Model I

<b>Dependent Variable: POTENTIAL GROWTH</b>				
<b>Selected Model: 3,4,4,3,3</b>				
Variable	Coefficient	Standard Error	T-Statistics	Probability
<b>LONG RUN ESTIMATES</b>				
<b>LNLAB</b>	-0.0105	0.0552	-0.1904	0.8528
<b>LNGFCF</b>	-0.5871	0.1196	-4.9077	0.0006***
<b>LNHUMANK</b>	0.1093	0.0813	1.3440	0.2086
<b>LNOILP</b>	0.1705	0.0324	5.2573	0.0004***
<b>C</b>	16.4339	3.4118	4.8168	0.0007***
<b>SHORT RUN ESTIMATES</b>				
<b>D(POTENTIAL_GROWTH (-1))</b>	1.3305	0.0639	20.7959	0.0000***
<b>D(POTENTIAL_GROWTH (-2))</b>	-0.7040	0.0396	-17.7789	0.0000***
<b>D(LNLAB)</b>	-0.0035	0.0008	-4.2280	0.0017***
<b>D(LNLAB(-1))</b>	-0.0061	0.0011	-5.4388	0.0003***
<b>D(LNLAB(-2))</b>	-0.0015	0.0012	-1.2201	0.2504

<b>D(LNLAB(-3))</b>	-0.0027	0.0013	-2.0546	0.0670*
<b>D(LNGFCF)</b>	0.0032	0.0005	6.5959	0.0001***
<b>D(LNGFCF(-1))</b>	-0.0075	0.0011	-6.9616	0.0000***
<b>D(LNGFCF(-2))</b>	-0.0030	0.0007	-4.4718	0.0012***
<b>D(LNGFCF(-3))</b>	-0.0018	0.0006	-3.1768	0.0099***
<b>D(LNHUMANK)</b>	-0.0011	0.0007	-1.5498	0.1522
<b>D(LNHUMANK(-1))</b>	-0.0019	0.0006	-3.2707	0.0084***
<b>D(LNHUMANK(-2))</b>	-0.0009	0.0006	-1.4275	0.1839
<b>D(LNOILP)</b>	-0.0008	0.0001	-4.5080	0.0011***
<b>D(LNOILP(-1))</b>	0.0023	0.0004	6.2901	0.0001***
<b>D(LNOILP(-2))</b>	0.0008	0.0002	4.2481	0.0017***
<b>CointEq(-1)*</b>	-0.0228	0.00251	-9.0960	0.0000***
R <sup>2</sup> = 0.999				
Adjusted R <sup>2</sup> = 0.998				
D.W. Statistics = 2.129				

Note: \*\*\*, \*\* and \* indicate probability value at 1%, 5% and 10% respectively.

Source: Author's Computation (2022)

The ARDL result shown above depicts the short and long run relationship existing among the variables. In the long run, physical capital measured with gross fixed capital formation and oil price have significant effect on potential growth at one percent. An increase in physical capital by 10 percent, will reduce potential growth by 5.87 percent. Conversely, an increase in oil price by 10 percent, will increase potential growth by 1.7 percent.

Short run estimates reveal that all variables except the two lagged value of labour, current value of human capital and two lagged value of human capital have significant effect on potential growth. A 10 percent increase in one and two lagged values of potential growth will increase the current value of potential growth by 13.3 percent and reduce potential growth by 7 percent respectively. An increase in the current value, one lagged value and three lagged value of labour force by 10 percent will reduce potential growth by 0.03, 0.06 and 0.02 percent respectively.

The current value of physical capital also has a positive effect on potential growth as an increase of physical capital in its current value by 10 percent is seen to increase potential growth by 3 percent. Conversely an increase in the one, two and three lagged values of physical capital by 10 percent, reduces potential growth by 0.07, 0.03 and 0.02 percent respectively. One lagged value of human capital has a significant effect on potential growth, with a 10 percent increase, leading to a 0.1 decrease in potential growth.

An increase in the current value of oil price by 10 percent, reduces potential growth by 0.008 percent. Conversely, a increase in the one and two lagged values of oil price by 10 percent increase potential growth by 0.02 and 0.008 respectively. The error correction term is statistically significant, negative and less than one. This means that the speed of adjustment from short-run to long –run equilibrium given any shock in the model is about 2 percent.

#### 4.5.1.1 Post Estimation Diagnostic Test on Model I

Some diagnostic tests are carried out after estimating the ARDL result to validate findings.

##### 4.5.1.1.1. Breusch-Godfrey Serial Correlation Test

**Table 4.7:**Breusch-Godfrey Serial Correlation Test

F-Statistic	1.2843	Prob. F (2,8)	0.3283
-------------	--------	---------------	--------

*Source: Author's Computation (2022)*

Since the probability value (0.3283) is greater than 0.05, we conclude that there is no evidence of serial correlation in the model.

##### 4.5.1.1.2:Breusch-Pagan Godfrey Heteroskedasticity Test

**Table 4.8:** Breusch-Pagan Godfrey Heteroskedasticity Test

F-Statistic	1.6237	Prob. F(21,10)	0.2164
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*Source: Author's Computation (2022)*

Since the probability value (0.2164) is greater than 0.05, we conclude that there is no evidence of heteroskedasticity in the model.

#### 4.5.2. ARDL results to estimate the effect of oil price on output gap.

Results of the ARDL of model II are reported in this section. This explains the effect of oil price on output gap in Nigeria. The short and long-run estimates are presented using the ARDL framework.

Table 4.9. ARDL Result for Model II

<b>Dependent Variable: OUTPUT GAP</b>				
<b>Selected Model: 4,3,3,4</b>				
Variable	Coefficient	Standard Error	T-Statistics	Probability
<b>LONG RUN ESTIMATES</b>				
LNOILP	0.0748	0.0138	5.3990	0.0001***
INT	0.0034	0.0018	1.8251	0.0894*
LNEXC	-0.0406	0.0595	-6.8330	0.0000***
C	-0.1501	0.0570	-2.6333	0.0197**
<b>SHORT RUN ESTIMATES</b>				
D(OUTPUT_GAP(-1))	0.4128	0.1141	3.615719	0.0028***
D(OUTPUT_GAP(-2))	0.2306	0.1226	1.8804	0.0810*
D(OUTPUT_GAP(-3))	0.2146	0.1316	1.6303	0.1253
D(LNOILP)	0.0016	0.0120	0.1378	0.8923
D(LNOILP(-1))	-0.6140	0.0190	-3.2318	0.0060***
D(LNOILP(-2))	-0.0424	0.0142	-2.9697	0.0101**
D(INT)	-2.34E-05	4061E-05	-0.508815	0.6188
D(INT(-1))	-0.0022	0.0009	-2.4700	0.0270**
D(INT(-2))	-0.0020	0.0008	-2.3510	0.0339**
D(LNEXC)	-0.0420	0.0106	-3.9584	0.0014***
D(LNEXC(-1))	0.0178	0.0126	1.4131	0.1795
D(LNEXC(-2))	0.0094	0.0136	0.6874	0.5030
D(LNEXC(-3))	0.0324	0.0103	3.1346	0.0073***

<b>CointEq(-1)*</b>	-1.0300	0.1786	-5.7662	0.0000***
R <sup>2</sup>	= 0.82			
Adjusted R <sup>2</sup>	=0.70			
D.W. Statistics	=2.12			

Note: \*\*\*, \*\* and \* indicate probability value at 1%, 5% and 10% respectively.

Source: Author's Computation (2022)

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The long run estimate reveals that oil price, interest rate and exchange rate have significant effect on output gap. While oil price and interest rate have positive effect on output gap, exchange rate has a negative effect. An increase in oil price and interest rate by 10 percent, will increase output gap by 0.7 percent and 0.03 percent respectively. A 10 percent increase in exchange rate will reduce output gap by 0.4 percent.

For the short run estimates, output gap in the one and two lagged periods significantly affect output gap in the current period. An increase in the one and two lagged values of output gap by 10 percent will increase the current value of output gap by 4.1 and 2.3 percent respectively. Conversely, oil price in its one and two lagged values have significant reducing effect on output gap, as 10 percent increase in oil price in these periods will reduce output gap by 0.6 and 0.4 percent respectively. Interest rate in the one and two lagged periods also has significant reducing effect on output gap. A 10 percent increase in exchange rate in these periods will reduce output gap by 0.02 percent respectively. Exchange rate in the current period has a reducing effect on output gap with a 10 percent increase in exchange rate reducing output gap by 0.4 percent. However, 10 percent increase in exchange rate in the three lagged period will increase output gap by 0.3 percent.

#### 4.5.2.1. Breusch-Godfrey Serial Correlation Test

Table 4.10: Breusch-Godfrey Serial Correlation Test Model II

F-Statistic	1.6477	Prob. F (2,11)	0.2332
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*Source: Author's Computation (2022)*

Since the probability value (0.23) is greater than 0.05, we conclude that there is no evidence of serial correlation in our estimation.

#### 4.5.2.2: Breusch-Pagan Godfrey Heteroskedasticity Test

Table 4.11: Breusch-Pagan Godfrey Heteroskedasticity Test Model II.

F-Statistic	0.4772	Prob. F(16,13)	0.9256
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*Source: Author's Computation (2022)*

Since the probability value (0.92) is greater than 0.05, we conclude that there is no evidence of heteroskedasticity in our estimation.

#### 4.5.3. ARDL results to estimate the effect of oil price on inflation.

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**Table 4.12: Effect of oil price on inflation**

<b>Dependent Variable: INFLATION</b>				
<b>Selected Model: 2,4,4,4,2</b>				
Variable	Coefficient	Standard Error	T-Statistics	Probability
<b>LONG RUN ESTIMATES</b>				
<b>LNOILP</b>	39.1309	12.3643	3.1648	0.0090***
<b>LNEXC</b>	1.8216	4.5454	0.4007	0.6963
<b>INT</b>	1.7555	0.6686	2.6253	0.0236**
<b>LN_GDP</b>	-69.6477	23.4162	-2.9743	0.0126**
<b>C</b>	584.0034	186.1298	3.1376	0.0094***
<b>D(INF(-1))</b>	0.7496	0.0855	8.7641	0.0000***
<b>D(LNOILP)</b>	7.3828	4.1870	1.7632	0.1056
<b>D(LNOILP(-1))</b>	-42.9751	6.9789	-6.1578	0.0001***
<b>D(LNOILP(-2))</b>	-43.0327	7.3892	-5.8237	0.0001***
<b>D(LNOILP(-3))</b>	-19.5344	5.1048	-3.8266	0.0028***
<b>D(LNEXC)</b>	-21.5046	4.0708	-5.2826	0.0003***
<b>D(LNEXC(-1))</b>	-17.9630	5.3561	-3.3537	0.0064***
<b>D(LNEXC(-2))</b>	-2.2987	4.2741	-0.5378	0.6014
<b>D(LNEXC(-3))</b>	16.3335	4.2228	3.8678	0.0026***
<b>D(INT)</b>	0.0291	0.0153	1.8979	0.0842*
<b>D(INT(-1))</b>	-2.5295	0.3197	-7.9105	0.0000***
<b>D(INT(-2))</b>	-0.2068	0.3503	-0.5903	0.5669

<b>D(INT(-3))</b>	1.0526	0.3151	-3.3397	0.0066***
<b>D(LN GDP)</b>	-178.3231	44.1998	-4.0344	0.0020***
<b>D(LN GDP(-1))</b>	-56.3199	37.0536	-1.5199	0.1567
<b>CointEq(-1)*</b>	-1.2537	0.1105	-11.3377	0.0000***
R <sup>2</sup> = 0.94				
Adjusted R <sup>2</sup> = 0.88				
D.W. Statistics = 1.79				

Note: \*\*\*, \*\* and \* indicate probability value at 1%, 5% and 10% respectively.

Source: Author's Computation (2022)

The long result shows that oil price and interest rate have significantly positive effect on inflation. A percentage increase in oil price will increase inflation by 39.13 units, while a unit increase in interest rate will increase inflation by 1.75 units. Results also show that output gap has a negative and significant effect on inflation as a percentage increase is seen to reduce inflation by 69.65 units.

From the short run estimates, inflation in its lagged form has a positive effect on the current level of inflation with a unit increase in the one lagged value of inflation, seen to increase the current value of inflation by 0.75 units. Conversely, oil price in their lagged values have significantly negative effect on inflation as a percentage increase in oil price in these periods is seen to reduce inflation by 42, 43 and 19 units respectively. Exchange rate in its current and one lagged period has reducing effect on inflation. A percentage increase in exchange rate in these periods, will reduce inflation by 21 and 18 units respectively. However, a percentage increase in exchange rate in the three lagged period, increases inflation by 16.3 units.

Interest rate in the current and three lagged period has a significantly positive effect on inflation with the coefficient of 0.03 and 1.05 respectively. However, interest rate in the one lagged period has a negative effect on inflation, as a unit increase in interest rate reduced inflation by 0.21 units. Output gap in the current period has a significant and positive effect on inflation, with a percentage increase in output gap, increasing inflation by 178 units. The ECM coefficient of (-1.2) shows that there is an oscillatory convergence.

#### 4.5.3.1 Post Estimation Diagnostic Test on Model III

#### 4.5.3.2. Breusch-Godfrey Serial Correlation Test

Table 4.13: Breusch-Godfrey Serial Correlation Test

F-Statistic	0.060	Prob. F (2,11)	0.941
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*Source: Author's Computation (2022)*

Since the probability value (0.941) is greater than 0.05, we conclude that there is no evidence of serial correlation in our estimation.

#### 4.5.3.3: Breusch-Pagan Godfrey Heteroskedasticity Test

Table 4.14: Breusch-Pagan Godfrey Heteroskedasticity Test.

F-Statistic	0.477	Prob. F(16,13)	0.927
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*Source: Author's Computation (2022)*

Since the probability value (0.927) is greater than 0.05, we conclude that there is no evidence of heteroskedasticity in our estimation.

### 4.6. Discussion of Findings

The study examined the effect of oil price on macroeconomic performance in Nigeria, while analyzing three objectives. The ARDL technique was employed for all the objectives given the mixed order of integration of the variables. For the first objective, which analysed the effect of oil price on potential growth within the ARDL framework, the long run estimates indicated that oil price has a positive effect on potential growth. This does not conform with a-priori expectation as higher oil price is likely to reduce output level due to an increase in cost of

production. An increase in oil price reduces aggregate supply since high oil prices mean that firms will purchase less of the commodity.

As a consequence, the productivity of capital and labor will decline and lead to potential output loss<sup>2, 3, 4</sup>. This dampening effect on potential output growth can be particularly strong in less diversified economies. This deviates from findings from studies such as<sup>5,6</sup>. However, from the short run analysis, results show that higher oil prices have short-term effects on the output gap. An increase in oil price in the current period leads to an increase in potential growth. Given that potential output is determined by the size and skills of the labor force, the accumulated capital stock, and the available technology, long run results on physical capital and short run estimates on labour deviates from apriori expectation because an increase in capital and labour is expected to increase potential output.

The second objective analyzed the effect of oil price on output gap, Results conform with a-priori expectation revealing a direct relationship between output gap and oil price, according to the New Keynesian model. This corroborates findings by<sup>7</sup>. Second, the study shows that higher oil prices have short-term positive effects on the output gap in the current period, while the values are negative for the one and two lagged periods. The negative effect of oil price on output gap can be justified by the fact that oil is an essential input in production, and as such any increase in oil price, will increase the cost of production. As production cost increases, investment will fall, consequently exports of the country are negatively affected and economy has to face adverse balance of trade. So also, the effect permeates into households, oil price fluctuation induces the consumers to reschedule their expenditures on durable goods. This suggested that oil price shocks have serious concerns for all types of economies as aggregate demand is reduced from both consumption and investment sides<sup>8,9</sup>.

For the third objective, results showed that in the long run, oil price is positively linked with inflation. This conforms with a-priori expectation that oil price changes are directly related to

the production cost, which affects the changing price levels. It is widely accepted that oil price shocks at least partially pass through into inflation and corroborates findings by<sup>10,11,12,13,14</sup>. The long run result also shows that interest rate and exchange rate has significantly positive effect on inflation. For exchange rate, results conform to a priori expectations as exchange rate depreciation is expected to increase inflation in Nigeria, given that the country is an import driven country, it, therefore, implies that a depreciation of the exchange rate would translate to an increase in inflation<sup>15</sup>.

Results from the short run analysis show that the one period past value of inflation determines current inflation as a unit increase in the one period past value of inflation increases current inflation by 0.75 units. This establishes the submission of the NKPC model that current inflation is determined by the past values of inflation. This is consistent with findings by<sup>14, 15</sup>. This explains the persistence of inflation. Oil price in the current period increases inflation due to the cost of production transmission mechanism. Conversely, oil price in their lagged values have significantly negative effect on inflation as a percentage increase in oil price in these periods is seen to reduce inflation by 42, 43 and 19 units respectively. This could be justified by the fact that foreign exchange receipts will increase following an increase in oil price, thus increasing the nation's foreign reserves and enhancing exchange rate stability. This to a large extent will reduce imported inflation in the country. Results align with studies by<sup>16,17</sup>. However, the findings contradict studies like<sup>14</sup>.

Exchange rate in its current and one lagged period has reducing effect on inflation. A percentage increase in exchange rate in these periods will reduce inflation by 21 and 18 units respectively. This aligns with<sup>18, 19</sup> while contradicting findings by<sup>20</sup> amongst other studies. However, this does not conform to a priori expectations as exchange rate depreciation is expected to increase inflation. However, a percentage increase in exchange rate in the three lagged period, increases inflation by 16.3 units. This is consistent with findings by<sup>19</sup>.

Interest rate in the current and three lagged period has a significantly positive effect on inflation with the coefficient of 0.03 and 1.05 respectively. However, interest rate in the one lagged period has a negative effect on inflation, as a unit increase in interest rate reduced inflation by 0.21 units. This conforms to a-priori expectation because interest rate is a powerful tool used by the monetary authorities in controlling inflation. This is similar to findings by <sup>20</sup>. Output gap in the current period has a significant and negative effect on inflation.

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## Chapter Five

### Conclusion

This chapter contains a summary of the major findings, followed by some policy recommendations and concluding remarks. Finally, areas of possible future research and the limitations encountered are presented.

#### 5.1. Summary

Crude oil is one of the most important sources of energy in the world and it has a vital impact on economic development and growth of various economies. Oil price has witnessed intricate fluctuations and this has a lot of implications for the performance of most macroeconomic variables, whereby it poses great challenges (monetary and fiscal) for policy making. Oil price fluctuations have macroeconomic outcomes in both oil exporting and oil importing nations, given that crude oil is an integral source of income and contributes significantly to the economic wealth of countries.

This has spurred increasing debate on the effect of oil price on the macroeconomy. However, this study analysed the effect of oil price on macroeconomic performance in Nigeria, an oil exporting country. Three models were analysed based on the objectives of the study. Unit root test for variables using the Augmented Dickey-Fuller (ADF) test showed a mix of variables integrated of order  $I(0)$  and  $I(1)$ . This justified the use of ARDL method in estimating the effect of oil price on macroeconomic performance in Nigeria. The Bounds test for co-integration was also used in establishing long-run relationship between the variables.

The first objective analysed the effect of oil price on potential growth within the ARDL framework. Long run estimates indicated that oil price has a positive effect on potential growth. Similarly, for the long run analysis, human capital has a positive but insignificant relationship with potential growth. Gross fixed capital formation significantly reduces potential growth in the long run. However, from the short run analysis, results show that higher oil prices have short-

term effects on the output gap. An increase in oil price in the current period leads to a decrease in potential growth. Given that potential output is determined by the size and skills of the labor force, the accumulated capital stock, and the available technology, long run results on physical capital and short run estimates on labour deviates from a-priori expectation because an increase in capital and labour is expected to increase potential output. The two and three lagged values of oil price, however, posit significant and positive effect on potential growth. Other variables like human capital, labour force and gross fixed capital formation, all significantly affect potential growth at different levels of significance.

The second objective analyzed the effect of oil price on output gap, Results conform with a-priori expectation revealing a direct relationship between output gap and oil price, according to the New Keynesian model. It was also observed that higher oil prices have short-term positive effects on the output gap in the current period, while the values are negative for the one and two lagged periods.

For the third objective, which analysed the effect of oil price on inflation, results showed that in the long run, oil price is positively linked with inflation. Similarly, interest rate and exchange rate have positive and negative influence on inflation respectively. Results from the short run analysis show that the one period past value of inflation determines current inflation and oil price in the current period increase inflation due to the cost of production transmission mechanism. Conversely, oil price in their lagged values have significantly negative effect on inflation. Exchange rate in its current and one lagged period has reducing effect on inflation.

Interest rate in the current and three lagged period has a significantly positive effect on inflation. However, interest rate in the one lagged period has a negative effect on inflation.

## **5.2. Conclusion**

This study analyzed the effect of oil price on macroeconomic performance in Nigeria using potential growth, output gap and inflation as macroeconomic indicators. This was done to analyze the effect of oil price from both the demand and supply channels. Annual data was employed from 1980 to 2020 for nine macroeconomic variables (oil price, inflation, exchange rate, interest rate, human capital, gross fixed capital formation, output gap, labour force, potential growth). The model was estimated using the New-Keynesian theory and employing the ARDL estimation technique. The model allows for the possibility that oil prices affect the macroeconomy in the short-term through demand and supply side effects, but also through more persistent supply side effects.

From the estimated models, the study was able to establish a positive effect of oil price on potential growth in the short and long run. Other control variables employed in the model such as human capital, gross fixed capital formation, and labour force exhibited different effects on potential growth in the long and short run. The study also discovered that oil price has a positive relationship with output gap in both short and long run. For inflation, oil price exhibited a positive effect in the long run, while reducing effects were established in the short run analysis. Other variables employed in the relationship between oil price and inflation exhibited different effects.

## **5.3. Recommendations**

Following the findings discussed in the previous chapter, the following recommendations are made:

- Monetary authorities should maintain a contractionary monetary policy that will have no adverse effect in the long run. This will reduce the increasing effect of oil price on inflation.

- To reduce the effect of increasing exchange rate on inflation, import-substitution is a main strategy for reducing imported inflation. Although some import-substitution policies have been put in place by government, such policies need to be strengthened and sustained to encourage and promote domestic production.
- Physical capital accumulation contributes to increase the level of production. There should be a deliberate collaboration between the government and the private sector towards building a conducive and enabling environment that promotes capital investment in the economy.
- Human capital development should be strengthened by the government through increased expenditure in education, as this will further promote potential growth.

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### **Contribution to Knowledge**

This work will assist other researchers in knowing how oil price affects the potential growth of Nigerian economy. This can be further researched on to show that if the behaviour of oil price is modeled more to provide additional insights, it can show the role human capital development can have on the growth of the economy.

While considering the fact that data used ends in 2020, further recent data can be used shed more light on the recent behaviour of oil price and the macroeconomy.

This will have economic development implications for Nigeria, because as developing economies' compositions evolve over time, knowing and understanding what this means for economic growth and prosperity can help maximize welfare and macro economic growth.

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## APPENDIX

	POTENTIAL	OUTPUT	INF	LABOUR	GFCF	HUMANK	ENV	EXC	GDP	INT
POTENT	1	-0.372306096	-0.327004470	-0.010593168	-0.189324642	0.587186803	0.019725564	-0.217895127	-0.226066103	-0.259653837
OUTPU	0.372306096	1	0.174059215	-0.166254227	0.041353093	-0.221724289	0.141846805	-0.184722914	0.093538662	-0.152338703
INF	-0.327004470	0.174059215	1	0.320725678	-0.466219629	-0.079036725	-0.458218814	-0.415281748	-0.446956107	-0.002895439
LABOUR	-0.010593168	-0.166254227	0.320725678	1	-0.432931873	-0.207746017	-0.561729696	-0.273287583	-0.519585247	0.137111943
GFCF	-0.189324642	0.041353093	-0.466219629	-0.432931873	1	-0.002296088	0.635169536	0.784015249	0.830427438	0.192172134
HUMANK	0.587186803	-0.221724289	-0.079036725	-0.207746017	-0.002296088	1	0.010554685	0.012951589	-0.067356935	-0.102228315
ENV	0.019725564	0.141846805	-0.458218814	-0.561729696	0.635169536	0.010554685	1	0.657496947	0.864867879	0.084547865
EXC	-0.217895127	-0.184722914	-0.415281748	-0.273287583	0.784015249	0.012951589	0.657496947	1	0.900645274	0.416141183
GDP	-0.226066103	0.093538662	-0.446956107	-0.519585247	0.830427438	-0.067356935	0.864867879	0.900645274	1	0.225757151
INT	-0.259653837	-0.152338703	-0.002895439	0.137111943	0.192172134	-0.102228315	0.084547865	0.416141183	0.225757151	1

	INF	OUTPUT	POTENTIAL	LN_OILP	LNLAB	LN_HUMANK	LN_ENV	LN_EXC	INT	LN_GDP
INF	1	0.174059215	-0.327004470	-0.506954150	0.312090288	-0.072103130	-0.473991045	-0.512174841	-0.002895439	-0.495616285
OUTPUT	0.174059215	1	-0.372306096	0.103149814	-0.182367295	-0.211780563	0.047284143	-0.235689597	-0.152338703	0.057989964
POTENTIAL	-0.327004470	-0.372306096	1	0.071187316	0.003022265	0.570402436	-0.153924245	0.164542991	-0.259653837	-0.079853477
LN_OILP	-0.506954150	0.103149814	0.071187316	1	-0.506027003	0.091531395	0.690610467	0.796417911	0.110406550	0.930830932
LNLAB	0.312090288	-0.182367295	0.003022265	-0.506027003	1	-0.206088925	-0.435604574	-0.419743399	0.131423055	-0.517113994
LN_HUMANK	-0.072103130	-0.211780563	0.570402436	0.091531395	-0.206088925	1	0.011108736	0.286586708	-0.098958624	0.024215651
LN_ENV	-0.473991045	0.047284143	-0.153924245	0.690610467	-0.435604574	0.011108736	1	0.816096945	0.184397418	0.831940514
LN_EXC	-0.512174841	-0.235689597	0.164542991	0.796417911	-0.419743399	0.286586708	0.816096945	1	0.202938375	0.896288822
INT	-0.002895439	-0.152338703	-0.259653837	0.110406550	0.131423055	-0.098958624	0.184397418	0.202938375	1	0.192374390
LN_GDP	-0.495616285	0.057989964	-0.079853477	0.930830932	-0.517113994	0.024215651	0.831940514	0.896288822	0.192374390	1

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Dependent Variable: POTENTIAL\_GROWTH  
 Method: ARDL  
 Date: 11/04/22 Time: 02:48  
 Sample (adjusted): 1990 2021  
 Included observations: 32 after adjustments  
 Maximum dependent lags: 4 (Automatic selection)  
 Model selection method: Akaike info criterion (AIC)  
 Dynamic regressors (4 lags, automatic): LNLAB LNGFCF LNHUMANK  
 LNOILP  
 Fixed regressors: C  
 Number of models evaluated: 2500  
 Selected Model: ARDL(3, 4, 4, 3, 3)  
 Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
POTENTIAL_GROWTH(	2.353295	0.165546	14.21537	0.0000
POTENTIAL_GROWTH(	-2.034450	0.292691	-6.950836	0.0000
POTENTIAL_GROWTH(	0.703964	0.127889	5.504486	0.0003
LNLAB	-0.003594	0.001459	-2.463197	0.0335
LNLAB(-1)	-0.002277	0.001890	-1.205117	0.2559
LNLAB(-2)	0.004646	0.002604	1.783847	0.1048
LNLAB(-3)	-0.001208	0.002981	-0.405109	0.6939
LNLAB(-4)	0.002673	0.001982	1.348989	0.2071
LNGFCF	0.003257	0.000822	3.964311	0.0027
LNGFCF(-1)	0.002601	0.000715	3.639972	0.0045
LNGFCF(-2)	0.004476	0.000929	4.817234	0.0007
LNGFCF(-3)	0.001271	0.000860	1.478440	0.1701
LNGFCF(-4)	0.001787	0.000803	2.224822	0.0503
LNHUMANK	-0.001109	0.001589	-0.697741	0.5012
LNHUMANK(-1)	-0.003332	0.001445	-2.305921	0.0438
LNHUMANK(-2)	0.001064	0.001088	0.977995	0.3511
LNHUMANK(-3)	0.000883	0.001146	0.770486	0.4588
LNOILP	-0.000841	0.000283	-2.967689	0.0141
LNOILP(-1)	-0.000764	0.000350	-2.182406	0.0540
LNOILP(-2)	-0.001431	0.000371	-3.859092	0.0032
LNOILP(-3)	-0.000853	0.000286	-2.985689	0.0137
C	-0.374855	0.075503	-4.964765	0.0006
R-squared	0.999979	Mean dependent var		0.046998
Adjusted R-squared	0.999935	S.D. dependent var		0.022771
S.E. of regression	0.000184	Akaike info criterion		-14.14868
Sum squared resid	3.39E-07	Schwarz criterion		-13.14099
Log likelihood	248.3789	Hannan-Quinn criter.		-13.81466
F-statistic	22545.68	Durbin-Watson stat		2.129242
Prob(F-statistic)	0.000000			

\*Note: p-values and any subsequent tests do not account for model selection.

DO NOT COPY

ARDL Long Run Form and Bounds Test  
 Dependent Variable: D(POTENTIAL\_GROWTH)  
 Selected Model: ARDL(3, 4, 4, 3, 3)  
 Case 2: Restricted Constant and No Trend  
 Date: 11/04/22 Time: 02:48  
 Sample: 1986 2021  
 Included observations: 32

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.374855	0.075503	-4.964765	0.0006
POTENTIAL_GROWTH(	0.022810	0.005933	3.844818	0.0032
LNLAB(-1)	0.000240	0.001245	0.192534	0.8512
LNGFCF(-1)	0.013392	0.002835	4.723907	0.0008
LNHUMANK(-1)	-0.002494	0.002108	-1.182847	0.2642
LNOILP(-1)	-0.003889	0.000753	-5.165429	0.0004
D(POTENTIAL_GROWTH	1.330486	0.167768	7.930497	0.0000
D(POTENTIAL_GROWTH	-0.703964	0.127889	-5.504486	0.0003
D(LNLAB)	-0.003594	0.001459	-2.463197	0.0335
D(LNLAB(-1))	-0.006111	0.001666	-3.669164	0.0043
D(LNLAB(-2))	-0.001465	0.001968	-0.744539	0.4737
D(LNLAB(-3))	-0.002673	0.001982	-1.348989	0.2071
D(LNGFCF)	0.003257	0.000822	3.964311	0.0027
D(LNGFCF(-1))	-0.007534	0.001972	-3.820114	0.0034
D(LNGFCF(-2))	-0.003058	0.001252	-2.442733	0.0347
D(LNGFCF(-3))	-0.001787	0.000803	-2.224822	0.0503
D(LNHUMANK)	-0.001109	0.001589	-0.697741	0.5012
D(LNHUMANK(-1))	-0.001947	0.000997	-1.953491	0.0793
D(LNHUMANK(-2))	-0.000883	0.001146	-0.770486	0.4588
D(LNOILP)	-0.000841	0.000283	-2.967689	0.0141
D(LNOILP(-1))	0.002284	0.000538	4.242484	0.0017
D(LNOILP(-2))	0.000853	0.000286	2.985689	0.0137

\* p-value incompatible with t-Bounds distribution.

Levels Equation  
 Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNLAB	-0.010509	0.055201	-0.190375	0.8528
LNGFCF	-0.587126	0.119634	-4.907668	0.0006
LNHUMANK	0.109330	0.081346	1.344010	0.2086
LNOILP	0.170484	0.032428	5.257344	0.0004
C	16.43396	3.411775	4.816836	0.0007

$$EC = POTENTIAL\_GROWTH - (-0.0105*LNLAB - 0.5871*LNGFCF + 0.1093*LNHUMANK + 0.1705*LNOILP + 16.4340)$$

F-Bounds Test		Null Hypothesis: No levels relationship			
Test Statistic	Value	Signif.	I(0)	I(1)	
F-statistic k	9.193046 4	10%	2.2	3.09	
		5%	2.56	3.49	
		2.5%	2.88	3.87	
		1%	3.29	4.37	
Actual Sample Size	32	10%	2.46	3.46	
		5%	2.947	4.088	
		1%	4.093	5.532	
		10%	2.525	3.56	
		5%	3.058	4.223	
		1%	4.28	5.84	

ARDL Error Correction Regression  
 Dependent Variable: D(POTENTIAL\_GROWTH)  
 Selected Model: ARDL(3, 4, 4, 3, 3)  
 Case 2: Restricted Constant and No Trend  
 Date: 11/04/22 Time: 02:49  
 Sample: 1986 2021  
 Included observations: 32

ECM Regression  
 Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(POTENTIAL_GROWT	1.330486	0.063978	20.79593	0.0000
D(POTENTIAL_GROWT	-0.703964	0.039596	-17.77886	0.0000
D(LNLAB)	-0.003594	0.000850	-4.228024	0.0017
D(LNLAB(-1))	-0.006111	0.001124	-5.438760	0.0003
D(LNLAB(-2))	-0.001465	0.001201	-1.220153	0.2504
D(LNLAB(-3))	-0.002673	0.001301	-2.054599	0.0670
D(LNGFCF)	0.003257	0.000494	6.595912	0.0001
D(LNGFCF(-1))	-0.007534	0.001082	-6.961647	0.0000
D(LNGFCF(-2))	-0.003058	0.000684	-4.471821	0.0012
D(LNGFCF(-3))	-0.001787	0.000563	-3.176775	0.0099
D(LNHUMANK)	-0.001109	0.000716	-1.549837	0.1522
D(LNHUMANK(-1))	-0.001947	0.000595	-3.270744	0.0084
D(LNHUMANK(-2))	-0.000883	0.000618	-1.427547	0.1839
D(LNOILP)	-0.000841	0.000186	-4.507994	0.0011
D(LNOILP(-1))	0.002284	0.000363	6.290063	0.0001
D(LNOILP(-2))	0.000853	0.000201	4.248010	0.0017
CointEq(-1)*	0.022810	0.002508	9.096011	0.0000
R-squared	0.999504	Mean dependent var	-0.000603	
Adjusted R-squared	0.998975	S.D. dependent var	0.004698	
S.E. of regression	0.000150	Akaike info criterion	-14.46118	
Sum squared resid	3.39E-07	Schwarz criterion	-13.68251	
Log likelihood	248.3789	Hannan-Quinn criter.	-14.20308	
Durbin-Watson stat	2.129242			

\* p-value incompatible with t-Bounds distribution.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	9.193046	10%	2.2	3.09
k	4	5%	2.56	3.49
		2.5%	2.88	3.87
		1%	3.29	4.37

Breusch-Godfrey Serial Correlation LM Test:  
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.284356	Prob. F(2,8)	0.3283
Obs*R-squared	7.777559	Prob. Chi-Square(2)	0.0205

Test Equation:  
Dependent Variable: RESID  
Method: ARDL  
Date: 11/04/22 Time: 02:51  
Sample: 1990 2021  
Included observations: 32  
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
POTENTIAL_GROWTH(	0.106981	0.174718	0.612309	0.5573
POTENTIAL_GROWTH(	-0.208915	0.313591	-0.666203	0.5240
POTENTIAL_GROWTH(	0.105187	0.140695	0.747627	0.4761
LNLAB	-0.000927	0.001899	-0.488080	0.6386
LNLAB(-1)	-0.000946	0.002325	-0.406828	0.6948
LNLAB(-2)	0.002898	0.003126	0.926944	0.3811
LNLAB(-3)	-0.001507	0.003048	-0.494367	0.6343
LNLAB(-4)	-0.000243	0.001935	-0.125705	0.9031
LNGFCF	0.000661	0.001033	0.639797	0.5402
LNGFCF(-1)	0.000484	0.000770	0.628592	0.5471
LNGFCF(-2)	0.000132	0.000966	0.136548	0.8948
LNGFCF(-3)	-0.000605	0.000959	-0.630638	0.5459
LNGFCF(-4)	-0.000373	0.000836	-0.445975	0.6674
LNHUMANK	0.000807	0.001640	0.491918	0.6360
LNHUMANK(-1)	-0.000244	0.001415	-0.172469	0.8674
LNHUMANK(-2)	-9.23E-06	0.001074	-0.008590	0.9934
LNHUMANK(-3)	0.000968	0.001270	0.762358	0.4677
LNOILP	-5.99E-05	0.000297	-0.201954	0.8450
LNOILP(-1)	0.000123	0.000350	0.352068	0.7339
LNOILP(-2)	-8.09E-05	0.000380	-0.212880	0.8367
LNOILP(-3)	-4.39E-05	0.000281	-0.156122	0.8798
C	-0.013262	0.075789	-0.174992	0.8654
RESID(-1)	-0.599497	0.565009	-1.061039	0.3197
RESID(-2)	-0.821555	0.536939	-1.530071	0.1645
R-squared	0.243049	Mean dependent var	4.86E-17	
Adjusted R-squared	-1.933186	S.D. dependent var	0.000105	
S.E. of regression	0.000179	Akaike info criterion	-14.30214	
Sum squared resid	2.57E-07	Schwarz criterion	-13.20284	
Log likelihood	252.8342	Hannan-Quinn criter.	-13.93775	
F-statistic	0.111683	Durbin-Watson stat	2.374169	
Prob(F-statistic)	0.999984			

DO NOT

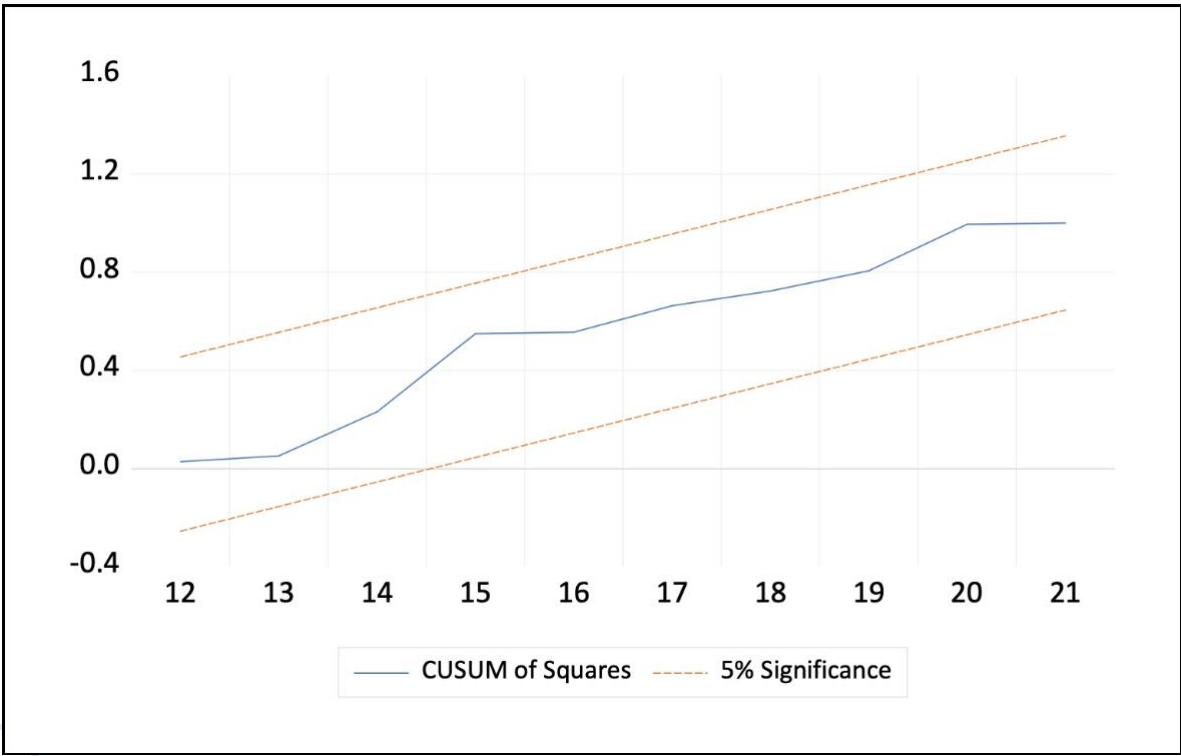
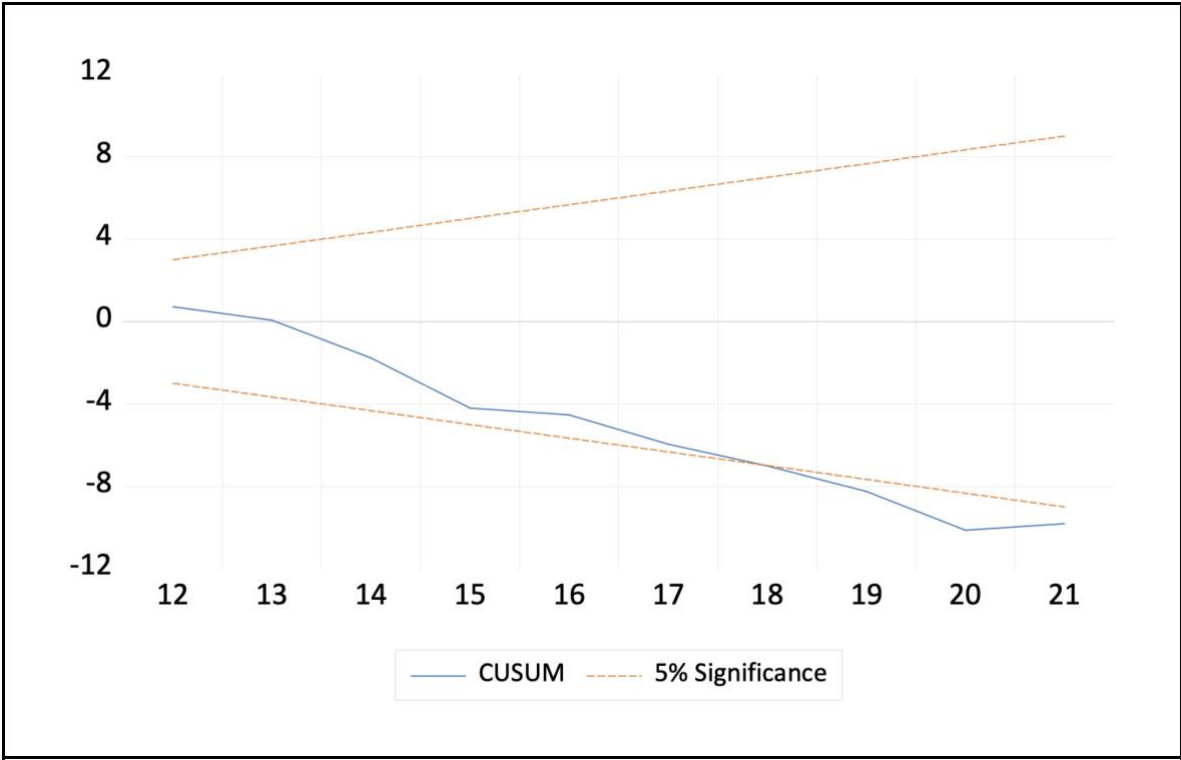
Heteroskedasticity Test: Breusch-Pagan-Godfrey  
Null hypothesis: Homoskedasticity

F-statistic	1.623689	Prob. F(21,10)	0.2164
Obs*R-squared	24.74335	Prob. Chi-Square(21)	0.2585
Scaled explained SS	1.704867	Prob. Chi-Square(21)	1.0000

Test Equation:  
Dependent Variable: RESID^2  
Method: Least Squares  
Date: 11/04/22 Time: 02:51  
Sample: 1990 2021  
Included observations: 32

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.72E-07	4.40E-06	-0.220885	0.8296
POTENTIAL_GROWTH(	-9.00E-06	9.65E-06	-0.933111	0.3727
POTENTIAL_GROWTH(	1.56E-05	1.71E-05	0.916760	0.3808
POTENTIAL_GROWTH(	-6.13E-06	7.45E-06	-0.822243	0.4301
LNLAB	-4.75E-08	8.50E-08	-0.558883	0.5885
LNLAB(-1)	1.52E-07	1.10E-07	1.384371	0.1964
LNLAB(-2)	-1.81E-07	1.52E-07	-1.194441	0.2599
LNLAB(-3)	1.62E-07	1.74E-07	0.934194	0.3722
LNLAB(-4)	-3.27E-08	1.15E-07	-0.283499	0.7826
LNGFCF	-1.39E-09	4.79E-08	-0.029007	0.9774
LNGFCF(-1)	1.08E-08	4.16E-08	0.260555	0.7997
LNGFCF(-2)	3.38E-08	5.41E-08	0.623447	0.5469
LNGFCF(-3)	4.45E-09	5.01E-08	0.088762	0.9310
LNGFCF(-4)	2.31E-08	4.68E-08	0.494376	0.6317
LNHUMANK	-1.43E-07	9.26E-08	-1.541460	0.1542
LNHUMANK(-1)	6.30E-09	8.42E-08	0.074879	0.9418
LNHUMANK(-2)	-4.71E-09	6.34E-08	-0.074307	0.9422
LNHUMANK(-3)	-1.35E-07	6.67E-08	-2.023229	0.0706
LNOILP	-2.04E-10	1.65E-08	-0.012345	0.9904
LNOILP(-1)	-1.67E-08	2.04E-08	-0.818282	0.4323
LNOILP(-2)	7.49E-10	2.16E-08	0.034657	0.9730
LNOILP(-3)	-7.30E-09	1.66E-08	-0.438762	0.6702
R-squared	0.773230	Mean dependent var	1.06E-08	
Adjusted R-squared	0.297012	S.D. dependent var	1.28E-08	
S.E. of regression	1.07E-08	Akaike info criterion	-33.64968	
Sum squared resid	1.15E-15	Schwarz criterion	-32.64199	
Log likelihood	560.3949	Hannan-Quinn criter.	-33.31566	
F-statistic	1.623689	Durbin-Watson stat	2.672709	
Prob(F-statistic)	0.216364			

DO NOT



ARDL Long Run Form and Bounds Test  
 Dependent Variable: D(OUTPUT\_GAP)  
 Selected Model: ARDL(4, 3, 4, 4, 4)  
 Case 2: Restricted Constant and No Trend  
 Date: 11/04/22 Time: 03:05  
 Sample: 1986 2021  
 Included observations: 32

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.167443	0.165516	-1.011647	0.3413
OUTPUT_GAP(-1)*	-0.970248	0.439964	-2.205291	0.0585
LNOILP(-1)	0.065600	0.038464	1.705489	0.1265
INT(-1)	0.001978	0.003210	0.615978	0.5550
LNEXC(-1)	-0.028290	0.012763	-2.216515	0.0575
INF(-1)	0.000830	0.001158	0.716752	0.4939
D(OUTPUT_GAP(-1))	0.415938	0.231395	1.797528	0.1100
D(OUTPUT_GAP(-2))	0.575590	0.244393	2.355181	0.0463
D(OUTPUT_GAP(-3))	0.237639	0.249894	0.950963	0.3695
D(LNOILP)	-0.014753	0.016892	-0.873342	0.4079
D(LNOILP(-1))	-0.054523	0.037559	-1.451635	0.1847
D(LNOILP(-2))	-0.028336	0.022990	-1.232527	0.2527
D(INT)	-5.49E-05	5.60E-05	-0.980207	0.3557
D(INT(-1))	-0.001980	0.002349	-0.842602	0.4239
D(INT(-2))	-0.000229	0.001856	-0.123375	0.9049
D(INT(-3))	0.002035	0.001758	1.157355	0.2805
D(LNEXC)	-0.056028	0.021624	-2.591027	0.0321
D(LNEXC(-1))	0.019277	0.024111	0.799515	0.4471
D(LNEXC(-2))	0.027173	0.025750	1.055243	0.3221
D(LNEXC(-3))	0.029116	0.015364	1.895080	0.0947
D(INF)	-0.000325	0.000503	-0.647412	0.5355
D(INF(-1))	-0.000821	0.000885	-0.927682	0.3807
D(INF(-2))	1.88E-05	0.000622	0.030180	0.9767
D(INF(-3))	-0.001076	0.000492	-2.189311	0.0600

\* p-value incompatible with t-Bounds distribution.

Levels Equation  
 Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOILP	0.067612	0.017802	3.798027	0.0053
INT	0.002038	0.002720	0.749397	0.4751
LNEXC	-0.029158	0.010879	-2.680094	0.0279
INF	0.000855	0.000950	0.900637	0.3941
C	-0.172578	0.109476	-1.576399	0.1536

$$EC = OUTPUT\_GAP - (0.0676 * LNOILP + 0.0020 * INT - 0.0292 * LNEXC + 0.000855 * INF - 0.1726)$$

F-Bounds Test Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic k	2.336569 4	10% 5% 2.5% 1%	Asymptotic: n=1000	
			2.2	3.09
			2.56	3.49
			2.88	3.87
Actual Sample Size	32	10% 5% 1%	Finite Sample: n=35	
			2.46	3.46
			2.947	4.088
			4.093	5.532
		10% 5% 1%	Finite Sample: n=30	
			2.525	3.56
			3.058	4.223
			4.28	5.84

DO NOT

ARDL Long Run Form and Bounds Test  
 Dependent Variable: D(OUTPUT\_GAP)  
 Selected Model: ARDL(4, 3, 3, 4)  
 Case 2: Restricted Constant and No Trend  
 Date: 11/04/22 Time: 03:07  
 Sample: 1986 2021  
 Included observations: 32

Conditional Error Correction Regression

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.154681	0.066427	-2.328594	0.0354
OUTPUT_GAP(-1)*	-1.030002	0.260644	-3.951762	0.0014
LNOILP(-1)	0.077058	0.020727	3.717797	0.0023
INT(-1)	0.003533	0.002277	1.551279	0.1431
LNEXC(-1)	-0.041902	0.010901	-3.843882	0.0018
D(OUTPUT_GAP(-1))	0.412882	0.135368	3.050064	0.0086
D(OUTPUT_GAP(-2))	0.230602	0.156417	1.474270	0.1625
D(OUTPUT_GAP(-3))	0.214632	0.183486	1.169749	0.2616
D(LNOILP)	0.001661	0.016216	0.102440	0.9199
D(LNOILP(-1))	-0.061409	0.025951	-2.366315	0.0329
D(LNOILP(-2))	-0.042431	0.019223	-2.207333	0.0445
D(INT)	-2.34E-05	5.51E-05	-0.425394	0.6770
D(INT(-1))	-0.002277	0.001702	-1.338027	0.2022
D(INT(-2))	-0.002077	0.001233	-1.685093	0.1141
D(LNEXC)	-0.042098	0.017300	-2.433360	0.0290
D(LNEXC(-1))	0.017863	0.018859	0.947227	0.3596
D(LNEXC(-2))	0.009405	0.015694	0.599304	0.5585
D(LNEXC(-3))	0.032474	0.015393	2.109653	0.0534

\* p-value incompatible with t-Bounds distribution.

Levels Equation  
 Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNOILP	0.074814	0.013857	5.399053	0.0001
INT	0.003430	0.001879	1.825135	0.0894
LNEXC	-0.040681	0.005954	-6.833096	0.0000
C	-0.150176	0.057029	-2.633317	0.0197

$$EC = OUTPUT\_GAP - (0.0748 * LNOILP + 0.0034 * INT - 0.0407 * LNEXC - 0.1502)$$

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic k	5.172181 3		Asymptotic: n=1000	
		10%	2.37	3.2
		5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	32		Finite Sample: n=35	
		10%	2.618	3.532
		5%	3.164	4.194
		1%	4.428	5.816
			Finite Sample: n=30	
		10%	2.676	3.586
		5%	3.272	4.306
		1%	4.614	5.966

ARDL Error Correction Regression  
 Dependent Variable: D(OUTPUT\_GAP)  
 Selected Model: ARDL(4, 3, 3, 4)  
 Case 2: Restricted Constant and No Trend  
 Date: 11/04/22 Time: 03:07  
 Sample: 1986 2021  
 Included observations: 32

ECM Regression  
 Case 2: Restricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(OUTPUT_GAP(-1))	0.412882	0.114191	3.615719	0.0028
D(OUTPUT_GAP(-2))	0.230602	0.122633	1.880423	0.0810
D(OUTPUT_GAP(-3))	0.214632	0.131645	1.630389	0.1253
D(LNOILP)	0.001661	0.012047	0.137887	0.8923
D(LNOILP(-1))	-0.061409	0.019001	-3.231890	0.0060
D(LNOILP(-2))	-0.042431	0.014288	-2.969763	0.0101
D(INT)	-2.34E-05	4.61E-05	-0.508815	0.6188
D(INT(-1))	-0.002277	0.000922	-2.470040	0.0270
D(INT(-2))	-0.002077	0.000883	-2.351082	0.0339
D(LNEXC)	-0.042098	0.010635	-3.958424	0.0014
D(LNEXC(-1))	0.017863	0.012641	1.413118	0.1795
D(LNEXC(-2))	0.009405	0.013682	0.687445	0.5030
D(LNEXC(-3))	0.032474	0.010360	3.134607	0.0073
CointEq(-1)*	-1.030002	0.178626	-5.766258	0.0000
R-squared	0.827597	Mean dependent var	-0.001551	
Adjusted R-squared	0.703083	S.D. dependent var	0.026123	
S.E. of regression	0.014234	Akaike info criterion	-5.366687	
Sum squared resid	0.003647	Schwarz criterion	-4.725428	
Log likelihood	99.86699	Hannan-Quinn criter.	-5.154128	
Durbin-Watson stat	2.129829			

\* p-value incompatible with t-Bounds distribution.

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
F-statistic	5.172181	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66

Breusch-Godfrey Serial Correlation LM Test:  
Null hypothesis: No serial correlation at up to 2 lags

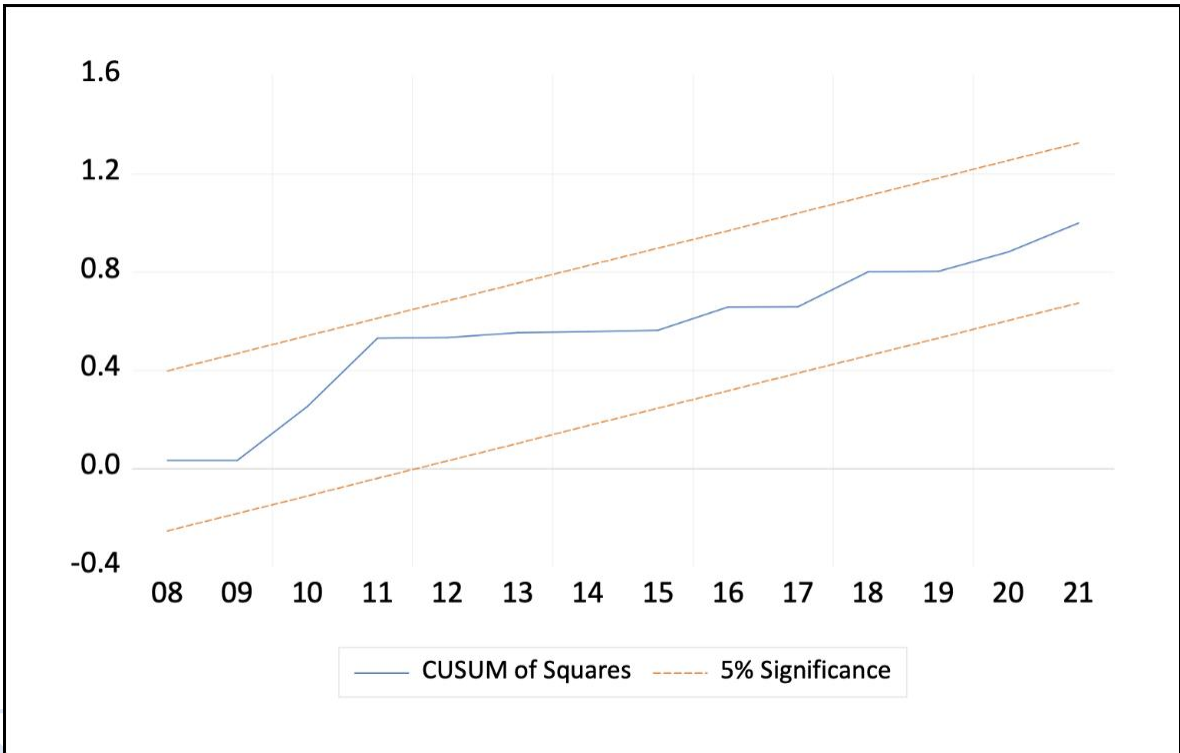
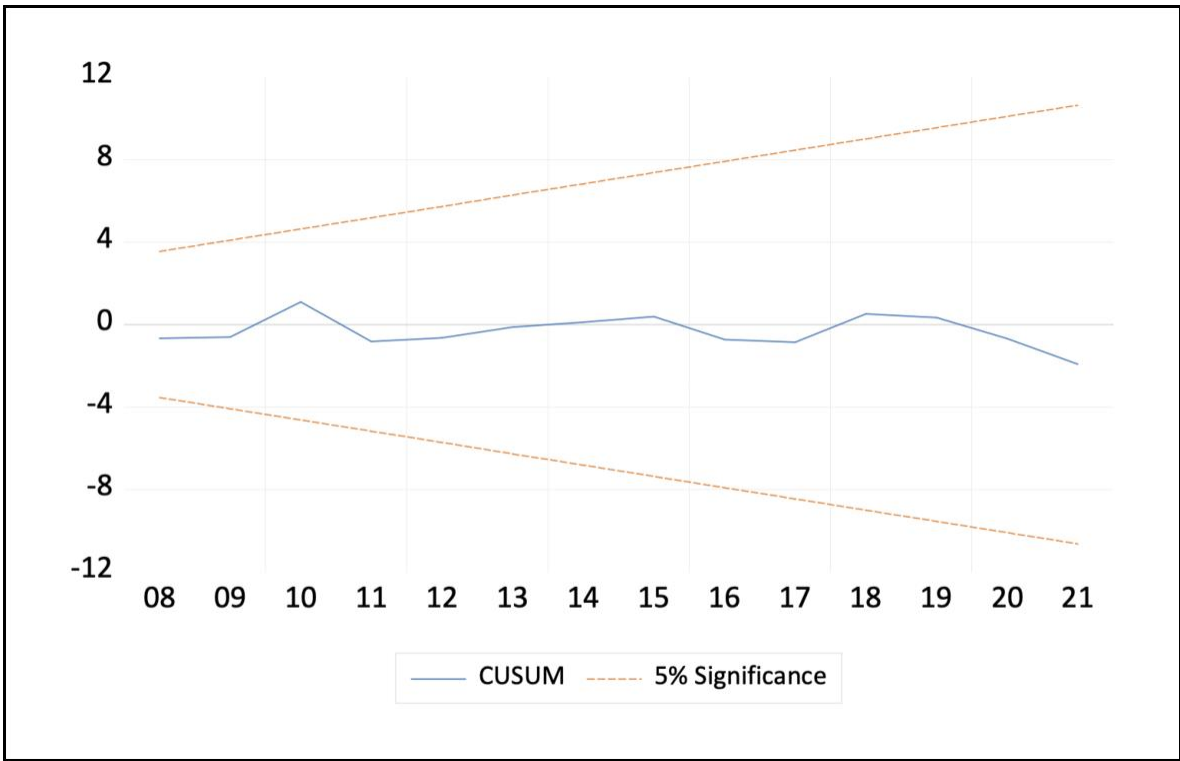
F-statistic	1.647733	Prob. F(2,12)	0.2332
Obs*R-squared	6.894522	Prob. Chi-Square(2)	0.0318

Test Equation:  
Dependent Variable: RESID  
Method: ARDL  
Date: 11/04/22 Time: 03:08  
Sample: 1990 2021  
Included observations: 32  
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
OUTPUT_GAP(-1)	0.085968	0.300706	0.285886	0.7798
OUTPUT_GAP(-2)	0.120529	0.234337	0.514339	0.6164
OUTPUT_GAP(-3)	-0.154179	0.213473	-0.722242	0.4840
OUTPUT_GAP(-4)	0.124546	0.188622	0.660291	0.5215
LNOILP	0.008562	0.016384	0.522578	0.6108
LNOILP(-1)	0.006300	0.020478	0.307639	0.7636
LNOILP(-2)	-0.013683	0.020458	-0.668850	0.5163
LNOILP(-3)	-0.006789	0.019044	-0.356473	0.7277
INT	3.17E-06	5.37E-05	0.059043	0.9539
INT(-1)	0.000261	0.001499	0.173885	0.8649
INT(-2)	0.000551	0.001298	0.424261	0.6789
INT(-3)	-0.000410	0.001202	-0.341048	0.7390
LNEXC	0.015644	0.019405	0.806202	0.4358
LNEXC(-1)	-0.020362	0.026882	-0.757480	0.4634
LNEXC(-2)	0.003341	0.024711	0.135187	0.8947
LNEXC(-3)	0.005351	0.022166	0.241381	0.8133
LNEXC(-4)	0.001235	0.014926	0.082713	0.9354
C	-0.008549	0.067430	-0.126784	0.9012
RESID(-1)	-0.178356	0.362464	-0.492064	0.6316
RESID(-2)	-0.710283	0.417036	-1.703171	0.1143
R-squared	0.215454	Mean dependent var	7.49E-17	
Adjusted R-squared	-1.026744	S.D. dependent var	0.010847	
S.E. of regression	0.015442	Akaike info criterion	-5.234337	
Sum squared resid	0.002861	Schwarz criterion	-4.318252	
Log likelihood	103.7494	Hannan-Quinn criter.	-4.930681	
F-statistic	0.173446	Durbin-Watson stat	2.142653	
Prob(F-statistic)	0.999611			

Heteroskedasticity Test: Breusch-Pagan-Godfrey  
Null hypothesis: Homoskedasticity

F-statistic	0.477226	Prob. F(17,14)	0.9256
Obs*R-squared	11.74029	Prob. Chi-Square(17)	0.8156
Scaled explained SS	1.781883	Prob. Chi-Square(17)	1.0000



### A. Personal Data

1. Full Names: Ogiogwa, OlufunkeChioma
2. Address: 9, AkanbiAkinpelu Close, OritaBashorun, Ibadan, Oyo State, Nigeria.
3. Date and Place of Birth: 4<sup>th</sup> February, 1979, Ibadan.
4. Nationality: Nigerian

**B. Name and Address of Next of Kin:**Osho-WyinsModupeore. 9, AkanbiAkinpelu Close, OritaBashorun, Ibadan, Oyo State, Nigeria.

### C. Educational Background

Educational Institutions Attended with Dates and Qualifications

Lead City University Ibadan, Oyo State (M.Sc. Economics)	In-view
Bureau of Public Procurement	2019
Babcock University, Ilishan- Remo,Ogun State. (B.Sc. Economics)	1999-2008
Christ Victory College Moniya, Ibadan (NECO)	2006
Universal Computers Ibadan (Diploma)	1998
St. Louis Grammar School Mokola, Ibadan (SSCE)	1990-1995
Mary Hill Convent School Idi-Ape Ibadan (First School leaving certificate)	1988-1989
St. Catherine's Model School Surulere, Lagos	1984-1988
Lebanese Community School Yaba, Lagos	1982-1984

### D. Working Experience with Dates

National Biotechnology Development Agency Deployed to Biotechnology Development Centre Ogbomosho	2016 - till date
Tigolf Travels & Tours Ltd Ibadan (Ticketing Officer)	2012 – 2015
Education Trust Fund, Maitama, Abuja ( NYSC)	2009
E. Certificates: Certificate of Conversion to Procurement Cadre	2019
F. Award and Fellowships: NIL	
G. Membership of Academic Professional Bodies:	
H. Publication (if Any) –NIL	

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Signature

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Date

### University Compliance Certification

This is to certify that the thesis by **OgiogwaOlufunkeChioma** in the Department of Economics, Faculty of Social Sciences, Lead City University, Ibadan is in full compliance with the approved University Format and Style.

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Name

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Date

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