# A COMPARATIVE ANALYSIS OF DECLINING OIL REVENUE IMPLICATIONS ON MONO-ECONOMY BUDGETARY OBJECTIVES

**A thesis submitted to Dundee Business School, Abertay University, In Partial Fulfilment of the Requirements for the Award of the Degree of Doctor of Philosophy (PhD)**

By


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**OCTOBER, 2019**

## Declaration

Candidate's declarations:

I, Eze Millicent Adanne, hereby certify that this thesis submitted in partial fulfilment of the requirements for the award of Doctor of Philosophy (PhD), Abertay University, is wholly my own work unless otherwise referenced or acknowledged. This work has not been submitted for any other qualification at any other academic institution.

Signed ………… [redacted]

Date……………. October, 2019

Supervisor's declaration:

I, Professor Reza Kouhy hereby certify that the candidate has fulfilled the conditions of the Resolution and Regulations appropriate for the degree of Doctor of Philosophy in Abertay University and that the candidate is qualified to submit this thesis in application for that degree.

Signed [Principal Supervisors signature]…………………………………...

Date……………………………………………………………………………..

## Certificate of Approval

I certify that this is a true and accurate version of the thesis approved by the examiners, and that all relevant ordinance regulations have been fulfilled.

Supervisor……………………………………………………………..…….

Date……………………………………………………………………………..

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## Dedication

This thesis is dedicated to the ***HOLY TRINITY***: God the Father, God the Son and God the Holy Spirit, my source of knowledge, strength and inspiration, who has made this academic journey, a very successful one. To God alone be all the Glory.

Also, to my Mother of Perpetual Help for her love and constant intercession.

## Abstract

*Crude oil is known as one of the most dynamically transacted commodities in today's world, and as such, the global impact of the changes in oil price cannot be over-emphasised. Historically, these changes in oil price have been a constant phenomenon from the time when the oil price dropped substantially to its lowest level of $1.17 per barrel in 1946 to the period when oil price reached its peak of $145.31 per barrel in 2008. Although the magnitude of the effects differ across nations as oil serves as a crucial input to oil importers and a good source of revenue generation to oil exporters. Economically, both oil importers and exporters are dependent on oil, and as such, fluctuations in oil price affects both market sides.*

*However, this study is a comparative analysis of declining oil revenue implications on mono-economy budgetary objectives, the case of Nigeria, Venezuela and Norway whose highest percentage of revenue emanates from oil. Recently, the oil industry has experienced a persistent decline in oil price, which has also led to the decline in oil revenues of most of the oil-exporting countries. The main concern is the ability of these nations to continue with their economic development aspirations in this new paradigm shift to oil revenue, necessitated by the decreasing oil price.*

*Methodologically, the study is based on dual methods of data sources, which involve both primary and secondary methods of data collection. The primary data analysis was mainly to supplement the secondary data analysis as it addresses one of the research questions. While the primary data were gathered using questionnaires and analysed with SPSS version 25, the ARDL estimation technique was employed for the empirical analysis using time series yearly data for 36 years (1981-2016).*

*The findings reveal that the government revenue of Nigeria, Venezuela and Norway dropped substantially for a percentage decrease in the oil price which indicates that the nations are overwhelmingly dependent on oil export as a major source of revenue. Contrary to expectation, the results also reveal that a percentage decline in oil price exerts a positive and significant effect on the government expenditures of Nigeria and Venezuela, financed mainly through borrowing. Norway serves as a reference to best practice as the results also reveal that Norway manages its resources effectively and not affected by the resource-curse syndrome. However, to improve the revenue base of the Nigerian and Venezuela economies, it is highly recommended that these nations diversify their revenue base, restore security which will attract foreign investors, develop the agricultural sector, which was the mainstay of the Nigerian economy before the discovery of oil, manage other natural resources efficiently and utilise government funds effectively. In addition, an economic model was developed for Nigeria and the Venezuelan economy, which would help in closing the revenue gaps in these oil-dependent nations.*

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## Abbreviations, Symbols and Notation

| | |
|---|---|
| ADF | Augmented Dickey-Fuller Test |
| AEXP | Actual Government Expenditure |
| ARDL | Autoregressive Distributed Lag |
| AREV | Actual Government Revenue |
| ATC | Average Total Cost |
| BBC | British Broadcasting Corporation |
| BC | Brent Crude |
| BCV | Banco Central De Venezuela |
| CAD | Cost of Administrative Duties |
| CBF | Cost of Building Facilities |
| CBN | Central Bank of Nigeria |
| CIA | Central Intelligent Agency |
| CLO | Cost of Lifting Oil |
| CNW | Cost of New Wells |
| CP | Capital Expenditures |
| CPI | Consumer Price Index |
| CPL | Cost of Pipelines |
| CUSUM SQUARES | Cumulative Squares test for Stability |
| CUSUM | Cumulative Sum |
| ECM | Error Correction Model |
| EIA | Energy Information Administration |
| EVIEWS | Econometric Views (Statistical Package) |
| EXCR | Exchange Rate |
| EXTR | External Reserves |
| GCC | Gulf Cooperation Council |
| GDP | Gross Domestic Product |
| GFSM | Government Finance Statistics Manual |
| GHG | Green House Gas |
| IEA | International Energy Agency |
| IISD | International Institute for Sustainable Development |
| IMF | International Monetary Fund |

| | |
|---|---|
| INFR | Inflation Rate |
| IOGA | Illinois Oil & Gas Association |
| LCU | Local Currency Units |
| MENA | Middle East and North Africa |
| NBS | National Bureau of Statistics |
| NNPC | Nigerian national Petroleum Corporation |
| NOK | Norwegian Krone (Official Currency of Norway) |
| OECD | Organisation for Economic Co-operation and Development |
| OGJ | Oil and Gas Journal |
| OILP | Oil Price |
| OP | Operational Expenditures |
| OPEC | Organisation of Petroleum Exporting Countries |
| PPT | Phillips-Perron Test |
| SPSS | Statistical package for the Social Sciences |
| SVAR | Structural Vector Auto Regression Model |
| SWF | Sovereign Wealth Fund |
| TC | Total Cost |
| TR | Total Revenue |
| UAE | United Arab Emirate |
| UEMR | Unemployment Rate |
| USA | United States of America |
| VAR | Vector Auto regression |
| VECM | Vector Error Correction Model |
| VEF | Currency Code for Venezuelan Bolivars |
| WTI | West Texas Intermediate |
| X-M | Net Exports (The External Sector) |

# CHAPTER ONE

## Introduction

# CHAPTER ONE

# 1.0 Introduction

## 1.1 Background and Rationale of the Study

Crude oil is one of the most dynamically traded commodities all over the world. Over the years, the interest in the causes and consequences of oil price fluctuations has been on the increase among different researchers, policymakers, academics and market practitioners (Fueki et al., 2018; World Bank, 2015; Arezki and Blanchard, 2015). Changes in oil price have been a constant phenomenon since February 1946 when the oil price was as low as $1.17 per barrel to July 2008 when oil price reached its peak of $145.31 per barrel. Presently, oil price as at the 12th of May 2019 was traded at an average of $70 per barrel while as at the 07th of December, 2018 it was traded at an average of $52.61 per barrel (Stocker, Baffes and Vorisek, 2018; Depersio, 2018; Macrotrends, 2010-2018). The changes in oil price in the whole series is often demonstrated using a roller coaster simulation of oil prices, which usually displays different years with the corresponding oil prices. However, it shows that oil price has been changing over the years.

Although, the magnitude of these changes differs across countries, depending on whether the country is oil importer or oil exporter. Both oil exporters and oil importers find oil prices very critical in dealing with the affairs of the nation as oil serves as a crucial input to oil importers and a good source of a revenue generator to oil exporters. Both are economically dependent on oil, and as such, fluctuations in oil prices as we often observe affects both market sides. Besides, oil price also plays a very significant role in the structure of these oil-exporting countries.

Since the year 2014, there has been a continuous decline in the oil price, which has correspondingly led to the decline in oil revenue of most of the oil-exporting countries. The concern is the ability of these oil-exporting nations to continue with their economic development aspirations in this new paradigm shift in oil revenue, necessitated by the depressed crude oil price.

Nevertheless, fluctuating oil prices are usually driven by various supply and demand factors. These changes in oil price affect the global economy in diverse ways depending on the main factor(s) generating the change. Davig et al., (2015) contend that the traditional demand and supply shocks have not fully explained the recent drop in oil prices since the year 2014 but that the unexplained part entails variations in expectations and uncertainty of oil demand and supply.

Most of these oil-exporting nations are overwhelmingly depending on oil revenue for over half of their exports such as Nigeria, Venezuela and Norway, which are the economies examined in this study. The three economies were examined and compared while necessary lessons were drawn from the Norwegian economy as it serves as a reference to best practice in this scenario. The choice of these countries was as a result of their high dependency on oil revenue which accounts for more than 96% of the Venezuelan export earnings (OPEC Annual Statistical Bulletin, 2016; Monaldi, 2015; Schipani, 2015; Pettinger, 2015). Also, oil accounts for over 85% of Nigeria's revenues (Adamu, 2015). While Nigeria is one of the highest producers and exporters of oil in Africa, Venezuela has the highest oil reserves in the whole world. The decline in oil revenue has adversely affected both the Nigerian and Venezuelan's economies and has widened the budget deficit gaps in these nations. The Norwegian economy on the other hand is a small open economy which has been tremendously transformed through the discovery of oil (Olsen, 2018; Krakenes, 2015) as the oil sector constitute about 57% of the Norwegians exports in 2014 and about 16% of its gross domestic product (Hass et al., 2017).

However, every nation has a statutory role in developing its economy, Nigeria, Venezuela and Norway like every other nation have been performing this role judiciously in their own peculiar ways through reliance on oil revenue and as such, oil revenue plays a very significant role in the structure of these oil-exporting countries. Given that oil price has been on the decrease since 2014, the major concern of this study, therefore, is hinged on the ability of these oil-exporting countries to continue with the economic development aspirations in this new paradigm shift to oil revenue, necessitated by the decreasing crude oil price. The power of OPEC in petroleum economics has always been to shore up prices, but in this new price shock, the collusive power of these oligopoly has failed as OPEC could no longer control the production quotas of its members which has also contributed to the recent persistent fall in oil price.

With the failure of the power of OPEC and with the trend that this fall in oil price might continue, in this study, an economic model has been proposed, which would help in closing the revenue gaps in these oil-dependent nations. Nonetheless, given the outcome of the analyses which reveal that these oil-exporting nations are overwhelmingly dependent on oil revenue as oil revenue declined substantially for a percentage decline in the oil price which metamorphosed to the inability of the nations to meet with their budgetary needs. As a result, an economic model was developed for Nigeria and Venezuela, which would help in closing their revenue gaps. Although, the Norwegian economy, which serves as a reference to best practice has an already existing model which is highly functional as the literature reveal the actions which the Norwegian economy take differently.

## 1.2 Research Aim and Objectives of the Study

The main aim of this research is to evaluate the consequences of declining oil revenue on the economic performance of Nigeria, Venezuela and Norway for a comparative analysis. However, the main objective was achieved through seven (7) other specific objectives as outlined below: -

i. To evaluate the effects of dwindling oil price on the actual revenues of Nigeria, Venezuela and Norway.
ii. To examine the impact of changes in oil price on the actual expenditures of Nigeria, Venezuela and Norway.
iii. To evaluate the effects of oil price fluctuation on Nigeria, Venezuela and Norwegian's economic growth.
iv. To assess the impact of declining oil price on Nigeria, Venezuela and Norway's external reserves.
v. To examine the impact of declining oil price on the inflation rates of these economies.
vi. To evaluate the effects of declining oil price on the unemployment rates of Nigeria, Venezuela and Norway.
vii. To assess how Nigeria, Venezuela and Norway attain their budgetary needs during the periods of declining oil revenues.

## 1.3 Motivation for the Study

The global oil markets had witnessed different episodes of oil price fluctuations since 1859 when oil was discovered in commercial quantities in Pennsylvania (Mohaddes and

Pesaran, 2016). Since 1946 to present, oil prices have fluctuated between the very high level of $145.31 per barrel and a low level of $1.17 per barrel which shows that crude oil is the most dynamically transacted commodities all over the globe. Although, the effect of this fluctuation in oil price differs across countries depending on whether the economy is oil-importing or oil-exporting. It also depends on the factors responsible for the fluctuation. While the oil-importing nations tend to benefit more from declining oil prices, the oil-exporting nations lose more revenues to lower oil prices. However, revenues from oil and gas play a very significant role in the structure of most of the oil-exporting countries and as such, its depletion due to lower oil prices, adversely affects their economic performance (Mohaddes and Pesaran, 2016; Eltejaei, 2015; Aliyan, 2013; Farzanegan, 2011; Farzanegan and Markwardt, 2009).

There was a drastic decline in the oil price of about 60% between June 2014 and January 2015. However, in the literature relating to oil price fluctuations and the macroeconomy, there is no consensus regarding the fundamentals of the decline in oil price, most of the studies rather contend that the decline in oil price was driven by a combination of diverse factors which has adverse effects on most of the oil-exporting nations relying so much on oil. The low oil prices have brought about significant shortfall in government revenues, potential economic recession and increasing risk of both economic and social instability (Kitous et al., 2016; Baumeister and Killian, 2016; Hodgson, 2015; Baffes et al.,2015; Husain et al., 2015; Arezki and Blanchard, 2014).

An unexpected increase in oil production is one of the essential parts in explaining the fluctuation in oil price. The discovery of shale gas as an alternative source of energy in the United States has also contributed immensely to the global drop in the oil price to less than $50 per barrel, since the second quarter of 2015. Also, more production of oil from

Saudi Arabia, Iraq and Libya may have contributed to the sharp decrease in the oil price since 2014. The development is negatively affecting the economic situation of petroleum exporting countries with the mono-economic system (Kitous et al., 2016; OGJ, 2015). For instance, nations like Saudi Arabia, Nigeria, Venezuela, Angola and others with economic sustenance based mainly on a single product that is only being sustained by revenue from oil export are facing challenges of attaining their financial needs (OGJ, 2015; Adamu 2015; Jimenez-Rodriguez and Sanchez, 2004; Abeysinghe 2001).

Nevertheless, decline in oil consumption (low aggregate demand) due to weaker economic growth in Europe and Asia could partly explain the sharp drop in oil prices coupled with the policy measures aimed at improving energy efficiency while most economies have increased their commitment towards renewable energy based on carbon reduction target of ensuring that global warming is kept under $2^0$C. More so, exchange rate volatility could lead to fluctuations in oil prices since the US dollar is the main currency used in the global oil market (Kitous et al., 2016).

Overall, the effect of the declining oil price on most of the oil-exporting countries cannot be overemphasised as these countries find it challenging to balance their budget, off-set foreign debts and to stabilise the local currencies (Hodgson, 2015).

Adamu (2015) contends that the effects of over-dependence of the Nigerian economy on the crude oil exports as a dominant source of foreign exchange earnings and government revenue are enormous. Thus, it revealed that the overall reduction in the price of Petroleum had a significant economic implication on the gross income and prices in Nigeria. Also, the decline in oil price has brought about serious exchange rate volatility, downward review of the budget benchmark, widened the budget deficit gap and increased the government expenditures financed mainly through borrowing.

However, Venezuela is one of the hardest hits among its peers as the economy is overwhelmingly dependent on oil than ever. The declining oil revenue has brought about an increase in foreign debt, increase in poverty level, increasing political tension due to economic instability. The Venezuelan economy is falling apart as residents lack access to basic food. The country has also laid off thousands of its oil workers and scrapped multibillion-dollar projects due to shortages of funds (Tong, 2016; Workman, 2016; OPEC Annual Statistical Bulletin, 2016; Monaldi, 2015; Schipani, 2015).

Additionally, the present slump in crude oil prices has affected Norway's profitability to the extent that three off-shore rigs are under suspension, more than ten thousand Norwegian oil workers have been suspended while over $150 million worth investments have been put on hold.

The foreign reserves of these countries are alarmingly very low and are reducing incessantly. Those exporting countries whose budgets are entirely relying on the high revenue from oil export as a result of the increasing price of petroleum are mostly in trouble. Nigeria has been forced to raise the interest rates and devalue the naira on two occasions from September 2014 to June 2015 (Oriakhi and Osaze 2013; Adamu 2015; Osuji 2015).

Nevertheless, the intricate issue with special concern is the implications of the declining oil revenues of these oil-exporting countries, especially Nigeria, Venezuela and Norway, on their budgetary provisions. Most of these economies are under stress due to the fiscal imbalance, exchange rate depreciation and deteriorating growth prospects imposed by the depressed crude oil price in the world oil market. How the Norwegian economy handled the "curse of oil" is worth emulating and would serve as a great lesson and reference to best practice to all oil-dependent economies. Particularly, to Nigeria and

Venezuelan economies in this period of the significant plunge in the oil revenues, which has resulted in the nation's inability to finance their fiscal needs (Koranyi, 2014).

Whenever this economic scenario occurs, the nations are left with severe fiscal implication on the budgetary provisions. The nations are often left with no other option than to move towards the categorisation of budgetary needs and as such, decide to embark on either internal or external borrowing to provide for the economy's budgetary requirements. More so, external reserves of the nations are depleted to sustain other viable sectors of the economies to avoid complete collapse. Hence, the need to examine the consequences of declining oil revenue implications on the mono-economy budgetary objectives of the nations with mono-economy, for a comparative analysis.

### 1.4 Significant of the Study

This research entails a comparative analysis of declining oil revenue implications on mono-economy budgetary objectives. The results and findings of all the analyses carried out in this research will redound to the benefit of the Nigerian economy, the Venezuelan economy and the Norwegian economy considering the significant roles the oil industries play in these nations. This research will help the government of these nations to find the solution to the issues of declining oil revenue due to low oil prices through the discovery of other natural resources and diversifying for more revenue.

However, other oil-exporting/dependent nations that consider all the recommended approaches derived from all the results and findings of this research, as outlined in chapter six, will also benefit immensely from the outcome/findings. The proposed economic model may be an excellent guide to improve the revenue base of all the nations that are overwhelmingly relying on oil revenue and also provide great lessons derivable from the Norwegian model which made them to stand out and not affected by the resource curse syndrome inherent in most oil-exporting nations, despite the huge sum and high windfall gains the Norwegian economy derives from oil since its discovery.

However, this study has actually enabled me to develop my knowledge of the subject and has aided me to uncover critical areas relating to oil and the macroeconomy which most of the previous oil-related studies were not able to explore. However, oil-related studies are not new at all given all the available works reviewed, but it is evident that most of the economies under study are developed and oil-importing such as Mohaddesay and Raissib, (2016) – USA; Fay et al., (2016) – Canada; Yoshino and Alekhina, (2016) – Russia; Taghizadeh-Hesary and Yoshino (2015) – USA, Japan and China; Saha, (2015) – Indonesia; Lusinyan and Thornton, (2012) – United Kingdom; Lorenzo et al., (2008) – Mexico; Gounder and Bartleet, (2007) – New Zealand; Hamilton and Herrera, (2004) – USA; Bhattacharya and Bhattacharyya, (2001) – India (Oil importing nation). Whereas this study focused on oil-exporting economies from different part of the globe: Nigeria – Western Africa on the Gulf of Guinea; Venezuela – Northern South America and Norway – Northern Europe.

More so, other related studies focus mainly on the impact of increasing oil price on the examined nations such as Nzimande and Msomi , (2016); Taghizadeh-Hesary and Yoshino (2015); Kaplan, (2015); Eltejaei, (2015); Dizaji, (2014)Yoshino and Hesary, (2014); Allegret et al., (2014); Ogundipe et al., (2014); Hesary et al., (2013); Oriakhi and Iyoha, (2013); Hamdi and Sbia, (2013); Emami and Adibpour, (2012); Asekunowo and Alaiya, (2012); Shi and Sun, (2012); Farzanegan, (2011); Hamilton, (2011, 2009, 2005, 2000, 1983); Kilian, (2010); Blanchard and Gali, (2010); Farzanegan and Markwardt, (2009). This study, however, unlike previous and most current studies on the subject, focus mainly on the impact of oil price decline on these selected oil-exporting nations.

Furthermore, some other related studies are mainly historical in nature whose findings and conclusions are based on previous studies and highly historical such as Syne and Hruby (2016); Fay et al., (2016); Husain et al., (2015); Francisco, (2015); Ouine, (2015); Idrisov et al., (2015); Adamu, (2015); Yanar, (2014); Grinkevich et al., (2014); Holden, (2013); Aron, (2013); Idemudia, (2012); Thurber et el, (2011); Hamilton (2011, 2009, 2005, 2000, 1983); Kilian, (2010); Stevens, (2009); Wierts and Schotten, (2008); Jones et al., (2004); Hamilton and Herrera, (2004); Tatom, (1987); Thulin, (1981). This research dealt with both the historical perspective of the subject and also carried out an in-depth analytical and comparative analysis as presented and discussed in chapters five and six. However, this study would also be beneficial to investors, oil companies, and succeeding researchers as it would contribute a lot to the ongoing debate in the world's oil market.

Notwithstanding, most related studies are based on one theory but this study has also contributed immensely theoretically to the body of knowledge given the three theories which underpins the research: The Revenue-Spend Hypothesis and Spend-Revenue Hypothesis; the Economic Growth Theories and the Theories of Budgetary Decision Making of Oil Revenue Decline. The details of these theories are outlined in chapter two.

## 1.5 Scope of the Study

This research builds on the "*shoulders*" of previous researchers whose studies relate to oil price fluctuations and the macroeconomy. Unlike other previous related studies, this research mainly focuses on the impact of declining oil price on the economic performance of Nigeria, Venezuela and Norway for a comparative analysis. Hence, in this research, the Norwegian economy serves as a reference to best practice to Nigeria and Venezuela given the distinctive results obtained from Norway, relative to those of Nigeria and Venezuela.

The scope of this thesis lies within the evaluation of the consequences of declining oil revenue on the economic performance of Nigeria, Venezuela and Norway for a comparative analysis. Additionally, in order to fully understand the impact of declining oil revenue on these selected oil-exporting nations, both primary and secondary data were considered in this research.

The analyses carried out are for the three-oil exporting/dependent economies only while yearly time series data employed for the period of Thirty-Six years (36), from 1981 to 2016. The variables of the model for the secondary data analysis include Actual Government Revenues (AREV), Actual Government Expenditures (AEXP), Gross Domestic Product (GDP), Oil Price (OILP), External Reserves (EXTR), Inflation Rate (INFR), and Exchange Rate (EXCR). The Autoregressive Distributed Lag (ARDL) estimation technique was employed for the analyses of all the secondary data using E-VIEWS 10 while SPSS version 25 was used in analysing the primary data for each of the countries respectively.

The primary data involved in this study were used to provide answers to one of the research questions for each of the economies under examination. The data for each of these countries were gathered using questionnaires which were distributed to the Ministry of finance and the budget office of Nigeria, Venezuela and Norway.

## 1.6 Outline of the Thesis

This section presents the contents of each of the chapters of the entire thesis. The thesis comprises of six main chapters. Chapter one is the introduction, which presents the background and the rationale of the study, the research questions and the objectives, significance and the scope of the study. This chapter also contains the overall structure of the thesis and the thesis flowchart.

Chapter two, as the first literature review chapter, evaluates the literature on the implications of dwindling oil revenues in oil-exporting countries. It provides all the relevant background literature on the subject and also examined the macroeconomic implications of oil price fluctuations on oil-exporting countries thereby revealing all the contending issues which metamorphose into the development of all the null research hypotheses, which were tested against the alternative hypotheses. This chapter also presents the empirical evidence on oil price fluctuations and economies of oil-importing and oil-exporting countries. Finally, all the various theories underpinning this research were outlined and discussed.

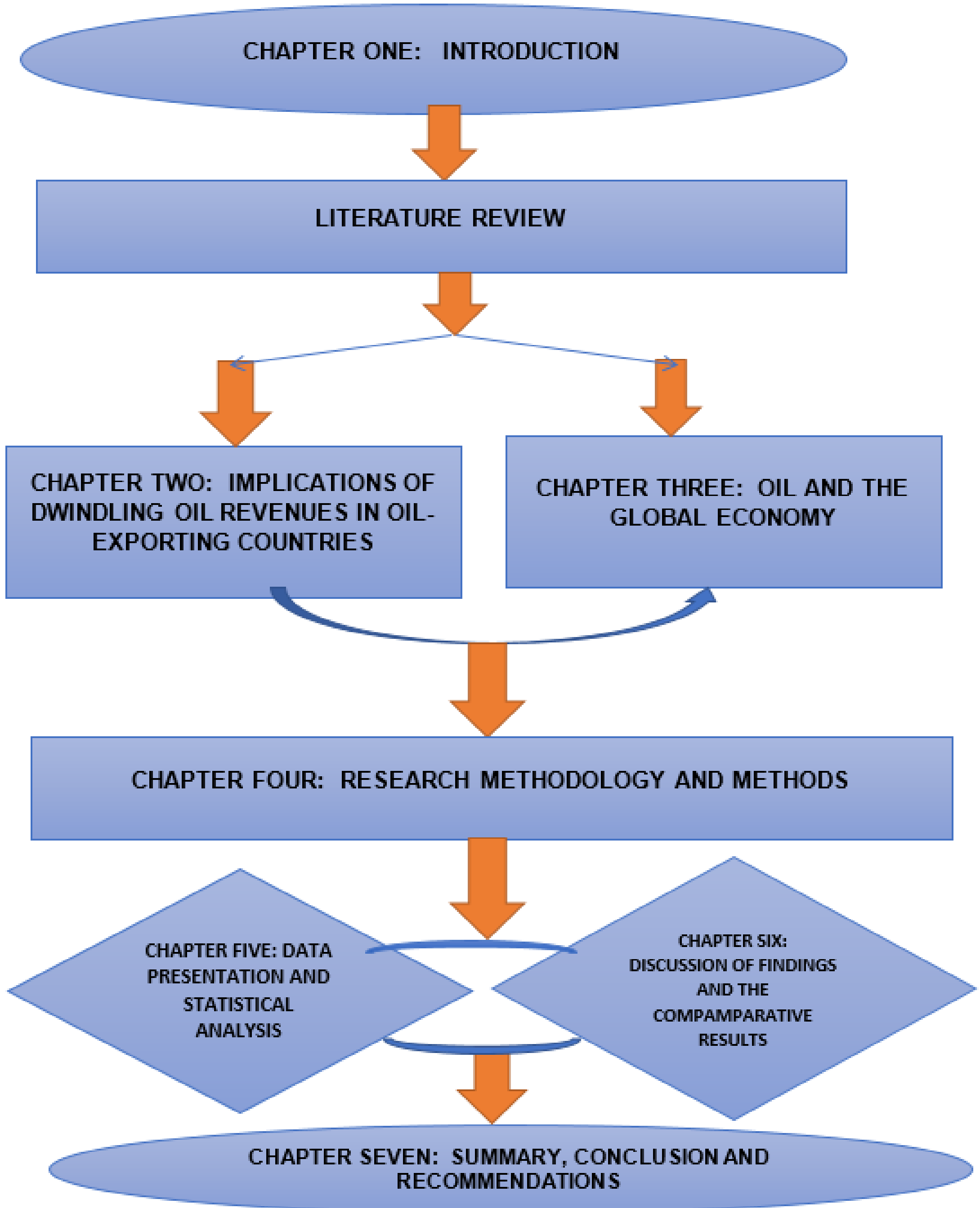
Chapter three presents oil and the global economy as the chapter elucidates in detail, the history and trends of changes in oil price from 1945 to date. The factors influencing the rising and falling of oil prices were also outlined and discussed. More so, the detailed overview of all the economies under examination in this research was also given.

Chapter four provides the details of all the research methodology and methods employed in this research. This chapter presents a detailed overview of the methodology used and also justified the chosen methodology. It also presents the research philosophy and research paradigms, the research approach, research strategy, research design, the model specification, definition of variables and the sources of data.

Chapter five entails the presentation of data and the statistical analysis. The line graphs, descriptive statistics of the secondary data and the examination of the unit root properties of the variables were presented. Also, this chapter presents the underlying assumptions and the estimation of the Autoregressive Distributed Lag (ARDL) Model while the diagnostic tests which includes: the stability diagnostics (Structural and Dynamic stability tests – CUSUM AND CUSUM SQUARES), Residual diagnostics (Heteroscedasticity, Serial correlation, and Normality tests) and the Coefficient diagnostics (Long-Run Form and Bound Test, Error Correction Form (Short-Run Test)) were adequately carried out. In chapter six, all the discussion of findings and the comparative results from both the secondary and primary data analyses were presented and discussed for each of these countries under study: Nigeria, Venezuela and Norway.

Chapter seven presents the summary and conclusion of the entire thesis. It also presents the developed economic model for both Nigeria and Venezuela as Norway serves a reference to best practice while the recommendations and policy implications were adequately outlined. The contribution of the study to the body of knowledge, limitations of the study and the suggestions for future research were also enumerated and discussed in this chapter.

*Figure 1. 1: Overall Thesis Flowchart*

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# CHAPTER TWO

## Implications of Dwindling Oil Revenues in Oil Exporting Countries

# CHAPTER TWO

## **2.0** Implications of Dwindling Oil Revenues in Oil Exporting Countries

### 2.1 Introduction

The chapter presents a review of relevant literature on the issue of dwindling oil revenue on oil-exporting countries with a focus on the ability of these nations to meet up with their budgetary requirements. Given the high level of oil revenue dependency by most oil-exporting nations, comprehensive analysis of the consequences of the declining oil revenues on the fiscal performance of oil-exporting nations becomes imperative especially due to the continuous decline in oil price, leading to decrease in oil revenues.

Fundamentally, every nation has a statutory role in developing its economy. Nigeria, Venezuela and Norway, being the focus of this research; like any other nation have been performing this function judiciously through reliance on oil revenue. As such, oil revenues play a very significant role in the structure of the oil-exporting countries (Eltejaei, 2015; Aliyan, 2013; Farzanegan, 2011; Farzanegan and Markwardt 2009).

Recently, the oil industry has witnessed a persistent decline in the oil price since 2014, which has correspondingly led to the decline in oil revenues of most of these oil-exporting countries. It may likely lead to an external sector anomaly because during these periods of increase in oil price; there is a corresponding growth in revenue, while the net export remains positive and vice versa when there is a decline in the oil price, the revenue also decreases.

Principally, the concern, therefore, is the ability of these nations to continue with the economic development aspirations in this new paradigm shift to oil revenue, necessitated by the decrease in oil price. It is therefore very imperative to evaluate the consequences of declining oil revenue on the economic performance of Nigeria, Venezuela and Norway and to assess how these nations attain to their budgetary needs during the periods of declining oil revenue. Evaluation of the effects of the dwindling oil revenues on the macroeconomic variables of these economies is also one of the concerns of this study given that most studies in the literature had diverse views and had not arrive at a compromise.

However, most oil-exporting countries are running towards budget deficits for a long time now, due to the decline in oil revenues. Oil revenues constitute a major part of income while the significant drop in government revenue was due to the decrease in oil price and the recessionary trend in these economies highly dependent on oil income (Luković and Grbić 2014).

Indeed, there exists a wide gap between oil prices at which different oil producers break even (Bently *et al*. 2016). Oil-exporting economies need the oil price to be at a certain level to balance their national budgets.  As at the 28th of March 2017, the oil price is at \$47.73 per barrel[1]. However, oil price needs to be above \$100 per barrel for most of these economies to balance their national budgets (Bently *et al.* 2016; Fahey 2015; Rascouet 2015).

Whenever government revenues and expenditures equal, it results in a balanced budget. When revenues exceed expenditures, then surplus budget and when expenditures exceed revenues, then budget deficits, which have a major effect on the economic performance of any nation.  Growth in an economy would stimulate through the reduction

[1] See OIL-PRICE.NET: Oil Price and Commodity Prices. 28th March 2017.

of the fiscal deficits, that is, by cutting down government expenditures and increasing revenues (Al-Zeaud 2015; Saeed and Somaye, 2012).

The power of OPEC known as "Call-on-OPEC"[2] has always been to increase prices. Thus, in this new price shock, the collusive strength of this oligopoly has failed, as OPEC could not control the production quotas of its members. With the fear of the failure of the power of OPEC and with the trend that this fall in oil price might continue, this research, therefore, aims at closing the revenue gaps in these oil-dependent economies.

Consequently, this chapter centres on the implication of dwindling oil revenues in oil-exporting countries. These issues were discussed from the global perspectives while research hypotheses raised in relevant sections of the chapter. The chapter has nine sections as follows: - Section one is the introduction; section two involves the impacts of oil price fluctuations in the global economy; section three underscores the macroeconomic implications of oil price fluctuations on oil-exporting countries; empirical evidence on oil price fluctuations and economies of oil-importing and oil-exporting countries is in section four; section five reveals the impact of dwindling oil price on other sectors of the economy; Section six entails the sovereign wealth funds and oil-exporting countries; while the theoretical framework of the study is presented in section seven. Section eight presents the development of the research hypotheses while section nine is the last section which concludes the chapter.

[2] The power of OPEC known as "Call-on-OPEC" See OECD/IEA 2015 and Patterson, 2014

## 2.2 The Impacts of Oil Price Fluctuations in the Global Economy

In the global economy, the oil price is of great importance since oil is the highest commodity, traded internationally in volume and value. Oil is the number one export product in the world as it accounts for about 4.8 per cent of the world's total exports while the total value of oil shipments was about $786.3 billion in 2015 (Workman, 2016). The price of all the energy-demanding goods and services, as well as the price of other fuels, are to a reasonable extent, linked to the oil price. Hence, an unexpected change in the price of oil tends to have great impact on oil-exporting economies, oil-importing economies and the world as a whole (Kitous *et al.,* 2016).

Oil price fluctuations are crucial to the global economy since oil serves as the main energy source and raw materials for several industries (Trkulja and Le Coq 2015). The impacts of oil on the world economy are paramount in today's world as it is an essential parameter about growth and development in the entire globe. For several decades now, oil is an indispensable and highly stabilising energy commodity, which is stimulating the global economy. There is no doubt that oil price fluctuations have a great impact on the total world economy since it serves as a vital input commodity for most oil importers and a very crucial source of revenue generation for most oil-exporting countries. There is indeed a positive correlation between oil price and oil revenue because fluctuations in oil price result in revenue fluctuations as well. The level of impact of the fluctuations differs across nations as it depends on different factors in these economies. These perspectives could be regarding the macroeconomy as a whole, socio-political factors, international market effects and the level of oil reserves. Also, other factors could be a strategy employed by the firm in an economy, the climatic condition of a nation and even depends on the developmental stage of the economy (Trkulja and Le Coq 2015; Yanar 2014; Aliyan, 2013).

Similarly, Husain *et al*. (2015) advanced that the magnitude of the impact of the decline in oil price is highly dependent on the engineering factor, the tenacity of the drop-in oil price as well as on the policy outcome. Furthermore, they maintained that the resultant effects of oil price fluctuations on the global economy are positive since the oil-exporting economies expenditure is likely to be less than the increasing expenditure of those of oil-importing economies. The impact of the decline in the recent oil price decline lowers the living cost of the populace. The real incomes of the oil-consuming economies rise as well. The marginal costs of the industries using oil as an input factor reduce; thereby reduce the actual prices for their goods and services and as well motivate supply.

The backside to the windfall gains is the loss of oil revenue on the part of the oil-producing economies, and this is one of the major concerns of this study. The mainstream macroeconomic models portrayed that the economic activities around the globe would be on the increase by about half per cent of the global gross domestic product, within the 2015 to 2016 period due to the oil price decline that began since mid-2014 (Husain *et al*. 2015). There is, therefore, the need for the examination of this claim through the analysis that would be carried out in this study.

The following outlined lenses could reveal the impacts of oil price fluctuations in the global economy: -

- Geopolitical tensions and oil price fluctuations
- Oil Price Fluctuations and Economic Crisis
- Production cost and oil price fluctuation

- Economic profit or loss of oil production and oil price fluctuation

### 2.2.1 Geopolitical tensions and Oil Price Fluctuations

Crude oil supply directly relates to geopolitical tensions in oil-producing areas, which invariably lead to an increase in oil price. Kristopher (2015) opined that the Persian Gulf War in the 90s increased the oil price twice and reduced by 30 per cent at the end of the war. On the other hand, oil supply reduced by 7 per cent. In 2003, during the invasion of the Iraqi Kingdom by the United States, the price of oil increased by 7 per cent and at the end of the war, it reduced by 12 per cent as oil production decreased by 3 per cent. As at the year 2013, the United States shale oil production increased; as such, in the Middle Eastern States, the tension does not affect the oil price.

However, any form of political unrest disrupts production and correspondingly affects oil price positively due to the obstruction in oil production.

### 2.2.2 Oil Price Fluctuations and Economic Crisis

Oil price volatility and economic crisis are inter-linked (Kristopher, 2015; Hamilton, 1983). Economic growth also plays a dominant role in oil price determination, as witnessed in recent time. As the economic growth increases, the higher the demand and the higher the oil price as well. Conversely, as economic growth slows down, it leads to a decline in oil demand, which invariably affects the oil price negatively. The ‘king’ of all the financial crises in the world is those of the Great Depression in the 1930s, which lasted for about ten years. There is retardation of economic growth and a decline in oil demand, which correspondingly led to drastic oil price decline during any period of economic crisis. The oil price fell from its highest point of $147 per barrel in 2008 (the highest so far in the history of oil price trends) to $32 per barrel in the same year 2008.

Subsequently, we had series of other financial crises like the 1997 Financial Crisis in Asia, the economic recession in the year 2000, the global financial meltdown of 2007-2008, which was the next to those of the 1930 Great Depression. Recently, there is a decline in oil demand, brought about by a decline in economic growth in most of the high oil consumers like in Europe, Japan, China and Russia (Kristopher, 2015).

However, if no measure is in place, to ameliorate the situation, it could further lead to an economic recession as well. In this present oil shock, the sharp decline in oil prices has caused economic instability in most oil-exporting countries that rely heavily on oil for sustainability, and as such, there is need to ascertain the level of such impact analytically and possible ways of meeting up with the budgetary requirements of these oil-dependent economies.

### 2.2.3 Production Cost and Oil Price Fluctuation

Most oil-exporting economies need to break even to continue with oil production in the future. The oil wells with higher lifting costs will likely close down if they are unable to cover up the cost of oil production. The lifting costs otherwise known as the production cost comprise of the equipment cost, the cost of maintaining the oil wells and facilities while the breakeven oil price involves production cost, finding or exploring cost, transportation cost, oil well development cost, selling and general administrative expenses. Petroff and Yellin (2015) outlined the total cost of production of oil in about twenty oil-producing countries as follows:

***Table 2. 1: Total Cost of Oil Production in Twenty Economies ($ per barrel)***

| S/NO | COUNTRIES | TOTAL COST OF OIL PRODUCTION ($ PER BARREL) |
|---|---|---|
| 1. | Nigeria | 31.60 |
| 2. | Venezuela | 23.50 |
| 3. | Angola | 35.40 |
| 4. | Norway | 36.10 |
| 5. | United Kingdom | 52.50 |
| 6. | Brazil | 48.80 |
| 7. | Canada | 41.00 |
| 8. | United States | 36.20 |
| 9. | Colombia | 35.30 |
| 10. | China | 29.90 |
| 11. | Mexico | 29.10 |
| 12. | Kazakhstan | 27.80 |
| 13. | Libya | 23.80 |
| 14. | Algeria | 20.40 |
| 15. | Russia | 17.20 |
| 16. | Iran | 12.60 |
| 17. | United Arab Emirate (UAE) | 12.30 |
| 18. | Iraq | 10.70 |
| 19. | Saudi Arabia | 9.90 |

**Source: Author's design and extracted from - Petroff and Yellin (2015)**

For any business to grow, one of the aims is usually to maximise profit and to minimise cost. The current crude oil price is trading at less than $50 per barrel while most of the oil producers are producing at a higher cost. Oil producers would make economic profits only when the Average Total Cost (ATC) is less than the unit price. However, when oil price increases and is above the breakeven price, oil revenue increases as well, but the reverse is the case when oil price decreases, especially when oil is the primary source of income.

### 2.2.4 Economic Profit or Loss of Oil Production and Oil Price Fluctuation

At any point of oil production, Frakt, (2014) shows that the producers' total revenue (TR) must be equal to the oil market price (P) multiplied by the quantity of oil sold (Q) in the oil market.

Therefore, it gives the following:

TR = P X Q ………………………… (1)

At any level of oil production, the producers' total costs (TC) must be equal to the average total cost of oil production (ATC) multiplied by the quantity of oil produced (Q).

Therefore,

TC = ATC X Q ………………………. (2)

Also;

ATC = TC ÷ Q …........................... (3)

If producing at the quantity Q, economic profit or loss is calculated as:

Profit = (P X Q) – (ATC  X Q) ………… (4)

Profit = TR - TC

i.e. Profit = (P – ATC) X Q     …………… (5)

However, at any given point of the market, if P > ATC, then the oil producers would make a profit. Otherwise, it would be a loss when P < ATC = loss.

**Figure 2. 1: Cost of Crude Oil Production**


**Source: Oggie, K. (2015): What it costs to pump oil in the 20 biggest oil-producing nations**

From the above graph, Petroff and Yellin (2015) shows that:

TC = CE + OE

CE = CBF + CPL + CNW

OE = CLO + CES +CAD

Where,

TC = Total Productions Costs

CE = Capital Expenditures

OP = Operational Expenditures

CBF = Cost of Building Facilities

CPL = Cost of Pipelines

CNW = Cost of New Wells

CLO = Cost of Lifting Oil

CES = Cos of Employee Salaries

CAD = Cost of Administrative Duties

## 2.3 Macroeconomic Implications of Oil Price Fluctuations in Oil Exporting Countries

Among economists and politicians alike, the crucial role of oil in the global economy has attracted lots of consideration (Farzanegan and Markwardt, 2009; Cunado and Garcia, 2005). Many studies are addressing the issue as to whether there is a link between oil price fluctuations and macroeconomic variables. The pioneering work on the US economy was carried out by Hamilton, (1983), who found that oil was the most vital instrument responsible for almost all the recessions in the US, while Darby (1982) found no relationship between oil price and macroeconomic variables (Farzanegan and Markwardt, 2009).

Some decades ago, the fluctuations in oil price had coincided with most of the global economic changes like the global recessions, inflation and others (Hamilton, 2005). It has caused most researchers to examine the relationship existing among these variables over time. The changes in these variables are highly unpredictable as both the oil importers as well as the oil exporters are affected differently (Aliyan, 2013).

The link between oil price and economic activity have been carried out using various econometric techniques. Some of these researchers include Nzimande and Msomis (2016); Baumeister and Kilian (2016);Taghizadeh-Hesari and Yoshino (2015); Kaplan (2015); Yoshino and Taghizadeh-Hesari (2014); Shi and Sun (2012), Oladosu, (2009), Gounder and Bartleet (2007), Canada and de Gracia, (2005), Hamilton, (2009, 2005,1983). Most of these authors arrived at the same conclusion that high oil price affects economic activity negatively while decreasing oil price have a positive impact on business. On the contrary, some other studies established an asymmetric relationship between oil price and economic activity. The discovery indicates that increasing oil price has a significant impact on the business while decreasing oil price have a less substantial positive impact on activities of the economy (Lardic and Mignon, 2008; Zhang, 2008; Brown and Yucel, 2002; Mory, 1993; and Mork 1989). On the other hand, Hooker (1996) found no relationship between oil price and the macroeconomic variables. There is, therefore, the need for the justification of these discrepancies among researchers regarding the impact of the macroeconomy and oil price fluctuations relationship.

Balli *et al*. (2016) examined the impact of oil price fluctuations on the macroeconomic variables in Turkey and found that there is a bi-directional causal relationship between GDP and inflation. There is also a causal relationship running from oil price to the gross domestic product and inflation. Also, Taghizadeh-Hesari and Yoshino (2015); Yoshino and Taghizadeh-Hesari (2014) assessed the impact of oil price changes on two macroeconomic variables: the gross domestic product (GDP) growth rate and the inflation rate, consumer price index (CPI). These factors, when considered in three highest oil-consuming economies: United States, of America, Japan, and China, reveal that the interests on the impacts of oil prices and the macroeconomy are highly topical in recent time. Due to the drastic increase in oil price from 2001 and the corresponding decline that followed immediately after the global financial crisis of 2008 – 2009. Using the N-variable Structural Vector Autoregression (SVAR) model, the result reveals that the impact of the fluctuations in oil price on the gross domestic product (GDP) of developed oil-importing economies (The USA and Japan) is highly insignificant when compared with those of emerging economy (China). Similarly, the impact of oil price fluctuation on the emerging economy's inflation rate was lower when compared with those of the developed countries. However, the economies under consideration are mainly developed and oil-importing economies.

Consistent with the above argument, Blanchard and Gali (2007) on examining the macroeconomic effects of an oil price shock on the US economy using SVAR as well concluded that the consequences of oil price fluctuations on inflation and activity were large. The oil price could only explain some parts of the 1970s oil price changes. The study concludes that the effects of changes in oil price on the inflation rate and activity are significant. US economy imported more than 50 per cent of the nation's oil and gas consumption (Hooker, 1999) which has likely classified the economy as an oil-consuming economy as portrayed by Taghizadeh-Hesari and Yoshino (2015). Aydin and Acar (2011) examined Turkey as an oil-importing economy, and the result shows that there are significant effects of increasing oil prices on macro indicators and about 5 per cent rise in inflation. They also reveal that the increasing oil price makes it very hard for economies with large oil import financial plan to be able to settle their budget shortfalls.

Hesary *et al.* (2013) estimated the impact of oil price shocks on oil-exporting economies (Iran, Russia, and Canada) and their trade partners. The outcome shows that the direct and indirect effects of a positive oil shock on the gross domestic products of Iran and Russia are positive while the direct effect is negative for Canada due to the small impact that the oil export contributes to their gross domestic product. The indirect effect on Canada is positive because of their high involvement in the exportation of final products.

In line with the above study, Farzanegan, and Markwardt, (2009) also carried out an analysis of the dynamic relationship existing between oil price movements and key macroeconomic variables in Iran using the VAR model. In the study, it is evident that there is a positive correlation between fluctuations in oil price and industrial output growth.

However, the focus was mainly on the real oil shock from 1975 to 2006, and the superior outcome is logical since Iran is an oil-exporting economy whose oil revenue increases because of an increase in oil price. Hence, there is the possibility of growth in output.

Monaldi (2015) examined the impact of declining oil prices on Venezuela's macroeconomy. The study shows the existence of a 3-digit inflation rate, a fall in the gross domestic product, current account deficit, contraction in production and a very high political instability. However, the robustness of the outcome is highly questionable since there is no statistical evidence shown. More so, the economy is likely to experience serious macroeconomic instability due to the decline in oil revenue but the magnitude of the effects, not ascertained because no statistical tool or technique was employed. Graphical representation, as shown in the study, is not sufficient in the explanations of the impact of declining oil price fluctuations on the macroeconomy.

Bruno and Sachs (1985) first gave a detailed analysis of the effects of oil price fluctuation on inflation and output for most developed economies in the 70s. The study mainly explored the role of monetary policy as well as the role of other shocks. Bruno and Sachs (1985) argue that most oil price increases of the 1970s and the corresponding oil demand decrease in response to the force of inflation led to the decay of most of the economies during the period. On the other hand, Hamilton, (1983, 1996) asserts that increases in oil price have been responsible for most of the major US recessions and that post-OPEC macroeconomic performance determines increases in oil price. However, the extent of the effect of the impact of the changes in oil price not specified.

On the contrary, Shi and Sun (2012) found out in the relationship between oil price movements and the macro economy in both China and India that there is no significant causality between most of the macroeconomic variables and oil price fluctuations.

Furthermore, that the inflation rate, increases initially and then remain positive while the gross domestic product moves positively in both economies. Consistent with the above position, Hooker, (1999) in assessing: “Are Oil Price Shock Inflationary” discovered that within the 1980s, the movements in oil price slightly affected inflation while its effects before the 1980s on inflation were highly significant. The study also reveals that the relationship between inflation and oil price movements would produce a spurious result by the linear, constant-coefficient specifications inherent in most Philip’s curves. In other words, the non-linear specification is likely to give a better and reliable outcome.

Hooker (1999) maintained that the relationship between oil and the macroeconomic variables might be difficult to identify because of the behavioural nature of the time series data on the oil price. Secondly, the systematic way that monetary policy responds to oil price fluctuations, which makes it tough for the macroeconomic effects to be recognised (Hoover and Perez, 1994; Romer and Romer, 1989). More so, due to the lack of dominant theoretical tool as most researchers previously argued that changes in oil price affect the macroeconomy diversely depending on the applied analytical instrument. These effects could be through the terms of trade as an import price (Hesary, 2013) or the production function as an input price or as a relative price movement, which leads to inter-sectorial reorganisation. Consistently, Darby (1982) found no relationship between oil price and macroeconomic variables. Farzanegan and Markwardt, (2009) in using a VAR framework for the Iranian economy, analysed the dynamic relationship between oil price fluctuations and macroeconomic variables. The result indicates that both positive and negative oil price shock increases inflation while a positive correlation exists between increasing oil price and output growth.

Mork, 1989 opined that what matters most is the increase in oil price rather than decreasing oil price effect on an economy. Hamilton, 1996 argues that oil price increase only matters when they are large enough about the previous experience.  Nzimande and Msomis (2016) on examining oil price changes and economic activity in South Africa suggests through the findings that both positive and negative oil price shocks are important as they both have asymmetric impacts on economic activities.

Consequently, Bohi (1991) argued that the oil price does not have any substantial macroeconomic effects by themselves. The result obtained from Bohi and Powers (1993) on the analysis of energy price shocks and regional output and employment does not support the opinion that the price of oil has any impact on both the oil-importing and oil-exporting economies. Aliyan, (2013), on the other hand, posits that changes in oil price have effects on the revenue base of most oil-exporting economies, which in turn affects the macroeconomic variables.

Tatom (1987) carried out a theoretical analysis of oil price effects on the macroeconomy and concluded that oil price increases or decreases have symmetric consequences for the economy. However, no analysis done as evidence was on previous assumptions surrounding oil price increases and decreases. There was no inclusion of macroeconomic variables as no statistical tests performed.

Also, the Granger causality tests between oil price changes, the gross domestic product (output) and unemployment deteriorate when the series of data extends beyond the 1980s (Hooker 1996; Lee *et al.* 1995 and Mork 1989).  The above affirms the views of Hamilton, (1996), Lee *et al*. (1995) and several other researchers who argued that the high inconsistency inherent in the results of oil price fluctuations after the 1985 periods portray elements of misspecification. As such, there is a need to run oil price changes through the application of the nonlinear models to be able to capture the macroeconomic effects.

Conversely, some recent studies have a contrary opinion to the above conclusions. For instance, Al-Quadsi and Ali (2016) portrayed that the fluctuations in oil price have both the long and short-term effects on the macroeconomy. Lorusso and Peironi (2015) in examining the causes and consequences of oil price fluctuations in the United Kingdom reveal that the real oil price and domestic inflation have positive correlation while growth in the gross domestic product falls with the fall in oil supply. Ogundipe *et al.* (2014) assert that oil price changes have a significant effect on the exchange rate volatility in Nigeria. In addition, Oriakhi and Iyoha (2013) reviewed the effect of an oil price shock on Nigeria's economic growth. They concluded that there exists a relationship between oil price changes and macroeconomic variables. As such, the Nigerian economy is very susceptible to oil price fluctuations, which has made it difficult for the attainment of the expected growth target. On the contrary, Arewa and Nwakahma, (2013) examination of this relationship in Nigeria as well reveals that the variables do not Granger[3] cause each other.

Furthermore, in Ayadi (2005) study for Nigeria, regarding the relationship between oil price fluctuations and macroeconomic variables; the result reveals an insignificant relationship. Consistently, Iwayemi and Fowowe (2011) reveal that oil price fluctuation has no significant impact on the main macroeconomic variables. Relatively, Olomola and Adejumo, (2006) work in Nigeria as well suggests a substantial impact of oil price fluctuations on macroeconomic variables, thereby confirming the Dutch disease

[3] The lagged values of the time series variables granger cause each other when the values of one of the variables provide statistical information about the future value of the other variable.

syndrome in Nigeria. Also, Eltony and Al-Awadi (2001) examined this impact in Kuwait and found that there is a high degree of the interrelationship among major macroeconomic variables.

Similarly, Mehrara, (2008) in examining this relationship in 13 oil-exporting economies found that the relationship between the GDP and oil revenues are asymmetric and non-linear while the magnitude of the positive oil shock is less than that of the negative price shock. However, the case under consideration in the above studies is mainly that of increasing oil price. The impact of decreasing oil price on the macroeconomic variables is very rare and scanty.

Using an SVAR framework, Taghizadey-Hesary and Yoshino, (2015) examined the impact of oil price fluctuations on the growth rate of GDP and inflation in the United States, China and Japan. The result reveals that the implications of the fluctuations in the oil price of an emerging economy's GDP growth are higher in comparison to developed oil importers GDP growth. On the other hand, the impact of oil price fluctuations on the inflation rate of the two developed economies (The USA and Japan) is higher when compared with the Chinese economy.  Consistently, Hamilton (2005) examined oil and the macroeconomy variables of the United States and concluded that one of the macroeconomic effects of oil price fluctuations is in the inflation rate. In other words, there exist a relationship between oil price and the macroeconomic variables. Although, majority of these studies deal with the case of increasing oil price while most of the economies under consideration are developed and oil-importing countries especially the USA in which most related studies on the impact of oil price fluctuations on the macroeconomic variables are focused.  For instance, the studies of Blanchard and Gali, 2010; Bollino, (2007); Jones *et al.,* (2004); Cooper, (2003); Balke *et al* (2002); Jones and

Leiby (1996); Mork et al., (1994) and Bruno and Sachs, (1982). Similarly, some authors explored the relationship between fluctuations in oil prices and macroeconomic variables in developing oil-importing economies such as Turkey – Bali *et al.,* (2016) and Aydin and Acar, (2011); Morocco - Jbir and Zouari-Ghorbel (2010); Turkey-Ozlale and Pekkurnaz (2010); Pakistan – Malik (2010); Tunisia - Jbir and Zouari-Ghorbel (2009) and Thailand – Rafiq *et al*., (2009).

Nevertheless, the focus of most of the studies above is those of the impact of increasing oil price on the macroeconomic variables of oil-exporting economies. Studies on the impact of decreasing oil price on the macroeconomic variables of developing and oil-exporting countries are rare and scanty. Some of those studies include Russia – Yoshino and Alekhina, (2016); Nigeria-(Stober, 2016; Imarhiagbe, 2015; Ademola *et al.,* 2015; Ogundipe *et al.,* 2014); Indonesia-Hidayat *et al.,* (2014). Given the diverse views and conclusions of most researchers as to the impact of oil price fluctuations on macroeconomic variables, it gave rise to the derivation of the research hypotheses of the study, presented in sub-section eight. Hence, the next is empirical evidence.

## 2.4 Empirical Evidence on Oil Price Fluctuations and Economies of Oil-Importing and Oil-Exporting Countries

Empirically, increasing oil price leads to deterioration in macroeconomic variables, while price decrease has a relatively small expansionary effect on macroeconomic variables (Balli *et al.,* 2016). Although this impact is dependent on whether the economy is oil-importing or oil-exporting. The related empirical studies are examined under the following sub-sections: government revenues and expenditures linkage; increasing oil revenues in oil-exporting countries; oil revenues decline in oil-exporting countries; Impact of oil price fluctuation on oil-consuming economies; the susceptibility of oil-exporting countries to declining oil revenues; impact of oil price volatility on budgets of oil-producing economies; and finally, the impact of dwindling oil price on other sectors of the economy.

### 2.4.1 Government Revenues and Expenditures Linkage

In line with the Keynesian paradigm, the role of government is paramount to any nation. Unlike the classical paradigm where a minimum level of government intervention in an economy prevails. Revenues, expenditures and fiscal policy are the most fundamental instruments of government intervention in an economy (Eltejaei, 2015). Stiglitz (1996) supports the above philosophy and believes that the economies that succeed without giving credence to its government are highly insignificant. Government revenues and expenditures are issues of the fiscal policy. In macroeconomics and public finance, the relationship between government spending and income remain one of the most contentious issues.

The increasing budget deficits in both developed and developing economies has culminated into a serious debate between economists and politicians alike. Several economists such as Albatel, (2002); Darrat, (1998); Payne, (1997) and Friedman, (1978) have argued the need to investigate the causal relationship between revenue and expenditure in an economy. The fundamental relationship between government revenues and government spending are paramount to any economy due to the high dependency of government budgets on the variables (Al-Zeaud, 2015; Aladejare, 2014; Ross and Payne, 1998; Darrat, 1998; Baghestani and McNown, 1994; Baffes and Shah, 1994).

In the literature, there are three major hypotheses as regards this relationship. The **revenue-and-spend** hypothesis originates from Friedman (1978), and it entails a unidirectional causality running from revenue to expenditures. Therefore, an increase in revenue leads to an increase in expenditure, which would, in turn, result in the inability of reducing the budget deficit gap (Chang, 2009). Buchanan and Wagner (1978) contend that increasing revenue is the best remedy for budget deficits. Also, the implementation of policies that stimulates government revenue would be beneficial. Secondly, **spend-and-revenue** hypothesis advocates that government expenditures lead to revenue (Baghestani and McNown, 1994). If it holds, then the government spends first and then raise revenue to pay for the spending later (Narayan and Nardayan, 2006).

Meltzer and Richard, (1981) and Musgrave (1966) suggests the **fiscal synchronisation** as the third hypothesis entails that both the government revenue and expenditure decisions are concurrently determined. It is, therefore, a bi-directional causality between government receipts and expenses (El-Zeaud, 2015; Chang, 2009). If it does not hold, then government income and expenditures are made independently.

Although, there is no consensus among numerous empirical studies available on the linkage between these two variables. There is evidence of unidirectional causality in some studies which runs from revenue to expenditure which aligns with the revenue-spend-hypothesis. Mupimpila *et al*., (2015) examined the causality between income and expenses in Botswana and found that there is a negative and unidirectional causality running from revenues to expenditures which support the revenue-and-spend hypothesis. Consistently, Muhammad *et al.* (2012) investigated this relationship for the Pakistan economy, and the result supports the revenue-and-spend hypothesis. In using the Autoregressive Distributed Lag (ARDL) test for the Nigerian economy, Omo and Taofik

(2012) confirmed the revenue-and-spend hypothesis. Also, Saeed and Somaye (2012) applied the P-VAR framework; the result shows a positive long-run relationship running from revenue to expenditure. Other studies with similar results include - Al-Khulaifi, (2012); Mohsen *et al.,* (2012); Owoye and Onafowora, (2011) and Keho, (2010).

Similarly, Edirisinghe and Sivarajasingham, (2015) investigation for Sri Lanka reveals the existence of spend-and-revenue hypothesis. Lukovic and Grbic (2014) examined the revenue and expenditure causality and found that a decrease in government spending would solve the problem of the budget deficit in Serbia. The result, however, supports the spend-and-revenue hypothesis. Also, Kaya, (2013); Richter and Dimitrios, (2013) got the same result for Turkey and Greece, respectively. Accordingly, Zafarullah and Harun, (2012) in using the Error Correction Model for the Malaysian economy, found the result consistent with the above. Other studies with similar outcome include Saysombath and Kyophilavong, (2013); Lusinyan and Thornton, (2012); Carneiro, (2005).

Furthermore, in using Grander causality and VECM for the Jordan economy, El-Zeaud, (2015) found a bidirectional causality running between revenues and expenditures in Jordan, which implies that the government make its income and expenditure decisions simultaneously. The study of Olaoye, (2015) and Aladejare, (2014) for the Nigerian economy indicate similar results. Yousef and Mohammad, (2012) in applying the bounds testing approach to the Iranian economy, also found bidirectional causality between revenues and expenditures. Other studies with similar results include Saha, (2015); Chang and Chiang, (2009).

On the contrary, Rafaqet and Mahmood (2012) examined the relationship between government expenditure and revenue for the Pakistan economy using Johansen cointegration and Granger causality techniques. The result indicates that there is no causal linkage between government income and expenses in Pakistan.

However, the main emphasis of most of these studies is on causative issues and the relationship between the variables. In considering government revenue and government expenditures as variables, the parameter of the fiscal profile is completely omitted from most of the studies. It is the difference between government spending and government revenues, which could be plus or minus as the case may be.

### 2.4.2 Increasing Oil Revenues in Oil Exporting Countries

The net impact of increasing oil revenues on the real GDP is mainly an empirical issue due to its opposite effects on both oil-importing and oil-exporting economies (Dreger and Rahmani, 2014). As shown in the previous sections, the highest percentage of the government revenue is mainly from oil, and as such, the volatility of oil revenues is highly driven by oil price fluctuations (Segal and Sen, 2011). Most oil-exporting countries depend mainly on oil revenues for the finance of government spending and importation of goods and services (Dizaji, 2014; Farzanegan, 2011). In the tradable sectors, oil revenues remain the engine of national development for oil-exporting economies. For these nations, to increase the country's public expenditures to attain to the desired growth is based mainly on the level of affluence of the state derivable from the oil revenues which in turn accumulates as oil price increases. It aids in boosting public expenditures and economic infrastructures of the states (Aregbeyen and Kolawole, 2015; Kablan *et al.,* 2014; Hamdi and Sbia, 2013; Cameron, 1978).

Consistent with the neoclassical growth theory, persistent increase in oil revenues in oil-exporting countries might have a long-lasting influence on the GDP per capita through an increase in investments. Increasing oil price yields growth in oil revenues, which it generates, not only for consumption purposes but also for infrastructural investment (Dreger and Rahmani, 2014). Basher and Stefano (2013) found a long-run relationship between investment and savings for the GCC economies. The oil revenues are channelled into modernising the domestic economy as an increase in oil revenue leads to an increase in savings, investment and capital accumulation. Many studies in the literature have carried out analyses on the relationship between oil price and economic performance in both oils importing and oil-exporting nations. Most of the studies concluded that, increasing oil revenues, due to increasing oil prices led to economic growth acceleration in most of the oil-exporting countries (Masan, 2015; Kaplan, 2015; Aregbeyen and Kolawole 2015; Eltejaei, 2015; Idrisov et al, 2015; Narayan et al, 2014; Esfahani et al., 2014; Ibrahim et al, 2014; Hassan and Abdullah 2015; Yanar 2014; Hidayat et al, 2014; Adesola et al 2014; Khabazi et al, 2014; Esfahani et al., 2013; Oriakhi and Iyoha, 2013; Hesary et al, 2013; Barkhordara and Saboohi 2013; Hamdi and Sbia 2013; Holden, 2013; Arewa and Nwakahma, (2013); Ali and Harvie, 2013; Segal and Sen, 2011; Mehrara, 2008; Jimenez-Rodriguez and Sanchez, 2004).

Most of the literature in this area opined that since the beginning of oil exportation, oil economics has been enjoying economic growth. Empirically, Aregbeyen and Kolawole, (2015) investigate oil revenue, government expenditure and economic growth nexus using the Ordinary Least Square (OLS), Vector Error Correction Model (VECM) and cointegration for the Nigerian economy. The study reveals that oil revenue Granger causes both government expenditures and growth. No causal relationship exists between government spending and growth. Using the Johansen multivariate cointegration technique and stationary VAR for the economy of Oman, Ahmad and Masan, (2015) found that government expenditure derived from oil revenue is the main source of growth in the long run. Also, Akinlo, (2012); Adedokun, (2012) and Odularu (2008) examined the effect of oil on growth for the Nigeria economy. The results indicate that oil revenue has a positive effect on growth but not favourable for the manufacturing sector.

In line with the above, Masan (2015) examined the relationship between oil revenues, government expenditures and growth in Oman using Johansen cointegration and stationary VAR. The result reveals that a long-run relationship exists between the three variables, thereby exempting the economy from the resource curse. Also, Hamdi and Sbia, (2013) used a multivariate cointegration and error correction model to analyse the dynamic relationship between oil revenues, economic growth and government expenditures in the Kingdom of Bahrain. According to the result, oil revenues remains the first source of growth in the Kingdom.

Consistently, Esfahani *et al.,* 2012 developed a long-run output relation for the Iranian economy; the oil revenue to output ratio is expected to remain high for an extended period. The result is in line with the conclusions of Mohaddes and Pesaran, 2013, which quantifies the benefits of oil revenue on the growth of the oil-exporting nation over the long term. Esfahani et al., (2014) applied a co-integration method identified long-run benefits of oil revenues on real GDP per capita for oil-exporting countries. Esfahani et al. 2013 showed the related result, for the Iranian economy as well, although the inappropriate policy may likely weaken the impact. Emami and Adibpour (2013) in using the SVAR analysis, found both positive and negative oil shock have opposite effects on the output growth of the Iranian economy. The real shock has a positive but limited effect on the economy while the negative shock hurts the Iranian economic performance.

On the contrary, Dreger and Rahmani, (2014) explored this relationship for the GCC states and the Iranian economy using panel cointegration approach. The study reveals that the long-run oil elasticities for the GCC countries exceed those of the Iranian economy. It is an indication that the high oil revenues may not have been wisely utilised to yield the expected growth in Iran. Also, Farzanegan, (2011) carried out an analysis of the dynamic effects of oil shocks in Iran for 48 years (1959-2007) and found that the military and security expenditures respond promptly to oil revenue shocks, but the impact on the growth of the economy was not specified. Using a multivariate VAR approach, Du *et al.* (2010) found that oil price shocks have a significant effect on economic growth and inflation in the Chinese economy. In like manner, Cunado and Gracia, (2003) maintain that increasing oil price has a significant effect on economic growth in some selected countries in Europe.

Nevertheless, the positive effects of oil revenue increase cannot be taken for granted because increasing oil revenues can also be detrimental to long-run growth. Such is evident in the resource curse hypothesis whereby nations that are rich in natural resources, experience lower growth when compared to the resource developing countries. Sachs and Warner (1999 and 1995) found a negative impact of a natural resource on economic growth. Consistent with the above, Robinson *et al.,* 2006; Mehlum, and Moene (2006) contend that natural resource abundance decreases overall income. Other studies with similar conclusions include Agbaeze et al., 2015; Ibrahim *et al.,* 2014; Holden 2013; Idemudia, 2012; Asekunowo and Alaiya, 2012; Emami and Adibpour, 2012; Baky-Haskuee, 2011; Oyefusi, 2007. Conversely, Mohaddes and Pesaran (2013) and Cavalcanti *et al.,* (2012) view it differently, that the curse is more related to oil revenue volatility and not due to the resource endowment.

Most studies in the literature relating to increasing oil revenues and oil-exporting economies are mainly descriptive and historical whose conclusions are based on previous literature and assumptions. Such studies include Aslani, 2015; Dizaji, 2014; De-Wit and Crookes, (2013); Asekunowo and Alaiya, (2012); Kilian, 2010; Lescaroux, (2010); Hamilton, (2011; 2009; 2005; 1983); Hamilton and Herrera, (2004); Jones *et al.,* 2004; Ross, (2003); Linderoth, (1992); Shams, (1989);

The main period under consideration in the studies is the period of increasing oil revenue due to an oil price increase, which centres mainly on causative issues and relationships among variables. Although the studies related with oil exporters, but the effects of declining oil revenues on the budgets of oil exporters and how these nations would be able to meet up with the economies budgetary requirements were not under consideration. Hence, the next sub-sections would centre on the impact of declining oil revenues in oil-exporting countries.

### 2.4.3 Oil Revenues Decline in Oil Exporting Countries

From the perspective of decreasing oil price leading to oil revenue decline, Dreger and Rahmani, (2014) maintain that as increasing oil price leads to oil revenue increase, decreasing oil price on the other hand drastically reduce the base of income of oil-exporting economies whose primary source of income lies on oil export. The fall in oil prices causes severe strain to the oil exporters' finances as it causes a significant loss in revenues (Foo, 2015). Consequently, the monthly price of Brent crude oil price fell to an average of 65% between June 2014 and March 2016, which remain an issue of concern for most oil-exporting countries.

In related literature, there is no consensus as to the fundamentals of the fall in oil price even though most studies concluded that many factors are responsible for the sharp decline. In that regard, Kitous *et al.,* (2016) in examining the importance of oil revenues to oil-exporting countries, carried out a descriptive study on the impact of low oil prices of oil-exporting countries. The descriptive statistics indicate the vulnerability of oil-exporting countries to low oil prices. Voigt *et al*. (2015) concluded that increasing and decreasing oil prices have the opposite effect on oil-exporting economies. Consistently, Husain *et al.,* (2015) in the examination of the implications of lower oil prices found that lower oil prices are beneficial to net oil importers and leads to real income losses to net oil exporters. The study further outlined the trends and the causes of the fall in oil prices. Further, it concludes that the resultant windfall gains of oil price add up to zero while the future market forecasts are made with a very high degree of uncertainty. In line with the above, Monaldi, (2015) in examining the impact of oil price decline in Venezuelan economy maintain that the decline in oil revenue base brought about the increase in the economy's foreign debt, shortages of essential goods and high rate of political instability in the economy.

Sayne and Hruby (2016) examined the impact of falling oil revenue in Nigeria and found that the drastic decline in oil revenue has undermined economic progress as GDP growth rate dropped to its lowest level in fifteen years bringing the possibility of a recession in the country. Adamu (2015) also examined the impact of the global fall in oil price on Nigerian oil revenues. The study concluded that the oil sector serves as the instrument of growth and development in the Nigerian economy and as such, the global fall in oil prices have a significant impact on the oil revenues and prices in Nigeria.

In the case of the Russian economy, Sabitovaa and Shavaleyeva (2015) maintain that over-dependency of the budget system on oil transmute into the underdevelopment of other sectors of the economy, whereas, the instability and the economic situation of the nation raise the budget risk. Consistently, Grushevenko (2015) in examining the effects of lower oil prices on Russia and concludes that declining oil revenues has dampened the conditions for further economic growth and led to increasing uncertainty.

Yanar (2014) examined the effect of oil price plunge on the Middle East and North African (MENA) countries and concluded that oil price decline leads to contraction of the economies and it is more likely to have a positive effect on inflation. Stephens, (2009) examined the declining oil revenues in Gulf Cooperation Council (GCC) states and concluded that the over-dependency on oil revenues brought about the chronic budget deficits and growing unemployment among the nationals. Other related descriptive and historical studies are those of Aron (2013); Looney (1988); Tatom (1987).

The above studies are perfectly related as the emphasis is on the impact of declining oil revenues on oil-exporting economies but the studies are mainly descriptive and historical as the authors arrived at their conclusion based on the recent happenings and assumptions. There is, therefore, need to carry out an in-depth analysis to ascertain the magnitude of the impact on the examined economies. Oil price fluctuations also have effects on oil-importing economies and as such, would be explored in the next subsection.

### 2.4.4 Impact of Oil Price Fluctuation on Oil Consuming Economies

For oil-importing nations, most studies such as (Belli *et al*., 2016; Cunado *et al.,* 2015; Taghizade-Hesary and Yoshino 2015; Gu 2015; Yoshino and Taghizade-Hesary 2014; Schubert and Turnovsky (2011); Gounder and Bartleet 2007; Hooker 1997; Hamilton, 2011; 2009; 2008; 2005; 1983; Mork *et al*., 1989), posits that increasing oil price adversely affects oil-importing economies.

Consistent with the above, Voigt *et al.,* (2015) maintain that there are negative economic and political consequences of oil price increase on oil-consuming nations just as oil-exporting nations face heightened instability as oil price falls. The impact of either positive or negative oil price shock differs across nations.

On the other hand, the declining oil price is of great benefit to sustain economic growth in oil-importing economies. The slumps in oil price make for substantial savings and also helps to restructure the fiscal positions of the nations without natural resources, and are relying heavily on the importation of fuel (Foo, 2015). It is contrary, to the assertions of Aliyan, (2013) that the lower oil price is a blessing in disguise because increasing oil price would help the economy to achieve a more stable desired inflation rate while the decreasing oil price would tend to frustrate the efforts of the government to fight deflation. Carlson (2015) has the view that lower oil price would be beneficial to the United States economy but to an extent. The decline in oil price translates into the gross domestic product growth of the economy. Although, the effect of oil price decline has adverse effects on the employment rate of the United States economy as the rate increased when oil price increases but reduces with a reduction in oil price.

Cunado *et al*. (2015) analysed the macroeconomic impact of oil price fluctuations in four consuming Asian nations. The result shows that the responses of economic activities and price to oil price volatility differ in magnitude depending on the type of shock. Jimenez-Rodriguez and Sanchez (2012) contend that oil price shock lead to a decline in industrial production is thereby resulting in the high inflation rate in Japan. Fay *et al*., (2016) concluded in his study of the benefit of low oil prices in Canada that the impact of low oil prices on oil-importing economies should be positive.

Le and Chang, (2013) carried out an analysis of the role of oil price fluctuations in trade balances for Malaysia, Singapore and Japan. The result shows that the fluctuations in oil prices differ according to their degree of oil dependence. In addition, Taghizadeh-Hesary *et al*., (2013) maintain that Netherlands, France, Italy, USA, China, UK, Germany have a direct adverse effect on oil price shock and positive indirect benefit derivable from the demand for other products by the oil exporters. Cunado and de Gracia, (2005) discovered that fluctuations in oil price have a significant effect on economic activity in Thailand, Malaysia, Philipines, Singapore, South Korea and Japan. Abeysinghe, (2001) in examining the United States and ten Asian countries, found that the economies could not avoid the influence of high oil prices. On the contrary, Ran and Voon, (2012) found that oil price fluctuations have no significant impact on real economic activity in Hong Kong, South Korea, Singapore and Taiwan.

The main emphasis in all the above studies is on the impact of increasing oil price on oil-importing economies. It does not relate to the performance of the economies during periods of decreasing oil prices, which affects the oil-exporting economies most. Hence, the next subsection would be the vulnerability of oil exporters to declining oil revenues.

### 2.4.5 The Susceptibility of Oil Exporting Countries to Declining Oil Revenues

Oil revenue fluctuations affect directly the economic performance of the nations where the heavy dependency on oil prevails. For the last century, one of the primary factors, which has determined both the economic and political developments in most oil-dependent nations, is the revenue from the oil sector. Experience has shown that revenues that have connections with oil are subject to very wide swings resulting from the instability in the oil market. Recently, most countries are facing a significant shortfall in their budgets due to the high dependence on oil production (Morris, 2016; Yanar, 2014). Consistent with the above, Hodgson, (2015) contends that the global fall in oil price would lead to a significant loss in government revenues, the decline in public expenditure, increase in the unemployment rate, possible economic recession as well as high risk of social and political instability.

There is indeed systemic vulnerability to low oil prices as most oil-dependent nations face declining oil revenues, which culminates in the government's inability to maintain the needed fiscal balances in this current price shock. Oil price drastically reduced from $112 per barrel to $32 per barrel within June 2014 and March 2016 (Kitous *et al.* 2016). Since that period, the price of oil has been fluctuating but at less than $50 per barrel, which has led to the inability of most oil-dependent nations to meet the budgetary needs of the economies. Consequently, this has resulted in fiscal deficits, which affect the economic development of oil-dependent nations and tends to reduce domestic savings as well. Most of these oil-exporting countries that are exclusively dependent on increasing oil price to generate revenue would be affected most, as these governments would find it tough to stabilise their national currencies and settle foreign debts (Hodgson, 2015).

Countries in Sub-Sahara Africa, in particular, North African countries have a very high elasticity of government revenues and gross domestic product to oil price coupled with very low reserves per capita and almost non-existing sovereign wealth fund thereby causing the nations to be susceptible to low oil prices. Algeria has a very low reserve per capita while that of Libya is relatively very high, although all rely heavily on oil for their sustainability (Kitous *et al.,* 2016). Most economies in the Gulf region have on the average, 55 per cent share of oil-related sectors, indicating a very high elasticity of government revenues and the gross domestic product to oil price (Kitous *et al.,* 2016). Iran also has a very high elasticity of government revenues to the price of oil, thereby making the economy very vulnerable to low oil prices, leading to declining revenues (Kitous *et al.,* 2016).

Declining oil revenue has widened the budget deficit gap in oil-exporting economies. The breakeven oil price needed to balance budgets are higher than the prevailing oil price which is trading presently at less than $50 per barrel (Bentley *et al.,* 2016; Rascouet, 2015; Fahey, 2015; Okusaga, 2015; Deutsche Bank and IMF, 2015). Due to the present slump in crude oil prices, most oil producers are unable to cover the cost of producing oil, which is indeed an issue of concern. Consistently, Frakt, (2014) maintained that for the oil producers to make a profit, oil price must be higher than the average total cost of producing a barrel of oil. Otherwise, the economies would be producing at a loss.

Most oil-exporting nations are incredibly dependent on oil for more than half of their exports and the present slump in crude oil price has drastically reduced their profitability. In Norway, for instance, about three offshore rigs are under suspension, more than $150 million worth of investments are on hold while about ten thousand Norwegian oil workers have been laid off. Norway's total net cash flow reduced drastically from NOK312 billion in 2014 to NOK218 million in 2015. The drop in revenue of the economy by about 30 per cent is due to the lower revenues emanating from sharp oil price decline (Norwegian Petroleum, 2016; Cunningham, 2014). The Nigerian economy is currently experiencing severe exchange rate volatility and a drastic reduction in government expenditures (Adamu, 2015). As oil price collapsed since 2014, the Angolan national currency has weakened by more than 7 per cent as against the dollar and has severely threatened the Angolan government revenues (McClelland, 2015). In the same vein, the estimate shows that Venezuela loses about $7.5 billion of its income for every $10 drop in oil price. The Venezuelan government budget deficit reached a peak of 14.1 per cent of its total gross domestic product in the year 2014, about 3.5 per cent of its gross domestic product in 2008. The economy is now amid a deep economic recession, battles with the looming debt default and the possibility of triple-digit inflation (Voigt *et al.,* 2015).

In Russia, the economy has been in serious distress since the present slump in crude oil prices as about 52 per cent of the Russian budget emanates from oil revenues. The unemployment rate had risen from 5.2 per cent in 2014 to 6.7 per cent in 2015. The level of unemployment in Nigeria is indeed an issue of concern and has also risen from 14.9 per cent in 2008 to about 23.1 per cent as the economically active population are already retrenched. Social insecurity is on the increase in most oil-exporting countries, especially the developing nations, due to the drastic fall in government revenues (Hodgson, 2015; Voigt *et al.,* 2015). Consistently, Yanar, (2014) maintained that the declining oil revenues would metamorphose into the shrinkage of the economies thereby causing political instability due to the drastic reduction in government expenditures, high inflation rate and an increase in unemployment. Indeed, the collapsing oil revenues have thrown the budgets of oil-exporting countries into chaos as they struggle amid the crisis.

In the light of the above, the purpose of this research, therefore, is to evaluate the consequences of declining oil revenue on the economic performance of Nigeria, Venezuela and Norway for a comparative analysis. These economies are highly dependent on the revenues from oil, and there is a need to examine and analyse the declining oil revenue implications on their budgetary requirements due to the present slump in crude oil prices leading to a drastic reduction in oil revenues. The dependency ratio of the economies to oil revenue is overwhelmingly high, as shown in the table below.

***Table 2. 2: Percentage of Government Revenues and Export Earnings of Some Selected Oil Exporting Countries***

| S/NO | COUNTRY | PERCENTAGE OF GOVERNMENT REVENUES | PERCENTAGE OF EXPORT EARNINGS |
|---|---|---|---|
| 1. | Nigeria | 90 | 96 |
| 2. | Venezuela | 95 | 96 |
| 3. | Saudi Arabia | 86 | 85 |
| 4. | Iraq | 90 | 80 |
| 5. | Libya | 96 | 98 |
| 6. | Iran | 75 | 80 |
| 7. | Angola | 90 | 95 |
| 8. | Norway | 79 | - |
| 9. | Algeria | 97 | 58 |
| 10. | Kuwait | 90 | 95 |
| 11. | Qatar | 70 | - |

**Sources:** (OPEC, 2016; Herculana, 2016; Aregbeyen and Kolawole, 2015; Voigt *et al.*, 2015; Essandoh-Yeddu and Yalamova, 2015; Krakenes, 2015; African Economic Outlook, 2012; Global Witness, 1999; Feld and MacIntyre, 1998).

Due to the vulnerability of oil-producing countries to oil price fluctuations, the impact on the budgets of oil-exporting countries cannot be overemphasised. The next subsection encompasses the impact of oil price fluctuations on the budgets of oil-exporting countries.

### 2.4.6 Impact of Oil Price Fluctuations on Budgets of Oil Producing Economies

The financial prospects of most of the oil-exporting economies are greatly in danger, as the oil price declined from about $110 a barrel in 2014 to less than $50 per barrel in 2016. As at the 18th of July 2016, the Brent crude oil price was at $46.13 per barrel. The fiscal balance of most of these oil-dependent economies is moving from their surplus base towards deficits. Most of the GCC countries' fiscal revenue has dropped drastically to about 10 to 20 per cent. Some members of the OPEC such as Nigeria, Iran, and Iraq with higher population growth and greater higher budgetary demands are seriously in a very tight corner. The oil price needed to balance the Iranian budget is about $131 per barrel while Iraq needed about $101 per barrel to balance its budget. The economies also need to produce about 8.4 per cent and 13 per cent of OPEC's share of production (Hough & Barton 2016; Husain *et al*. 2015; Bowler (2015) and IMF, Regional Economic Outlook 2015; Rascouet 2015).

Aliyan (2013) posits that the oil revenue, which is usually from the oil exports of most oil-exporting economies, goes into their budgets directly or indirectly and as a result, any form of changes in oil price affects their revenue base. Such changes also affect the macroeconomic variables, such as the GDP, inflation, consumption, investment, production, exchange rate, employment.

During the periods of increases in oil price, which correspondingly increases the revenue base of most oil-exporting economies, most of these countries' fiscal budgets were operating at a surplus; it is otherwise when oil price decreases. In the study carried out by Al-Quadsi and Ali (2016) on the implications of oil price fluctuations in the GCC states, they revealed that there is a shift in the fiscal budget of the Kingdom of Saudi Arabia from surplus to deficits despite the 14 per cent spending cut in 2016. The kingdom had 2016 budget deficit forecasts of $87 billion, as it needs about $105 per barrel oil price to balance the national budget. More so, about 80 per cent of the Kingdom's revenue is generated from oil export and is highly affected by the depressed crude oil price. Similarly, the budget of Oman for the 2016 forecasts was also a deficit of about $8.5billion. Qatar on the other hand, projected a deficit of about $12.8billion in 2016, as the economy needed about $55.50 per barrel to balance its national budget and two per cent share of OPEC oil production (IMF, Regional Economic Outlook, 2015; Rascouet 2015; Fahey 2015).

The US oil benchmark, as at January 2016 collapsed by about 70% about what it was a few months ago. The United States shale oil manufacture sector is currently experiencing severe financial struggle due to the high production cost and the recent continuous decline in oil price. Most oil giants are also on the losing side due to the refining margin squeeze. Although the United States shale oil productions have a high cost of production than the conventional oil production, they continued to cover the basic costs and settle some of their debts. Shell BP specifies that the company's revenue reduces by about $500 million per annum for every $1 decline in the oil price (Al-Qudsi and Ali 2016; Bowler, 2015).

Deutsche Bank and IMF, (2015) and Bowler, (2015) posits that the economy of Russia has lost a considerable amount of revenue of about $2billion for every $1 fall in the price of oil. The study further predicted that the economy of Russia would shrink by about 0.7 per cent should the oil price fail to improve by that same year, 2015. The oil price needed to balance the budget is about $105 per barrel. However, as the 18 of July 2016, the price of oil was about $ 48.13 per barrel, thereby creating a fiscal gap.

One of the largest oil producer and exporter in the world–Venezuela, is already in a dilemma due to the present slump in oil price, as the inflation rate in the economy is already 60 per cent and moving towards recession. The oil price needed to balance the budget of Venezuela's budget is about $118 per barrel as against the oil price of $48.13 as at the 18th of July 2016 and about 7.8 per cent share of OPEC's production (Rascouet, 2015). Saudi Arabia, on the other hand, as the world's highest oil producer and exporter has failed to cut down its oil production to stabilise oil price as they did in the 1980s. Bowler (2015) further posits that the Kingdom desires the oil price to be within $85 per barrel to have a proper fiscal balance. Even though the Kingdom has a very high oil reserves, about $700billion was drawn from the reserves to augment the shortfall due to the oil price decline.

Other Persian Gulf producers such as Kuwait and the United Arab Emirates have enough foreign exchange reserve to the extent that they could continue with the budget deficits for a longer period. For how long can they continue, should the decline in oil revenue persist longer than anticipated? The Brent crude oil price needed to balance the budgets of Kuwait and the United Arab Emirates are $78 per barrel and $81 per barrel, respectively. There is indeed an urgent need for serious adjustment in the financial process of the oil-dependent economies (Bowler, 2015; Deutsche Bank and IMF, 2015).

Nigeria, as the highest oil producer in Africa, is heavily dependent on oil export as its primary source of revenue. About 80 per cent of the government income comes from oil and about 90 per cent of its total exports, and as such, this recent decline in the price of oil has drastically affected the base of income of the economy. Oil price needed to balance the budget is about $123 per barrel whereas the Brent crude oil as the 18th of July 2016 was $48.13 per barrel. Nigeria also needs about 6.3 per cent production out of OPEC's share (Deutsche Bank and IMF, 2015; Bowler, 2015; Rascouet, 2015).

The driving force of Angola's economic growth is the revenue from crude oil. The recent slump in the oil price has generated an economic crisis in the economy, such as high inflation rate, currency depreciation. Angola, as an oil-dependent economy turned to a new leaf with the oil revenue after 27 years of civil war. The Angolan economy was transformed entirely due to the deep-water discoveries and is known as the second-highest oil producer in Africa after Nigeria. In the year 2015, the economy decided to cut the national budget by about 25 per cent while the revenue from oil declined drastically by more than 50 per cent this year 2016. It has caused a high cost of living in Luanda since oil constitutes more than 95 per cent of its total exports and about 75 per cent of its fiscal revenue. Angola needed an oil price of about $110 per barrel to balance its budgets and a 3.4 per cent share of the production by OPEC (Engebretsen, 2015; Fahey, 2015; Rascouet, 2015)

According to Campbell, 2015, Norway is the sixth oil exporter of oil in the world and the second gas exporter in the world as well. About 90 per cent of the Norwegian oil is for export. As at the year 2013, the oil revenue made from oil export is about $87.68 per barrel. Norway had the world's highest sovereign wealth fund of about $1.1 trillion since 1990 when it was set up. The Norwegian government spend only 4 per cent of its funds on maintaining the financial system as they always ensure a balanced budget or surplus budgets while the rest goes into the sovereign wealth fund. By prosperity, Norway is the most prosperous economy in the world as its healthcare sector receives more than their United States counterpart does by about 60 per cent. Those working in the hotels and restaurants receive about three times per hour higher than their United States counterparts. The economic progress retarded due to the present oil price slump as is substantial resources and the backbone of the economy of Norway. The economy is highly driven by oil, and the government cannot continue to maintain a surplus budget nor add more revenue to the sovereign wealth fund (Madslien, 2016; Buvarp, 2015; Klein, 2015). However, should the price of oil continue to decline, how will the economy meet up with the fiscal needs of the nation?

Most of these oil-exporting countries already have the oil price, which the economies need to balance the national budget. In 2015, the oil price required to balance the budget in some of the oil exporters was as shown in figure 2.4.1 below. The prices are significantly lower than the recent oil price, which would likely lead to a drastic reduction in the oil revenues of these economies.

***Figure 2. 2: Oil Price Needed to Balance the National Budgets***


Source: Deutsche Bank and IMF (2015)

Consistent with the above, Hayes (2015) in examining falling oil price and the break-even oil prices needed by most oil producers to balance budgets. The study reveals that Libya needs oil price to rise to $184 per barrel, Iran-$313 per barrel, Iraq - $101.50 per barrel, Venezuela - $117.50, Algeria - $130 per barrel to break even as the economy has already lost more than $28 billion as a result of the declining oil price. The Nigerian economy also lost about $42.5 billion as the economy needs oil price to trade at about $123 per barrel to balance its budget[4]. For the United States, the break-even oil price is on the average of $75 per barrel while Russia has lost more than $150 billion since oil price declined and needed oil price to be $98 per barrel to balance the budget.

In additit.ion, Shyam, (2018) outlined that Venezuela needed $216; Qatar - $27; Saudi Arabia - $88 and Russia - $53 per barrel to balance their budgets. Consistently, TAGOil, (2017) presents that Nigeria needed $139 per barrel; Iraq - $61; Angola - $82; Oman – 75; Kazakhstan - $71; Bahrain - $84 and Oman – $75 per barrel to also balance their budgets.

However, in the light of the above and given the fact that most of the oil-producing nations that rely heavily on oil for the sustainability of the nation with the terrible impact of declining oil revenues which could lead to the collapse of the economies. This study, therefore, seeks to address and answer the research question as thus:

*“What sustainable measures would Nigeria, Venezuela and Norway as oil-dependent nations use to withstand the budgetary needs of the nations during periods of declining oil revenues”?*

The preceding sub-section examines the sustainability of the government budget.

[4] See Hayes, (2015)

#### 2.4.6.1 The Sustainability of Government Budget during Periods of Economic Uncertainty

The viability of the state budget is more than projecting into the future; rather it is the urgent need for policy changes as well as the need for new budget tools to assess the government's fiscal position. Innovations in accounting and economic analysis have stimulated the interest in sustainability. The focus of financial viability has shifted from the near term to the distant future (Chote *et al*., 2014; Schick, 2005). Thus, the present slump in crude oil prices, which has reduced the revenue base of most oil-exporting countries, has caused economic uncertainty in these nations. There is a need for sustainability of government budgets in this period of the economic downturn to enable the oil-exporting nations to meet up with the budgetary requirements both in the short term, medium-term and in the long term.

The aim of any *Government Economic Strategy* should not only be to offer greater protection to the economies during periods of economic uncertainty, but also to bring about a long-term, or structural change in the quest for the nations' sustainable growth.

The concern about fiscal sustainability has shifted from being an issue only for underdeveloped and emerging economies that are vulnerable to cyclical disturbances.

It is extended to advanced economies as some have established some processes for maintaining their fiscal position for a lengthy period. During the past decade, some nations, like the United Kingdom, Australia and New Zealand, reviews fiscal sustainability as part of the new fiscal responsibility. In the medium-term budget frameworks submitted to the European Commission, the European Union member countries commented on sustainability in pursuant of the stability and growth pact. In addition, the United States reviews its long-term viability of social security and Medicare on an annual basis. In OECD economies, the focus is on the long-term because the concern is that the fiscal posture is manageable but may not be sustained into the future (Schick 2005).

Since most oil-exporting economies rely heavily on oil revenue for their sustainability, there is a need for exploratory research to examine the measures necessary by most oil-dependent nations in meeting up with the budgetary requirements during periods of declining oil revenues. There is also a need to examine the impact of the oil price fluctuations on other sectors of the economy. Hence the next section gives an insight into the impact of dwindling oil price on other sectors of the economy.

## 2.5 Impact of Dwindling Oil Price on Other Sectors of the Economy

In the United States, the decline in oil price aids industrial growth, especially those industries that are highly dependent on oil and the cost of transportation (Carlson, 2015). Oil price movements have remarkable effects on the industries that are relying on oil, especially the manufacturing sector in Iran (Aliyan, 2013). The superior outcome is consistent with the findings of Lee and Nee (2002) that supply decreases for the industries that have a higher share of the cost of oil while demand reduces on the part of transportation industries. More so, Jimenez-Rodriguez (2007) discovered that there are the various responses of oil price shocks on the European Monetary Union countries – Spain, Germany, France and Italy, which relates to the findings in the United States and the United Kingdom. The impact of the oil price movements on the manufacturing sectors of these economies is not equal.

Ari, (2015) in analysing the relationship between oil price shocks and agricultural prices in Turkey indicated the upward and downward movement of oil price fluctuation has similar positive and adverse effects on cotton prices. The effects of oil price on the sectors of the Malaysian economy shows that there is a long-run effect on the examined sectors - service sector, manufacturing sector and the Agricultural sector (Yee Ee, 2015). In addition, Shaari, Pei and Rahim, (2013) on examining the effects of oil price movements on the segments of the Malaysian economy reveal that oil price movements have long term effects on the agricultural sector, transportation, construction and the manufacturing sector. These nations rely heavily on the oil industry, and as such, the fluctuation in oil price is very destructive on the sectors.

The above findings are highly consistent with the results of Hanson *et al.* (1993). The findings also reveal that the shock in oil price affects the agricultural sector immensely as it caused a drastic decline in the income of the industry. The revenue from the sale of some farm produce, which rises as oil price increases, is usually not enough to offset the fall in the sector's revenue.

On the contrary, Nazlioglu, (2011) findings reveal that there is no relationship between oil price and agricultural commodities from the linear causality analysis carried out while the non-linear tests have mixed results.

IMF, Regional Economic Outlook, (2015) posits that there is a drastic reduction of non-oil growth because of the decline in oil price. It is only in Saudi Arabia, due to their low cost of oil production that could benefit from the increasing production of oil. Most of these countries under focus are developed and emerging economies. There is a need to examine the sovereign wealth funds, which aid the oil exporters to save the windfall gains from oil for future use. The next section gives an insight into the sovereign wealth funds of oil-exporting nations.

## 2.6 The Sovereign Wealth Funds and the Oil Exporting Countries

According to Wilson (2016), sovereign wealth fund is established to meet up various motives of different economies. It enables the oil-exporting nations to save the accrued profits of windfall gains from oil for future use, especially for the benefit of the citizenry. Agbaeze and Onwuka, (2016) view the sovereign wealth fund as a stabiliser, which gives assurance for the future generations and as well, provides for the developmental needs of the nation. Brown *et al*. 2014 maintained that the Sovereign wealth fund is made up of bonds, stocks and other financial assets, which are targeted to manage the gains from oil and for the well-being of both the present and future generations. In the periods of fiscal imbalance, the excess oil revenues in the sovereign wealth fund become very helpful.

In line with the above, Naser (2016) classified the sovereign wealth fund as an 'investment vehicle' which aids the governments to save and stabilise the richness of the economy in both national and global financial markets.

The sovereign wealth funds enlarged as most of the oil-exporting nations save the oil windfall gains during periods of increasing oil price. The reverse is the case now as oil price declines since 2014, thereby reducing the revenue generation of these oil exporters who have not gotten enough revenue to meet up with the budgetary needs of the nations. The break-even oil price of most of these oil-dependent nations, as outlined above are higher than the prevailing oil price as most of these nations now withdraws from the reserves to meet up with the budgetary needs.

Norway withdrew about $570 from its reserves last year and still declares the intention of withdrawing more this year. On the other hand, Russia has withdrawn about 44 per cent of its reserves to support the economy's budgetary needs last year. Kazakhstan's economy has planned to take about $28.8 billion from its reserves to meet up with budgetary requirements and finance the government's deficits. Should the oil price continue to trade below $50 per barrel, more oil-dependent nations would draw more from the country's reserves to finance budget, thereby depleting the sovereign wealth fund. In the words of Delaney, (2016):

> *"Countries from Norway to Russia to Saudi Arabia have begun drawing down their reserve funds to plug budget gaps and defend currencies" (Delaney 2016)[5].*

Mohaddes and Pesaran, (2013) stated that stabilisation of the sovereign wealth fund would be able to tidy up government expenditures as well as offset the instability in oil revenues. Although, the Government Pension Fund in Norway aims to manage the oil income in the long term effectively but is adversely affected due to the declining oil revenues. Libyan Investment Authority Khattaly posits that the rainy day has come since the sovereign wealth fund was meant for it as Libya would need a break-even oil price of about $207 per barrel to balance the nation's budget. However, the sovereign wealth fund of the oil-dependent nations would continue to deplete should oil price continue to plummet. However, there is, therefore, urgent need to ensure that the revenue gap in oil-exporting nations is adequately closed to build up the sovereign wealth funds for usage over the long term.

[5] See, Delaney, 2016

## 2.7 Theoretical Framework of the Study

The last section related sovereign wealth funds with regards to saving the windfall gains from oil, which most oil-exporting countries rely on during periods of economic crisis. This section expresses the theoretical framework of the study and the justification of its adoption as the basis upon which the research relies.

The theoretical framework provides the rationale for conducting any investigation as it helps to reveal the underlying assumptions relating to ones' research. The assumptions, however, are established in theory (Simon and Goes, 2013; Trochim, 2006). The theoretical framework also serves as the lens which aids the researcher in justifying the foundation and the scope of the study, whether inductive or deductive (Ocholla and Le Roux, 2011; USC LibGuide, 2011; Zielder, 2007; Borgatti, 1999).

Swanson and Chermack (2013) view the theoretical framework as the structure, which backs the research theory as it, explains the reasons behind the existence of the research problem. From the preceding, theory is to research what the heart is to the body and as such can be referred to as the nucleus of any investigation as it controls the growth of the cell and gives signals to the body. In like manner, theories controls, coordinates, and shows clearly the direction of any research and reasons for its existence.

Based on existing literature, there are quite some valuable theoretical perspectives surrounding the increasing and declining effects of oil revenues on the budgets of both oils importing and oil-exporting economies. Although, the theories of budgetary decision making of oil revenue decline, economic growth theories, income and expenditures theories, and target revenue theories. The conventional theories of oil price are the main tenets of theories identified in the literature of oil revenue effects on the budgets of both oil-exporting and consuming nations (Hayes, 2016; Gosling, 2016; Rezaei, 2015; Al-Zeaud, 2015; Mupimpila et al 2015; Olaoye, 2015; Ostadi and Shahbaz, 2015; Aladejare, 2014; Al-Qahtani, 2008; Ibrahim and Proctor, 2007; Reddick, 2003 and 2004; Ramcharran, 2001; Al-Yousef, 1998; Sielke, 1995; Wilson and Sylvia, 1993; Linderoth, 1992; Downs and Rocke, 1984; Padgett, 1980).

Principally, the research assessed three major theories upon which this research is based. These are the revenue-spend and spend-revenue hypotheses; theories of budgetary decision making of oil revenue decline and Economic growth theories.

### 2.7.1 Revenue-Spend and Spend Revenue Hypotheses

Revenue-Spend hypothesis originates from Friedman (1978), and it entails a unidirectional causality running from revenue to expenditures. It, therefore, means that an increase in government revenue would lead to an increase in government expenditure, which would lead to the inability of reducing the budget deficit gaps. Although Buchanan and Wagner (1978) contend that an increase in government revenue is the best remedy for budget deficits. Since the revenue-spend hypothesis is evidenced in this study, budget deficits can be avoided by implementing policies that would help in stimulating government revenue.

Spend-Revenue hypothesis, on the other hand, was proposed by Peacock and Wiseman (1979), and it is built on the tenet that expenditures cause revenues. That is, when government expenditures increase due to political and economic crises, government revenues increase as well. This means that the government spends first and then raise revenues to pay for the expenditures later. The spend-revenue hypothesis, therefore, suggests that decreasing government expenditures can reduce budget deficits.

### 2.7.2 The Theories of Budgetary Decision Making of Oil Revenue Decline

The theories of budgetary decision-making are part of the internal change theories, which examine the budget procedure changes within the government of any nation. External influences outside the immediate control of the government do not have any significant impact on budgetary decisions. The internal change theories primarily examine the changes, ability and the size of variations in the fiscal choice of a given nation from one period to the next.

There are three main theories within the class of internal change budgetary theories such as rational expectations theory; The Incrementalism, otherwise known as (the Bureaucratic Process theory) and The Garbage Can Theory.

#### 2.7.2.1 Rational Expectations Theory

This theory has been used traditionally in the explanations of the macroeconomic behaviour as the governments face inter-temporal budgetary constraint, which entails the budget-balancing, in the long-run, that is, it requires enough time for the budget to adjust either through revenue increase or decrease in expenditures. The current decisions of the government would have a significant impact on the options that would be available in the future. The US, United Kingdom and Canada[6] follow the logic of this theory (Reddick, 2004; 2003; Downs and Rocke, 1984).

The rational expectations theory was introduced by; Hamilton and Flavin (1986) who wants to find out if the government is subject to a constraint in the public finance literature.

[6] The US, United Kingdom and Canada aligned their budgets with the Rational Expectation theory. See, Reddick (2004; 2003); Downs and Rocke (1984).

This theory assumes that decision-makers have all the necessary information at their disposal and should be able to make policy choices to determine the budget of the economy concerned. The budget makers are assumed to think and act rationally about the future, consider all the possible outcomes of the budgeting processes and not just using the previous decisions to determine the government's current budget. They choose the best solution through unanimous agreement. It is a forward-looking process that all the available information are for future planning (Reddick, 2004; 2003; Downs and Rocke, 1984).

The rational expectations theory has some limitations, as it requires more information and more time. It also assumes that the criteria for the decision-making are rational, measurable and readily available. The theory assumes perfect knowledge of all the alternatives, preferences, non-political world, goals and consequences.

This theory centres on the future in making a budgetary decision while the decision-makers are assumed to have the time and the needed resources to take the right decision in the budgetary process. Indeed, even as the revenues of most oil-dependent nations are on the decline due to the recent fall in oil price. As such, creating time and looking into the future of these economies by the decision-makers would enable the right decisions to be taken in the budgetary process.

Oil serves as the mainstay of these oil-dependent nations and as such, generating more revenues to carry out the statutory roles of these nations requires the best budgetary policy to revitalise the nations. Oil dependent nations require adequate information to come out with a sound budgetary outcome for the economy. Since the main study purpose is to find out the economic consequences of decline oil revenue in consideration of long-term position, this validates the adoption of rational expectations theory as one of the theories, which the research is based.

#### 2.7.2.2 Budgetary Incrementalism Theory

Budgetary incrementalism theory is also known as the bureaucratic theory of decision making (Sielke, 1995; Cibulka, 1987; Downs and Roche, 1984; Boyd, 1982; Wildavsky, 1979). This theory is a rival model of decision making in the internal change framework. The theory states that the spending decisions made in the past determine the current spending decisions (Reddick, 2004, 2003; Berry, 1990).

The Incremental theory was first identified by Lindblom (1987) and is recognised globally as a dominant descriptive budgetary theory for almost three decades now. It centres on events from the discovery of the problem to the possible solution (Khan, 2002; Khan and Hildreth, 2002; Gordon, 1990; Wildavsky, 1964). The agencies can select the incremental funding with an equal percentage increase across the different programmes. For instance, incrementalism applies whenever an agency requests for a proportionate increase in funding its various budgetary programmes. Budgets are driven by historical data since the budget incrementalism represents slight changes from the budgetary base. An important characteristic of this theory is the avoidance of a comprehensive investigation of the budgetary needs. It is, therefore called ‘a theory of avoidance’ (Jordan, 2002). Khan, (2002) and Sharkansky, (1969) argue that incrementalism theory gives room for budget outcomes to be separated from controversy since controversies may still be inherent within policy makers.

Conceptually, incrementalism is known as the amount of steadiness in the design of the budgetary outputs over time. In-so-far-as the underlying incremental patterns of budgetary outputs are specified, the assessment of the incremental nature of the budget could be through the evaluation of the adherence of its budgetary output to the pattern over time (Ibrahim and Proctor, 1992; Dye, 1972).

Most of the empirical studies on incrementalism centred mainly on the federal and state levels, (Reddick, 2003, 2004; Caiden, 1994; Ibrabim and Proctor, 1992; Thompson, 1987; Downs and Rocke, 1984; Lowery *et al*. 1984; Padgett, 1980; Davis *et al.* 1974,1966). At the local level, incrementalism has been universal as a descriptive theory (Jordan, 2002; Khan and Hildreth, 2002).

The theory is concerned with change at the margin as decision-makers usually lack the information that could facilitate existing expenditures and the need for future spending. Regarding, this theory, only slight changes are made to existing budgetary programmes as the budget mainly comprises of a repetition of the previous budget and the standard operating procedure of adding a marginal increase to the past year's budget (Ibrahim and Proctor, 1992; Sharpe, 1984; Wildavsky, 1979). Incremental theorists argue that decision making in the society be highly complex at all times and as such, requires the development of a short cut to facilitate the decision-making process (Lindblom, 1958,1959).

Three incremental strategies include **previous years' increment approach** in which the agencies demand the same percentage increase across the programmes as was appropriated in preceding years. Secondly, **inflation strategy** whereby, the agency administrators to determine the incremental use the inflation funding index funding. Thirdly, the **best guess strategy** whereby the agency officials use their wealth of knowledge through budgetary experience to form the best guess about the increment to request for in the budget procedure (Whicker and Mo, 2002; Caiden, 1994; David *et al.*

1987). However, whenever an economy has a favourable environment, the incremental budget strategies are most likely to be used.

Incrementalism had severe shortcomings, as it could not clearly show the relationship between the outcome and the behaviour. It did not show clearly whether the outcome was incremental because the behaviour was incremental. Secondly, defining incremental as the outcome is in itself ambiguous (Reddick 2004, 2003; Whicker and Mo, 2002; Caiden, 1994; Berry, 1990).

From the preceding, the budgetary decision-making theory underpins this study, particularly the rational expectations theory and the incrementalism theory. The inflation rate strategy and the best guess strategy perfectly fits into this study, but the previous year's incrementalism theory has no base in this research. As the revenue of the government declines due to the decrease in oil prices, increasing the budget of each of the programmes by equal proportion as the 'previous year's budget' suggests, would not be possible due to the shortfall in the government's oil revenues. If the income of the current budget is higher than the previous, then it would be justifiable for decision-makers to increase the budgets by the same proportion as the previous year's budget or even more. The main issue of concern is the revenue shortfall, which needed to be improved to enable these oil-dependent nations to meet with the budgetary requirement of the economies.

From the perspectives of the 'inflation strategy.' and 'best guess strategy' of the incrementalism theory, this study is based on these strategies in that the current inflation rate need to be considered by the decision-makers' in determining the budget. There is need to examine the impact of the declining revenues on an inflation rate of these economies as well given the fact that different researchers have diverse views as regards to the implications of the income fluctuations on the macroeconomic variables as discussed earlier. More so, the agency officials would also use their wealth of knowledge in determining the increment to request for during the budgetary process.

Consistent with the conclusions of Reddick, (2004; 2003); Downs and Rocke, (1984), the garbage can theory has no base in this research and does not underpin the study because the already-made solutions may not be able to answer the problems it is meant to solve. The world is dynamic in nature; everything is constantly on the move as change is the only constant thing. The present slump in crude oil price in the world oil market took many nations by surprise, especially the oil-dependent nations that are heavily relying on the revenues from crude.  Previously, OPEC countries control the production quotas of its members to regulate oil prices by cutting down oil production to increase oil price or increase oil production when the oil price becomes too high. However, presently, it seems that the power of this oligopoly has failed, as OPEC has not been able to control the production quotas of its members[7]. Thus, causing the oversupply of oil that led to the fall in oil price below the expected price.  One expects that the severe impact of declining oil price on the revenue of oil-producing nation's budgets should encourage them to cut down oil production to regulate the oil price. There is a rise in oil production from non-OPEC countries as well, coupled with the drastic decline in oil consumption due to slower growth from most oil-consuming nations contributed immensely in the recent fluctuations in oil price.

[7] The power of this oligopoly has failed, as OPEC has not been able to control the production quotas of its members. See OECD/IEA 2015.

### 2.7.3 Economic Growth Theories

Economic growth theory entails the increase in the goods and services produced by a nation measured as the real gross domestic product percentage adjusted for inflation (Weils, 2016). Antwi *et al.* 2013 posit that economic growth is an increase in real gross domestic product, adjusted for inflation. Endogenous growth theories are present in the works of Cesaratto, (2008); Jones, (2002); Solo, (1970). The main types of economic growth theories underpinning this study are the exogenous and endogenous growth theories.

#### 2.7.3.1 Classical Theory of Economic Growth

This theory emerged during the eighteenth and nineteenth centuries through the works of Adam Smith, David Ricardo and Robert Malthus, which states that every nation has a steady-state GDP and any deviation from the GDP is temporary, as it would eventually return to its original state. It relies on a simple concept that population grows with the growth in GDP and tends to grow more due to the rising demand higher than the available resources which will eventually cause the GDP to return to its steady-state (Weil, 2016; Idrisov *et al*. 2015).

Population indeed grows with the growth in GDP, but deviations in GDP are inevitable and may not be temporary as well as not return to its steady state. For instance, the fluctuations in the oil price which has a ripple effect on the GDP through the oil revenue of oil-exporting nations have lingered for a while now and has a further effect on another aspect of the economy. The theory, therefore, does not fit into this study as economic growth is attainable through savings in oil revenue while substantial investment of oil revenue leads to high growth in GDP (Adesola, 2014; Barkhordara and Sboohi 2013; Hamdi and Sbia, 2013; Pettinger, 2007).

Hence, the classical theory of economic growth does not underpin this study because both increasing and decreasing in the gross domestic product of the nation may be correlated with the population growth but is unlikely to return to its steady-state as outlined in theory due to the unpredictable nature of activities in the global oil market.

**2.7.3.2 Exogenous Growth Theory (Neo-Classical Theory of Economic Growth)**

Two economists, Robert Solow and T.W. Swan developed the Solow-Swan, growth model. They emphasised that labour, capital and technology are factors that impact growth in an economy. The theory state that output per worker increases with output per capital but at a decreasing rate known as diminishing marginal returns. Hence, the increase continues to a point where capital and labour attain an equilibrium state. The theory entails that economic growth is unattainable except through advancement in technology, which happens by chance. Labour and capital adjust immediately with technological advancement while there will be an equal level of the living standard once all the economies have access to same technology (Sinha, 2015; Barkhordara and Saboohi, 2013; Mehrara 2008; Todaro & Smith 2004).

The conclusions that economic growth can only be attainable with the advancement in technology and happens by chance is ambiguous, while it is not possible, for all the nations in the world to have access to same technology to have an equal living standard. It is indeed a theory of growth, but this aspect of the theory does not fit into this study (Weil, 2016).

The Solow-Swan growth model, also known as **exogenous growth theory,** assumes that external factors are primarily responsible for economic growth and not through internal factors. Solow's model maintains that economic growth is unattainable in the absence of technological process.

### 2.7.3.3 Endogenous Growth Theory

The **endogenous growth theory** is an economic theory, which contends that economic growth originates from inside a system as a direct outcome of internal processes. That is, economic growth is an endogenous outcome of an internal economic structure (Sinha, 2015; Parker, 2012; Pettinger, 2007; Romer, 1994; 1980).

It entails that human capital enhancement will lead to economic growth through the development of new forms of technology and effective means of production. They also posit that there is a need for the government of a nation to support technological innovation (Sinha, 2015; Cesaratto, 2008; Pettinger, 2007; Grossman and Helpman, 1994).

The endogenous growth theory has a connection to the budgetary decision-making theories where the actions and reactions of the decision-makers (human capital) determine the fiscal performance of the economy. More so, for the exogenous growth theory, technological progress would be achieved through the external sector, which involves the interaction in the exportation of the economies resources and other means of generating revenues for the nation in the long run.

For an endogenous growth model, with the help of human capital and technological innovation, economic growth can be achieved.  This assertion is entirely in line with this study as both the endogenous and exogenous growth theories underpin the study because the oil-exporting countries would be able to achieve the desired growth from both within the system and externally through the external sector performance. Hence, this study relies on both the endogenous and exogenous growth theories.

Different studies such as (Kryeziu, 2016; Ali *et al.,* 2015; Antwi *et al*., 2013; Iqbal and Zahid, 1998; Suliman and Osman, 1994; Grossman and Helpman, 1994) have shown that economic growth relates to macroeconomic variables. Although economic growth is, a complex macroeconomic phenomenon given the fact that it is still difficult to distinguish which of the determinant that has greater or less impact on growth (Kryeziu, 2016)

Antwi *et al.* (2013) found a co-integration relationship between economic growth and macroeconomic variables in Ghana. Also, in Pakistan, high inflation rate, increasing foreign debt, low level of physical and human capital are mainly the source of unstable economic growth inherent in the economy (Iqbal and Zahid, 1998). In other words, macroeconomic stability in any nation leads to economic growth. Every nation in the world aspires to attain a major goal of sustainable economic growth, which measures the entire economic development of a country and brings about the good standard of living (Ali *et al.,* 2015; Suliman and Osman, 1994).

## 2.8 Development of the Research Hypotheses

The previous section succinctly discussed the theoretical bases of the research, as such, various theories were examined which underpinned the study. Considering the background of the study and after reviewing several studies with diverse views as to the impacts of oil price fluctuation on macroeconomic variables; the hypotheses development would be in recognition of the research objectives and questions raised in Chapter one.

This leads to the derivation of the following research hypotheses to be tested in this study:

*$H_{01}$: There is no effect of dwindling oil price on the actual government revenues of Nigeria*

*$H_{02}$: There is no effect of dwindling oil price on the actual government revenues of Venezuela*

*$H_{03}$: There is no effect of dwindling oil price on the actual government revenues of Norway*

*$H_{04}$: There is no impact of oil price changes on the actual government expenditures of Nigeria*

*$H_{04}$: There is no impact of oil price changes on Venezuela's actual government expenditures*

*$H_{06}$: There is no impact of oil price changes on the actual government expenditures of Norway*

*$H_{07}$: There is no effect of oil price fluctuation on the economic growth of Nigeria*

*$H_{08}$: There is no effect of oil price fluctuation on the economic growth of Venezuela*

*$H_{09}$: There is no effect of oil price fluctuation on the economic growth of Norway*

*$H_{010}$: There is no impact of declining oil price on Nigeria's external reserves*

*$H_{011}$: There is no impact of declining oil price on Venezuela's external reserves*

*$H_{012}$: There is no impact of declining oil price on Norwegian's external reserves*

*$H_{013}$: There is no impact of oil price fluctuations on the inflation rates of Nigeria*

*$H_{014}$: There is no impact of oil price fluctuations on the inflation rates of Venezuela*

*$H_{015}$: There is no impact of oil price fluctuations on the inflation rates of Norway.*

*$H_{016}$: There is no effect of declining oil price on the unemployment rates of Nigeria*

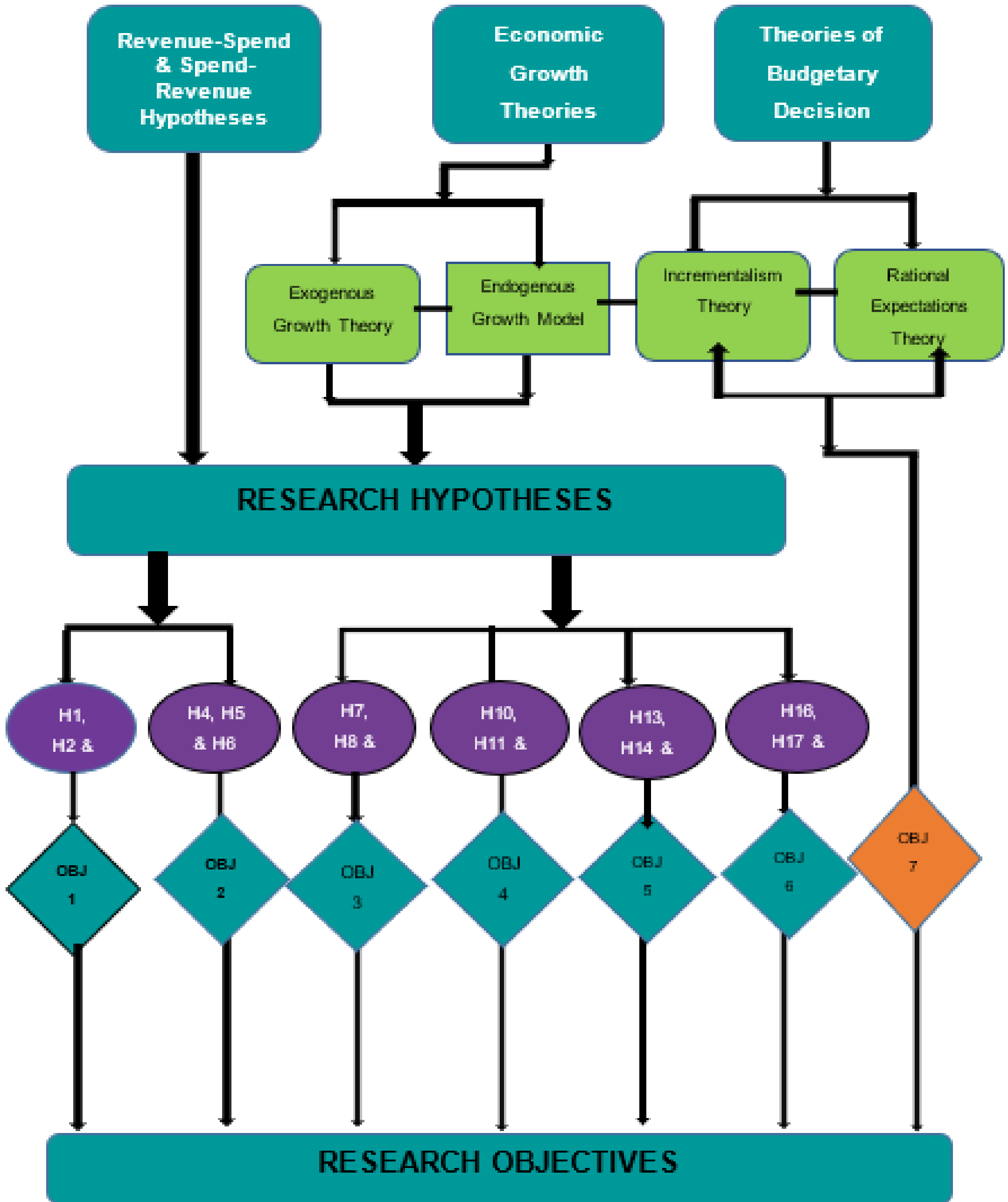
*$H_{017}$: There is no effect of declining oil price on the unemployment rates of Venezuela*

*$H_{018}$: There is no effect of declining oil price on the unemployment rates of Norway*

The null hypotheses $(H_0)_s$ were tested as against the alternative hypotheses, $(H_1)_s$ and it applies to all the oil-exporting economies under study: - Nigeria, Venezuela and Norway. The focus of most researchers is on the impact of positive oil price shocks within developed and net oil-importing nations. Explicit studies on declining oil revenue implications on net oil exporters have been very rare and scanty, especially on how these nations would be able to meet with the budgetary needs of the economies. Some of the closely related studies are descriptive and historical in nature. For example, Monaldi, (2015) examined the impact of declining oil prices on the macroeconomic variables of Venezuela; Husain *et al*. (2015) examined global implications of lower oil prices; Idrisov *et al.,* (2015); examined the theoretical interpretation of the oil prices impact on economic growth in Russia and concluded that GDP and oil price are correlated positively while increasing oil price cannot influence long-term economic growth; Yanar, (2014) on examining the effects of the plunge in oil prices on the MENA economies found that increasing oil price lead to economic growth while decreasing oil prices have an opposite effect. Also concluded that decreasing oil prices have positive effects on inflation; Holden, (2013) and Hamilton (1983) which examined Oil and the macroeconomy since World War II. However, all the conclusions are based on assumptions and previous literature as descriptive and historical. Statistical analysis was not carried out, and as such, the study could not show the magnitude of the impacts.

The impact of oil price shocks depends on the country's institutional framework, sectoral composition and their economic development.  Notwithstanding, the literature is still far from attaining a compromise on the way forward (Farzanegan and Markwardt, 2009; Cunado and Garcia, 2005).

***Figure 2. 3: Interconnections between the Research Objectives, Examinable Hypotheses and the Theories***




Source: Author's design

## 2.9 Conclusion

The chapter centred on the dwindling oil revenue implications on oil-exporting countries. The literature reveals that the susceptibility of the oil-exporting countries to the declining oil revenues has metamorphosed into several economic issues, such as creating a wide budget deficit gap and general chaotic situation in oil-exporting nations. The above gave rise to the need to evaluate the consequences of the declining oil revenue implications on the economic performance of oil-exporting economies, Nigeria, Venezuela and Norway in particular for comparative analysis.

Oil-related studies are not new, considering all the available literature reviewed. The issue of concern is mainly positive oil shocks, historical and causative factors to declining oil revenue, the relationship among variables in developed and oil-importing economies.

The analysis of the declining oil revenue implications on oil-exporting countries (Mono-economy nations) is rare more especially, on how these economies would be able to meet up with the fiscal needs in the periods of decline in oil revenue, necessitated by depressed crude oil prices.

It is evident that the slumps in oil price makes for substantial savings and helps to restructure the fiscal positions of the nations without natural resources and are relying heavily on the importation of fuel. The review also ascertained that this impact differs across nations.

Essentially, due to the diverse views and conclusions as regards to the impact of oil price fluctuations on macroeconomic variables, examinable hypotheses of the study were raised. These hypotheses would assist in the development of the required models for the Nigerian economy while the relevant research question was also raised.

Finally, the theories adopted for this research are the revenue-spend and spend-revenue hypotheses, the rational expectations theory, the budgetary incrementalism theory, and the exogenous and endogenous growth theories. However, the oil serves as the mainstay of these oil-dependent nations and as such, generating more revenues to carry out the statutory roles of these nations requires the best budgetary policy to revitalise the nations. However, the next chapter presents “Oil and the Global Economy” which is the second chapter of the literature review.

Abertay University

# CHAPTER THREE

## Oil and the Global Economy

# CHAPTER THREE

# 3.0 Oil and the Global Economy

## 3.1 Introduction

The previous chapter related to the implications of dwindling oil revenues in oil-exporting countries. This chapter, however, explains the trends and the interaction and reaction of oil in the world oil market as the importance of oil remain incontestable in the global economy[8]. After World War II, oil controlled the world's energy market[9]. Therefore, it is no doubt that oil revenue plays a significant role in economies of both importing and exporting countries, and with diverse effects on different economies (The Assam Tribune, 2016; Rahman, 2004).

Unlike the previous oil shocks, the present oil price series, which began since the year 2014, is due to a combination of factors; demand factor, supply factor or both. A slight change in the price of crude has a direct effect on the economic performance of both oil-exporting and importing economies. Hence, the assessment of the previous and future trends in oil prices in the global economy becomes imperative (Al-Hamad and Verleger, 2016). Klevnas et al. (2015) also posit that low-carbon policy ambition is capable of reducing oil prices by more than 50 per cent in the long term. There is an urgent need for the reduction of CO2 emissions in the environment while most economies are presently moving towards the expansion of international markets for the trading of green energy goods and services (OECD, 2015). Nachtigall and Rübbelke (2013) and Sinn, (2012)

[8] This chapter centres on the history and trends of oil prices from 1946 to present.
[9] After the Second World War, oil controlled the world's energy market. See Rahman, 2004.

maintained that empirically, there had not been any evidence to prove that the fall in oil prices in recent time was hinged on the green paradox[10].

Reliance on oil has caused world oil shock and the primary source of macroeconomic fluctuations that have well possessed a significant impact on both macroeconomic policy and economic activities in most oil-dependent nations. On global perspectives, the decline in oil revenue might affect economic performance relating to its impact on government expenditure, money supply, inflation, real exchange rate and import (Emani and Adibpour 2012; Strum et al. 2009). For the private sectors, lower oil price lead to less profit in oil exploration and extractive activities[11].

The impact of the global oil price changes on the world economy cannot be over-emphasised; as such, an in-depth understanding of the oil price trends in the global economy becomes very necessary. This understanding would aid policymakers to create strategic responses, which would assist in mitigating those impacts. Many researchers have made meaningful contributions to the debate on oil price fluctuations and the effects on the global economy. Some of these studies are those of (Al-Hamad and Verleger, 2016; Timilsina 2015; Blanchard and Riggi 2013; Morana 2013; Kilian 2009; Jimenez-Rodriguez and Sanchez 2005; Barsky and Kilian 2004; Mork 1989; and Hamilton 2011, 2009, 2008, 2005, 1996, 1983). The emphases of the studies above, revolve around the consequences of an increase in oil price on the world economy. This study would instead centre on the effects of decreasing oil price, which in turn metamorphose into decreasing oil revenues of most oil-dependent economies.

[10] Sinn first proposed 'Green Paradox' in 2008, which entails a pragmatic approach of controlling the supply of non-renewable energy rather than its demand.

[11] Lower oil price lead to less profit in oil exploration and extractive activities; see Obstfeld *et al*., 2016.

This chapter would centre on the examination of the oil price trends at different periods from 1946 to present and the overview of the oil-exporting countries under examination. The chapter comprises five sections. Section 1 is the introduction. Section 2 discusses the history and trends of changes in oil price. Section 3 explains the factors influencing the rising and falling of oil prices. Section 4 involves the overviews of the oil-exporting economies understudy while Section 5 summarises and concludes the chapter.

## 3.2 The History and Trends of Changes in Oil Price

One of the most dynamically transacted commodities in the world today is crude oil. Oil as the primary source of energy is a form of power; oil reserves possession is a source of geopolitical power[12]. Historically, there have been drastic changes in the price of oil since February 1946 when the oil price was as low as $1.17 per barrel to July 2008 when oil price reached its peak of $145.31 per barrel. Presently, oil price as at the 10$^{th}$ of January 2017 traded at $51.58 per barrel[13]. The changes in oil price in the whole series from 1946 to present are as shown in figure 3.1.

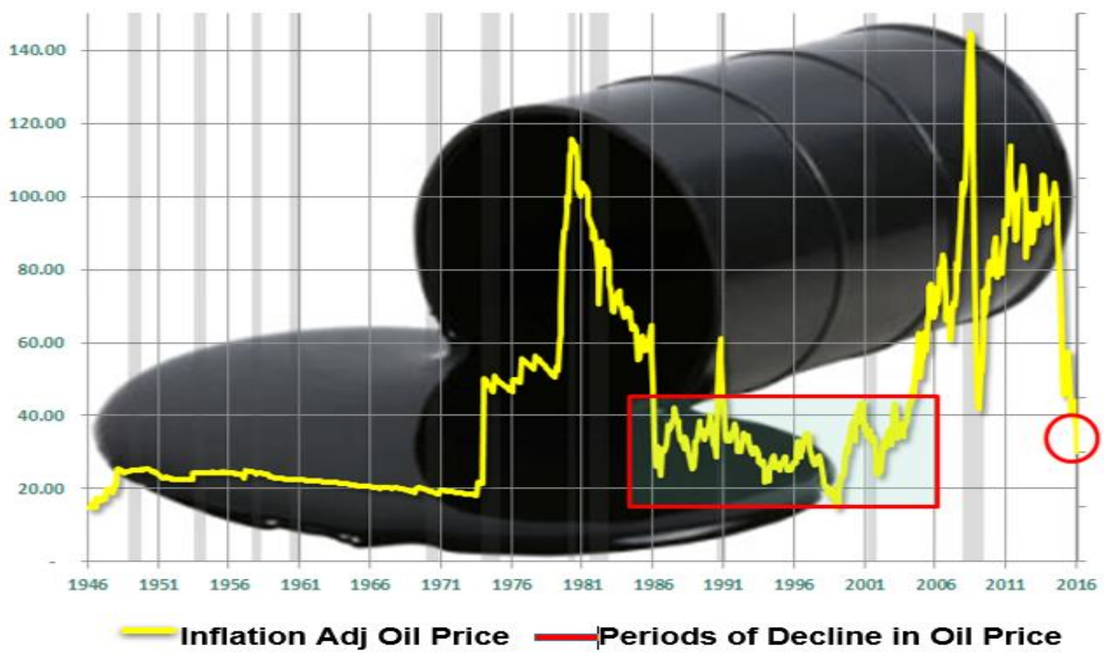
[12] Oil is a form of power and the most dynamically transacted commodities in the world today. See Lin, 2011.
[13] The price of oil as at the 10th of January 2017 traded at $51.58 per barrel. See Macrotrends, 2016-2017.

*Figure 3. 1: 70-Year Historical Chart of Crude Oil Prices (1946-2016)*


**Source: Macrotrends, (2016): Crude Oil Prices – 70 Year Historical Chart**

The crude oil trends and path from 1946 through 2016 is highly consistent with those of Roberts, (2016) as shown below:

**Figure 3. 2: Real Oil Price History - 1946 to Present**




**Source: Roberts, (2016) "Why Oil Prices Could Remain Low."**

The persistent decline in oil price since June 2014 from the high price of $115 per barrel to less than $35 per barrel as at February ending, 2016 has been one of the many significant macroeconomic developments globally in recent time. The sharp decrease in the price of oil in red colour borders as indicated in the above diagram is akin in magnitude with those of early 1981 to 1986 which was mainly supply-driven and the 2008 to 2009 decline which was due to a decrease in demand, triggered by the global financial crisis of the period. The recent year's drop seems to be the mixture of both supply and demand factors (Rogoff, 2016).

There was a loss of $13.37 per barrel, which is about 26.51% since April 2015 as the price of oil declined from $50.44 to $37.07 per barrel on the 7th of April 2016 (Trading Economics, 2016). In periods of scarcities or excess, the supply of crude petroleum, the price of oil just like the prices of other products does experience various changes. There was a severe regulation of the United States price of oil through the control of prices or production in almost the whole of the twentieth century (Williams, 2011). The US recessions since World War II usually emanate from the drastic increase in the price of oil (Hamilton 1983). It still does not indicate that the recessions were triggered by the increase in the price of oil. It shows that from 1948 to 1972 that this relationship was statistically substantial and non-spurious. It, therefore, supported the motion that believed that before 1972, some of the US recessions were highly attributed to the oil price increases of the periods. Mork (1983), who discovered that the negative relationship between the growth in the oil price also continued in the extensive sample periods while the price control strengthened it, carried out a continuation of Hamilton's outcome.

Studies, as mentioned earlier, laid more emphasis on an oil price increase and did not consider the periods of decline in oil price. Also, Morks (1983) was more of theoretical and just an extension of Hamilton's work, which was not specific on what the actual price of oil was at the time. IEA Washington DC (2016), Hamilton (2011), Bowen (2011), Williams (2011, 2007, 1999), Barsky and Kilian (2004) gave a well-articulated historical account of the changes in oil price at different periods. The IEA Washington DC (2016) showed the factors that influence the oil markets using charts as well as monthly and quarterly data. The chart indicates that oil crude plays a very significant role in commodity investment. The current prices of work cum investment stocks were regarded as strong determinants of future oil price from 2003 to 2008 due to OPEC's inability to meet up with the high demand because of their low level of production (IEA Washington DC, 2016).

Indications, as expressed above, revealed that the changes in non-OPEC production also affect the oil prices and that the price of oil around the globe move together due to arbitrage[14]. It also reveals that oil prices respond to diverse geopolitical and commercial activities while the increase in oil price and consumption decrease in OECD countries coincides[15]. Oil price impact on the consumption of OECD countries has been higher than that of non-OECD countries, due to the slower growth while oil price increases as the OECD oil consumption fell drastically from 2006 to 2009 and during the economic downturn (EIA, 2017).

The above information was given using graphs and charts. The conclusions were drawn based on the previous outcome as no analysis was carried out. The study only laid

[14] The price of oil around the globe move together, due to arbitrage, which exists because of market inefficiencies. Arbitrage entails the simultaneous buying and selling of any asset to benefit from the price difference. See IEA Washington DC, 2016.

[15]OECD stands for Organization of Economic Cooperation and Development that consists more of advanced economies, the United States and more of the European countries. See US Energy Information Administration, Thomson Reuters, 2017.

emphasis mainly on what stimulates changes in oil price at these different times and completely ignored the impact of the oil price changes on the economy at the time.

History and trends of the changes in oil price remain more explanatory by carrying out thorough insights of such changes from the origin at different periods. Thus, the following periods would be considered: - The Post World War Period (1945 -1957); The Restriction of oil by OPEC - Yom Kippur War (1972-1974); Quadrupling of Oil Price (1974 – 1978); The Iranian Upheaval (1978 – 1979); The Iraq – Iran Battle (1980 – 1981); The Great Fall in Oil Price (1981-1986) (1987 – 1990); The Initial Persian Gulf Battle (1990 – 1991); Calamity in the East Asian (1997 – 1998); Worldwide Financial Decay and Stagnating Supply of Oil (2007 -2008); Unimaginable Shock in Oil Price (2010 – 2013); The Most Recent Slump in Oil price (2014 – present)

### 3.2.1 The Post World War Period (1945-1971)

Throughout the Post World War II, there have been irregular increases in the oil price[16] (Hamilton 1985; 1983). Oil prices have been inconsistent due to the forces of demand and supply in the world's oil market[17]. Both the oil importers and oil exporters find oil prices very critical in dealing with the affairs of the economies as oil serves as a crucial input to oil importers and a good source of revenue generation for the oil exporters. Both are economically dependent on oil, as such, fluctuations in oil price tend to affect both the market sides (Al-Quadsi and Ali 2016; Trkulja and Le Coq 2015). The Texas Railroad Commission was a significant factor in the world oil market at the beginning of the post-

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[16] Throughout the Post World War II period, there have been irregular increases in oil price See Hamilton, (1985; 1983).

[17] The inconsistency in the oil prices is largely due to the forces of demand and supply in the world's oil market. See (Baumeister and Kilian, 2016; Alquist et al. 2013; Dvir and Rogoff 2010).

war period. In that early post-war period, this commission usually takes advantage of the obstructions in the external supply of oil to produce unexpected random variations in oil prices. The nominal price of oil in this period of Texas Railroad Commission fluctuates to react to specific unique events (Hamilton, 2011; Adelman, 1990).

Until 1974, the United States had been the largest consumer and producer of oil in the world; as there were post-war disruptions by 1947-1948. This gesture led to the abrupt speeding up of country's switch to the era of the automobile. The United States demand for oil increased drastically by about 12 per cent, and their automobile record-keeping also rose 22 per cent. Within these two years, oil price increased by over 80 per cent (Hamilton, 2011). 1948 marked the commencement of the first post-war depression due to the general reduction in the construction spending of residents while the price of oil increased from $2.50 per barrel in 1948 to $3.00 per barrel in 1957. This price remained stable until 1970[18].

The Korean battle brought about the interruptions in oil supply in 1952-1953. The second post-war recession started within this period because of the rise in oil price by 10 per cent as they lifted the price control in 1953[19]. Oil price was static due to the Korean Conflict. The monthly production of the Iranian government of about 19 million barrels was boycotted from the market in 1951's summertime by the world because of Mohammad Mossadegh; the then Prime Minister nationalised the oil industry in Iran. There was an order to reduce the delivery of fuel for the civilian flights by 30 per cent by both the British

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[18] 1948 marked the commencement of the first post-war depression due to the general reduction in the construction spending of residents while the price of oil increased from $2.50 per barrel in 1948 to $3.00 per barrel in 1957. See (Hamilton, 2011; Reisdorf, 2008; Williams, 1999; Williamson, 1966).

[19] Second post war recession took place from 1952-1953. See Hamilton, 2011.

government and the United States. There was also an established intentional plan to ration gasoline for motor vehicles by the Kansas City and Toledo while Chicago halted 300 public buses. All these led to the above second post-war recessions that frozen the oil price (Hamilton, 2011 and Williams, 2007).

The oil price was affected within 1956-1957 by the Suez Crisis as Gamal Abdel Nasser, the then President of Egypt, nationalised the Suez Canal. After the Second World War, the canal continued to be tactically essential because it served as a channel for the delivery of crude oil. Its application was as the highway of oil that connects Africa and other Asian countries. As of 1955, the shipment of oil products was responsible for the traffic experienced in the canal[20]. In the course of the crisis, the canal was blocked by about 40 boats that hindered daily transportation of millions of barrel through the route.

Hamilton did not stipulate specifically what the effect was on the price of oil at the time though the study was highly in-depth historically as it outlined what happened at each period. Such obstruction in the Suez Canal would, of course, lead to shortages in the supply of oil which will, in turn, bring about the increase in the price of oil which Hamilton (2011) failed to capture.

Ro (2014) revealed in his study that the movement of about 10% of the world's oil brought about the oil price increase in the short-run. This information is graphically oriented and no further information about the long-run effect on the oil price. Similarly, Mcmahon, (2015); Williams, (2011, 1999, 2007) Mofat, (2008) reviewed the changes in oil price in

[20] As at 1955, the shipment of oil products was responsible for the traffic experienced in the Suez Canal, see Hamilton, (2011).

the same period. From the above, the studies did not reveal or capture the factors responsible for such increase in oil price.

Mcmahon (2015) maintained that oil prices were stable within 1958-1971 as the price of oil revolves around an average of $3.01 per barrel at that period. However, these prices were just the historical unrestricted market values, and the study did not capture the oil price stimulant in this case. The outcome of the survey is highly consistent with those of Williams, (2011, 1999, and 2007) and Moffat, (2008) who revealed that at that same period, oil prices were highly stable at about $3.00 per barrel. Meanwhile, IOGA (2015) maintained that as six more countries joined OPEC, in 1971, oil price control moved to OPEC[21]. The exact oil price movements at the period not outlined.

On the contrary, Hamilton, (2011) in examining this period in his study claimed that there was instead a modest increase of about 7% in oil price as a reaction to the late 1960's inflationary forces. The shortfall in oil supply due to the strike by the oil deliverers and by the Atomic, Chemical and Oil Workers Union were the major factors responsible for the price increase. The price further rose by 8% due to the destruction of the Trans-Arabian pipeline in 1970, leading to the fifth post-war recession[22]. However, the study was not specific as to the exact price movement like the preceded examined studies. The discrepancies relative to the previous studies prevailed on this study's contribution to the body of literature, by reassessing both the past and current oil price history and trends to address it.

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[21] OPEC as a permanent intergovernmental organization was found by five countries in September 1960 in Baghdad, Iraq and it stands for Organization of Petroleum Exporting Countries. As six more countries joined OPEC, in 1971, oil price control moved from the US to OPEC. See (OPEC, 2017; Reisdorf, 2008).

[22] The price further rose by 8% due to the destruction of the Trans-Arabian pipeline in 1970 leading to the fifth post-war recession. See Hamilton, (2011).

### 3.2.2 The Restriction of oil by OPEC: Yom Kippur War (1972-1974)

After the Post World War Period of1945-1971, then the Yom Kippur War, this entails the restriction of, oil production by OPEC. Organisation of Petroleum Exporting Countries (OPEC) was established in 1960, by only five oil-exporting countries but has now expanded to fourteen member countries. One of their roles is to regulate crude oil production to influence oil prices[23]. Before this period, the group of seven large universal oil firms often referred to as Seven Sisters, or the majors controlled more than half of the world's oil reserves. They conducted their operation effectively through combined ownership of firms, which are in operation in diverse countries. Vertical integration characterised their operations, while both the upstream and downstream operations were under their control as well. Both the vertical and horizontal connections empowered these international oil firms to control most of the oil exports from all the major oil-producing economies thereby minimising the risk of pushing the oil price below their targeted level (Campbell, 2013; Goswami, 2012 and Fattouh, 2011).

Campbell, (2013) posits that the realisation that oil can be obtained easily through acquisition than by exploration brought about the merging of the Seven Sisters into four. The coming of the independent oil companies who invested in the upstream operations enabled them to have access to crude petroleum outside the Seven Sister's control. In the international market, these Majors enjoyed an oligopolistic market system in the 1950s and 1960s. They maintained an integrated price structure globally, which was

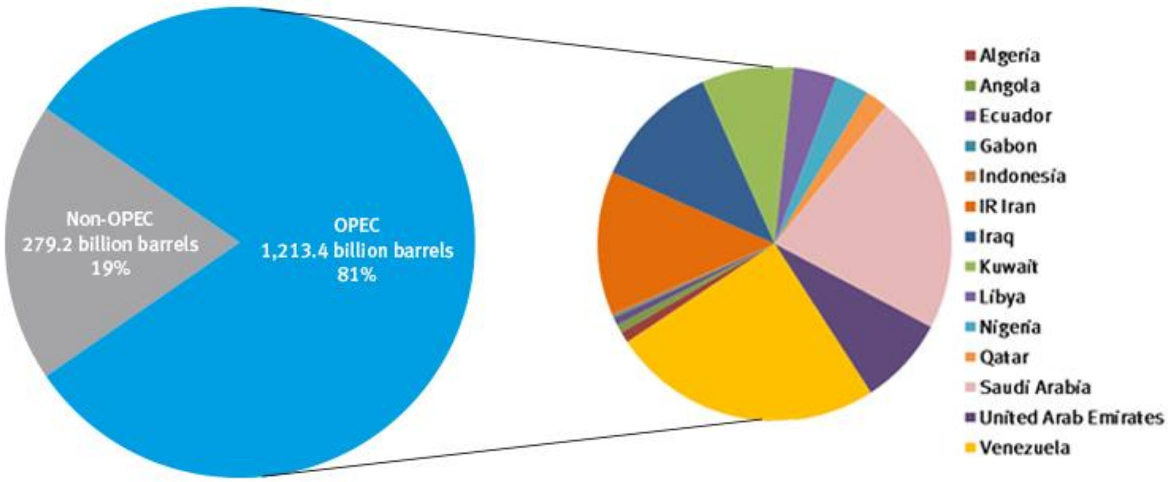
[23] OPEC regulates crude oil production to influence oil prices. See (IOGA, 2015; Li, 2010; Reisdorf, 2008).

above cost price but at the same time, very low to discourage new markets for oil products. These Majors diplomatically handled political disturbances.

There was never any obstruction to the oil reserves in the host economies. Within that 1950 period, the oil price was not fluctuating but somewhat stable (Goswami, 2012). The above assertion is highly consistent with the view of Al-Yousef (1998). It maintained that OPEC had the power to control prices in the oil market around 1973 to 1978 since it had a very high share of the oil market alongside Saudi Arabia as the demand for oil was fluctuating within the period and subsequently reduced in 1975, which was highly responsible for the economic recession at the time. Due to the inelastic supply curve, the price of oil stabilised at $11.58 per barrel average and subsequently increased to $12.7 per barrel.

After the Yom Kippur War oil crisis in 1973, the dominance of the oil industry shifted to OPEC and other state-owned oil corporations (Goswami 2012; Reisdorf 2008). According to OPEC Annual Statistical Bulletin, 2016, the organisation's share of the total world oil reserves is about 81% as shown below.

*__Figure 3. 3: OPEC SHARE OF WORLD CRUDE OIL RESERVES, 2015__*




OPEC proven crude oil reserves , at end 2015 *(billion barrels, OPEC share)*

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Venezuela | 300.88 | 24.8% | Kuwait | 101.50 | 8.4% | Qatar | 25.24 | 2.1% | Indonesia | 3.23 | 0.3% |
| Saudi Arabia | 266.46 | 22.0% | United Arab Emirates | 97.80 | 8.1% | Algeria | 12.20 | 1.0% | Gabon | 2.00 | 0.2% |
| IR Iran | 158.40 | 13.1% | Libya | 48.36 | 4.0% | Angola | 9.52 | 0.8% | | | |
| Iraq | 142.50 | 11.7% | Nigeria | 37.06 | 3.1% | Ecuador | 8.27 | 0.7% | | | |

**Source: OPEC Annual Statistical Bulletin 2016**

There was a drastic decrease in the total oil production of OPEC because of its restriction of oil exports to some selected countries that they feel are in support of Israel when an attack was laid on Israel by Syria and Egypt in 1973. The global oil output decreased to about 7.5% while the increase in the production of other countries was not enough to balance the shortage. As a result, the price of oil increased twice in 1974 (Hamilton, 2011).

Contrary, Hammes and Wills (2005); Barsky, and Kilian (2001) argued that the war between the Arabian countries and the Israelites remain inconsequential to explain the OPEC embargo. They observed that both political and economic motivations were instead some of the factors behind such upheaval since the restriction was over without the achievement of those intentions. Hammes and Wills (2005) maintained strongly that economic influence is the most convincing factor in explaining the oil price shock of the period and not the political factors as emphasised by Barsky and Kilian (2001) and Hamilton, (1999). They maintain that the political activities in the Middle East brought about the drastic reduction in oil production, which in turn raised the oil price very high to about 135% higher, from $4.31 to $10.11. The drastic increase in oil price had a significant impact on the world economy as a whole. Apart from attributing the high oil increase to political and nationalisation events, Hammes and Wills (2005) were also of the view that OPEC members were an effective cartel, and that is why they were able to implement the drastic oil price increase efficiently at the time. Unlike most other views, Barsky and Kilian (2002) argue that the quadrupling of the oil price has nothing to do with the OPEC embargo. Instead, the oil price increase was just about a half increase while the second half increased before the oil embargo.

This assertion backed up the claim that the oil embargo was pre-empted earlier before the war.  The study strongly emphasises that the price increase at this period was demand-driven.   In addition to the above arguments, Hamilton (2003) was of the view that economic factors alone were not enough as geopolitical factors also contributed as well. Hejny and Nielsen (2003) supported that the energy crisis of 1972-74, 1978-1979 and those of the 1990s was mostly due to political disorder in most economies that export oil and because of the high increase in the demand for petroleum.

They emphasise that most top oil producers with a substantial economic stake not behind the oil embargo but rather some of the hostile countries without any oil to export were profoundly in support of the embargo. These studies centred more on mechanisms, rather than the exact price movement at the period.

Nevertheless, (Mcmohan 2015; Alkhathlan, Gately and Javid 2013; Goswami, 2012; Williams 2011, 2007 and 1999; Bowen 2011 and Moffat 2008, were specific in their own studies. They concluded that the oil price change of 1972 to 1974 tripled from $3.00 per barrel to about $12.00 per barrel[24]. Mcmohan (2015) which study centred around the quadrupling of the oil price from about $3.00 per barrel in 1964 to about $12.21 per barrel in 1975 only outlined the changes in the price of oil, without attributing the quadrupling of the oil price, to any event. Williams (2011, 2007, and 1999) further attributed the 400% increase in the price of oil within the short period of six months' intervals to show and eliminate doubts that the ability to regulate the price of oil had moved from the United States to the OPEC countries. As OPEC drastically reduced production due to the embargo, the price skyrocketed, but the price of oil normalised after the ban.

Alkhathlan, Gately and Javid (2013), Goswani (2012), Pindyck (2001) and Gately (1984) posits that aside from the assertions of blundering actions of some of the OPEC countries during the Yom Kippur War, the unexpected event can further be explained better by two competing theories. The first theory argues that OPEC intentionally restricted production and increased the oil price due to its exploitive power as a cartel[25]. That is, the oil industry was entirely monopolised by OPEC as they quoted the price of oil and as well controlled the amount of oil produced. This view is the most commonly accepted by economists (Gately, 1984).

[24] Oil price fluctuation from 1972 to 1974 tripled from $3.00 per barrel to about $12.00 per barrel. See Mcmohan (2015); Alkhathlan et al., (2013); Goswami, (2012); Williams (2011, 2007 and 1999); Bowen (2011) and Moffat (2008).

[25] The first theory argues that OPEC intentionally restricted production and increased the oil price due to its exploitive power as a cartel. See Gately, (1984).

Pindyck (2001) viewed the period from the theory of exhaustible resources by using a functional wealth-maximisation model. The study attributed OPEC's behaviour of simultaneously cutting production and increasing the price of oil to the exhaustible nature of the petroleum product. The primary emphasis is that competing for oil-producing countries gave much attention to the inevitable depletion of the oil product. It maintains that OPEC inadvertently cut down production and as well as increased prices, which tend towards the monopoly level.

Contrary to the above assertions, most of the OPEC countries at the time still have more than enough oil reserves, and the issue was not the exhaustibility of the petroleum resources. There was crude oil in most of the countries within the period, and as such, very high oil reserves as can be seen from the table created below.

**Table 3. 1: FACTS AND FIGURES OF OPEC COUNTRIES**

| S/N. | COUNTRIES | DATE OF OIL DISCOVERY | DATE PRODUCTION STARTED | OPEC MEMBERSHIP DATE | PROVEN CRUDE OIL RESERVES (BILLION BARRELS) |
|---|---|---|---|---|---|
| 1. | Algeria | 1956 | 1958 | 1969 | 12.20 (1.0%) |
| 2. | Angola | 1955 | 1955 | 2007 | 9.52 (0.8%) |
| 3. | Ecuador | 1921 | 1921 | 1973 and 2007 | 8.27 (0.7%) |
| 4. | Indonesia | 1885 | 1885 | 1962 and 2016 | 3.23 (0.3%) |
| 5. | Iran | 1908 | 1908 | 1960 (FM) | 158.4. (13.1%) |
| 6. | Iraq | 1927 | 1927 | 1960 (FM) | 142.50 (11.7%) |
| 7. | Kuwait | 1938 | 1946 | 1960 (FM) | 101.50 (8.4%) |
| 8. | Libya | 1959 | 1961 | 1962 (FM) | 48.36 (4.0%) |
| 9. | Nigeria | 1956 | 1956 | 1971 | 37.06 (3.1%) |
| 10. | Qatar | 1935 | 1940 | 1961 | 25.24 (2.1%) |
| 11. | Saudi Arabia | 1938 | 1938 | 1960 (FM) | 266.46 (22.0%) |
| 12. | United Arab Emirate | 1958 | 1958 | 1967 | 97.80 (8.1%) |
| 13. | Venezuela | 1914 | 1914 | 1960 (FM) | 300.88 (24.8%) |
| 14. | Gabon | 1931 | 1931 | 1975-1995 and 2016 | 2.00 (0.2%) |

**Source: Developed by the author, adapted from 2016 OPEC Reports**

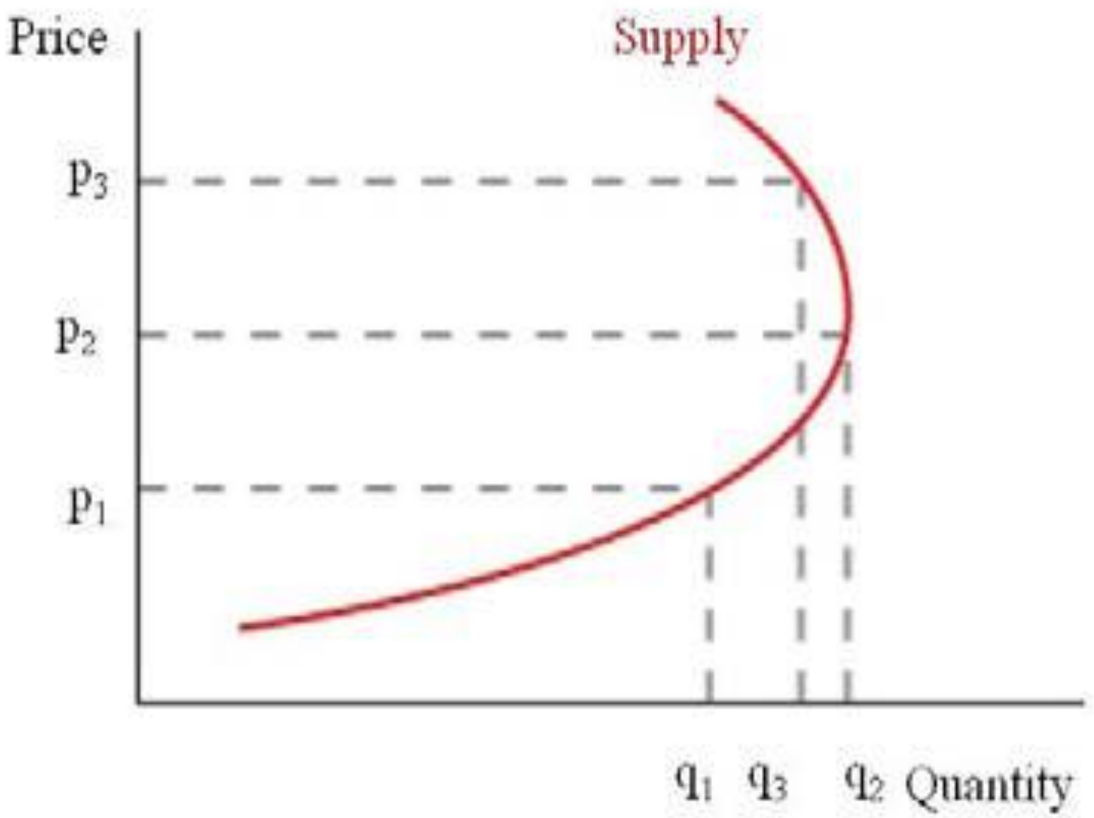
From the above table, the proven crude oil reserve of Saudi Arabia is 266,578 million barrels, Venezuela is 299,935 million barrel, Iran and Iraq are 157,530 million barrel and 143,069 million barrels respectively. If the crude oil reserves, of these economies, are still as high as depicted on the table presently, meaning that as at the period of the OPEC embargo in the ’70s, the oil reserves were much higher. The above scenario counters the exhaustibility claims by the authors mentioned above. It is very evident that economic and political factors, as well as the gains from global oil market derived by the cartel and the underlying market conditions, were designed to benefit OPEC members which led to oil price shock. It was because of the increasing level of demand for oil, which was not able to equate supply and given the fact that the main aim of any business is to maximise profit and to minimise cost. Non-OPEC countries could not produce enough to equate the shortage created in the oil market due to the high cost of production.

OPEC probably utilised the opportunity of the high demand of the petroleum product and the low level of production by non-OPEC members to maximise their profit using the Yom Kippur War; coupled with the fact that the war started due to the attack on Israel by the Arabian countries. The reasons for the attack was not mentioned by any of those studies and as such, politically oriented.

Barsky and Kilian (2001) maintained that the oil-producing Arabian countries had discussed and planned the execution of the embargo before the war. They also noted that the most important political objectives purported were not even achieved before the end of the ban. Those intended policy objectives were not outlined in their studies. It was like a predetermined event while the Yom Kippur War serves as a tool for its execution.

The second theory argues that the target model can explain the behaviour of OPEC by using the target revenue model, which shows that the supply curve of oil is backwards-bending as indicated in the diagram below[26].

***Figure 3. 4: Backward-bending Supply Curve of oil***




Source: Goswani (2012); Al-Qahtani, Balistreri and Dahl (2008)

Alkhathlan, Gately and Javid (2013); OPEC (2013); Goswani (2012); Wesley (2010); Al-Qahtani, Balistreri and Dahl (2008); Griffin (2001); Alhajji (2004); Cremer and Salehi-

[26] The second theory argues that OPEC's behaviour during the Yom Kippur War can best be explained using the target revenue model, which indicates that, the supply curve of oil is backward bending. See Goswani (2012); Al-Qahtani, Balistreri and Dahl (2008).

Isfahani (1989) supported the view of the backwards bending supply curve. These studies contend that most of these oil-exporting economies already have a target of the level of oil revenue needed to meet up with the budgetary requirements of the nations. The cutback or the reduction in OPEC's production only occurred because the economies had already attained to their targeted revenue and as such reduced production at the increased oil price. The above figure shows that when the price of oil increased from $P_1$ to $P_2$, there was a corresponding increase in the quantity of oil supplied. A further increase in price from $P_2$ to $P_3$ led to the cutback of oil provided by OPEC. As the targeted revenue had reached and as such, no more incentive for further oil production, the authors claimed. Alhajji, (2004) added that the above scenario characterises the situation of an imperfect market, whereby as supply increases with price, the producers in the course of exhibiting their market power, increase the price of the commodity much higher and at the same time reduce the quantity of the commodity supplied.

Al-Qahtani, Balistreri and Dahl (2008) added that the relatively lower oil price before the oil embargo shows the interaction between demand and the upward sloping oil supply curve of OPEC. Demand increased due to the world economic growth, which shifted the demand curve far enough to intersect the backwards bending part of OPEC's supply curve at a very high price (Cremer and Salehi-Isfahani, 1989).

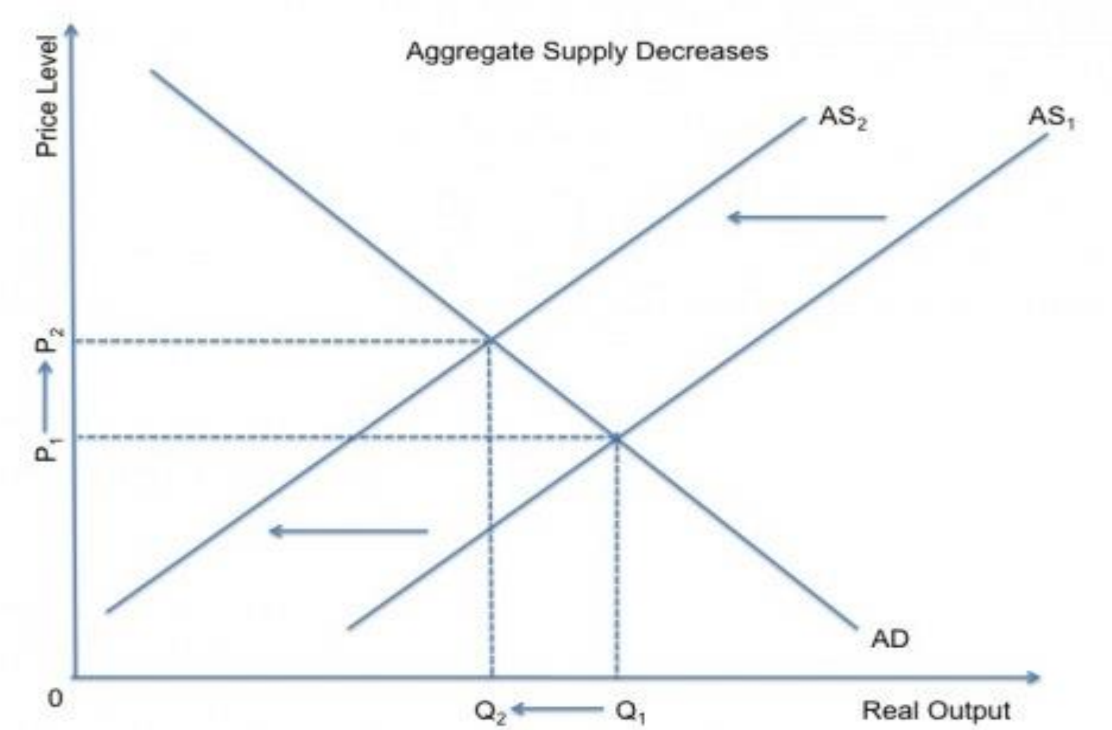
The conclusions of Griffin (2001) were consistent with the above analogy. OPEC's role was described in the study using the target revenue model as well. The theory argues on the basis that the investment needs of the economy determine the necessity of the oil revenue. It is the investment requirements of the budget that compels the members to determine oil production to increase the price. This theory further portrays that once the economy satisfies the investment target, and then there would be no more need for further production. The above supports the backwards bending supply curve in explaining OPEC behaviour during the 1972-1974 oil crises.

Critical examination of the models reveals that the wage rate reaches a certain level before the output drops because of a further increase in the wage rate. At that point, the worker is not willing to give up leisure for work, which led to a drop in output. In the period of OPEC's oil restriction, most studies (Sorkhabi, 2015; Hamilton 2011, 1983; Williams 2011, 2007, 1999 and Williamson, 1966) emphasise that it was the reduction in output due to the attack launched on the Israeli by Syria and Egypt. It was the reduction in production that led to the quadrupling of the price. None of the studies mentioned that these oil-exporting nations had already met their budgetary needs at the time before the production cut.

If the price had already increased to some degree before the cutback of the production, it can then be justified that perhaps, OPEC countries had already reached their targeted revenues and as such, not willing to make more revenue by cutting down production at higher prices. Nevertheless, that was not the case at all because it is unlikely that any of these oil-exporting countries would just desire a fixed level of revenue such that any income beyond that would result in a cut in oil production to substitute leisure for work. The above conclusion is highly justified further by the findings of OIGA, (2015) and Williams, (2011).

In contrast to all the above, Blinder and Rudd (2008); Hejny and Nielsen (2003) viewed the 1972 – 1974 oil price event differently as they interpreted the history through the lens of the shock supply model. They noted that both the aggregate demand shock and aggregate supply effects were the best to explain the high stagflation events with the aggregate demand shocks having more significant effects. The supply shocks events on impact, simultaneously move both the price level and the output degree in the opposite direction, thereby leading to stagflation. Hejny and Nielsen (2003) further stressed that it is usually tough to address the effects of stagflation on any economy and added that the occurrence of the energy crisis is because of different balance existing between domestic production and domestic demand.

***Figure 3. 5: Supply shocks in aggregate supply and aggregate demand framework***




**Source: Blinder and Rudd (2008)**

The diagram shows a standard aggregate demand and aggregate supply, whereby the aggregate supply curve, shifts inwards along a stationary aggregate demand curve. The outcome is stagflation because price increased while output decreased drastically[27]. In using this phenomenon to explain the OPEC embargo, Blinder and Rudd (2008) did not explicitly state why the reduction in output by OPEC, which led to the increase in the price of oil as demonstrated in the model.

Al-Yousef (1998) posits non-existence of competition amongst OPEC members who work in a group to maximise their profits and does not set prices as the residual supplier. The models in the study assume that the cartel is in charge of the oil market whose members co-operate, to maximise profits jointly. In like manner, several other authors such as Griffin (2001), Pindyck 2001 and Gately (1984), have described OPEC as a cartel who through the joint co-operation reduces the quantity of commodity supplied thereby causing prices to be higher than the marginal cost. Gately (1984) further contradicted the above assertion by portraying that increases in the price of oil were instead a natural consequence. Adelman opposed the view in 1982 by pointing out that the oil embargo of 1973 to 1974 was a deliberate collusive act, and not a natural phenomenon as argued in the study of Gately (1984).

On the contrary, Alhajji and Huettner (2000), have a different view of the 1972 – 1974 oil price increase. They argued that an oil price increase of that period could be explained better by other factors apart from cartelization. They concluded that non-OPEC production outweighed OPEC production in the world oil market. They further were of the view that OPEC has never agreed on oil prices and production quotas among OPEC

[27] Stagflation occurs when there is high inflation and high unemployment in an economy; in the model above, stagflation occur because oil price increased while output decreased. See Blinder and Rudd (2008).

countries were never possible until 1983. One the dominant characteristic of a cartel is the ability to punish defaulted members of which OPEC lacks they concluded.

The conclusion that non-OPEC production outweighs OPEC production quota is highly inconsistent with the report in OPEC's statistical bulletin, 2015, which showed in figure 3.1 that OPEC production for the period was 81 per cent of the total world oil production while that of non-OPEC members was 19 per cent. Huppmann and Holz (2010) also rejected the notion that OPEC is a cartel. The study reveals that OPEC members are not acting co-operatively and are not maximising profit jointly. The changes in the oil price of the period under examination were not attributed to any factor at all.

### 3.2.3 Quadrupling of Oil Price (1974 – 1978)

After the Yom Kippur War had been characterised by doubling oil prices and reduction in oil production; the crude oil price increased moderately from $9.35 per barrel to $14.95 per barrel[28]. ChartsBin (2015) posits that oil price was approximate $11.58 per barrel in 1974 to $14.02 per barrel in 1978. The findings of IOGA, (2015) revealed that the oil price averaged between $11.20 per barrel in 1974, to $14.95 per barrel in 1978; this finding was similar to those of ChartsBin, (2015). More so, Goswami (2012) shows a detailed account of the new regime in which Saudi Arabia took a different stand and bore the burden of change to the drastic reduction in the demand for oil production from OPEC. Saudi Arabia realised that the severe economic depression in the western countries due to the OPEC embargo could threaten its members economically and politically in the end and so bargained to stabilise the oil price in the world oil market. The position of Saudi

[28] After the Yom Kippur War, oil price increased moderately from $9.35 per barrel to $14.95 per barrel. See Mcmohan, (2015).

Arabia in OPEC was motivated because of the Middle Eastern politics development. However, the exact stable price maintained at that period, not specified at all by these authors.

Goswami, (2012) instead emphasised that between 1974 -1979, oil prices were determined collectively after coordination and consultation among the four leading OPEC members, namely: Saudi Arabia, Iran, Iraq and Kuwait. Although the leading position within OPEC was highly enjoyed by Saudi Arabia. The kingdom acquired such position due to its great production capacity, very high oil reserves and, which still enables them to cope amid oil price fluctuations[29]. The prices were relatively flat, ranging from $12.52 per barrel to $14.57 per barrel (Williams 2011 and 1999). Oil price in this period ranged from $12.21 per barrel to $13.55 per barrel (Moffat, 2008). The study was highly consistent with the findings of (Williams, 2007).

On the other hand, Wesley, 2010 noted that oil price was undistorted in real terms during this period but did not categorically state the actual price figures as well. In the same vein, Blinder & Rudd (2008) also maintained that the real price of crude oil remained roughly flat from 1974 to 1978 but was not categorical as to the actual price range. Sorkhabi (2015) was not also specific as to the price of oil but outlined the after-effects of the initial oil shock before this period. Firstly, the initial oil shock empowered most of the OPEC governments to have control over their crude oil resources. Secondly, the oil crisis encouraged most of the western economies to search for another alternative to oil all over the world. Finally, the centre of policymaking on the price of oil shifted to the Middle East

[29] Saudi Arabia enjoyed the leading position in OPEC due to its great production capacity and very high oil reserves. See Goswami, (2012).

from the United States. In general, however, the price of oil during this period was ranging according to almost all the above-examined authors. The period was also characterised as that of increasing oil price.

### 3.2.4. The Iranian Upheaval (1978 – 1980)

The oil embargo was followed immediately by the Iranian upheaval between 1978 to 1980. Mcmohon (2015) and IOGA (2015) showed that the price of oil increased rapidly from $14.95 per barrel in 1978 to $37.42 per barrel in 1980. The reasons for the drastic increase in oil price were not disclosed in these studies. During the oil embargo of the OPEC countries in 1973, the Iranian economy had the highest oil production in that period. In 1978, this act led to the tremendous public demonstrations, thus leading to the 7 per cent reduction in the Iranian oil production as at January 1979 before Sheikh Khomeini took over power from Shah[30]. Nevertheless, Saudi Arabia increased its oil production capacity, which made up for the lost Iranian oil production (Hamilton, 2011). The oil price movements during the Iranian crisis were not categorical, and neither were the effects of the increase of Saudi Arabia's oil production on price stipulated.

Hejny, (2003) was of the view that the Iranian riot had the same effect with those of 1973 oil price increase of the OPEC embargo as the price of oil was on a very high side during the period. The crisis in Iran, is one of the major oil exporters, was based on political disturbance as well as the rationing methods used during the period. The study posits that the oil crisis adversely affected the consumption of petroleum due to some adopted strategies, for instance, efficient usage of oil even at that high price as well as industrial

[30] The increased production of oil by Iran during the oil embargo in 1973 metamorphosed to the Iranian crisis, which further led to the 7% reduction in the Iranian oil production in 1979. See Hamilton, (2011).

developments. The decline in the demand for oil importation led to a decrease in the oil price, which inadvertently brought about the end of the second oil disaster, just like the findings of Hamilton, (2011), the specific price movement, not discussed.

Conversely, Graefe, (2013) posited that the doubling of oil price was because of the increase in the demand for oil. Such demand increase was also because of the growth in the world economy and due to the drastic increase in the precautionary demand for oil. The very high inflation rate was the resultant effect of the oil price increase during this period. Additionally, the study maintained that there was a drastic decline in oil production due to the Iranian revolution, which may not be the only reason why the oil price increased. Relatively, speculative hoarding spurred because of fear of further disruption. Similarly, Haryono (2012) was highly consistent with the above as it laid more emphasis on the relationship between political development and the precautionary demand for oil as well. The precautionary demand for oil is the application of oil rising because of the future expectations of the markets about supply and demand.

In like manner, Graefe, (2013); Barsky and Kilian (2002) also argued that the persistent oil price increase at the period be only possible because of excess demand in the oil market. Such excess demand was due to favourable macroeconomic conditions such as reduced rate of interest, economic growth, and development. The increase in the oil price between t979 to 1980 was because of the precautionary demand for oil due to increase in uncertainty as regards to the supply of oil in the future and the expectation of the use of oil in the future. Specifically, Barsky and Kilian (2002) stressed that oil price increased from $19 per barrel to $25 per barrel; it rose further to $34 per barrel in April 1980. By December 1981, oil price increased to the zenith of about $39 per barrel due to the precautionary demand for oil, which was responding to the uncertainty rise about the request, and supply of oil in future.

Kilian (2008) first introduced the speculative demand shock or the precautionary demand shock in 2009 and originally derived from the structural decomposition of the real prices of oil. The effects of the oil shock on real oil prices and the macroeconomic aggregates depends on the type of shock accountable for the fluctuation. The precautionary demand shock found to have an instant and significant effect on the real price of crude oil. Previous oil crises were also because of these movements, contrary to the traditional assumptions, which believed that supply shock was responsible for the oil price fluctuations (Filis et al. 2011; Kilian 2008).

Barsky and Kilian (2004) noted that most of the crisis in the main oil-manufacturing regions happened at the same time as the precautionary demand shock. In trying to establish the link between recessions and most oil price increase, discovered that in the ’70s and ’80s, oil has been accountable for all the backwardness in production. The oil price increase of 1979 triggered the recession in 1980, whereas the 1983 recession came before the oil price increase of those periods. On the contrary, the 1981 recession occurred during the term of decline in the oil price. The above assertions depict that there is a strong relationship between oil price, whether increasing or decreasing and economic recessions. The precise oil price movement not specified, as well.

Moffat (2008) and Williams (1999) had different opinions altogether from the above point of view. The studies highly specified that the high oil price during the Iranian upheaval brought about the decline in the demand for oil and which subsequently, led to the fall in oil price as predicted by the then minister of petroleum, Ahmed Yamani of Saudi Arabia. Many factors were responsible for the low oil demand, which led to the oil price decline. Reacting to the rising oil prices, many new houses, insulated while improving the insulation of the older houses. More energy efficiency, used in the industrial sector while the vehicles with very high-energy efficiency, produced and increased oil manufacture and exploration from non-OPEC countries. All these and the global economic depression reduced oil demand and in turn, lowered oil price. It was unfortunate for OPEC because the world economic recession was not permanent. As soon as it was over, the insulated houses, not removed, neither was the energy-efficient machines changed. Nevertheless, the level of reduction in the price of oil not indicated.

On the contrary, Williams (2011, 2007) further argued that since the history of World War II, the high oil price came because of the Iranian revolution. The production of crude oil was less by 10 per cent in 1979 due to the revolution. The decline in production due to the crisis increased the oil price to more than twice over from $14 per barrel in 1978 to $35 per barrel in 1981. The study of Alhajji (2004) was highly in the same resonance with the above as it posits that the period was the second oil crisis, which was responsible for the doubling of oil price to $93.41per barrel in 1979 from $46.13 per barrel in 1978. This period was also categorised as the initial attempt to influence the oil price in the world oil market by the OPEC.

Reisdorf, (2008) view the period differently as the transformation of the Iranian Kingdom from a Monarchy government to the Islamic Republic of which the process brought about the drastic drop in the oil production by the two nations. It brought about the loss of about 2.5 million barrels of oil in one day. There were complete price differentials in the above studies, but both acknowledged the fact that there was an increase in the oil price of about twice the initial price due to the second oil crisis.

Goswami (2012); Gately (1984) and Adelman, (1982) thought that there are two surrounding theories to the explanation of the oil price surge of 1979 to 1980. The first theory posits that OPEC deliberately used the oil revolution in Iran to make more gain from the oil market, which was already tight. The Organisation unilaterally made Saudi Arabia to cut back its oil production, thereby creating excess demand for oil globally. As a result, the blame shifts to the restriction of oil production and not to the Iranian revolution. On the contrary, Gately (1984) argued that both the oil price increase and the reduction in oil production from 1979 to 1980 be a mere extension of the Yom Kippur War of the 1972 to 1974 oil crisis[31].

Tthe second theory consists of two opinions. The initial interpretation was that Saudi Arabia was the main actor that caused the oil price to increase due to some political constraints at the time. The alternative view argues that the rise in oil price was because of the principles of demand and supply and further posited that OPEC was not important as an organisation (Goswami, 2012 and Moran, 1982). The dominant producer theory of OPEC was adopted by Al-Qahtani, Balistreri and Dahl (2008); Al-Yousef, (1998); Adelman, (1995); Griffin and Tecee (1982) in explaining the above scenario. The studies suggest that the monopoly power of OPEC was in Saudi Arabia being the highest oil producer while the other OPEC members and non-OPEC members behave like a competitive fringe.

[31] Both the oil price increase and the reduction in oil production from 1979 to 1980 is seen as a mere extension of the Yom Kippur War of the 1972 to 1974 oil crisis. See Gately, (1984).

### 3.2.5 The Iraq – Iran War (1980 – 1981)

While the oil production in Iran was still picking up and recovering from the revolution crisis, the war against Iran in 1980 by Iraq further increased the loss in the world's oil production by 6 per cent. Considering the Iranian upheaval and the Iraq-Iran battle as a single of two distinct events depends on the measure used for the oil price. While the United States producer price index for crude oil views it as two different events, the WTI considered the doubling of the oil price at those periods to be an extended event from 1978 to 1981 (Hamilton, 2011).

Responding to the cost increase during this period led to the imposition of price control by the United States on the crude oil, which is, produced locally made the United States oil consumers to pay more for imported oil. It, therefore, reduced the level of importation oil dependency by the United States in 1979 – 1980 and as such, not affected by the price increase caused by the Iranian upheaval and that of the Iran – Iraq war. It was seen as a bad policy as it has other effects aside subsidising the domestic oil industry for the United States consumers (Williams, 2011; Reisdorf, 2008; Moffat, 2008).

On the same note, Williams, (2011, 2007 and 1999) and Reisdorf, (2008) posits that there was chaos in the Iranian oil production during the revolution in Iran, it was further aggravated in 1980 when Iraq attacked Iran. Consequently, oil production was lower by 6.5 million barrels in one day, which was about 10 Percent lower. The combined effects of both the Iran – Iraq battle and the Iranian revolt triggered the price of oil to increase more than twice. Specifically, oil price increased in 1978 from $14.00 to $35.00 in 1981. The outlined effect in this study is highly consistent with those of Hamilton, (2011).

On the contrary, Mcmahon (2015) showed that oil price in 1980 was $37.42 per barrel and declined to $35.75 per barrel in 1981.

The reasons for the decline in oil price not stipulated. It is also unlikely for the price of oil to be decreasing at that period given the fact that there were disruptions in the oil production at the period due to the Iranian revolution, subsequently followed by the Iraq – Iran war. The shortages in the world oil production from these two major oil producers would be likely to lead to the increasing price of oil rather than oil price decrease as claimed by the author.

### 3.2.6 The Great Fall in Oil Price (1981-1986)

The drastic rise in oil price due to the two great crises in the world; the Yom Kippur war and the Iranian revolution preceded a sharp decline in the world's demand for oil between 1981 to 1986. During the period, oil demand fell sharply by about 20 per cent. Many factors were responsible for the reduction in the demand for OPEC's oil. The reason was partly the recession, which came after the drastic increase in the oil price of the previous periods as the whole world was still recovering from the oil price shocks. The second view was also due to the drop by 19 per cent in the ratio of energy consumed about the Gross National Product. The use of other alternative sources of energy also increased drastically while the share of the world's energy consumption fell so drastically at the period (Goswami, 2012; Flavin, 1985).
However, the above findings were in line with the conclusions of IOGA (2015). They maintain that in the 80s, one of the highest importers of crude oil products, the United States of America, improved and became more energy-efficient regarding its industrial

processes, also improved in automobiles with higher gas mileage and in the insulation of homes. All these, in turn, reduced drastically its demand for oil at that period. The study posits that the production quotas set by OPEC were not enough to stabilise the oil price as most of the OPEC countries produce more than their given quotas. IOGA, (2015) outlined the oil price in this period as $37.42 per barrel in 1980, $35.00 per barrel in 1981, $31.55 per barrel in 1982, $29.00 per barrel in 1983, $27.50 in 1984, $26.50 per barrel in 1985. However, the increase in oil production further forced the oil price to as low as $14.68 per barrel in 1986. The above showed that there was a continuous decline in the price of oil from 1981 to 1986.

Hamilton (2011) and Alhajji (2004) were highly consistent with the above position. The studies were of the view that oil production from Iran and Iraq reduced due to the war experience in those kingdoms. Coincidentally, the world's consumption of petroleum products reduced significantly in the 1980s. Saudi Arabia voluntarily reduced oil production as well around 1981 to 1985, which was not enough to offset the 25 per cent sharp decline in the oil demand. In 1986, Saudi Arabia opened its oil valve again and flooded the market with more oil production, which inadvertently, forced the oil price to fall from $27 per barrel in 1985 to $12 per barrel in 1986.

Similarly, Barsky and Kilian (2002) supported this view by enunciating that the efforts of the Saudi Arabia Kingdom to reduce production at that period to increase the price of oil were highly frustrated by the weak in demand for oil. While new oil producers joined the oil market, the new ones expanded their oil production, thereby increasing oil supply and inadvertently leading to the decline in oil price.

Barsky and Kilian 2002 posits that the resultant effects of the changes in oil prices in the form of a drastic decrease in the demand for oil truly falls in line with the Hotelling model.

This model enables the consumers to go to the producer from which they can conveniently purchase their product[32]. In the same vein, Yousef (1998) employed the competitive model to explain Saudi Arabia's role during the period. The study contends that a drastic decrease in oil price because the market was highly competitive in 1985 – 1986 as OPEC members produce as much as desired while Saudi Arabia's oil production was almost at the bursting capacity.

Various explanations for the drastic decline in the demand for oil at the period, also given by (Goswami, 2012; Fattouh, 2007; International Energy Agency, 2005, Alhajji, 2004; Georgiou 1987 and Gately, 1986). They emphasise that there was an increase in the oil production of non-OPEC members from 48 per cent to 71 per cent from 1975 to 1985. The non-OPEC countries not only increased oil production but also sell at a very competitive price, thereby attracting more buyers and forcing the oil price to fall below $10 per barrel. As OPEC failed in the regulation of oil prices through the oversupply of oil in the world oil market, the introduction of a new structure agreement in price known as the netback-pricing instrument by Saudi Arabia in 1985 aggravated the situation. It was because the price of crude oil at that time depends on the petroleum oil product prices in such a way that 5 per cent increase in the supply of oil in the world market, had more than 60 per cent corresponding drop in oil price.

In 2004, Alhajji in his work entitled "managing the price of crude oil: a case study of OPEC" further posits that OPEC lost the market share because the members violate the free quota system introduced by the organisation by cheating on their quotas. The price of oil

[32] The Hoteling model enables the consumers to go to the producer from which they can conveniently purchase their product. See Barsky and Kilian (2002).

was further cut down to $14.92 per barrel to favour the netback-valuing tool. In 1988, OPEC finally dropped the pricing policy for the formula, which connects the market price to its crude oil prices. However, the actual year in which the oil price fell to $14.92 was not stipulated.

### 3.2.7 The First Persian Gulf Battle (1990 – 1991)

Hardly had the Iraq-Iran upheaval stopped; then the first Persian Gulf battle erupted in the Persian Gulf region (DeVore, 2009). This period has to do with the improvement in the oil production techniques as well as improvement in drilling technology. There was a drastic increase in the price of oil in this time as well because of the invasion of Kuwait by the Kingdom of Iraq and due to the Persian Gulf War. Oil price increased from $18.33 per barrel in 1989 to $23.19 in 1990 (IOGA, 2015).

This is highly consistent with the study of Hamilton (2011). It posits that about 9 per cent of the total world oil production came from Iraq and Kuwait at this period. There was a threat in August 1990 with Kuwait's invasion by Iraq. The price of oil increased about twice the initial price within the short period but stabilised some months after as Saudi Arabia increased its oil production capacity. Although Hamilton, (2011) maintained that there was an oil price increase at the period, the actual price movements were not featured.

However, contrary to the above, Goswami, (2012) view this period differently as the time of oil and blood amid high politics and decreased oil price due to the invasion of Kuwait by Iraq at the commencement of 1990. The invasion of Kuwait was highly politically and regionally oriented. Saddam Hussein's other objective was to liberate Iraq from the economic calamity threatening the Kingdom due to the low prices of oil in the world oil market. To improve the oil revenue, Iraq demanded that OPEC members promulgate policies for oil production to raise the oil price. Kuwait and the United Arab Emirate failed to adhere to this by producing more to recompense the loss in oil revenues caused by a decrease in oil price.

The motivation for supporting decreased oil prices was rooted in the equation that low oil prices trigger high demand for oil, which will, in turn, lead to the world economy expansion and economic growth. Though low oil prices highly jeopardised the economic interests of Iraq, thereby resulting in the use of Iraqi's military against Kuwait. The imposed oil export embargo on the two economies further caused an increase in oil price at the period (Goswami, 2012).

The exact price movement, not shown in the study. The Persian Gulf War further disrupted oil production among OPEC members. The members, particularly, Saudi Arabia and the United Arab Emirate, failed to cut back oil production to accommodate Kuwait back to the oil market. OPEC's production quotas policy was fruitless as both economies refused vehemently to restrict oil production. In this period, OPEC ability to control oil prices and the production quotas among OPEC members was not easy to achieve, as production discipline among members was difficult.

There was an increase in the world oil consumption from 1990 to 1997 and Russia reduced its oil production, oil price began to recover but did not last because OPEC continued to increase its oil production. Also, the rapid growth in the Asian economies and their oil consumption declined drastically within a space of sixteen years for the first time in 1998. Oil price dropped from $19.09 to $12.72 per barrel due to the corresponding decline in oil consumption and 10 per cent increase in oil production at the time (Goswami, 2012; Hamilton, 2011; Williams, 2011; Reisdorf, 2008; Moffat, 2008 and Ahhajji, 2008).

Consistent with the above, Hooker (1999) discovered that oil price drastically decreased to $10 per barrel in 1998 from about $23 per barrel in 1996. Such decline relates to the economic crisis in Asia. In 1999, the oil price began to recover as OPEC finally cut back oil production by 1.799 barrels in one day. Oil price increased to more than $25.00 per barrel (Williams, 2011; Reisdorf, 2008; Moffat, 2008). In contrast, IOGA, (2015), presented oil prices as follows: $11.91 per barrel in 1998; $16.55 per barrel in 1999 and $27.40 per barrel in the year 2000.

The reasons for the increase in the price of oil at that period, not captured. Although very consistent with Hamilton, (2011) who attributed the oil price increase to the Hotelling Principle, suggesting that a belief that the growth rate of the Asian Tigers would continue to force oil price upwards. The oil price increase was short-lived as investors were doubtful of the story of the Asian growth due to the financial and economic tensions. By the end of the year 1998, the oil price was below $12.00 per barrel, and within 1999 – 2000, there was an increment of about 38 per cent of oil price after which it declined again because of economic recession. The above is highly consistent with the findings of IOGA (2015) for the same period.

### 3.2.8 The Second Persian Gulf War and the Venezuelan Conflict (2003)

There was a reduction of about 2.1 million barrel per day in 2002 of oil production from Venezuela due to a general strike. It follows shortly by an additional reduction of about 2.2 million-barrel-per-day after the attack on the Iraqi economy by the United States. Hamilton (2011) argued that the above events could be characterised as geopolitical events, while Killian (2008) claimed that the events instead be classified as part of the oil shocks of the post-war era. Although there was an increase in oil price, which did not last between 2002 and 2003, the figures for the oil price changes, not identified.

The above was highly inconsistent with the studies of Williams, (2011); Moffat, (2008) and Alhajji, (2004). They conclude that due to the strike in Venezuela and the Iraq attack by the United States, significant shortage in the oil production occurred leading to an excess oil price increase of $40 to $50 barrels per day. Also, the oil price increase at the period was due to the high growth rate of the Asian economies as well as the hurricanes in the year 2005 and the refinery problems in the United States. Specifically, IOGA, (2015) stipulated that oil price increase from $22.81 in 2002, $27.69 in 2003, $37.41 in 2004 to about $50.04 in 2005 which is highly consistent with the above findings.

The reasons for the oil price increase in those periods, not mentioned. The law of demand follows in this regard, as the price of oil and the quantity of oil demanded are inversely proportional, all things being equal. Mathematically, we have: -

$$Price \propto \frac{1}{Demand}$$

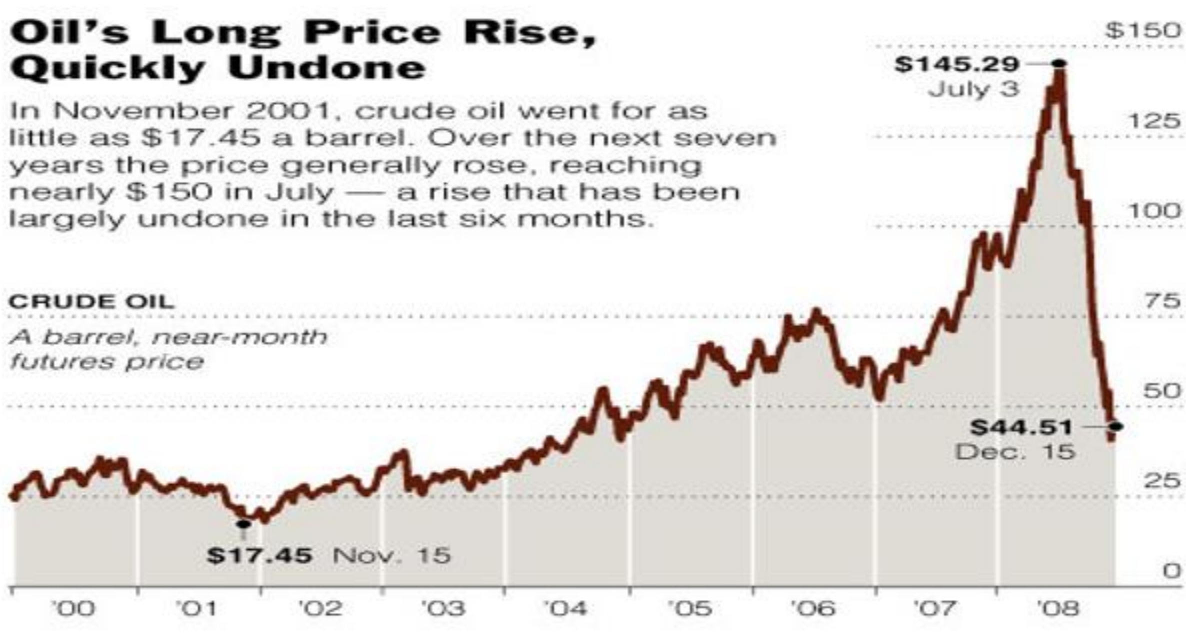
$$Price = K \frac{1}{Demand}$$

Where is K the constant of proportionality and as the demand for oil declines, price increases since they move in the opposite direction.

### 3.2.9 Worldwide Financial Decay and Stagnating Supply of Oil (2007 -2008)

After the Second Persian Gulf Battle and the Venezuelan Conflict in 2003 comes the worldwide financial decay and stagnating supply of oil from 2007 to 2008. Hough and Barton, (2016) in the examination of oil price outlook and trends disclosed that the price of oil continued to increase from $90 per barrel in 2007 and persisted until it reached its peak price of an average of $146.08 per barrel in July 2008[33]. Similarly, this is consistent with the conclusions of (The New York Times, 2008) as being the peak price in the series, as shown in the diagram below:

**Figure 3. 6: Peak Oil price in the Series**

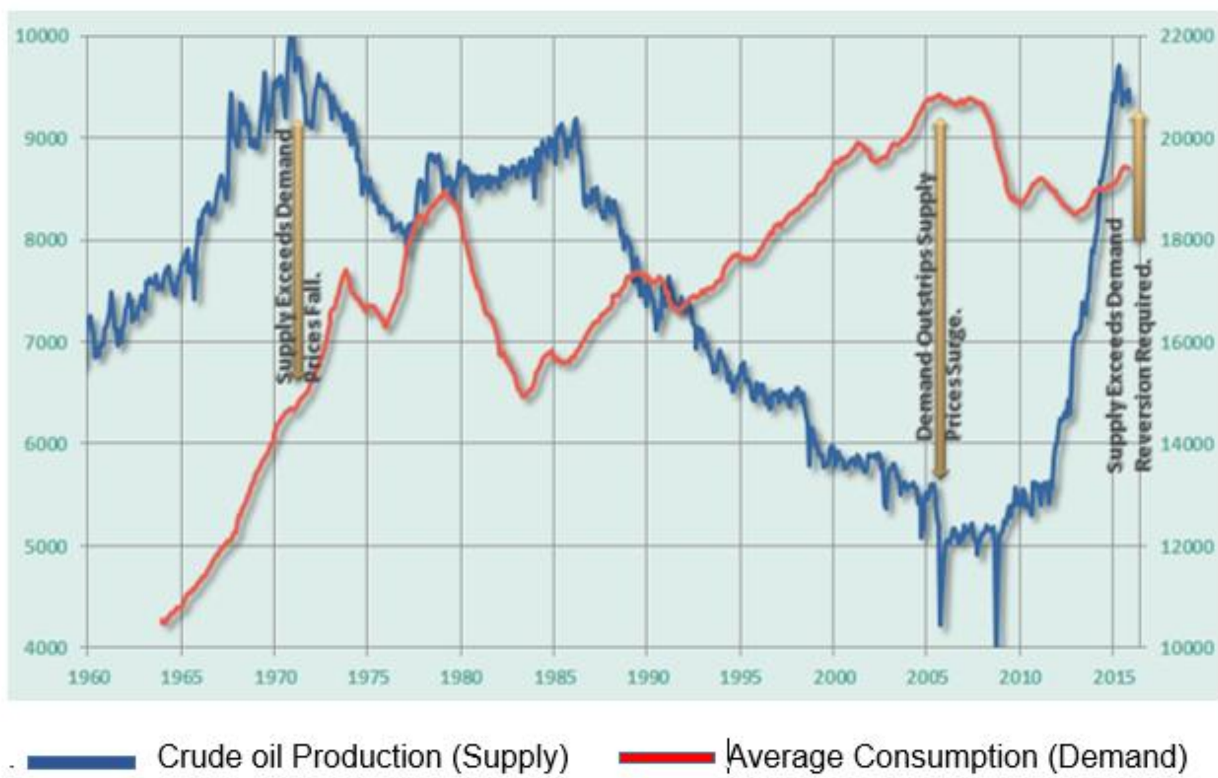



**Source: The New York Times (2008)**

[33] Oil price reached its peak in 2008 as oil traded at $146.08 per barrel. The highest in the whole series of oil price fluctuations. See Hough and Barton, (2016) and The New York Times, (2008).

The above conclusion was highly in the same resonance with the findings of Roberts, (2016) who posits that the oil price was very high in this period because oil demand outweighs oil supply as shown in fig. 3.2.7 below. In recent time, from the year 2014 to be precise, the reverse is the case as crude oil production outweighs oil demand, thereby forcing oil price to remain relatively low.

***Figure 3. 7: The Demand-Supply Relationship***



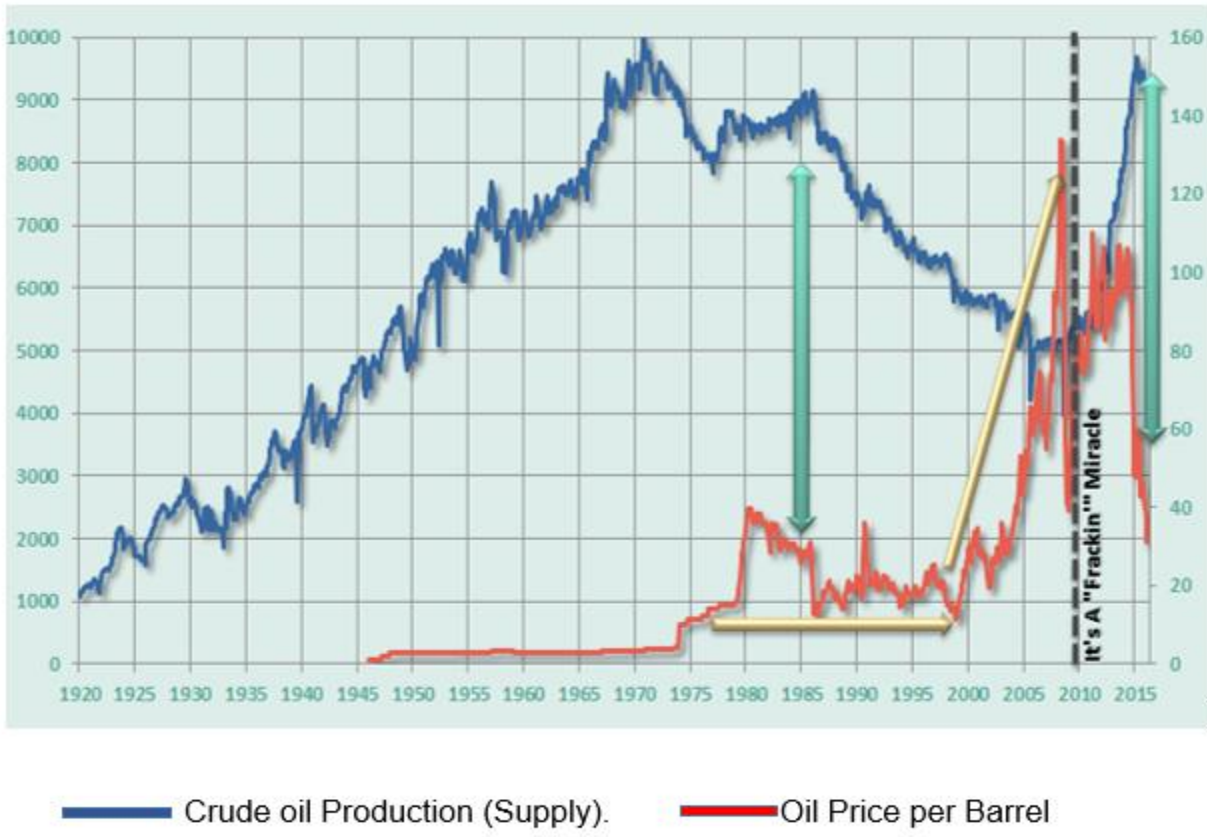

**Source: Roberts, (2016): Why Oil Prices Could Remain Low**

As of November 2008, oil price became relatively stable at $40-$50 per barrel and later, rapidly increased to $60 per barrel in June 2009. Also, IOGA (2015) indicated that there was an increase in the price of oil from an average of $64.20 per barrel in 2007 to the mean price of $91.48 in 2008. However, the actual cause of the oil price increases not specified.

This period indicates a time of demand for oil increase and stagnating supply of oil. The growth in the world's consumption of oil in this period could not equate the oil production because, after 2005, oil production declined due to the political instability in Iraq and Nigeria at the period[34]. Most oil-producing countries like Mexico, Indonesia, the North Sea, also experience a drastic decline in oil production at the period (Hamilton, 2011). This conclusion is highly consistent with those of Roberts, (2016), who demonstrated the scenario through the diagram below. It shows that as at that 2008, the oil price was very high because crude oil production and supply was relatively low.

[34] The growth in the world's consumption of oil in this period could not equate the oil production due to political instability in most of the oil producing countries. See Hamilton, (2011).

***Figure 3. 8: Price-Supply Imbalance***




**Source: Roberts, (2016): Why Oil Prices Could Remain low**

The Kingdom of Saudi Arabia, which accounts for about 13 per cent of total world oil production in 2005, decreased its oil production by 850,000 barrels per day in 2007, which is lower than the 2005 production. Saudi Arabia was indeed an active producer of oil in the 80s and the 90s as well but had reduced production drastically during the 2008 - 2009 periods, shortly after the global financial crisis in the same period (Hamilton, 2011).

The decrease in oil production leading to the increase in oil price at the period was highly inconsistent with the economic theory, which states that at high prices, producers would be very willing to supply more, all things being equal[35]. It also violated the law of supply, which states that at higher prices, producers would be very willing to supply more quantities to the market to expand the business. The law of demand did not hold in this period as well as it states that at higher prices, demand decreases and vice versa[36]. This period was instead characterised, according to Hamilton (2011) at the time of the increase in oil demand and stagnating supply thereby exhibiting abnormal demand and supply curves.

Different theories surround the decline in Saudi Arabia's oil production at this period. Ghawar field reached its peak since it has been in operation since 1951and has accounted for about 6 per cent of the entire world's oil production, Simmons (2005) posits. The year 2009 was tagged a year to regret by Cohen (2009) as there was a drastic decline in the oil revenue of the Republic of Yemen. Afterwards, the worst environmental disaster in the United States, which was an oil spill, then followed as well as the death of one of the icons of the peak oil movement, Matthew R. Simmons (Hamilton, 2011; Kaminski, 2010; Schall, 2009a). Hamilton, (2009b) still posits that the decline in oil production just coincided with the increase in oil price[37]. Further argues that political uncertainty and maladministration in Iran, Iraq, Russia, Venezuela, Nigeria and Mexico, aside environmental considerations were also contributory factors to the decline in oil production at the period.

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[35] The decrease in oil production leading to the increase in oil price at the period was highly inconsistent with the economic theory, which states that at high prices, producers would be very willing to supply more, all things being equal. See Riley, (2015).

[36] The law of demand did not hold in this period as well as it states that at higher prices, demand decreases and vice versa. See Singh, (2016).

[37] Hamilton, (2009b) maintain that the decline in oil production and the corresponding increase in oil price was just a coincidence.

The different theory argues that as many analysts assumed, it would not be in the best interest of the OPEC members to have increased their oil production at this period. Gately and Simmons had already predicted that just as many analysts predicted before, the Kingdom of Saudi Arabia would fail to increase their oil production[38]. Irrespective of the fact that oil production has drastically declined over this period, oil demand continued to rise as China increased its oil consumption within 2005 and 2007 by 840,000 barrel each day. As a result, oil price increased to $142 per barrel in 2008, $145 per barrel in July 2008 as against $55 per barrel in 2005. The 2007-2008 oil price increase and the 2007 United States recession were the greatest ever, since the post-war period. Although, the financial crisis was the main attribute to the economic downturn at the period[39].

On the contrary, a projected surge led to the oil price increase to $147 per barrel in 2008 (Bowen, 2011). Williamson, (2011) on the other hand, posits that the growth in inventories of the OECD-led to the high rate of demand within the period. Williamson also acknowledged the fact that 2008 was the highest United States recession ever as the price of oil increased to about $145.29 per barrel at the time. Kilian (2010) argued in line with the above that the increase in the price of oil was due to the global business cycle fluctuations triggered by a sudden growth in emerging Asia and OECD.

The precise oil price movement at the period not mentioned. The above was consistent still, with the findings of Moffat, (2008) which also attributed the cut back in the oil

[38] There was a prediction that the Kingdom of Saudi Arabia would fail to increase their oil production. See (Hamilton, 2011; Simmons, 2005; Gately, 2001).

[39] Since the Post-World War period, the increasing oil price of the 2007-2008 and the 2007 US recession were the greatest ever. Financial crisis was the main attribute to the economic downturn at the period. See (Hamilton, 2011; 2009a) and Williamson, (2011).

production at this period to the inventory growth in OECD but not specific about the oil price movements.

In summation, 2007 – 2008 was a period of high increase in the oil price, a drastic increase in the demand for oil, decline in oil production and backed up with the highest economic recession ever, after the Post World War II with varying contributors. Williamson, (2011) maintained that the oil production reduction by OPEC as well as the increasing demand for oil by the Asians, caused the price of oil to be steadily on the increase. Hamilton, (2011, 2009a, 2009b) on the other hand concluded that apart from the political instability in most of the oil-producing economies as outlined above, the reduction in the production of oil even from most stable economies at that period could be strongly linked to resource depletion. Contrary to the above, Bowen, (2011) argue that there be still enough oil untapped in the ground as the oil supply disruption was due to an imbalance in the trade as the human-induced change in the norm responsible for the incessant disturbances in oil price.

From Table 2.1, "OPEC Proven Oil Reserves at the end of 2014", it is unlikely that the issue of resource depletion was the key player to the reasons for the drastic decline in most oil-producing economies because their oil reserves were very high then, even at present. Table 2.1 is highly consistent with the position of Bowen (2011). Mismanagement, political instability, and the economic, financial meltdown at that period were likely the contributory factors to the then economic downturn.

### 3.2.10 Unimaginable Shock in Oil Price (2010 – 2013)

The effects of the global financial crisis and the decline in oil production led to a persistent increase in oil prices. From August to December 2010, oil price rose from about $75 per barrel to about $90 per barrel. In 2011, oil price increased further to $125 per barrel due to the civil war that broke up in Libya. The period was the highest increase in oil price after the peak of 2008[40].

The price of oil remained much unstable within the range of $100 - $110 per barrel during the rest of the year, 2011. The price further increased above $120 per barrel around June 2012. As at April 2013, the price of oil fell relatively to $100 per barrel, but the growing tension in Syria pushed the oil price further to more than $115 per barrel lately in summer, 2013. Rising demand for oil characterised the latter part of 2013. There was a disruption in oil supply due to the political instability in Iraq and Libya but the United States and OPEC increasing oil supply during that period contributed to the moderately stable oil price (Hough & Barton 2016). Oil price during this time was relatively high due to the aftereffect of the global financial meltdown during the previous cycle and because the supply and the demand for oil were still in disequilibrium. However, increasing oil price dominates the period.

### 3.2.11 The Most Recent Slump in Oil Price (2014 – Present)

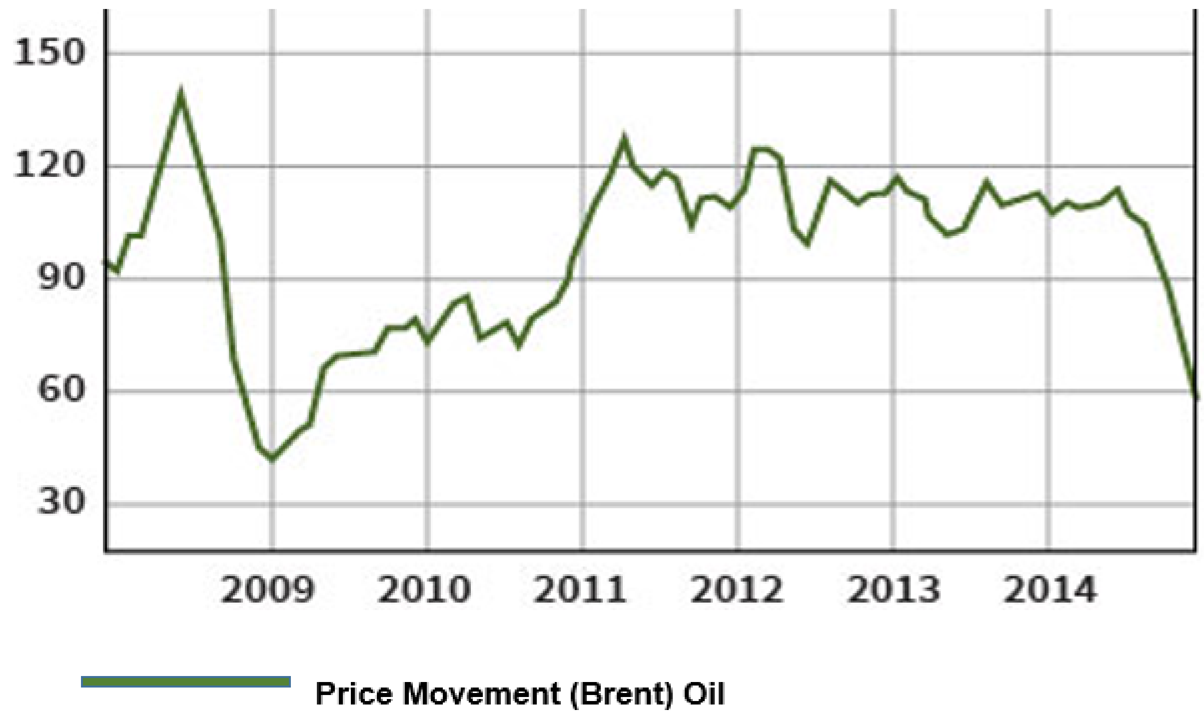
Recently, precisely from the year 2014, '*the dancing steps*' of increasing oil price began to change in the global oil market as the oil price continues to decline since then thereby

[40] From August to December 2010, oil price rose from about $75 per barrel to about $90 per barrel. In 2011, oil price increased further to $125 per barrel due to the civil war that broke up in Libya. The period was the highest increase in oil price after the peak of 2008. See (Hough & Barton 2016; Bowen, 2011; Williamson, 2011).

keeping most oil-dependent economies in disarray, as to what next? That is, those whose primary source of revenue generation relies mainly on oil. Most of these oil-dependent economies already have their income target aimed at meeting up with their budgetary provisions, which were prepared based on certain fixed oil prices. More so, the fiscal break-even price needed to balance the budget by some of the OPEC countries include Nigeria - $123 per barrel; Angola - $110 per barrel, Saudi Arabia - $106 per barrel, Iran – $87 per barrel, Iraq - $81.00 per barrel, United Arab Emirate - $73 per barrel, Algeria - $96 per barrel, Kuwait - $49 per barrel, Qatar - $56 per barrel, Venezuela - $117.50 per barrel and Libya - $269 per barrel[41]. However, as discovered by Rogoff, (2016), Petinger (2015), Anderson, (2014) and as indicated in figure 3.9 below, since the year 2014, the oil price has been on the decline and even below the break-even prices stipulated by most of these oil-producing countries.

[41] The breakeven oil price needed by most oil dependent nations are higher than the prevailing oil price. See (Bentley et al., 2016; Fahey, 2015 and Rascouet, 2015).

*Figure 3. 9: Falling Oil Price Since 2014*




**Source: Anderson, (2014): Crude Oil Price Charts Compare 2014 to 2008**

The significant plunge in the oil price of 2014, 1981 to 1986 oil decline and the 2008 oil price slump have a similar effect. There is an increment in the real incomes of the oil-consuming nations while the living cost of the oil exporters reduces[42]. Similarly, Anderson, (2014) reveal the same effect diagrammatically as indicated in figure 3.2.9 above. The marginal costs of the industries using oil as an input factor reduced; thereby reducing the actual prices for their goods and services.

The above was highly consistent with the findings of Taghizadeh-Hesari and Yoshino (2015); oil price fell from $133.11 per barrel in July 2008 to less than $42.02 per barrel in

[42] The significant plunge in the oil price of 2014, 1981 to 1986 oil decline and the 2008 oil price slump have the similar effect. See Husain et al., (2015).

December 2008. Moreso, the price of oil began to increase again after dropping for a short while. In line with the above, Yoshino and Taghizadeh-Hesari (2014), asserts that after the period of the global financial crisis in 2007 – 2009, the price of oil declined to less than $33.87 per barrel from the peak of $145.18 per barrel (WTI oil price), in 2008. Yoshino and Taghizadeh-Hesari (2014) further attributed such decline to be more of demand-oriented as global oil demand went so low. However, that period is likened to those of the recent decline as depicted in figure 3.9 above, even though oversupply factor from both the OPEC and non-OPEC countries was likely part of the reasons for the drastic fall in the oil price of recent years (Baffes *et al.* 2015).

At the very beginning of the year 2014, the oil price was between $105 and $110 per barrel but rapidly increased to $115 per barrel. In August 2014, the price of oil drastically decreased to $100 per barrel. It continued to decline due to oversupply on the part of most oil-producing economies and a drop in the oil demand growth. The increasing expansion of the shale oil and shale gas production in North America also led to the rapid development of the commercial stock. The oil price fell as low as $47 per barrel in October 2014 and January 2015. As OPEC failed to reduce oil production, oil price further declined (Hough & Barton 2016; Husain *et al.* 2015). Oil price fell as low as $42 per barrel when Iraq, Saudi Arabia, and the United Arab Emirates supply more oil at a rate higher than OPEC official supply target. The price of oil went as low as $27 per barrel as at the early period of 2015, and this was the lowest ever, since the year 2003[43].

[43] The price of oil went as low as $27 per barrel as at the early period of 2015, and this was the lowest ever, since the year 2003. See (Hough & Barton 2016 and Baffes *et al*., 2015).

Similarly, Baffes *et al.* (2015) posit that the decline in the oil price since June 2014 to 2015 January was the highest since thirty decades ago but attributed the significant plunge in the oil price to be more of supply-driven rather than demand. The oil price has been volatile, increasing and decreasing at intervals but as at the end of the year 2015, the price of oil was on the average of $41.85 per barrel from the mean of $86.73 per barrel in the year 2014 (IOGA, 2015).

This is highly in line with the assertions of Husain et al. (2015) that about 50 per cent decline in oil price from the middle of 2014 to the early period of 2015 is more of supply-driven rather than demand. It was because OPEC and non-OPEC oil production increased more than expected, especially the shale oil and gas production from Northern America, coupled with the corresponding decrease in oil demand.

Contrary to the above conclusions, Sachs (2016) maintain that the oil price decline in this period was due to demand, stimulated by macroeconomic factors. More so, oil price as at the 14$^{th}$ of June, 2016 was below $50 per barrel as it declined from $53 per barrel the previous week. In general, the rate of oil price decline since the year 2014 is about 70 per cent[44].

The key macroeconomic stimulants of demand have not been mentioned in the study. It is likely that the supply factor was part of the contributory element to the continuous decline in oil price in this period (Plumer 2016; Crauss 2016; Davig *et al*. 2015; Shaji 2015; OPEC annual statistical bulletin 2015; Menton 2015; Jarver 2015). Though Middle Eastern states are in control of about 66 per cent of OPEC Oil and gas reserves out of

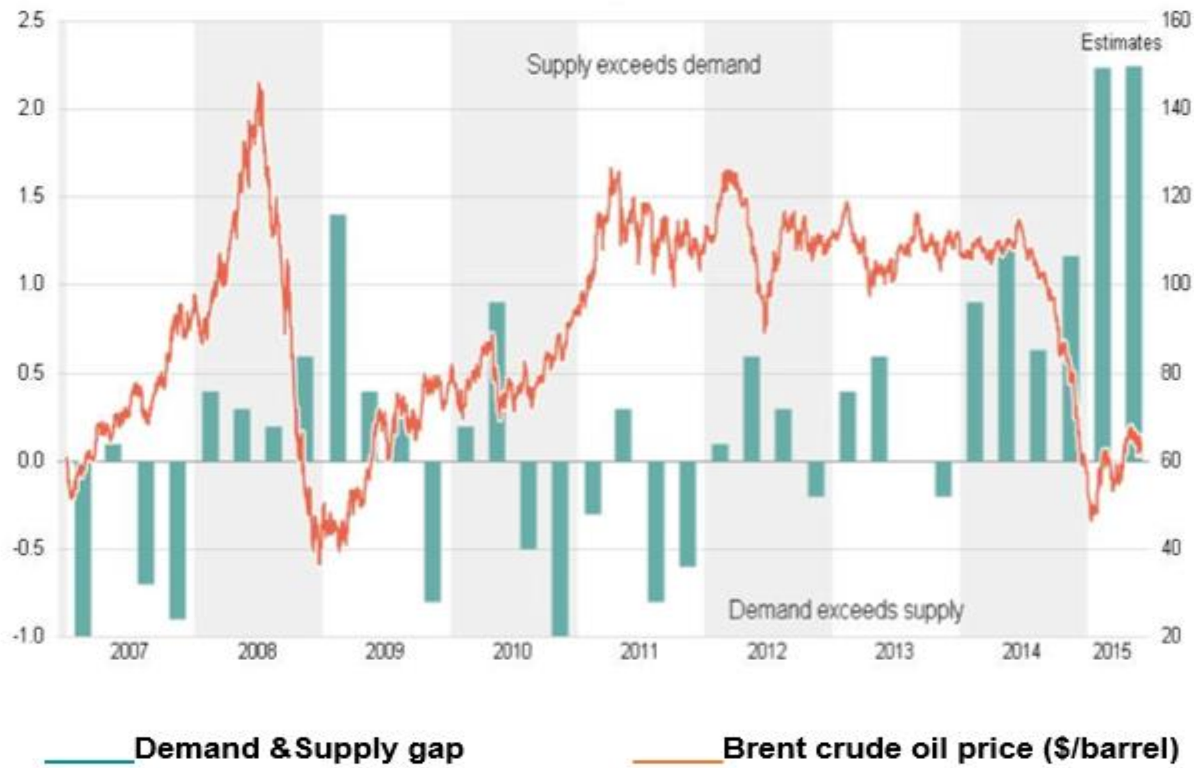
[44] The rate of oil price decline since the year 2014 is about 70 percent. See (Sachs, 2016).

80% in the power of OPEC members' nations. Plumer, (2016) posits that because most oil producers are busy pumping more oil into the world's oil market, oil price keeps going down and down than expected. Figure 3.2.10 below shows that the supply of oil (in green colour) is greater than oil demand (in yellow) while the excess supply is in stockpiles (blue) for future use.

Rogoff (2016) maintain that the continuous fall in the oil price since 2014 is the mixture of two effects. The oil price decline of 1985 – 1986, when there was production reduction by the OPEC members and those of 2008 – 2009, after the global financial meltdown. The two events are due to supply-driven and demand-driven oil price fluctuations.

Classifying the recent slump in the oil price to be the mixture of the above two periods is contradictory as there is enough supply of oil in the oil market by both the OPEC and non-OPEC members. The above is likely to cause a fall in oil price as experienced. The price decline of 1985 – 1986 as portrayed by Rogoff, 2016 due to production cut should rather lead to shortages in the oil market, which should eventually result in scarcity, followed by the price increase and not price decrease.

*Figure 3. 10: Oil Demand and Supply of OPEC Oil (in a million barrels per day)*




**Source: Mirhaydari, (2015): Four Reasons Oil Could Fall to $40 a Barrel**

From the above figure, because the world was trying to recover from the global financial crisis, most oil-producing economies were struggling to meet up with oil production and the crisis in Iraq and Libya were hampering further oil supply, oil demand was rather on the increase within 2010 and 2014. The high oil price motivated the United States to employ the use of innovative hydraulic fracturing and horizontal drilling techniques to unlock huge quantities of oil from shale formations[45]. The new form of oil production more than doubled the United States Oil production from 2010 until date, thereby aiding oil

[45] The high oil price motivated the United States to employ the use of innovative hydraulic fracturing and horizontal drilling techniques to unlock huge quantities of oil from shale formations. See (Plumer, 2016 and Mirhaydari, 2015).

supply to catch up with oil demand and even surpass it as depicted in the diagram above. Saudi Arabia and other OPEC members failed to cut back production as previously the case to stabilise prices. As if that was not enough, Iran has started to produce and export more oil as sanctions on the economy are lifted (Plumer, 2016 and Mirhaydari, 2015).

We keep observing the dynamics of both demand and supply since expectations are of paramount importance in this regard. If new data depicts an unanticipated increase in the production of oil or an unexpected decline in the demand for oil, price tends to fall as a result. On the contrary, a surprise decrease in oil supply or an unanticipated increase in oil demand will force the oil price to rise. Nevertheless, based on the above premise, in-so-far-as the oil supply outweighs oil demand, the price of oil will likely remain relatively lower than expected and vice versa.

## 3.3 Factors Influencing the Rising and Falling of Oil Prices

In recent history, oil price declined to about 44 per cent, partly due to the reduction in the economic activities of most of the consumer oil giants[46]. Some decades ago, there were alternating oil price cycles between increases and decreases inherent in the oil industry, but since 2014, the oil price cycle in the oil industry is on the decreasing side. It is imperative to identify some of the likely factors responsible for the constant movements in oil prices. Understanding these factors influencing the rising and falling of oil prices

[46]Oil price declined to about 44 percent recently, partly due to the reduction in the economic activities of most of the consumer oil giants. See Kilian, (2015)

would be crucial to the critical assessment of the likely global macroeconomic impact were already discussed in the previous chapter.

Different researchers have different opinions as to the factors responsible for the oil price fluctuations in various episodes. To some researchers, the demand factor triggered most of the oil price volatility while some were of the view that supply factors were responsible. Others still posit that the mixture of both the demand and supply factor caused the oil price fluctuations in some episodes. From the literature so far, there is no consensus as to the rudiments of this recent oil price fall. Kitous et al. (2016); Baumeister and Kilian (2016); Bloomberg Business (2016a); Baffes et al. (2015); Pflunger (2015); IMF, Regional Economic Outlook, (2015); Arezki and Blanchard (2014); Yanar, (2014); Hamilton, (2011); Brown, 2006 and Al-Yousef, (1998) presents diverse views, as regards these factors.

In line with the above are the conclusions of Kristopher, (2015) that both the supply and demand factors were the cause of the oil price slump in recent years. The increase in OPEC and non-OPEC countries production coincided with the decline in the oil demand from most of the greater oil consumers like the US, China, Japan. The United States importation of crude oil declined due to increasing in the production of shale oil in recent years. The Kingdom of Saudi Arabia oil export to the United States has dropped drastically by about 450,000.00 barrels per day, which is about 34 per cent (Lee, 2017). Shale oil has been in existence with high reserves since the 16th century, not tapped due to its enormous cost of production. The real oil shock before 2014, coupled with improved technology through horizontal drilling and fracturing motivated the increase in the manufacture of oil in the United States. However, the increase in oil production forced the oil price to go down, lower than expected.

Al-Quadsi and Ali (2016); Krugman (2008) posits that one of the engineers of the oil price fluctuations in the oil market is speculations, which tends to ignite the oil price increase. For instance, the growth in the oil price of 2007 - 2008 was partly because some investors bought oil not as a commodity for its usage but rather as a financial asset. The study further asserts that the spike in oil price at that period was also due to increasing demand and not just due to production cut by the OPEC members. It was instead astonishing that the interest rate and the inflation rate at the period were relatively low. However, based on the recent decline in oil price, to less than $50 per barrel since 2014, Al-Quadsi and Ali (2016) attributes it to the increase in the United States shale oil production for the past few years now, hence, an oversupply of oil.

Consistently, Husain *et al.* (2015) and Hinckley, (2015) opined that the recent decline in the oil price since 2014 was mainly due to supply factors, which was somewhat persistent. The declined could be traced to the demand factor too while the supply factor plays a dominant role in the recent oil price decline. Consistent with the above is the report from the Regional Economic Outlook: The Middle East and Central Asia, IMF 2015 that the recent decline in oil price is mainly supply-side oriented due to the shale oil production from North America and the oversupply of oil by the members of the OPEC. The lifted sanction on Iran also added to the oversupply in the oil market. Also, a weak global economic activity, which has led to a decline in demand for oil, is also a factor behind the sharp drop in the price of oil.

The above is highly consistent with the conclusions that, the supply factors were the cause of the increases in the oil price of the 1970s, especially those of the Yom Kippur

War (Alkhathlan, Gately and Javid 2013; Goswani 2012; Williams 2011, 2007 and 1999; Pindyck 2001).

Based on the above premise, the supply factor is the most important factor responsible for both the oil price fluctuation of the Yom Kippur War and those of the recent oil shocks. The only distinction in both periods is that while increasing oil price characterised the fluctuations during the Yom Kippur War, the recent oil price volatility is mainly decreasing oil prices. The decreasing oil price affects the oil-exporting nations regarding meeting up with the budgetary needs of the economies since the contribution of oil to the revenue base is very high.

Lorusso and Peironi (2015) studied the causes and consequences of oil price fluctuations on the economy of the United Kingdom. Their results show that demand factor rather than supply has been responsible for the oil price movements in the 1970s. The direction of the oil price movements in the 70s was mainly real shocks, that is, oil price increase. The recent oil price movements, while the negative oil price shock was not captured in the study.

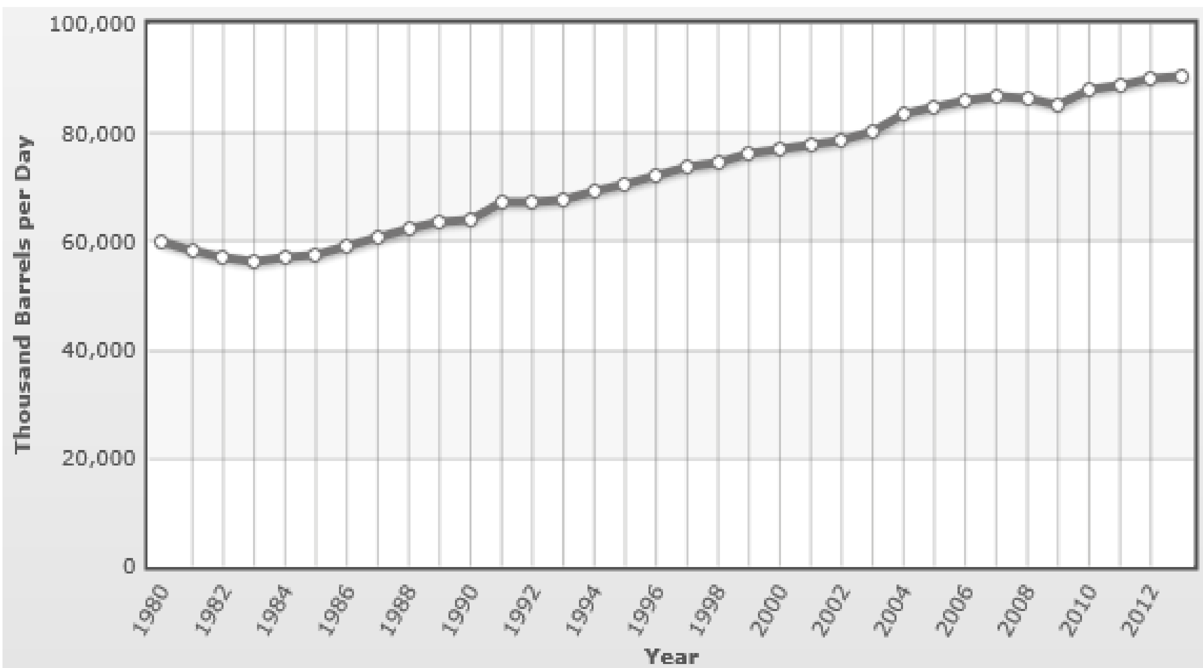
Consistent with the above study, Bowler, (2015) maintained that weak demand contributed to the recent fall in oil price due to low economic growth. Further added that oversupply is another factor from both the OPEC members and an increase in the United States increasing shale oil production.

From the preceding, both demand and the supply factor play a significant part in the movement of the oil prices from the 1070s to date. Although this study is not looking at the causative factors alone. It also focuses more on the effects of the declining oil revenues of those oil-exporting countries, especially the economies under consideration – Nigeria, Venezuela and Norway to close the income gap created as a result of the oil price decline in recent years.

### 3.3.1 Demand Side

For about three decades ago, the world's daily crude oil consumption has been on the increase.  See figure 3.11 below.

***Figure 3. 11: Yearly Crude oil consumption***




**Source: Energy Information Administration – USA (2015)**

Oil demand increases as economies develop and industrialise.  The United States of America is known as the highest consumer of crude oil in the world.  The next is China.  Below are the top ten oil consumers in the world.

*Table 3. 2: Top Ten Oil Consumers in the World*

| S/N. | COUNTRIES/REGION | OIL CONSUMPTION (BILLION BARRELS PER DAY) | YEAR (ESTIMATED) |
|---|---|---|---|
| 1. | United States | 19,840,000 | 2011 |
| 2. | China | 9,790,000 | 2011 |
| 3. | Japan | 4,464,000 | 2011 |
| 4. | India | 3,509,000 | 2013 |
| 5. | Russia | 3,196,000 | 2012 |
| 6. | Saudi Arabia | 2,817,000 | 2011 |
| 7. | Brazil | 2,594,000 | 2011 |
| 8. | Germany | 2,400,000 | 2011 |
| 9. | South Korea | 2,301,000 | 2012 |
| 10. | Canada | 2,259,000 | N/A |

**Source: Extracted by author, from International Energy Administration (IEA) (2016)**

Recently, the global consumption of oil has declined drastically in most of the oil consuming economies like the United States and China. Kilian (2015) posits that such decline was mainly due to the drastic reduction in the world's economic activity. Consistent with the above, Yanar, (2014) maintain that the low growth in most European countries and the recession expectations in Japan decreased oil demand, which in turn led to the oil price decline. Despite the increase in the business in the United States of about 50 per cent, oil consumption continued to decline since 2014. The drop in global oil consumption referred to as '2014 consumption surprise' was more than the projections made by the International Energy Agency in 2003.

The then American president, Barack Obama and the Canadian prime minister, Justin Trudeau have taken a strong move to shift the United States and the Canadian economies to a very low carbon emission economies by reducing the amount of oil consumption. They are also very dedicated to providing clean, secure and renewable energy for the future generations who would continue with the carbon reduction strategy through the laid down policies[47].

### 3.3.2 Supply Side

According to Daniel (2016) and the International Energy Agency (IEA), (2014), the top ten oil-producing economies in the world, supply more than 66 per cent of the oil. The crude oil suppliers comprise of both OPEC members Iran, Iraq, Saudi Arabia, Kuwait, and Venezuela (founding members) Qatar, United Arab Emirates, Libya, Nigeria, Angola, Algeria, Ecuador and Gabon[48]. Non-OPEC countries comprise of Norway, United States, Russia, China, Mexico, Canada, Brazil. Some of the responsibilities of OPEC as an organisation are to coordinate the petroleum policy to protect the interest of its members, to ensure a stable oil price and consistent oil production, among others. Above all is to maximise their profit, which is the main aim of any business organisation.

OPEC is referred to as a cartel due to its role in giving production quotas to members and cutting down production to raise the oil price. Recently it assumed that OPEC's role in the control of the production quotas among its members has failed since most researchers attribute the recent slump in crude oil prices too high oil production, which outweighs the oil demand.

[47] There was a strong move to shift the US and the Canadian economies to very low carbon emission economies by President Barack Obama and the Canadian Prime Minister, Justin Trudeau through the reduction in oil consumption. The nations are highly dedicated to providing a clean, secure and renewable energy for the future generations who are expected to continue with the carbon reduction strategy through the laid down policies. See (Goldenberg, 2016; Cox, 2015).

[48] The crude oil suppliers comprise of both OPEC members Iran, Iraq, Saudi Arabia, Kuwait, and Venezuela (founding members) Qatar, United Arab Emirates, Libya, Nigeria, Angola, Algeria, Ecuador and Gabon. See OPEC, (2017).

Increasing oil reserves and the rise in oil production in both OPEC and non-OPEC countries as a result of the discovery of the alternative procedures in oil production facilitated the decline in oil price[49].

Nevertheless, there was a drastic increase in oil production by the United States in 2014 from 5 million barrels in one day to about 9 million barrels per day. It also added to the total world oil production mainly from the hydraulic fracturing and horizontal drilling, making the United States be one of the highest oil producers in the world. The United States further plans to reduce its oil dependency by the year 2020 (Cox, 2015; Yanar, 2014). The figure below shows the crude oil reserves, crude oil production and the crude oil exports of some oil-dependent, exporting economies.

***Table 3. 3: Crude Oil Reserves, Production and Export in Nigeria, Venezuela and Norway***

| S/N. | COUNTRIES | CRUDE OIL RESERVES (BILLION BARRELS) | CRUDE OIL PRODUCTION (THOUSAND BARRELS PER DAY) | CRUDE OIL EXPORTS ($ BILLION)/%WORLD TOTAL |
|---|---|---|---|---|
| 1. | Nigeria | 37.06 | 2,321.50 | 38 (4.8%) |
| 2. | Angola | 9.52 | 1,856.10 | 32.6 (4.1%) |
| 3. | Norway | 5.50 | 1,957.70 | 25.7 (3.3%) |
| 4. | Venezuela | 300.88 | 2,653.90 | 27.8 (3.5%) |
| 5. | Saudi Arabia | 266.46 | 10,192.60 | 133.3 (17%) |

**Source: Extracted and designed by author from – OPEC Annual Statistical Bulletin, 2016; Daniel, (2016) Crude Oil Exports by Country; International Energy Agency (2014)**

[49] Increasing oil reserves and the rise in oil production due to unconventional procedures in oil production facilitated in the decline in oil price. See Yanar, (2014).

### 3.3.3 Quest for Renewable Energy

Renewable energy, like wind, solar, biomass, hydropower and geothermal which are naturally replenishing fuel sources, providing clean, zero or low carbon emissions could also be a factor because the United States supply of electricity through the renewable energy sources increased from 8 per cent to 13 per cent between 2007 and 2014. The development of most economies also leads to an increase in the need and demand for energy. Most countries, however, are already increasing their commitment toward the renewable energy (Harris and Roach, 2017; Motyka et al. 2017; World Energy Resources, 2016; IISD, 2014; Timmons et al.; 2014; Morales, 2010).

90 per cent of the electricity generation in the year 2015 emanated from renewables while it is expected that by the year 2040, zero-emission energy source would constitute about 60 per cent of installed capacity. More so, 195 countries signed a fair deal on greenhouse gas emissions during the United Nations Conference on climate change, resulting in the drastic growth in renewable energy in recent times. Most economies are in support of clean energy in the form of provision of renewable energy subsidies and taxation of carbon emissions (Motyka et al. 2017; Nachtigall and Rübbelke 2013).

Consistently, Klevnas et al. (2015) maintained that energy choices among different countries took different dimensions due to the nature of the fluctuations in oil prices in the world's oil market. This volatility has been constant over time and has culminated into the desire of most countries of the world to be clamouring for economic growth and at the same time trying to take part in the reduction of the hazardous GHG emissions that comes with the use of energy. Most countries are now concerned with the expansion of renewable energy use, improvement of energy efficiency and discouragement of wasteful consumption of fossils while ensuring the expansion of the supply of renewable energy. The need for climate change and conventional wisdom on the development of energy are based on the carbon reduction target of ensuring that the global warming is kept under $2^oC$ which is achievable through the drastic reduction of the use of non-renewable energy (Papandreou and Ruzzenenti, 2015).

Klevnas et al. (2015) also posit that the low-carbon policy ambition is capable of reducing oil prices by more than 50 per cent in the long term. There is an urgent need for the reduction of CO2 emissions in the environment while most economies are presently moving towards the expansion of international markets for the trading of green energy goods and services (OECD, 2015).

An effective climate change policy has a significant adverse effect on the price of oil in the world's oil market. Most economists are also considering whether carbon pricing in the form of taxing the emission of $CO_2$ would be able to assist in the eradication of climate change even when the means of attaining to such goal is not yet certain (Papandreou and Ruzzenenti, 2015).

Conversely, Nachtigall and Rübbelke (2013) and Sinn, (2012) maintained that empirically, there had not been any evidence to prove that the fall in oil prices in recent time was hinged on the green paradox. The green paradox entails that oil producers try as much as possible to increase oil production to prevent the effects of the expectations of the world policies supporting the reduction of fossil energy in future which, would in-turn hurt their revenue base.

### 3.4 Overview of some Oil Exporting Countries

The revenue from oil and gas play a very significant role in the structure of most of the oil-exporting countries[50]. Oil as the number one export product in the world accounts for about 4.8 per cent of the total export products in the world. As at the year 2015, oil export amounts to $786.3 billion, which represents a significant drop of about 50.3 per cent since 2011 and 44.4 per cent drop between 2014 and 2015. Out of the total world oil exports, the Middle Eastern nations account for the highest, which amounts to about $325 billion, equivalent to 41.3 per cent of the world's oil exports. Comparatively, 18 per cent of the world's oil export is from Europe, 9.9 per cent from Northern America while 7.7 per cent is from the Latin America, which includes the Caribbean exporters, and Mexico (Workman, 2016).

The 15 countries that exported the highest dollar worth of oil, accounting for about 80.5% of all the oil exports in 2015 are shown in the table below:

[50] The revenue from oil and gas play a very significant role in the structure of most of the oil exporting countries. See Farzanegan and Markwardt (2009).

*Table 3. 4: Dollar Value Worth of Oil Export in 2015*

| S/N. | COUNTRIES | CRUDE OIL EXPORTS (IN BILLION DOLLARS) | PERCENTAGE OF WORLD TOTAL EXPORT |
|---|---|---|---|
| 1. | Nigeria | 38 | 4.8% |
| 2. | Angola | 32.6 | 4.1% |
| 3. | Norway | 25.7 | 3.3% |
| 4. | Venezuela | 27.8 | 3.5% |
| 5. | Saudi Arabia | 133.3 | 17% |
| 6. | Russia | 86.2 | 11% |
| 7. | Iraq | 52.2 | 6.6% |
| 8. | United Arab Emirate | 51.2 | 6.5% |
| 9. | Canada | 50.2 | 6.4% |
| 10. | Kuwait | 34.1 | 4.3% |
| 11. | Kazakhstan | 26.2 | 3.3% |
| 12. | Iran | 20.5 | 2.6% |
| 13. | Mexico | 18.8 | 2.4% |
| 14. | Oman | 17.4 | 2.2% |
| 15. | United Kingdom | 16 | 2% |

Source - Workman, (2016): Crude Oil Exports by Country

Between 2011 to 2015, there was a drastic decline in the value of crude oil exports. For instance, Nigeria recorded a drop in oil export of about 57.8%, Venezuela recorded a decrease of about 54.4%; a decrease of about 56.7% for Norway while Canada recorded a decline of about 27.7%.

In this section, the overview of the oil-exporting nations under examination, such as the Nigerian economy, Venezuela and Norway, would be discussed. The choice of these nations is as a result of the fact that the economies are highly dependent on oil for their sustainability. Nigeria is the highest oil producer and exporter in Africa, Venezuela is also highly dependent on oil and is known to have the largest proven oil reserves in the world. Norway, on the other hand, is also highly driven by oil, and it is imperative to examine the effects of the fluctuations in crude oil prices on these nations. The vulnerability of these oil-exporting nations to declining oil prices is indeed worth noting, and the synopses of the economies under examination are as outlined in the sub-sections below.

### 3.4.1 Overview of the Nigerian Economy

The Nigerian economy is located in West Africa with Abuja as its Federal Capita City. According to the 2015 estimate, the economy is populated by about 173 million people. The economy uses Nigerian Naira as its currency, while English is the official language (The World Bank, 2017).

Nigeria is a nation with abundant natural resources, oil and gas being the highest gifted mineral in the country. The country remains the highest oil producer in Africa and the sixth-largest producer of petroleum in the world. About 83% of Nigeria's federal government revenue is generated by the oil and gas industry in the year 2000, which was more than 98% of the total export. Shell-BP discovered oil in Oloibiri, Niger Delta in 1956 but began production of about 5,100 barrels per day in 1958 (Adamu, 2015; Halid 2015; Riman et al. 2013; Kadafa 2012; Akinlo, 2012; Whiteman 2012; Odularu, 2008; Olusi and Olagunju 2005). Consistently, Ademola *et al.* (2015) referred to oil as the dominant source of revenue for the Nigerian economy. More than 90 per cent of the Nigerian total export earnings emanates from oil and about 80 per cent of the total government revenues.

Nigeria came into existence in 1914 while the agricultural sector played a dominant role in the economy. It was until the end of the civil war, from 1967 to 1970 that the oil industry began to play a major role in the economic cycle of the country as the revenue from oil increased drastically while the agricultural sector, relegated to the background. Nigeria became a member of the Organisation of Petroleum Exporting Countries (OPEC) in 1971. The Nigerian National Petroleum Corporation (NNPC) – a major player in both the upstream and downstream sectors was established in 1977 (OPEC, 2017; Odularu, 2008)

For more than forty decades ago; oil has been the main source of energy and foreign exchange earnings and revenues for the Nigerian economy[51]. The discovery of oil in Nigeria has both positive and adverse effects on the economy. The positive effect has to do with its revenue generation for the economy while the adverse consequences are connected with the communities where the oil is exploited as the surrounding communities suffer ecological degradation, deprivation of means of livelihood, economic and social factors (Ademola et al., 2015; Odularu, 2008).

The World Bank, (2017) maintain that the Nigerian Economy Nigeria is the largest economy in Africa as it accounts for about 47 per cent of the West African population which is about 173 million people. Oil contributes about 90 per cent of export earnings and about 75 per cent of the budgetary revenues. There has been lots of challenge to Nigeria's external balance and public finance due to the drastic decline in the oil price since 2014.

The Nigerian economy is currently experiencing serious exchange rate volatility, downward review of the budget benchmark and drastic reduction in government expenditures (Adamu, 2015).

### 3.4.2 Overview of the Venezuelan Economy

The Venezuelan economy, located on the northern coast of South America is known as the Bolivarian Republic of Venezuela with Caracas as its City capital and a population of

[51] For more than forty decades ago, crude oil has always been the major source of energy, foreign exchange earnings and revenues for the Nigerian economy. See Odularu (2008).

about 31.11 million people, according to 2015 estimate, while covering the area of 916,445 $km^2$. Crude oil is the major export commodity with Bolivar as the nation's currency and Spanish as the main language. The economy is highly blessed with abundant mineral resources, with the largest oil reserves in Latin America (The World Bank, 2017).

Venezuela's economy depends heavily on the oil sector as oil, was traced back in the economy since the early 20th century. By the production of oil, Venezuela is the fifth-highest producer in OPEC, has the highest proven oil reserves of about 24.8 per cent in OPEC and the 9th oil exporter in the world as oil accounts for about 96 per cent of its total exports and more than half the country's gross domestic product. Crude oil fuels the Venezuelan economy and saturates all aspect of society. There is an exhibition of the 'resource curse' or the 'paradox of plenty' syndrome in the economy (The World Bank, 2016; Tong, 2016; Workman, 2016; OPEC Annual Statistical Bulletin 2016)

There is a sharp decline in the Venezuelan oil production by more than 350,000 barrels per day, and the macroeconomic crisis deteriorates drastically as well due to the continuous decline in the country's oil revenues. There is also difficulty in attracting investment in a low oil price situation. The domestic currency was severely overvalued. Venezuela had one of the lowest per capita income because of the crisis. Poverty has also increased significantly. The external public debt increased substantially from US$37 billion in 1998 to US$102 billion in 2013. Oil represented about 96% of export and more than 60% of total government revenues (Monaldi, 2015).

Until 2014, the Venezuelan economy has tremendously benefitted from the historical oil prices, which supported the increased government expenditures. The decline in oil prices since 2014, combined with the inadequate micro and macro policies have tremendously affected the Venezuelan economic performance. The declining oil revenue has indeed widened the budget deficit gap and has created serious macroeconomic imbalances in the economy as the nation now experiencing severe stagflation (The World Bank, 2017).

### 3.4.3 Overview of the Norwegian Economy

The Kingdom of Norway, located in Europe is known for its mountains, coastline and seafaring power as the economy has the world's largest sovereign wealth fund. Norway also has one of the world's highest standard of living because of the discovery of oil and gas in the 60s. Norway has Oslo as its capital city with a population of about 5 million people and occupying an area of about 323,759 $km^2$ Europe while using the Norwegian Krone as the country's currency. The major language is the Norwegian language. Norway shared boundaries with Finland, Sweden and Russia and got its independence in 1905 from Sweden (BBC, 2016).

Norway's economy is greatly endowed with abundant natural resources such as forests, fish, hydrocarbon and other minerals. Norway is the 5$^{th}$ leading oil exporter in the world; it accounts for oil revenue of about $40 billion yearly. The oil sector is highly relied on by the economy because it accounts for the largest portion of export earnings and close to 30% of the administrative revenues (Recknagel 2016; 2016 CIA World Factbook).

The declining oil revenues due to the fall in oil price has indeed widened the budget deficit gap in the most oil-dependent nation. The economy of Norway is tremendously dependent on oil for more than half of its exports and the present slump in crude oil has reduced its profitability to the extent that about three offshore rigs are under suspension. There is also the suspension of about $150 million worth of investments while more than 10,000 Norwegian oil workers were laid off already (Cunningham, 2014).

## 3.5 Summary and Conclusion

In this chapter, many related kinds of literature as to oil price changes and its impact on the global economy were reviewed. Section One is the introduction, while in section two, the history and trends of oil price changes were discussed. The section emphasises that oil price shock diversely affects different economies depending on whether the economy is oil-exporting or oil-importing. Historically, the oil price has been changing since 1946 when the price of oil was as low as $1.17 per barrel in July 2008 when oil price attained to its peak of $145.31 per barrel. The price continued to decline since 2014 from the high price of $115 per barrel to less than $35 per barrel as at the end of 2016. Since then, the oil price has been fluctuating within an average of $50 per barrel. The fluctuations in oil price have been constant over these years with different factors being the drivers in various episodes. According to different literature expectations, demand and supply factors have played significant roles in the constant changes associated with oil prices.

The Post World War period (1945-1971) was mainly characterised as the period where the United States was the highest consumer and producer of oil in the world until 1974. This period marked the first Post-World War recession due to the general reduction in the spending of residents while oil price increases from $2.50 per barrel in 1948 to $3.00 per barrel in 1957. The increasing oil price led to the second Post World War Recession as Mohammad Mossadegh; the Prime Minister nationalised the oil industry in Iran while Gamal Abdel Nasser, the then Egyptian President, nationalised the Suez Canal.

Additionally, the Yom Kippur War of 1972-1974 was viewed differently by diverse authors through various lenses and as having the most remarkable events in the history of oil prices. The Call-on-OPEC, meant to shore up prices prevailed at this period as the global

7.5 per cent production cut led to about 400 per cent rise in oil price, that is, tripling of the oil price from about $3 per barrel to about $12 per barrel. The incidence at the period was backed up by two competing theories; the first theory maintains that the period revealed the exploitative power of OPEC to control both oil production and price while the second theory was snarled to the exhaustible nature of the petroleum products and the wealth-maximization model using the backwards-bending supply curve of oil.

As indicated previously, the exhaustible nature of the petroleum products was far from being the reason for the production cut as most of the OPEC members have higher oil reserves at the period. More so, the wealth maximisation model, using the backwards bending supply curve was also excluded from being the reason because most of the economies discovered oil not too far from the period with the development targets yet to be achieved.

If the price had already increased to some degree before the cutback of the production, it can then be justified that perhaps, OPEC countries had already reached their targeted revenues and as such, not willing to make more revenue by cutting down production at higher prices. That was not the case at all because it is unlikely that any of these oil-exporting countries would just desire a fixed level of revenue such that any income beyond that would result in a cut in oil production to substitute leisure for work.

Conversely, Blinder and Rudd (2008); Hejny and Nielsen (2003) argued that both the aggregate demand and aggregate supply shock effects be the best to explain the great stagflation of the period. The supply shocks events on impact simultaneously moved both the price level and the output degree in the opposite direction, thereby leading to stagflation. However, the above assertion did not clearly state why the reduction in production by OPEC, which increased the price of oil, as demonstrated in the model.

The oil price was still on the increase between 1974 to 1978 and further doubled from 1978 to 1980 due to growing demand resulting from the Iranian revolution (Graefe, 2013; Barsky and Kilian, 2002). Oil price increased further due to the Iraq – Iran battle within 1980 – 1981.

The great fall in oil demand led to a decrease in oil prices as well between 1981 to 1986. The oil price decline was short-lived as oil price increased again due to the first Persian Gulf Battle from 1990 to 1991. Further reduction in oil production increased the oil price due to the second Persian Gulf War and the Venezuelan conflict in 2003.

Oil price increased further, due to the global financial crisis effects and oil production decline from $90 per barrel in 2007 and persisted until it reached its peak price of $146.08 per barrel on the average in July 2008. It is the highest ever in the history and trends of oil prices. The price of oil remained unstable within the range of $100 - $120 per barrel for the rest of 2011 and 2013 due to increasing oil demand at the period.

Since the year 2014, the oil price has been declining until the date which has been the major concern in this study.

There is need to understand the history and trends of oil price volatility and its effects on the oil-exporting nations depending highly on oil export to meet up with the budgetary requirements of the economies should the price of oil continue to fall.

Section three captured the factors influencing the rising and falling of oil prices. Different researchers have different opinions as to the factors responsible for the oil price fluctuations in various episodes. Most studies attribute the fluctuations in oil prices to both demand and supply factors. Klevnas et al. (2015) posit that the low-carbon policy ambition is capable of reducing the oil prices by more than 50 per cent in the long term.

From the literature so far, there is no consensus as to the rudiments of this recent oil price fall.

While Section four elucidates the overview of some of the oil-exporting countries under examination; Nigeria, Venezuela and Norway, who are depending highly on oil revenues for over half of their exports, section five concludes the chapter. Oil revenue and the budget of oil-exporting economies are highly inter-linked as changes in oil price, directly and indirectly, affect the revenue base of income of these countries. Some of these nations have already mapped out the break-even oil prices needed for the national budgets. Unfortunately, the break-even oil prices for these countries are higher than the current oil price.

There is a need for serious adjustments in the financial process of the oil-exporting economies due to the significant and persistent nature of the oil price decrease since 2014. There is an urgent need for faster progress in developing specific plans and models that would enable the fiscal positions of these economies to be firmly rooted and able to finance or meet up with the budgetary needs of the countries (IMF, Regional Economic Outlook, 2015).

Most of the studies focused on developed and oil-consuming economies, real oil price shocks, causative factors, among others. None of these studies concentrated on the declining oil revenue implications on mono-economy budgetary requirements. This study focused on oil-exporting economies - Nigeria, Venezuela and Norway, the causative factors, the extent of the effects of the declining oil revenue on the budgetary performance of the nations and would also, delve into the possible ways to close the income gaps in those economies that are highly dependent on oil.

Nevertheless, the subsequent chapter presents the research philosophy, methodology, methods of data collection and the analytical tools employed for the analysis.

Abertay University

# CHAPTER FOUR

## Research Methodology and Methods

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## 4.0 Research Methodology and Methods

### 4.1 Introduction

The previous chapters entail the review of the relevant related literature, which aids in raising the primary research question, formulation of the research hypotheses, selection of the appropriate theories underpinning the research, review of the history and the trends in oil prices. Using a systematic way to find out about something unknown, which gives a broad understanding of the phenomenon under study and increases our knowledge about the subject, is referred to as research (Saunders et al., 2012; Kumar, 2008). For any investigation to be successful, produce the expected results, findings, and expose the researcher to new knowledge, it must involve the use of one form of methodology or the other.

While the methodology is described as the general approach of collecting and analysing data in the research process, a method entails the different ways by which data is gathered and analysed (Collis and Hussey, 2014; Hussey and Hussey, 1997). There are diverse ways of conducting research, and as such, different methodologies. The methodological choice also depends mainly on the nature of the research to be undertaken.

The choice of an appropriate research methodology plays significant roles in any research, to ensure the accuracy and validity of the data. It also aids in the prevention of spurious results from the analyses to be carried out (Collis and Hussey 2014; 2009).

Nevertheless, the research process depends mainly on the research philosophy and the research paradigm, which the researcher adopts for the study. This chapter, therefore, aims at justifying the research methodology and methods adopted for this study, which aims at achieving the research objectives.

The chapter consists of the following subsections: Section 1 is the introduction, and section 2 contains the research philosophy and paradigms. The research approach is shown in section 3, while section 4 entails the research strategy. Section 5 explains the research design, while section six presents the data analysis. Section 7 summarises and concludes the chapter.

## 4.2 Research Philosophy and Research Paradigms

**Research philosophy** is coordination of beliefs surrounding the study under consideration. It encompasses the nature of knowledge, existence and reality, thereby elucidating the process involved in gathering the required data, the analysis and its applicability to the real world (Waite and Hawker, 2009; Galliers, 1991). Research philosophy can also be referred to as the assumptions surrounding how the researcher views the real world, as the assumptions will underpin the research strategy and methods used in the research process, which is vital in any study (Saunders et al., 2012).

Easterby-Smith et al. (2013) outlined the importance of philosophical assumptions in any research, which enables the researcher to clarify the research designs employed in the research process. It thereby shows the research evidence, sources of data and its interpretation to address the research questions. The research philosophy enables the researcher to identify the research design that would enable the researcher to achieve the research objectives and to determine the limitations associated with each of the research approaches. Research philosophy also helps researchers to identify or create new research design.

**Research paradigm** is an essential aspect of any research, which serves as the philosophical structure that guides the researcher on the best way to conduct the research. It is also perceived as a framework, comprising a researcher's beliefs, assumptions and philosophies about the world, the nature of reality and the sources of knowledge (Collis and Hussey, 2014; 2009; Easterby-Smith et al., 2013; Saunders et al., 2012; Manion and Morrison 2011; Gliner, Morgan, and Leech 2009; Bryman, 2008). Kuhn introduced the first paradigm in 1962, embedded in natural sciences, while the second paradigm was developed because of the growth in social sciences. Before the 19th century, most research was based on inanimate objects, which involves observation and experiment. Inductive logic applies in the explanation of theories for predictive purposes. Collis and Hussey (2014; 2009) and Benton and Craib, (2001) maintain there are two main research paradigms: Positivism and interpretivism. Positivism originated from natural science, based on the principle of realism. It relies on the assumption that social reality is objective, singular and is indifferent to the act of investigating it, which therefore means that the act of investigating social reality has no impact on that reality. The positivist research involves a deductive process, which centres on theories for the explanation and understanding of social phenomena. The positivist believes that the researcher is independent of the phenomena under study. More so, the positivist paradigm relates to the quantitative methods of analysing research data as it assumes that social phenomena are quantifiable (Creswell, 2014; 1998; 1994; Collis and Hussey, 2014; Saunders et al., 2012; Corbin and Strauss, 2008).

On the contrary, interpretivism as a paradigm emerged due to the criticisms of the positivist paradigm to meet the needs of the social world. The interpretivists believe that social reality is subjective, multiple, perceived in our minds and not possible to separate the researcher from that research itself or from what exists in the social world. Hence, the researcher interacts with the phenomena under study.  It is based on the principle of idealism. Just as the positivist believe in the measurement of a social phenomenon, the interpretivist believes in the exploration of the complexity of social phenomena through interpretive understanding. For the interpretivist, research findings emerge through qualitative methods of analysis, which is based on the interpretation of qualitative research data (Collis and Hussey, 2014; Creswell, 2014; 1994; Smith, 1983; Van Maanen, 1983).

One of the main criticisms of the positivist paradigm is regarding capturing complex situations in the social world in a single measure is ambiguous and has not recognised the Participants feelings by separating people from the study they are investigating.  The interpretivism paradigm is criticised for uncritical acceptance of the reports from the participants and the relevance of human subjectivity in the research (Collis and Hussey, 2014; Easterby-Smith et al. 2012).

From the preceding, Collis and Hussey, 2014 presented the characteristics of the two most important research paradigms as thus:

*Table 4. 1: Attributes of the two most important paradigms*

| S/NO | POSITIVISM | INTERPRETIVISM |
|---|---|---|
| 1. | Quantitative in nature | Qualitative in nature |
| 2. | Objective | Subjective |
| 3. | Scientific | Humanistic |
| 4. | Based on Realism | Based on Idealism |
| 5. | Deductive approach | Inductive approach |
| 6. | Singular Reality | Multiple Realities |
| 7. | Traditionalist | Phenomenological |
| 8. | Indifferent to the act of investigating it | It is affected by the act of investigating it |
| 9. | Uses large samples | Uses small samples |
| 10. | Carried out in an artificial location | Carried out in a natural location |
| 11. | It is concerned with testing of the research hypotheses | It is concerned with theories generation |
| 12. | The results produced have high reliability but low validity | The results produced have low reliability but high validity |
| 13. | Moves from general to specific | Moves from specific to general |
| 14. | The data are in a numerical form | The data are in nominal form |

Source: Adapted from (Collis and Hussey 2014; 2009; Brewerton and Millward 2001)

None of the paradigms is better or superior to the other as your choice depends on the direction of your research and the philosophical assumptions surrounding the two most important research paradigms. Collis and Hussey, (2014) and Alreck & Settle, (1995) assert that it is necessary to ensure that the choice of a research paradigm aligns with the research question.

### 4.2.1The choice of positivism in this research

To the best of my knowledge, this research, being the first to carry out the analysis of declining oil revenue implications on oil-dependent nation's budgetary objectives, embraces the positivist paradigm due to the following reasons: First, positivism assumes that the methods used in the natural sciences, which is quantitative in nature, is applicable to the social science phenomena (Goldenberg and White 2014). The use of large samples is also imminent in positivist research like this study, which would carry out the statistical analysis from 1981 to 2016 (36 years) for the three economies under examination, namely Nigeria, Venezuela and Norway.

Secondly, positivism is concerned with the testing of research hypotheses (Collis and Hussey, 2014, 2009). There are examinable hypotheses, which emanated because of the divergent views from the literature about the effects of oil price fluctuations on macroeconomic variables, which were tested as it involves quantitative data set while the analyses was carried out in an artificial location, an econometric laboratory to be precise. Hence, the adoption of a more objective stance towards the study is essential (Saunders et al., 2012).

Thirdly, the positivist paradigm provides a highly structured methodology using statistical analysis based on quantitative research data. More so, precise, objective and quantitative data are some of the concerns of the positivist's paradigm (Collis and Hussey, 2014). Statistical analyses would be carried out, but the choice of the time series models to adopted depends mainly on the outcome of the diagnostic tests to be carried out or on the theory. The qualitative data, which were sourced through the primary means (questionnaires), were quantified and analysed statistically as well.

Collis and Hussey, (2014, 2009) and Creswell, (1998, 1995, 1994) outlined a summary of five main philosophical assumptions, which underpin the two most important research paradigms – the positivism and the interpretivism. These assumptions include Ontological assumption, Epistemological assumption, Axiological assumption, Rhetorical assumption and Methodological assumptions.

### 4.2.2 Ontological Assumption

The ontological assumption of any research has to do with the nature and structure of reality, which raises the question about how the world functions (Collis and Hussey, 2014, 2009; Easterby-Smith et al., 2012). Saunders et al. (2012) emphasized the objectivism and subjectivism aspects of ontology. While the positivists contend that, there is only one reality, which is separate from the researcher and is objective, the interpretivists believe that social reality is subjective, multiple and the researcher depends heavily on the research.

This research on the analysis of declining oil revenue implications on the selected oil-dependent nations is in line with the objective views, which indicate that the researcher is independent of that being researched. The positivist paradigm embraced in this research calls for an ontological stance that necessitates the statistical method of analyses to be implemented in the search for reality in this study is indeed underpinned by the premise that social reality is objective and external to the researcher (Collis and Hussey, 2009, 2014).

#### 4.2.3 Epistemological Assumption

This assumption deals with the origin of the value of knowledge. The positivists believe that knowledge emanates from objective data which is observable, measurable and the researcher is independent of the study; while the interpretivists opine that knowledge comes from subjective data from the participants and relates with the phenomenon under study (Collis and Hussey, 2014, 2009; Saunders et al., 2009). In general, the epistemological assumption entails how to acquire knowledge about reality (Eriksson and Kovalainen, 2008; Blaikie, 2007; Chai, 2002). According to Hatch and Cunliffe, (2006), epistemology is “knowing how you can know “.

#### 4.2.4 Axiological Assumption

Axiological assumption refers to the role of values which is of vital importance at different stages of any research which enable the researcher to obtain reliable results (Collis and Hussey, 2014; Saunders et al., 2012). The positivists believe that the process of research is value-free as the results are unbiased, while the interpretivists believe that the process of research is value-laden. A positivist axiological assumption is less common in social sciences. It is because the discipline relates to people’s behaviour and activities instead, the axiological skills are demonstrated when the researchers make judgements based on their values for the kind of research they conduct and how they do it via the method adopted (Collis and Hussey, 2014; Saunders et al., 2012).

### 4.2.5 Rhetorical Assumption

The rhetorical assumption entails the language adopted during the research process. The paradigm adopted in any research also decides the nature of the language to adopt. In a positivist setting a formal style, quantitative words and passive voice prevail while an informal voice, qualitative terminologies and personal or active voice dominate in an interpretivist setting (Creswell, 2014, 1994; Collis and Hussey, 2014, 2009).

### 4.2.6 Methodological Assumption

The methodological assumption is the process of the research which describes the methods employed in the research to examine the world and the social phenomena (Collis and Hussey, 2014, 2009; Easterby-Smith et al., 2012; Holden and Lynch, 2004). The positivists mainly employ the experiment and survey methods for the study while the interpretivists employ the use of exploration, pure subjectivity and multiple methods to have different perceptions about the problem. This study would employ the use of quantitative methods in analysing the data. Qualitative data would be gathered through the questionnaire that would be administered, the qualitative data would be quantified and analysed statistically. Hence, the study embraces the positivist paradigm.

The use of qualitative data is imminent in this research through the questionnaires that would be administered. The qualitative data would be quantified using survey data analysis, thereby conforming the research towards data and methodological triangulation, which would be discussed in detail subsequently.

In summation, the assumptions of the two-main research paradigm are presented below.

*Table 4. 2: The Philosophical Assumptions Surrounding the two Main Research Paradigms*

| Philosophical assumption | Positivism | Interpretivism |
|---|---|---|
| Ontological assumption (the nature of reality) | Reality is objective, singular, and separate from the researcher | Reality is subjective, multiple, and as seen by the participants |
| Epistemological assumption (what constitutes valid knowledge) | Researcher is independent of that being researched | Researcher interacts with that being researched |
| Axiological assumption (the role of values) | The research is value-free and unbiased | The researcher acknowledges that research is value-laden and biases are present |
| Rhetorical assumption (the language of research) | Researcher writes in a formal style and uses the passive voice<br><br>Accepts quantitative words and set definitions | Researcher writes informally and uses the personal or active voice,<br><br>Accepts the qualitative terms and limited definitions |
| Methodological assumption (the process of research) | The process is deductive. Study of cause and effect with a static design<br><br>Research is context-free. Generalisations lead to prediction, explanation and understanding.<br><br>Results are accurate and reliable through validity and reliability | The process is inductive. Study of simultaneous mutual shaping of factors with an emerging design<br><br>Research is context-bound. Patterns and theories are developed for understanding.<br><br>Findings are accurate and reliable through verification |

Sources: (Collis and Hussey, 2014, 2009; Creswell, 2014, 1994)

## 4.3 Research Approach

In every research, it is vital to adopt an appropriate research approach to support the research philosophy, and research paradigm which is underpinning the study (Saunders et al., 2012; Babbie, 2010). Bryman (2016) opine that two main research approaches prevail, which includes the deductive and inductive approaches.

### 4.3.1 Deductive Approach

In the literature, there are discussions relating to the choice of either a deductive approach or an inductive approach in any research process which should also be in line with the research philosophy and research paradigm (Collis and Hussey, 2014, 2009; Ketokiviand Mantere, 2010). The deductive approach entails deriving the conclusions from a set of premises, which are the hypotheses and theories that emerge from the literature by the researcher (Saunders et al., 2012). Consistent with the above, Coolican, (2014) maintain that a deductive approach involves the development and testing of research hypotheses based on existing theory while Collis and Hussey, (2014, 2009); Frewerton and Millward, (2001) describe the deductive approach as moving from the general to specific. It is associated with the positivist paradigm and mainly, with quantitative research (Collis and Hussey, 2014, 2009; Bryman and Bell, 2007; Kelle, 2007).

Following a deductive approach in any investigation means that the research would involve the formulation of relevant research hypotheses, which would be tested through the application of the relevant research methodology Gulati, (2009).

### 4.3.2 Inductive Approach

The inductive approach is the reverse of the deductive approach, which entails moving from specific observations to broad general patterns and theories. It emphasises the development of theory from data collection and presentation of results through the statistical analysis of from the observation of empirical reality. The inductive research approach also entails deducing general inferences from specific instances. It is associated with the interpretivist paradigm, involving qualitative research (Bryman and Bell, (2015); Collis and Hussey, 2014, 2009; Crowther and Lancaster, 2009; Brewerton and Millward 2001). Saunders et al., (2012) maintain that this approach deals with moving from the specific to the general while the observations and relevant research theories are formulated at the end of the research.

This on-going study of the analysis of declining oil revenue implications on mono-economy budgetary requirements, a comparative analysis of Nigeria, Venezuela and Norway, adopts the deductive approach. Through the relevant related literature reviewed, research hypotheses were formulated as regards to the impact of oil price fluctuations on macroeconomic variables, of which the null hypotheses would be tested as against the alternative for acceptance or rejection through the application of the appropriate research methodology.

## 4.4 Research Strategy

The research strategy relates to the process which enables the researcher to adopt the research method(s) suitable for addressing the research problem. The research strategy also provides the overall direction for achieving the research objectives, which largely depends on the research approach adopted for the study (Saunders et al., 2012). This subsection presents the justification for the selection of the research strategies to adopt in this study.

The main research strategies according to Collis and Hussey, (2014); Yin, (2014); Silverman, (2013); Denzin and Lincoln, (2011); Belli, (2009) are classified into methodologies for both the positivists and interpretivists as presented in the table below:

Collis and Hussey (2014) outlined different methodologies that are associated with different research paradigm. Since this study is adopting the positivist paradigm, the methodologies associated with it are briefly discussed in the table below:

***Table 4. 3: Methodologies Associated with the Positivist Paradigm***

| S/NO | POSITIVISTS METHODOLOGY |
|---|---|
| 1. | **Experimental Studies** investigates the relationships among variables. The researcher could alter the independent variables to see the impact on the dependent variable. |
| 2. | **Surveys** as a methodology involve the collection of either primary or secondary data from a sample statistically analyse it and then generalise the results to a population. |
| 3. | **Cross-Sectional Studies** uses different research data to investigate various subjects in different contexts over the same period. |
| 3. | **Longitudinal Studies** investigate a group of subjects or variables over an extended period. |

Source: Collis and Hussey, (2014, 2009); Yin, (2014); Silverman, (2013); Denzin and Lincoln, (2011); Belli, (2009) Conversely, the methodologies associated with the interpretivist paradigm are as shown in the table below:

**Table 4. 4: Methodologies Associated with the Interpretivist Paradigm**

| S/NO | INTERPRETIVISTS METHODOLOGY |
|---|---|
| 1. | **Hermeneutics** centres mainly on the interpretation of scriptures but now formalised to the understanding and interpretation of historical text |
| 2. | **Ethnography** as a methodology involves the researcher into the group being studied. |
| 3. | **Participative Enquiry** is a methodology where the participants determine the progress and direction of the research |
| 4. | **Action Research** is a practical research which brings about change of which the researcher and the research are part of that change as the researcher monitors the results |
| 5. | **Case Study** is a methodology which studies a single phenomenon known as the case, for in-depth knowledge and understanding over a long period. |
| 6. | **Grounded Theory** is a methodological framework which uses the generated data to create an inductively derived theory |

Source: Collis and Hussey, (2014, 2009); Yin, (2014); Silverman, (2013); Denzin an Lincoln, (2011); Belli, (2009)

From the preceding, this research is based on three methodologies associated with positivism. First, the impact of oil price fluctuations on macroeconomic variables of the oil-dependent nations under study – Nigeria, Venezuela and Norway involves both dependent and independent variables whose effects on other variables would be observed during the proposed analyses, hence an experiment. Secondly, the study involves the collection of both primary data through the questionnaires that would be administered and secondary data from the database of the countries under examination. Finally, the study is longitudinal since the analysis involves the use of secondary data for a period of 36 years, that is, from 1981 to 2016, which is an extended period.

There are also other types of research strategies which entail quantitative, qualitative and mixed methods research strategies, associated with different research paradigms (Collis and Hussey, 2014).

#### 4.4.1 Quantitative and Qualitative Research Strategies

Quantitative research entails the gathering and the analysis of statistical data while qualitative research focuses on the descriptive or empirical data (Halcomb and Hickman, 2015; Hayes et al., 2013). The incorporation of both the qualitative and quantitative data within one single study refers to mixed-method research (Halcomb and Hickman, 2015; Wisdom et al., 2012; Creswell and Clark 2011).

Bryman, (2008) opines that the quantitative and qualitative research lies at the center of research strategy to adopt in any study. There are three fundamental differences between the quantitative and qualitative research strategies, the first relates to the role of theory in research where the quantitative strategy is based on deductive approach, while the qualitative strategy is based on an inductive approach. Secondly, the epistemological orientation of quantitative research strategy adopted the positivism paradigm while the epistemological orientation of a qualitative research strategy is interpretivism. Finally, objectivism is the ontological orientation for quantitative research strategy while constructionism or subjectivism is the ontological orientation for qualitative research strategy.

While the quantitative and qualitative research strategies are the most widely used in the process of research, mixed-method research strategy combines both the quantitative and the qualitative methods.

This research being quantitative in nature relies on ontological objectivism and epistemological positivism as the main research philosophy underpinning this study, as shown in figure 4.1 below:

***Figure 4. 1: Research Philosophy and paradigm underpinning this Study***


The choice of ontological objectivism and epistemological positivism as the philosophy underpinning this research is because the hypotheses derived from the literature are mainly quantitative and were analysed quantitatively as well. More so, the variables involved are numerical while the data collected are from 1981 to 2016, which are time-series data are also numerical. Although relating it to the types of mixed methods design as outlined in Morse and Niehaus, (2009), whereby the core component of the research is quantitative (QUAN) with a qualitative (qual) supplementary component and vice versa. This study proves to be mainly quantitative (QUAN) in nature with supplementary qualitative (qual) data which were sourced from the questionnaires and then quantified and analysed quantitatively as well.

### 4.4.2 Triangulation and Mixed Methods Research Strategy

The mixed-method research strategy merges both the quantitative and qualitative data in one research study (Halcomb and Hickman, 2015; Wisdom et al., 2012; Creswell and Plano Clark, 2011). The integration of both the quantitative and qualitative data, which may occur at different stages in a single study is the most important component of mixed-method research (Maudsley, 2011; Glogowska, 2011; Simons and Lathlean, 2010). Consistently, Tashakkori and Creswell, 2007 defined a mixed-method as research in which the researcher collects and analyse data, draw conclusions by employing both the quantitative and qualitative research approaches. The mixed-method strategy provides more research evidence, widens the researcher's choice of collecting data and tries to answer the research question(s), which might not be easy to answer using only one approach. (Halcomb and Hickman, 2015; Creswell and Plano Clark, 2011).

Mixed-method research is applied through triangulation, which involves using different sources of data collection within single research to avoid spurious results (Sauders 2012). Triangulation as a measurement technique is a concept which originated from surveyors to trace an object in space by depending on two already existing points (Mertens and

Hesse-Biber, 2012). The two known points aids to 'triangulate' on the fixed unidentified points in the same space. This concept was borrowed by social scientists in the validation of the social science research results (Mertens and Hesse-Biber, 2012).

In addition, Collis and Hussey, (2014) refer to triangulation as the use of various means of data collection, the use of diverse research methods and more than one researcher in carrying out any form of research. The use of different methods of analysis of different researchers in carrying out any research would lead to greater validity and reliability of research results as well as in the reduction of bias in the sources of data in-so-far-as the researchers arrive at the same results (Denzin, 2009; 1978; Jick, 1979).

There are four elements of triangulation outlined by Collis and Hussey (2014) and Easterby-Smith et al., (2012). The first is a **triangulation of theories**, in which an adopted theory from one discipline is used for an explanation in another discipline. The second is **data triangulation,** which relates to the collection of data through different sources and at different occasions. Thirdly, when different researchers engage in data collection independently and compare the result afterwards, is referred to as **investigator triangulation**. Finally, **methodological triangulation** entails the usage of more than one method to collect and analyse data. Easterby-Smith et al. (2012) emphasise that it is essential to use one research paradigm when methodological triangulation is applied. Collis and Hussey (2014) maintain that the word 'mixed method' is better used when a researcher employs different methods from different research paradigms; otherwise, it remains triangulation.

In this study of the analysis of declining oil revenue implications on the budgetary requirements, primary data would be sourced through the questionnaires that would be administered while the secondary data would be sourced from the database of each of the countries under examination, that is, Nigeria, Venezuela and Norway. As a result, both data and methodological triangulation would be employed in this research since it involves both primary and secondary data which would be sourced and analysed independently through various means. Difficulty in the replication of research results, high cost and time wastage in the collection of data and the research analysis are some of the limitations of using the methodological triangulation in any research (Collis and Hussey, (2014). The government of the Nigerian economy is sponsoring this project, thereby covering the aspect of the research cost. The researcher would carefully carry out the analysis independently through the various means and within the shortest possible period to obtain reliable results. These would aid in overcoming the outlined shortcomings.

## 4.5 Research Design

The previous section dealt with the research strategy relating to the appropriate research method(s) adopted in this study, which would be suitable for addressing the research problem. This section, therefore, presents the research design which entails the various sources of data, model specification, the definition of the research variables, data analyses and the scope of the study.

### 4.5.1 Sources of Data

The Cambridge University Press (2017) referred to data as the necessary information, evidence or figures, which are gathered and examined for decision making. Manukumarkm, (2013) defined data as the quantitative or qualitative values of a variable which could be in either figures, words, images, numbers, facts or ideas. The social scientists employ different strategies for collecting data for research purposes (Hox and Boeije, 2005).

Data sources are the diverse ways of collecting information which would be able to answer the research questions (Creswell, 1994). Data collection is of great importance to any research and as such, should be properly organised and carefully planned. Every study is centred on data which is collected, analysed and interpreted to obtain useful information (Manukumarkm, 2013). Collection of data, therefore, is of great importance to any form of research. There are two main types of data; these include primary data and secondary data. While the primary data originates from the researcher, the secondary data emanates from already existing publications and diverse data bases of various areas of study.

According to Saunders, Lewis and Thornhill (2012), secondary data are also classified into three. Namely, survey-based data, documentary data and multiple sources compiled data. Survey-based data refers to the data sourced from previous researchers through primary means via questionnaires or interviews stored for use by succeeding researchers. Documentary secondary data are the data from public and administrative records, the internet and webpages while the third category of secondary data emanates from multiple sources which are compiled by different organisations, government parastatals, agencies and the statistical office of different economies.

For this research, therefore, data would be sourced through both primary and secondary means. While the primary data would be collected through the questionnaires which would be administered by the relevant government agencies and parastatals, the secondary data would be collected through the database of the various economies under consideration in this study, i.e. Nigeria, Venezuela and Norway.

#### 4.5.1.1 Primary Data Collection

Primary data collection entails the gathering of data, which are not known previously from the source. The data are usually gathered by the researchers themselves as it entails the researcher's surveys, interviews, experiments or focus groups (Collis and Hussey, 2014, 2009). Primary data can be collected through diverse means such as questionnaires, interviews, focus group interviews, observation and case studies. New data are introduced into the database whenever primary data are collected because they are often non-existent. The need for primary data depends largely on the nature of research to be carried out or on the nature of information needed by the researcher.

In this study, therefore, the use of primary data is paramount to address one of the research questions whose answers are nonexistent and could not be obtained through secondary means. During the collection of primary data in any investigation, the identification of both the research population and the research sample becomes inevitable. In addition, the instrument of the data collection (Questionnaires) need to be put into consideration as well. Hence;

- Research Population and Sample
- Questionnaire Design
- Pilot Study of the Questionnaires

**a. Research Population and Sample**

There is a need to identify both the research population and sample while collecting primary data. The research population, therefore, entails the entire group for which information is sought. According to Collis and Hussey (2014; 2009), population refers to individuals or entities to be considered for statistical purposes in any research.

Consistently, Bryman, 2008 view population as an entity from which a sample is to be selected.

In the field of social science discipline, the identification of the research population is followed by the identification of the research sample (Bryman, 2008). Research sample, therefore, refers to a chosen part of the population or a sub-set of the entire population (Collis and Hussey, 2014; Chaudhury and Banerjee, 2010; Banerjee et al.; 2007). It is required to be chosen from the identified population.

Saunders et al., (2012) categorised sampling techniques as probability sampling (when the probability is known) or representative sampling which is usually associated with survey research strategies and non-probability sampling (when the probability is unknown), which is based on the researcher's subjective conclusion. The researcher uses the sample to interpret the entire population to address the research objectives by answering the research questions. Rafaeli et al. (1997) posit that probability sampling is applicable in both quantitative and qualitative research.

Henry (1990) maintains that probability sampling should not be applied when the entire population is less than or equal to fifty. The population in this study is more than fifty, hence the need to use the probability sampling but data would rather be collected through the questionnaires that would be administered by relevant government agencies of the three economies under examination. The probability of the population is unknown. Instead of employing the probability sampling, survey questionnaires would be sent to the entire population of the research which would aid the researcher in drawing inference from the sample to generalise the entire population

A purposive sampling which requires the researcher to use their initiative in the selection of the samples that would be most appropriate in meeting up with the research objective and in answering the research questions (Saunder, et al., (2012). Based on the above-stated analogy, this study has identified, the budget office and the ministry of finance of the three economies, as the appropriate research sample for the distribution of the questionnaire survey.

The above is in conjunction with the main aim of the research, which is to ascertain how Nigeria, Venezuela and Norway attain to their budgetary needs during periods of declining oil revenues. Each of these government agencies takes part in the budgetary decisions of these economies as the budget office prepares the budget with the collaboration of the ministry of finance of Nigeria, Venezuela and Norway.

**b. Questionnaire Design**

Collis and Hussey, (2014) refer to questionnaire as a list of questions which are carefully designed to enable the researcher to gather relevant and reliable information from a chosen group of people to aid in the achievement of the research objectives and in addressing the research questions. Sunders et al. (2012) and deVaus, (2002) maintain that questionnaire relates to diverse methods of gathering data from different respondents, who provide answers to the same set of outlined questions aimed at providing answers to the research questions.

Saunders et al. (2012) and Gillham (2000) maintain that it is essential to ensure the reliability and validity of data sourced through questionnaires by appropriately designing the questionnaire. The validity of the questionnaire is the ability to generate accurate data by the researcher with the use of the questionnaire while the reliability of the questionnaire refers to the consistency in the collection of the relevant data needed for the research analysis.

There are seven main steps involved in the questionnaire design as outlined by Collis and Hussey, (2014), these include:

i. Question design and instruction
ii. Determination of the order of the question arrangement
iii. Writing of the request letter which would accompany the questionnaires
iv. Testing of the questionnaire with a small group of samples
v. Choice of methods for the distribution and return of the questionnaires
vi. The plan for the strategy on how to deal with non-responses
vii. Conduction of tests for validity and reliability

Furthermore, one of the most important parts of data collection through the questionnaire survey is the cost and the methods through which the questionnaires are distributed and collected. The best method(s) to be employed in any study depends on both the location and on the sample size. According to Collis and Hussey, (2014), questionnaires can be distributed and collected through the **post**, whereby both the questionnaire, the covering letter and a prepaid envelope for returning the questionnaires are sent out to the respondents by post. Although it is easy to administer the questionnaires by post, often expensive when the sample size is large. It also has a low response rate. Administering the questionnaires through the **telephone** is another method, which helps in reducing the cost associated with a face-to-face interview, but the result could be biased because some people may not be willing to respond promptly. Another most widely used method in the distribution and collection of questionnaires is through **online** by employing the Web-based tools such as Free online surveys, SurveyMonkeys, Kwicksurveys and Qualtrics, which enables the researcher to create an email used in sending the questionnaires to potential respondents. Although obtaining sufficient response may be time-consuming, this method allows the researcher to view preliminary results using some software packages like SPSS, IBM or Microsoft Excel. The **face-to-face** method could also be employed, whereby the researcher goes to the respondent's homes, streets, offices or any other convenient location for the questionnaire distribution and collection. This method could be time-consuming and expensive but encourages comprehensive data collection through the high response rate. The **Group distribution** method entails the distribution and collection of research questionnaires within a small group in one or more locations. The researcher, in this case, explains the purpose of the research to the group and stays around to answer any proceeding questions. There is also **the individual distribution, which** is carried out when the sample is situated in one location, like a workplace or offices. In this case, the questionnaires could be distributed and collected individually.

There could be some problems associated with the distribution and collection of research questionnaires such as reluctance to respond promptly to the questionnaires and the issue of non-response bias. The non-response bias could be imminent since the research design would be to generalise the research findings based on the outcome of the sample population. The researcher could overcome the above outline shortcomings by sending follow-up requests to non-respondents while keeping records of those responded (Collis and Hussey, 2014).

### c. Pilot Study of the Questionnaires

It would be necessary to carry out the pilot test of the designed questionnaires. It would enable the researcher to correct some of the questions by employing some of the important inputs made by the respondents in the research. It would give the researcher the idea of what to expect from the respondents when sent out to the main research sample or population. It is very imperative to first, pilot test any research, which involves self–completion questionnaires as this supports the evaluation of the validity of the questionnaire. It further enables the researcher to measure the reliability of the data, sourced through the questionnaires (Bryman, 2016, 2008).

Pilot testing the surveys would also enable the researcher to identify any issue(s), which may be inherent in the distributed questionnaires and gives an opportunity for the revision of any question(s), which may be confusing to the respondents before they are finally distributed to the main targeted research population. Yin, 1994 maintains that a pilot study entails the rehearsal or the replication of the main study. Consistently, Champion, (2000) and Dane, (1990) describe a pilot study as a reduced version of a research project. It enables the researcher to test the research procedures to be employed in the main study and also to identify whether there is any fault with the method of data collection to be used in the survey. On the other hand, Mesa-Lao (2011) described the pilot study as a small experiment, which is to be carried out before the formal study to have prior knowledge of the research result.

Pilot testing also aims at refining of the questionnaires, elimination of any difficulties while ensuring that the questions are comprehensible, effective and successful (Rossouw, 2001; De Vos, 1998).

### d. Pilot Study of this Research

In this study, a pilot study was carried out within the graduate school before distributing the questionnaires to the main targed audience in the three countries under examination. A total of 30 questionnaires were distributed while 23 were received with comments and suggestions. The remaining 7 could not be reached as they were not in school as at the period of collection. The feedback gotten from the pilot study helped immensely in the restructuring of the whole questions before distributing to the main targeted audience.

Some of the respondents from the pilot study suggested that the total number of questions should be reduced since they are aimed at addressing only one research questions while some questions are repeated in different forms. As a result, the number of qustions were reduced from 17 to 10 questions. Another comment from the pilot study was to employ 5 Likert scale format, to include "Neutral". One of the reasons given is that some of the respondents may not have the idea of some of the questions. The suggestion was adopted as we now have 5 Likert scale formats: Strongly Agree, Agree, Neutral, Disagree and Strongly Disagree. However, one of the respondents suggested a question to be included but that question was discarded as it is not within the purview of this study.

### e. Research Ethics

Research ethics entails a set of principles that guides the way most research involving humans are designed and conducted. It is the critical part of any research design as it involves decisions and behaviour, guided by values. The research design and strategies are formulated in such a way that there is no risk causing harm, embarrassment or any other foreseeable disadvantage to humans (Saunders, Lewis and Thornhill, 2012).

However, Bryman, (2008) highlighted the importance of being aware of all the ethical principles and ethical trepidations that are inherent in social research. While Diener and Crandall (1978) divided the ethical principles in social research into four main parts which include: invasion of privacy, possible deception, possible harm to participants and possible lack of informed consent.

There are lists of ethical principles that researchers are supposed to know, which are derived from the ethical codes, guidelines, statement of practice of various internationally recognised research associations and society. These principles include the following:

i. Respect for others
ii. Avoidance of harm
iii. Integrity and objectivity of the researcher,
iv. Privacy of those participants
v. Participation should be voluntary
vi. Rights to withdraw if desired by the participants
vii. Informed consent of the participants
viii. Confidentiality should be ensured

ix. Maintenance of anonymity of participants

x. Data management compliance and

xi. Guarantee of the researcher's safety.

However, this research complied with all the ethical principles as supposed in any social science research. Ethical approval was obtained through the Research Ethics Committee which helped in conducting this research according to the Abertay University's Code of Ethics in research.

#### 4.5.1.2 Secondary Data Collection

While researchers gather primary data from an original source such as questionnaire surveys, interviews or through experiments, secondary data are data, which are gathered from already existing sources. Such data are sourced from reliable research institutions, databases of different countries and organisations, publications of various issues of diverse companies and government parastatals, non-government publications, internet records (Crossman, 2017; Collis and Hussey, 2014). Secondary data could be in either soft or hard copy for easy access by the researchers.

According to (Johnston, 2014; Andrew et al., 2012; Schutt, 2011; Smith et al., 2011 and Smith, 2008), the usage of existing data which are previously collected and archived by other researchers is becoming common all over the globe today. Using this data enables the researcher to save both time and money, which would have been involved if sourcing for primary data.

For this study, therefore, secondary data would be sourced from the databases of the three countries under examination, which includes Nigeria, Venezuela and Norway.

Specifically, for the Nigerian economy, secondary data would be sourced from the World Bank, Central Bank of Nigeria (CBN) statistical bulletin of different issues, the Nigeria National Petroleum Corporation (NNPC) publications, Organisation of Petroleum Exporting Countries (OPEC) publications, Ministry of Finance, National Bureau of Statistics (NBS) and publications from the budget office.

Secondary data would also be sourced for the Venezuelan economy through the World Bank publications, Central Bank of Venezuela (BCV) statistical publications, Central Office of Statistics and Information, National Institute of Statistics, Organisation of Petroleum Exporting Countries (OPEC) publications, International Monetary Fund (IMF) publications.

Data for the Norwegian economy would be sourced from the World Bank publications, Central Bank of Norway publications of various issues, Statistics Norway, Library and Information Centre. Statistics Norway has all the needed official statistics about the Norwegian society since 1876 and can be assessed freely for statistics and analyses in-so-far-as the Statistics Norway is referenced accordingly.

### 4.5.2. Model Specification

The key variables inherent in this study are mainly time series of macroeconomic variables which are often regarded to be non-stationary and capable of generating serious issues in the estimation relationships between economic variables when using any form of regression technique (Hakimipour et al.; 2013).

Iordanova, (2017) maintain that most time-series data such as exchange rates, Gross Domestic Product, inflation, prices and other macroeconomic variables have means, variances and covariances which are changing over time. Non-stationary data need to be transformed to stationary data to avoid spurious results when modelled.

According to Nkoro and Uko, 2016; Saeed, 2015, the outcome of the unit root test determines the type of econometric technique to be employed in the estimation process. They propose that if all the variables are stationary at level I(0), then simple/multiple regression analysis applies. When all the variables are stationary at first difference, I(1), it leads to cointegration and further to the use of VAR model or Error Correction Models. However, ARDL applies when both the variables that are stationary at level are combined with those stationary at first difference. Also, the combination of variables which are stationary at first difference and those stationary at the second difference, lead to the use of Autoregressive Models (Masan, 2015).

The choice of the appropriate model to be employed in this study would, therefore, depend on the outcome of all the diagnostic tests to be carried out before the commencement of the analyses. Given that most of the macroeconomic variables are usually stationary at first difference, the Autoregressive Distributed Lag (ARDL) model would tentatively be specified for the study.

However, the variables inherent in the research hypotheses entail:

$$(AREV, AEXP, OILP, GDP, EXTR, INFR, EXCR, UEMR)$$

Where

$$AREV = Actual\ Government\ Revenues$$

$$AEXP = Actual\ Government\ Expenditures$$

$$OILP = Oil\ Price$$

$$GDP = Gross\ Domestic\ Product$$

$$EXTR = External\ Reserves$$

$$INFR = Inflation\ Rates$$

$$EXCR = Exchange\ Rates$$

$$UEMR = Unemployment\ Rates$$

There are two exogenous variables in the model, namely OILP and EXCR. Oil price is the main independent variable while the exchange rate, which is also an independent variable serves more as a control variable in the model. Exchange rate is one of the vital macroeconomic variables which plays an important role in international trade of any country and in effecting payment among different nations. The foreign exchange system of any economy is highly related to its state of development because it serves as a global parameter for international competitiveness which in turn shows the world ranking of different economies (Akhter and Faruqui, 2015).

Within the purview of data arrangement and in maintaining currency consistency among different economies, the exchange rate is usually employed by multiplying with each of the nation's local currency to obtain United States Dollars (USD).

From the outlined research hypotheses for the study, the following relationships among the variables can be deduced:

$AREV\ and\ OILP$

$$\Longrightarrow\ H_1\ with\ \ \alpha\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

$AEXP\ and\ OILP$

$$\Longrightarrow\ H_2\ with\ \ \beta\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

$GDP\ and\ OILP$

$$\Longrightarrow\ H_3\ with\ \ \gamma\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

$EXTR\ and\ OILP$

$$\Longrightarrow\ H_4\ with\ \ \theta\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

$INFR\ and\ OILP$

$$\Longrightarrow\ H_5\ with\ \ \pi\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

$$UEMR\ and\ OILP\ \Longrightarrow\ H_6\ with\ \ \rho\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

In general, ARDL can be derived from the following functional equations:

Given that:

$$Y_t = f(X_{1t} and\ X_{2t})\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

Where:

$X_{1t}$: is a vector of endogenous variables

$X_{2t}$: is a vector of exogenous variables

$Y_t$: is any dependent variable from the vector of endogenous variables ($X_{1t}$)

A standard error correction model (ECM) is specified as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta Y_{t-i} + \sum_{i=0}^{q_a} \beta_j \Delta X_{1t-i} + \sum_{i=0}^{r_b} \theta_k \Delta X_{2t-i} + \varphi ECT_{t-1} + \mathcal{U}_t\ \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..2$$

$$(a = 1, 2, 3, \dots\dots\dots\dots\dots, n)$$

$$(b = 1, 2, 3, \dots\dots\dots\dots\dots, n)$$

$$(k = 1, 2, 3, \dots\dots\dots\dots\dots, n)$$

$$(j = 1, 2, 3, \dots\dots\dots\dots\dots, n)$$

To specify the general ARDL, we replace the $\varphi ECT_{t-1}$ with all variables in the model lagged once in level or log-level forms.

Let $X = X_{1t} \,\&\, X_{2t}$

∴

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta Y_{t-i} + \sum_{i=0}^{q_a} \beta_j \Delta X_{t-i} + \lambda_k X_{t-i} + \mathcal{U}_t \quad \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 3$$

**Hypothesis one**

$H_1$ : (AREV and OILP) = $\alpha$

$H_{1.0}$ $\alpha_3$ ≠ 0

In functional form, the relationship between AREV and OILP could be specified as follows:

$$AREV = f\,(AEXP, GDP, EXTR, INFR, UEMR;\ OILP, EXCR)$$

The semicolon is used to demarcate the endogenous variables from the exogenous variables; hence the former comes first.

The unrestricted error correction ARDL model is specified as follows:

$$\Delta lnAREV_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta lnAREV_{t-i} + \sum_{i=0}^{q} \alpha_2 \Delta lnAEXP_{t-i} + \sum_{i=0}^{r} \alpha_3 \Delta lnOILP_{t-i}$$

$$+ \sum_{i=0}^{s} \alpha_4 \Delta lnGDP_{t-i} + \sum_{i=0}^{u} \alpha_5 \Delta lnEXTR_{t-i} + \sum_{i=0}^{v} \alpha_6 \Delta lnINFR_{t-i}$$

$$+ \sum_{i=0}^{w} \alpha_7 \Delta lnUEMR_{t-i} + \sum_{i=0}^{z} \alpha_8 \Delta lnEXCR_{t-i} + \lambda_1 lnAREV_{t-1} + \lambda_2 lnAEXP_{t-1}$$

$$+ \lambda_3 lnOILP_{t-1} + \lambda_4 lnGDP_{t-1} + \lambda_5 lnEXTR_{t-1} + \lambda_6 lnINFR_{t-1}$$

$$+ \lambda_7 lnUEMR_{t-1} + \lambda_8 lnEXCR_{t-1} + \lambda_9 D$$

$$+ \mathcal{U}_{tI} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \; 4$$

**Hypothesis two**

$H_2$ : (AEXP and OILP) = $\beta$

$H_{2.0}$ $\beta_3 \neq 0$

In functional form, the relationship between AEXP and OILP could be specified as follows:

$AEXP = f\,(AREV, GDP, EXTR, INFR, UEMR;\; OILP, EXCR)$

The Unrestricted ECM (Conditional ARDL) is as presented below:

$$\Delta lnAEXP_t = \beta_0 + \sum_{i=1}^{p} \beta_1 \Delta lnAEXP_{t-i} + \sum_{i=0}^{q} \beta_2 \Delta lnAREV_{t-i} + \sum_{i=0}^{r} \beta_3 \Delta lnOILP_{t-i}$$

$$+ \sum_{i=0}^{s} \beta_4 \Delta lnGDP_{t-i} + \sum_{i=0}^{u} \beta_5 \Delta lnEXTR_{t-i} + \sum_{i=0}^{v} \beta_6 \Delta lnINFR_{t-i}$$

$$+ \sum_{i=0}^{w} \beta_7 \Delta lnUEMR_{t-i} + \sum_{i=0}^{z} \beta_8 \Delta lnEXCR_{t-i} + \lambda_1 lnAREV_{t-1} + \lambda_2 lnAEXP_{t-1}$$

$$+ \lambda_3 lnOILP_{t-1} + \lambda_4 lnGDP_{t-1} + \lambda_5 lnEXTR_{t-1} + \lambda_6 lnINFR_{t-1}$$

$$+ \lambda_7 lnUEMR_{t-1} + \lambda_8 lnEXCR_{t-1} + \lambda_9 D$$

$$+ \mathcal{U}_{tII} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots \dots .5$$

**Hypothesis three**

$H_3$ : (GDP and OILP) = $\beta$

$H_{3.0}$ $\beta_3 \neq 0$

In functional form, the relationship between GDP and OILP could be specified as follows:

$GDP = f\ (AREV, AEXP, EXTR, INFR, UEMR;\ OILP, EXCR)$

Unrestricted ECM (Conditional ARDL) is as presented below:

$$\Delta lnGDP_t = \gamma_0 \sum_{i=1}^{p} \gamma_1 \Delta lnGDP_{t-i} + \sum_{i=0}^{q} \gamma_2 \Delta lnAREV_{t-i} + \sum_{i=0}^{r} \gamma_3 \Delta lnOILP_{t-i} \sum_{i=0}^{s} \gamma_4 \Delta lnAEXP_{t-i}$$

$$+ \sum_{i=0}^{u} \gamma_5 \Delta lnEXTR_{t-i} + \sum_{i=0}^{v} \gamma_6 \Delta lnINFR_{t-i} + \sum_{i=0}^{w} \gamma_7 \Delta lnUEMR_{t-i}$$

$$+ \sum_{i=0}^{z} \gamma_8 \Delta lnEXCR_{t-i} + \lambda_1 lnAREV_{t-1} + \lambda_2 lnAEXP_{t-1} + \lambda_3 lnOILP_{t-1}$$

$$+ \lambda_4 lnGDP_{t-1} + \lambda_5 lnEXTR_{t-1} + \lambda_6 lnINFR_{t-1} + \lambda_7 lnUEMR_{t-1}$$

$$+ \lambda_8 lnEXCR_{t-1} + \lambda_9 D + \mathcal{U}_{tIII} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots 6$$

**Hypothesis four**

$H_4$ : (EXTR and OILP) = $\theta$

$H_{4.0}$ $\theta_3 \neq 0$

In functional form, the relationship between EXTR and OILP could be specified as follows:

$\mathrm{EXTR} = \mathrm{f}\,(\mathrm{AREV}, \mathrm{AEXP}, \mathrm{GDP}, \mathrm{INFR}, \mathrm{UEMR};\ \mathrm{OILP}, \mathrm{EXCR})$

Unrestricted ECM (Conditional ARDL) is as presented below:

$$\Delta lnEXTR_t = \theta_0 \sum_{i=1}^{p} \theta_1 \Delta lnEXTR_{t-i} + \sum_{i=0}^{q} \theta_2 \Delta lnAREV_{t-i}$$

$$+ \sum_{i=0}^{r} \theta_3 \Delta lnOILP_{t-i} \sum_{i=0}^{s} \theta_4 \Delta lnAEXP_{t-i} + \sum_{i=0}^{u} \theta_5 \Delta lnGDP_{t-i} + \sum_{i=0}^{v} \theta_6 \Delta lnINFR_{t-i}$$

$$+ \sum_{i=0}^{w} \theta_7 \Delta lnUEMR_{t-i} + \sum_{i=0}^{z} \theta_8 \Delta lnEXCR_{t-i} + \lambda_1 lnAREV_{t-1} + \lambda_2 lnAEXP_{t-1}$$

$$+ \lambda_3 lnOILP_{t-1} + \lambda_4 lnGDP_{t-1} + \lambda_5 lnEXTR_{t-1} + \lambda_6 lnINFR_{t-1}$$

$$+ \lambda_7 lnUEMR_{t-1} + \lambda_8 lnEXCR_{t-1} + \lambda_9 D$$

$$+ \mathcal{U}_{tIv} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots .7$$

**Hypothesis five**

$H_5$ : (INFR and OILP) = $\pi$

$H_{5.0}$ $\pi_3 \neq 0$

In functional form, the relationship between INFR and OILP could be specified as follows:

$$\mathrm{INFR} = \mathrm{f}\,(\mathrm{AREV}, \mathrm{AEXP}, \mathrm{GDP}, \mathrm{EXTR}, \mathrm{UEMR};\ \mathrm{OILP}, \mathrm{EXCR})$$

Unrestricted ECM (Conditional ARDL) is as presented below:

$$\Delta lnINFR_t = \pi_0 \sum_{i=1}^{p} \pi_1 \Delta lnINFR_{t-i} + \sum_{i=0}^{q} \pi_2 \Delta lnAREV_{t-i}$$

$$+ \sum_{i=0}^{r} \pi_3 \Delta lnOILP_{t-i} \sum_{i=0}^{s} \pi_4 \Delta lnAEXP_{t-i} + \sum_{i=0}^{u} \pi_5 \Delta lnGDP_{t-i}$$

$$+ \sum_{i=0}^{v} \pi_6 \Delta lnEXTR_{t-i} + \sum_{i=0}^{w} \pi_7 \Delta lnUEMR_{t-i} + \sum_{i=0}^{z} \pi_8 \Delta lnEXCR_{t-i}$$

$$+ \lambda_1 lnAREV_{t-1} + \lambda_2 lnAEXP_{t-1} + \lambda_3 lnOILP_{t-1} + \lambda_4 lnGDP_{t-1} + \lambda_5 lnEXTR_{t-1}$$

$$+ \lambda_6 lnINFR_{t-1} + \lambda_7 lnUEMR_{t-1} + \lambda_8 lnEXCR_{t-1} + \lambda_9 D$$

$$+ \mathcal{U}_{tv} \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots . 8$$

**Hypothesis six**

$H_6$ : (UEMR and OILP) = $\pi$

$H_{6.0}$ $\rho_3 \neq 0$

In functional form, the relationship between INFR and OILP could be specified as follows:

$$\mathrm{UEMR} = \mathrm{f}\,(\mathrm{AREV}, \mathrm{AEXP}, \mathrm{GDP}, \mathrm{EXTR}, \mathrm{INFR};\ \mathrm{OILP}, \mathrm{EXCR})$$

Unrestricted ECM (Conditional ARDL) is as presented below:

$$\Delta lnUEMR_t = \rho_0 \sum_{i=1}^{p} \rho_1 \Delta lnUEMR_{t-i} + \sum_{i=0}^{q} \rho_2 \Delta lnAREV_{t-i}$$

$$+ \sum_{i=0}^{r} \rho_3 \Delta lnOILP_{t-i} \sum_{i=0}^{s} \rho_4 \Delta lnAEXP_{t-i} + \sum_{i=0}^{u} \rho_5 \Delta lnGDP_{t-i} + \sum_{i=0}^{v} \rho_6 \Delta lnEXTR_{t-i}$$

$$+ \sum_{i=0}^{w} \rho_7 \Delta lnINFR_{t-i} + \sum_{i=0}^{z} \rho_8 \Delta lnEXCR_{t-i} + \lambda_1 lnAREV_{t-1} + \lambda_2 lnAEXP_{t-1}$$

$$+ \lambda_3 lnOILP_{t-1} + \lambda_4 lnGDP_{t-1} + \lambda_5 lnEXTR_{t-1} + \lambda_6 lnINFR_{t-1}$$

$$+ \lambda_7 lnUEMR_{t-1} + \lambda_8 lnEXCR_{t-1} + \lambda_9 D$$

$$+ \mathcal{U}_{tvI} \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots \ldots .9$$

From the diagnostic tests, the unit root results show that all the variables are integrated at levels I(0) and at first difference I(1) hence the adoption of the ARDL model.

### 4.5.3. Definition of Variables

The variables of any model refer to some factors or elements involved in the research process, which changes over time and could assume any set of value(s). The modification of the variables does not follow a particular trend but changes randomly (Collins, 2017). The variables in this study are mainly macroeconomic variables, which are indicators used by economists to assess or measure the overall performance of any economy. The variables of the model include the gross domestic product, inflation rate, unemployment rate, exchange rate, external reserves, oil price, actual government expenditure, actual government revenue.

#### 4.5.3.1 Gross Domestic Product (GDP)

The gross domestic product of any nation refers to the annual total market value of all the goods and services manufactured within an economy. It measures the economic output of any nation and is often regarded as the proxy of economic growth, which is a sustainable rise in the goods and services produced in any economy over a given period. It also shows the total internally generated revenues from all the factors of production of any economy (Todaro and Stephen, 2005; Samuelson et al. 2005; Romer, 1990;).

The proceeds obtainable from the gross domestic product can be measured through its composition, as shown below:

$$Y = C + I + G + (X-M)$$

Where:

Y = Gross Domestic Product (GDP)

C = Consumption Expenditure

I = Investment

G = Government Expenditure

X = Exports

M = Imports

X-M = Net Exports (The External Sector)

When the gross domestic product of any nation increases, it shows that such an economy is economically solvent and vice versa (Irvin, 2011). The data are presented in constant 2010 U.S dollars, measured by converting the currency the currencies of each of the countries under examination through the usage of 2010 official exchange rates.

#### 4.5.3.2 Inflation Rate (INFR)

Inflation is the general and persistent rise in the general prices of goods and services within an economy thereby lowering the purchasing power of the populace, reducing the living standard of the populace and decline in the value of money. It also refers to the rate of change in the level of the price of goods and services. The Consumer Price Index (CPI) as one of the best barometers for measuring the degree of the price of goods and services at any given period by taking its first log difference. Inflation tends to affect every aspect of an economy as it undermines the main basis of exchange in the market, which entails price and value relationships (UK Office for National Statistics, 2017).

Inflation being measured by the consumer price index reflects the yearly percentage change in the cost of purchasing a basket of goods and services by the average consumer which could be constant or varies every year using the Laspeyres formula (World Bank Group, 2017).

#### 4.5.3.3 Unemployment Rate (UEMR)

Unemployment rate refers to the fraction of the labour force who are not working, but actively searching for a job to do but could not find due to the absence of jobs. It could also be referred to as that part of the labour force that is completely jobless. It is a crucial macroeconomic variable as the employment level is always examined regarding the rate of unemployment. It differs across economies and is measured as the percentage labour force (World Bank Group, 2017; UK Office for National Statistics, 2017; BLS, 2017).

#### 4.5.3.4 Exchange Rate (EXCR)

The exchange rate is a crucial decision-making variable, which aids growth and development of any nation while the achievement of a realistic exchange rate is of great importance to any economy (Fepetu and Oloyede, 2014; Oloyede, 2002; Ahmed and Zarma, 1997). The exchange rate is referred to as the rate at which the currency of a country purchases another as it reveals the strength/weakness of one currency to another. It also entails the value of the currency of any nation, relative to another country's currency thereby involving two components namely, the local and international currency (Osigwe and Uzonwanne 2015; Jhingan, 2003).

The exchange rate is one of the vital macroeconomic variables, which have impacts on the aggregate economy regarding regulating the international trade through the conversion of international prices of exports and imports to the national currency of the economy concerned. The ability to convert the currency of any particular country into another at the prevailing exchange rate is indeed essential in the decision-making of any economy and the international market. The basic tools employed by most economies in the correction of external imbalances are currency devaluation and appreciation, which are usually short term in nature because their effects manifest few months after the exchange rate implementation (Siddig, 2011; Thirwall, 1992).

The International Monetary Fund (IMF) play a very important role in the implementation of macroeconomic reforms in different economies, including the management of exchange rate volatility. The flexibility in Exchange rate is perceived as one of the major keys, which aids most economies in meeting up with the safeguarding and rebuilding foreign exchange reserves (Siddig, 2011; IMF, 2010; 2009; Obaseki, 1991).

The official exchange rate of each of the countries under examination is determined as a yearly average which is based on monthly averages regarding the Local Currency Units (LCU) relative to the U.S Dollar (World Bank Group, 2017).

#### 4.5.3.5 External Reserves (EXTR)

The issues of accumulation and usage of external Reserves, also known as foreign exchange reserves, international reserves or simply foreign reserves have gained ground among policy makers and researchers in recent times as it ensures macro economic stability. The Central banks of different economies have the responsibility of safeguarding and managing the external reserves. One of the primary macroeconomic objectives entails the efficient management of the accumulated external reserves of the economies concerned (Osigwe and Uzonwanne 2015; Kalu, 2014; Olokoyo et al. 2009).

Different countries accumulate external reserves to withstand impending shocks within the international markets (European Central Bank, 2006). The local currency of any nation is undervalued whenever there is an increase in external reserves, which in turn, motivates the growth in the exportation of goods and services and promotes the reputation for the economies' liquidity level for borrowing (Bentum-Ennin, 2014; Udo and Antai 2014).

However, each economies external reserves are measured as the holdings of monetary gold, reserves/foreign exchange held by the IMF/monetary authorities in current U.S Dollar.

#### 4.5.3.6 Oil Price (OILP)

Crude oil remains one of the most dynamically traded commodities across the globe, and as such, the oil price is highly sensitive to geopolitical activities. There are different oil benchmarks, but the most common transacted grades are the West Texas Intermediate (WTI), the Brent North Sea Crude (Brent Crude) and the Dubai/Oman (the Middle Eastern crude). Barrels of oil, therefore, is measured by crude oil prices in either Brent, West Texas Intermediate (WTI) or Dubai, Oman or Abu Dhabi (Amedeo, 2017; Kurt, 2015).

The Brent comprise of oil, which is produced in different locations in the North Sea and within the Brent oil areas. The Brent crude oil price remains the benchmark for Europe, Middle East and African crude while Asian countries apply the use of the mixture of both WTI and Brent to value their crude oil benchmark prices (Amedeo, 2017; Hecht, 2016).

Brent has a very low sulphur content of about 0.37%, which makes it cheaper and easier to refine other crude products such as gasoline. It is often referred to as sweet crude. Conversely, the other most highly transacted crude oil, West Texas Intermediate (WTI) is the benchmark crude commonly used in North America. It has a sulphur content of about 0.24% and as such, sweeter than Brent. While WTI favours the production of gasoline, the Brent crude favours the production of diesel fuels. On the other hand, the Dubai/Oman have high sulphur content, heavier and sour. It is mainly for Persian Gulf areas and always delivered in the Asian market (Amedeo, 2017; Hecht, 2016; Kurt, 2015).

However, since WTI is the main benchmark inherent in the United States, while Dubai/Oman is mainly influential in the Asian market, the Brent is the benchmark reference for more than two-thirds of the world traded oil for Europe, Middle East and Africa. Since the Brent is the most widely used in the world, it would be used for this study as well given that the economies under examination are Nigeria, Venezuela and Norway.

#### 4.5.3.7 Actual Government Revenue (AREV)

Actual government revenue, also known as real government income, comprises of the aggregate incomes generated by the government of any nation from diverse sources for a given period, usually in one year and not estimated. Also refers to all the cash receipts from social contributions, taxes, and other revenues from sales, rents and fees. It is also measured in the Local Currency Units of the economy concerned or in U.S Dollar. Grants are considered as revenue but are excluded from the actual government revenues (World Bank Group, 2017).

On the other hand, budgeted government revenues comprise of the summary of all the estimated income intended to be generated from diverse sources by the government of any nation in future. State budget remains the core as it relates to the implementation of fiscal policy in every economy (Hajdúchová et al. 2015). The government provides a variety of goods and services through its budget, which in turn depends on various factors in different economies. As such, the financial operation of the government is indeed a concept of duality as the government has the fiduciary duty of raising revenues to attain current expenditures (Aladejare 2014 and Adesola 1995).

The budget of any nation entails estimated revenues and expenditures for a given economy, usually for one year. Monetary value is linked to each of the outlined items of the budget. It is usually measured in the Local Currency units of the economy concerned or in U.S Dollar (Thesaurus, 2017; OECD, 2016; Gupta et al. 2012; World Bank Group, 2017).

#### 4.5.3.8 Actual Government Expenditure (AEXP)

Actual Government Spending, also known as real government expenditure comprises of all the aggregate government investments, government consumption and all the other transfer payments carried out by the government of any nation within a given period and not estimated expenditures. Collins English Dictionary (2017) defined government expenditure as the total spending, carried out by the government of any country for the welfare of its citizens.

When directed towards the important economic sectors of any economy, actual government spending contributes enormously to the productive capacity of the country and as such, represent the engine of economic growth. Increase in public expenditure revitalise the economy as it boosts economic growth through the provision of economic and social infrastructures, education, defence, the formation of the pension schemes, maintenance of law and order among others (Eromonsele et al., 2017; Aladejare, 2014; Mitchell, 2005). Government expenditure also serves as an effective tool towards economic recovery (Al-Fawwaz 2016; Patricia and Izuchukwu 2013).

Consistent with the above, Chude and Chude (2013) argued that government spending could stimulate the stagnant economy, which would bring about crowed-in effects from the private sectors. For the Keynesian views, borrowing from the private sector and refunding such money from the industry through the various expenditure plans can reverse the economic downturn of any nation. Barro, (1990) through the endogenous growth models, maintain that it is only productive government spending that would yield positive long-run growth in an economy. Hence, government spending on the economy to achieve the desired growth and development and to achieve macroeconomic stability.

However, the actual government expenditure is either measured in the local currency units of the concerned economy or in U.S Dollar (World Bank Group, 2017).

Budgeted government expenditures, therefore, comprise of the summary of all the projected expenditures intended to be carried out by the government of any nation in future. Various services are provided to the citizens of a nation through the budget. The fiscal operation of any government is mainly a concept of dualism which entails the provision of goods and services on the one hand and the ability to generate revenues needed to meet up with the budgetary requirements of the nation on the contrary (World Bank Group, 2017; Aladejare,2014).

Most economies use the format laid by the International Monetary Fund (IMF) Government Finance Statistics Manual 1986 (GFSM 1986) for data on the total expenditures of the economies. It is the older version of the GFSM 1986 standard instead of the new version GFSM 2001(Thesaurus, 2017; Government Spending Watch, 2017; OECD, 2016; Gupta et al. 2012).

### 4.5.4. Sources of Data in Tabular Form

The sources of data for each of the outlined variables for the three economies under examination, which is Nigeria, Venezuela and Norway are as presented in the table below: -

***Table 4. 5: Sources of Data for Nigeria, Venezuela and Norway***

| S/NO | VARIABLES | SOURCES | | |
|---|---|---|---|---|
| | | NIGERIA | VENEZUELA | NORWAY |
| a. | Gross Domestic Product | National Bureau of Statistics | World Bank | World Bank |
| b. | Inflation Rate | National Bureau of Statistics | Banco Central De Venezuela | Statistics Norway |
| c. | Exchange Rate | World Bank | World Bank | World Bank |
| d. | Unemployment Rate | National Bureau of Statistics | National Institute of Statistics, Venezuela | Statistics Norway |
| e. | External Reserves | Central Bank of Nigeria | Banco Central De Venezuela | Statistics Norway |
| f. | Actual Government Revenue | Central bank of Nigeria | Banco Central De Venezuela | Statistics Norway |
| h. | Actual Government Expenditure | National Bureau of Statistics | Banco Central De Venezuela | Statistics Norway |

Source: Adapted and designed by the author from different sources as outlined above.

## 4.6 Data Analysis

The analysis of data involves the cleansing, transformation and modelling of data to obtain meaningful information, which would be beneficial to policymakers. There are different approaches involved in analysing data in different fields; sciences, social sciences and in businesses as it encompasses different techniques. It also entails the process of evaluating all the data sourced by employing various diagnostic and logical reasoning to assess the data components to arrive at some conclusions or findings (Business Dictionary, 2017; Bryman, 2016; Creswell, 2013; Creswell and Clark, 2011).

The vector autoregressive models are frameworks, which describe the dynamic relationships among stationary time series. Most time series of economic and financial variables exhibit non-stationarity in their mean. One of the main tasks of econometrics, in this case, is to transform or model the data to stable form before the research analysis (Baum, 2013; Kilian, 2011; Baumeister and Kilian, 2011). SPSS statistic package and EVIEWS were employed in carrying out the analysis and other required statistical diagnostic tests due to their ability to provide good time series analysis and for being user-friendly. They are also being used in related studies. For the diagnostic tests of the data, the Augmented Dickey-Fuller Test (ADF), Philips-Perron Test (PPT) and Johansen co-integration Test were examined. Developed in1979 by David Dickey and Wayne Fuller, Dickey-Fuller test, would be employed to examine the presence of a unit root test in the model. Philips-Perron Test (PPT) would also be employed to cross-check the presence of unit roots in the model as it has the advantages of being robust in the form of heteroskedasticity in the error term. The researcher does not have to specify the length of the lag for the analysis, although the EVIEWS 10 statistical package does automatic lag selection. The Johansen co-integration test would enable the researcher to determine whether three or more of the time series variables, which were employed, are co-integrated or not. (Kilian and Lutkepohl, 2016; Ouliaris et al., 2016; Halls-Moore, 2016; Baum, 2013; Kilian, 2011; Baumeister and Kilian, 2011; Jakab and Kaponya, 2010; Edelstein and Kilian 2009; Toda and Philips, 1994).

Since this study is quantitative in nature, qualitative data were employed through the questionnaires to supplement the secondary data analysis. Although, the qualitative data were analysed quantitatively as discussed in sub-section 4.5.1.1 above.

## 4.7 Scope of the Study

The scope of the study entails all the areas to be covered in this study. The study involves three oil-exporting countries, Nigeria, Venezuela and Norway. The choice of these economies is mainly due to their level of dependency on oil as a major source of revenue generation. Nigeria is a nation with abundant natural resources, oil and gas being the highest gifted mineral in the country. The country remains the highest oil producer in Africa and the sixth-largest producer of petroleum in the world. About 83% of Nigeria's federal government revenue is generated by the oil and gas industry. It is more than 98% of the total export (Adamu, 2015; Halid 2015; Riman et al. 2013; Kadafa 2012; Akinlo, 2012; Whiteman 2012; Odularu, 2008; Olusi and Olagunju 2005). Consistently, Ademola *et al.* (2015) referred to oil as the dominant source of revenue for the Nigerian economy. More than 90 per cent of the Nigerian total export earnings emanates from oil and about 80 per cent of the total government revenues.

On the other hand, Venezuela is an economy, which depends heavily on the oil sector as oil was traced back to the economy since the early 20th century. By the production of oil, Venezuela is the fifth-highest producer in OPEC, has the highest proven oil reserves of about 24.8 per cent in OPEC and the 9th oil exporter in the world as oil accounts for about 96 per cent of its total exports and more than half the country's gross domestic product. Crude oil fuels the Venezuelan economy and saturates all aspect of the society (The World Bank, 2016; Tong, 2016; Workman, 2016; OPEC Annual Statistical Bulletin 2016). Nevertheless, the Norwegian economy is greatly endowed with abundant natural resources such as forests, fish, hydrocarbon and other minerals. Norway is the 5th leading oil exporter in the world; it accounts for oil revenue of about $40 billion yearly. The oil sector is highly relied on by the economy because it accounts for the largest portion of export earnings and close to 30% of the administrative revenues (Recknagel 2016; 2016 CIA World Factbook).

Additionally, the period of coverage in this study is for thirty-six years (1981 to 2016), while the data were mainly time series data of the above-outlined variable. Time series data entails a sequence of variables, which are consistently measured at time intervals over a particular period. It also refers to the sequence of discrete-time data (Research Optimum, 2017; Adhikari, and Agrawal, 2013; Becketti, 2013).

## 4.8 Summary and Conclusion

This chapter comprises of the methodology and methods employed for this study. It aims at justifying the research methodology and methods adopted for this research, which targets towards achieving the research objectives. In carrying out any research, the methodology is highly essential because it shows the approach employed in the research process, which entails a different kind of methods (Collis and Hussey 2014; 2009). The choice of an appropriate research methodology plays significant roles in any research, to ensure the accuracy and validity of the data. It also aids in the prevention of spurious results from the research analyses to be carried out.

Section two of this chapter captures the research philosophy and research paradigms, which is an essential part of any study. This study embraces the positivism paradigm, which assumes that the methods used in the natural sciences, which is quantitative, apply to the social science phenomena (Goldenberg and White 2014). Positivism is concerned with the formulation and testing of research hypotheses, which is imminent in this study (Collis and Hussey, 2014, 2009; Saunders et al., 2012). The positivist paradigm also provides a highly structured methodology using statistical analysis based on quantitative research data; this is also inherent in this study. More so, precise, objective and quantitative data are some of the concerns of the positivist's paradigm (Collis and Hussey, 2014). Statistical analyses of the secondary data were carried out using the Autoregressive Distributed Lag (ARDL) Model, while the primary data analysis was carried using SPSS Version 25.

The positivist paradigm embraced in this research calls for an ontological stance that necessitates the statistical method of analyses to be applied in the search for reality in this study is indeed underpinned by the premise that social reality is objective and external to the researcher (Collis and Hussey, 2009, 2014).

While section three elucidates the research approach, which supports the research philosophy and paradigm underpinning the study. This research, however, adopted the deductive approach, since the null hypotheses derived from the literature were tested as against the alternative hypotheses.

Section four showcases the research strategy. In this study of the analysis of declining oil revenue implications on the budgetary objectives of the selected oil-dependent economies, primary data were sourced through the questionnaires that were administered while the secondary data were sourced from the database of each of the countries under examination as outlined in fig. 4.3 while the analysis of the secondary data depends on the outcome of all the statistical and diagnostic tests that were carried out.

# CHAPTER FIVE

## DATA PRESENTATION AND STATISTICAL ANALYSIS

# CHAPTER FIVE

# 5.0 Data Presentation and Statistical Analysis

## 5.1 Introduction

The preceding chapter involves the research methodology and methods which presented the general approach of data collection and analyses of both the primary and secondary data. It also laid emphases on the primary research paradigm and research philosophy underpinning this study, which is indeed the starting point of any research design. All the data sources for both the primary and secondary data were adequately outlined while the justification for the choice of the method of data analyses and the scope of the study, presented.

This chapter deals with the presentation of data, the descriptive statistics of the data, the analyses of both the primary and secondary data, the diagnostic tests and other statistical tests carried out in the course of the analyses. The discussion of the findings from both the primary and secondary data analyses would be presented in the subsequent chapter. Next section deals with the presentation of the secondary data for the analyses.

## 5.2 Data Presentation: Line Graphs and Descriptive Statistics of the Secondary Data

Both secondary and primary data are used for the analyses which aid in providing answers to the outlined research questions and in addressing all the objectives in this study. While the primary data were sourced from the budget office and ministry of finance of the countries under study, using questionnaires, the secondary data were sourced from the database of the three economies as well.

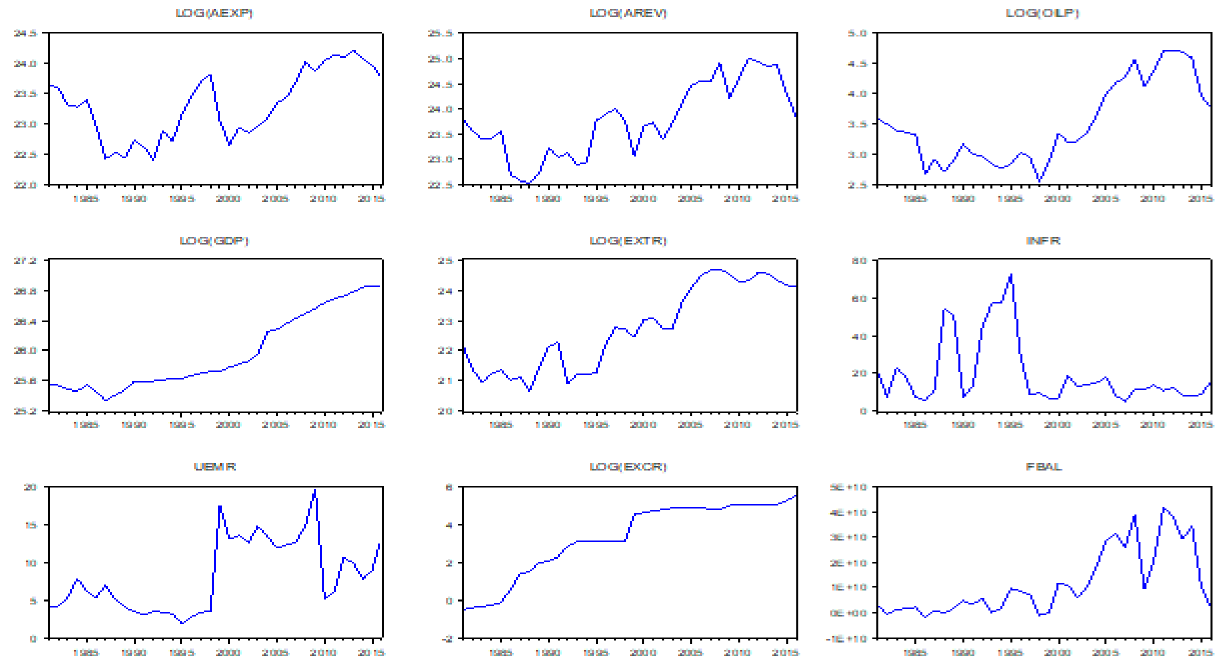
All the secondary data were collected from the databases of the economies, World Bank, National Bureau of Statistics, and Central Bank of Nigeria, Banco Central De Venezuela, National Institute of Statistics, Venezuela, Statistics Norway, the ministry of finance and the budget offices of the three economies. The period of coverage is for thirty-six years (1981 to 2016). All the secondary data are contained within the Eviews-10 statistical package used for the analyses while the primary data analysis was carried out using SPSS statistical package. The line graphs and the descriptive statistics of the secondary data are as presented in the next sub-section while that of the primary data is presented and discussed in section 5.4.

### 5.2.1 Line Graphs

It is essential to present the line graphs of the variables of the model and to also present the descriptive statistics of the variables before proceeding to the main econometric model estimation. Relationships among various data of any model are commonly presented visually using graphs since some data are usually too voluminous and complicated to be presented using texts. Aside from revealing the relationship between the different variables, graphs also indicate the direction of the curves. However, all the macroeconomic variables were analysed graphically to determine if there are pronounced visual trends or not and then subsequently, empirically tested using intercept only, intercept and trend depending on the visual analyses obtained (Slutsky, 2014; Spriestersbach et al. 2009).

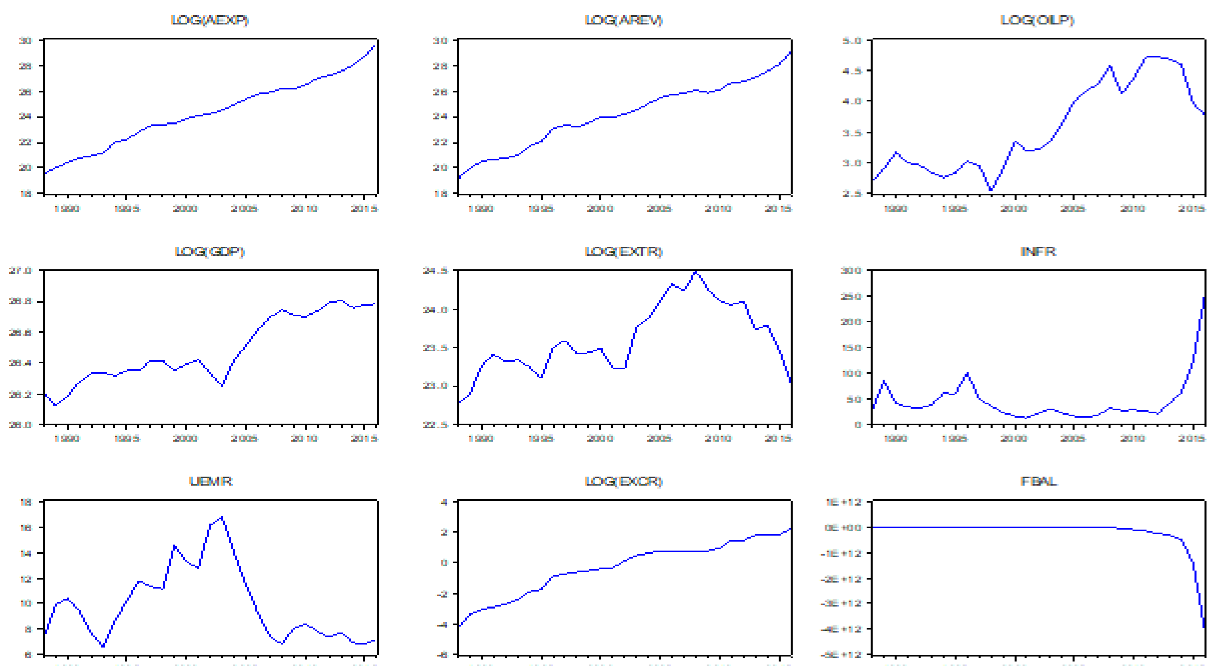
The line graphs for the three economies, Nigeria, Venezuela and Norway are as presented below:

*Figure 5. 1: Line Graphs for Nigeria*



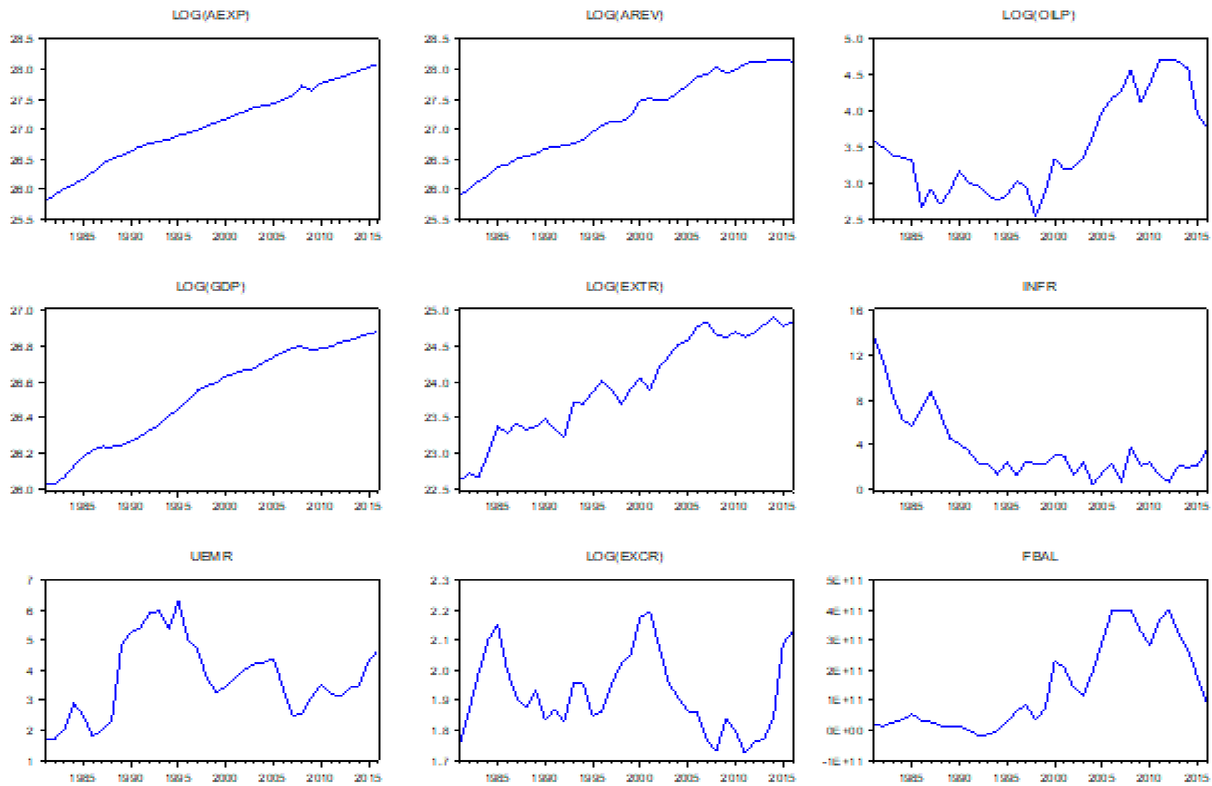

**Source: Author's construction using E-views 10.0**

*Figure 5. 2: Line Graphs for Venezuela*




**Source: Author's construction using E-views 10.0**

***Figure 5. 3: Line Graphs for Norway***




**Source: Author's construction using E-views 10.0**

The line graphs for each of the economies indicate that all the variables of the models have intercepts on the vertical axis and are trending upwards as well; except the inflation rate, signifying that they are non-stationary at level. However, there is a need then to ascertain the stationarity tests of these variables before using them for the analyses in order to avoid spurious regression. After examining the nature of the line graphs, we proceed to the descriptive statistics of the data as presented in the next sub-sections.

### 5.2.2 Descriptive Statistics of the Data

The descriptive statistics of the data is one of the essential parts of the analysis and serves as a prerequisite for more understanding of the physical and statistical properties of the series before carrying out the main analysis. Descriptive statistics also help to describe and summarise the data of the models concerned (Slutsky, 2014; Spriestersbach et al. 2009).

The descriptive statistics of key macro indicators for Nigeria are presented in Table 5.1. From the table, oil price ranged from $12.7 per barrel to $111.7 per barrel. The large dispersion suggests that oil price fluctuated mainly over the past three decades. On average, the oil price was $41.8 per barrel with a standard deviation of $31.1 per barrel. Government expenditure ranged from $5.4 billion to $33 billion. The average expenditure incurred by the government over the past three decades stood at $15.5 billion, with a standard deviation of $8.4 billion. On the revenue side, it ranged from $6.1 billion to $72.3 billion, while the average revenue generated by the government was $27.0 billion with a deviation of $19.7 billion. This implies that the revenue generated over the past three decades exceeded average government spending. Gross Domestic Product (GDP) ranged from $101.0 billion to $464.0 billion. On average, GDP stood at $217.0 billion with a standard deviation of $121.0 billion. The minimum exchange rate was 0.9 N/$, and the maximum was 253.5N/$. The wide dispersion implies that the Naira has been largely devalued over the past three decades. The total reserves accumulation ranged from $0.9 billion to $53.6 billion. The average reserve accumulated over the past three decades was $16.6 billion with a deviation of $18.2 billion. Inflation ranged from 5.4 per cent to as high as 72.8 per cent. On average, consumer prices grew at 19.6 per cent, with a deviation of 17.7 per cent. The unemployment rate was low at 1.9 per cent and high at 19.7 per cent, over the past three decades. The average unemployment rate was 8.2 per cent, with a deviation of 4.8 per cent.

*Table 5. 1: Descriptive Statistics of the Data for Nigeria*

| | Min | Max | Mean | Std. Dev. |
|---|---|---|---|---|
| OILP ($/barrel) | 12.7 | 111.7 | 41.8 | 31.1 |
| AEXP ($b) | 5.4 | 33.0 | 15.5 | 8.4 |
| AREV ($b) | 6.1 | 72.3 | 27.0 | 19.7 |
| GDP ($b) | 101.0 | 464.0 | 217.0 | 121.0 |
| EXCR (N/$) | 0.6 | 253.5 | 76.5 | 71.9 |
| EXTR($b) | 0.9 | 53.6 | 16.6 | 18.2 |
| INFR (%) | 5.4 | 72.8 | 19.6 | 17.7 |
| UEMR (%) | 1.9 | 19.7 | 8.2 | 4.8 |

**Source: Author's Computation using E-Views 10.0**

Table 5.2 presents the descriptive statistics of key macro indicators for Venezuela. Global oil price ranged from $12.7 per barrel to $111.7 per barrel. On the average, oil price stood at $45.5 per barrel, with a deviation of $33.5 per barrel. The least government spending in Venezuela was $0.3 billion, and the highest was $8260 billion. On the average government spending was $559 billion, with a deviation of $1600 billion. This is lower compared to spending in Norway, but much higher compared to spending in Nigeria. Government revenue ranged from $0.2 billion to $4,150 billion. On average, government revenue was $319 billion, with a deviation of $809 billion.

Similarly, Venezuelan government-generated less revenue compared to Norway, but much higher revenue compared to Nigeria. However, Venezuela's relatively high revenue could probably be as a result of its highest oil reserves in the whole world (OPEC, 2018). GDP ranged from $221 billion to $438 billion, with a mean and standard deviation of $326 billion and $71.4 billion. External reserve ranged from $7.8 billion to $43.1. On the average external reserves stood at $19.8 billion, with a deviation of $9.4 billion. Also, the exchange rate ranged from 0VEF/$ to 9.3VEF/$ and had an average of 2.0VEF/$ with a standard deviation of 2.4VEF/$. Inflation rate hovered around 12.5 per cent to 254.9 per cent, with the average and deviation of 46.7 per cent and 47.7 per cent respectively. The unemployment rate was low at 6.6 per cent and high at 16.8 per cent. The average unemployment rate was 9.9 per cent, with a standard deviation of 2.9 per cent.

***Table 5. 2: Descriptive Statistics of the Data for Venezuela***

| | Min | Max | Mean | Std. Dev. |
|---|---|---|---|---|
| OILP ($/barrel) | 12.7 | 111.7 | 45.5 | 33.5 |
| AEXP ($b) | 0.3 | 8260.0 | 559.0 | 1600.0 |
| AREV ($b) | 0.2 | 4150.0 | 319.0 | 809.0 |
| GDP ($b) | 221.0 | 438.0 | 326.0 | 71.4 |
| EXCR (VEF/$) | 0.0 | 9.3 | 2.0 | 2.4 |
| EXTR ($b) | 7.8 | 43.1 | 19.8 | 9.4 |
| INFR (%) | 12.5 | 254.9 | 46.7 | 47.7 |
| UEMR (%) | 6.6 | 16.8 | 9.9 | 2.9 |

**Source: Author's Computation using E-Views 10.0**

The descriptive statistics of the key macroeconomic indicators for Norway are presented in Table 5.3. Global oil price ranged from $12.7 per barrel to $111.7 per barrel. The large deviation suggests that oil price fluctuated largely over the last three decades. On the average global oil price stood at $41.8 per barrel, with a standard deviation of $31.1 per barrel. Government expenditure in Norway ranged from $159 billion to $1560 billion. On the average, the Norwegian government expended $684 billion, much higher compared to the average government expenditure in Nigeria and Venezuela. Government revenue was low at $176 billion and high at $1,680 billion, with an average and standard deviation of $827 billion and $525 billion respectively. It implies that the Norwegian government generated more revenue compared to the Nigerian government. Norwegian GDP ranged from $202 billion to $470 billion.

On the average, GDP was $341 billion, with a deviation of $87.5 billion. Domestic exchange rate ranged from 5.6 Norwegian Krone/$ to 9.0 krone/$. On the average, exchange stood at 6.9 krone/$ with a deviation of 0.9 Krone/$. The higher exchange rate relative to Nigerian Naira suggests that the Norwegian Krone was higher valued compared to the Nigerian naira. The external reserve was lowest at $6.7 billion and the highest at $64.8 billion. On the average, foreign reserves stood at $31.3 billion, with a deviation of $19.0 billion. The lowest inflation rate experience in Norway was 0.5 per cent, and the highest was 13.6 per cent. On average, the inflation rate was 3.7 per cent, with a deviation of 3.0 per cent. The unemployment rate was low at 1.7 per cent and high at 6.3 per cent, with the average and deviation of 3.7 and 1.3 per cent respectively. This implies that Norway had a lower unemployment rate compared to Nigeria and Venezuela.

*Table 5. 3: Descriptive Statistics of the Data for Norway*

| | Min | Max | Mean | Std. Dev. |
|---|---|---|---|---|
| OILP | 12.7 | 111.7 | 41.8 | 31.1 |
| AEXP ($b) | 159.0 | 1560.0 | 684.0 | 409.0 |
| AREV ($b) | 176.0 | 1680.0 | 827.0 | 525.0 |
| GDP ($b) | 202.0 | 470.0 | 341.0 | 87.5 |
| EXCR (Krone/$) | 5.6 | 9.0 | 6.9 | 0.9 |
| EXTR($b) | 6.7 | 64.8 | 31.3 | 19.0 |
| INFR (%) | 0.5 | 13.6 | 3.7 | 3.0 |
| UEMR (%) | 1.7 | 6.3 | 3.7 | 1.3 |

**Source: Author's Computation using E-Views 10.0**

On the average, both the government revenues and expenditures in Norway are higher relative to those of Nigeria and Venezuela. The descriptive statistics also reveal that the inflation and unemployment rates in Nigeria and Venezuela outweigh those of the Norwegian economy. The average reserves accumulation in Norway is higher when compared to those of Nigeria and Venezuela, which suggests that the Norwegian economy conserves its proceeds from their natural resources for future use. In addition, the average economic growth in Norway is also high relative to Nigeria and Venezuela which supports the findings of Holden (2011) that Norway does not fit into the categories of the countries identified with resource curse syndrome as the economy manages its petroleum resources effectively, leading to more economic growth and welfare of the populace.

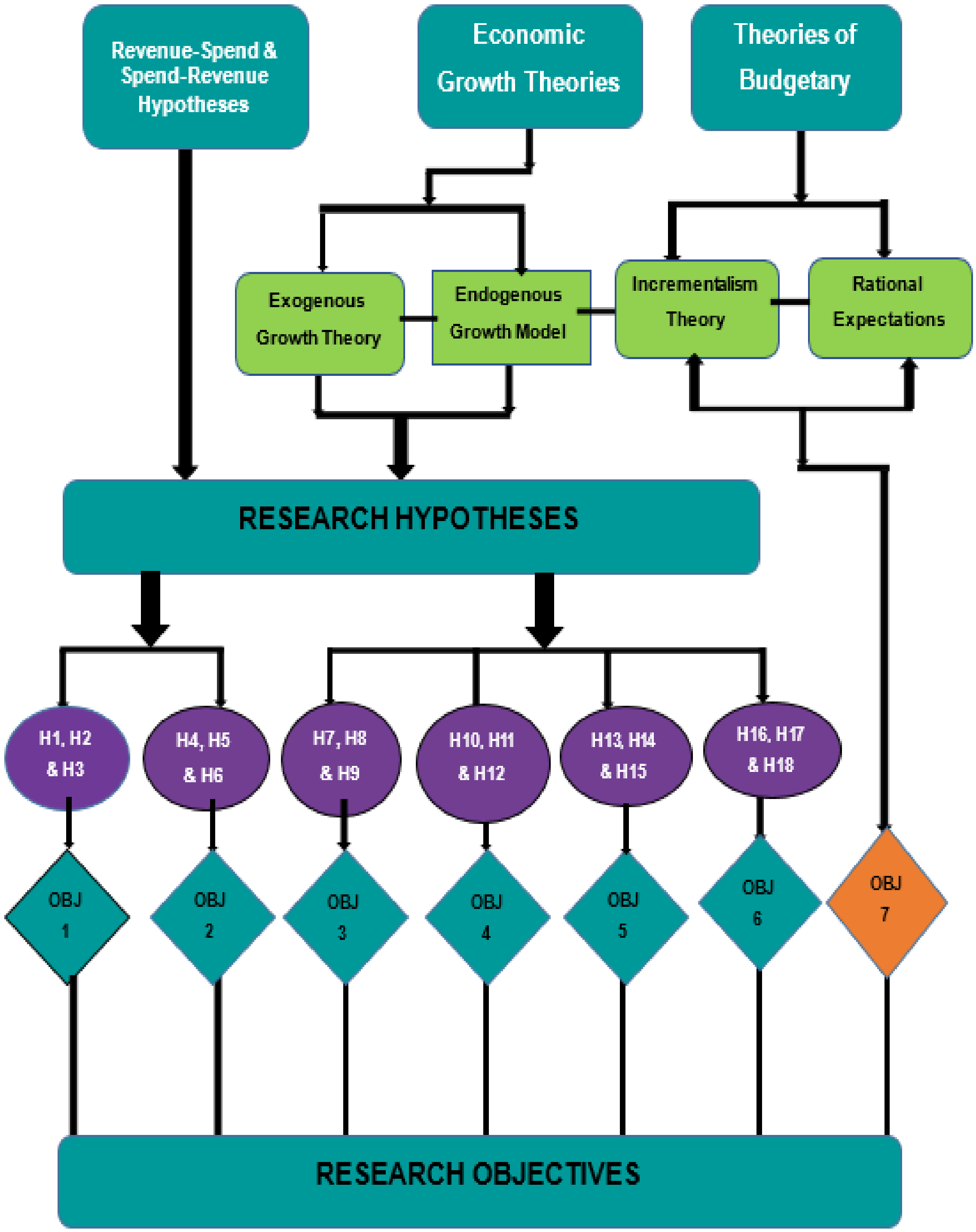
### 5.3 Secondary Data Analyses

The previous section dealt with the descriptive statistics of the data, which enables us to understand the physical and statistical properties of the data before carrying out the main analyses. This section, however, presents the secondary data analyses. In this study, we employed the use of the Autoregressive Distributed Lag (ARDL) technique for the secondary data analyses due to its advantages. The method helps to prevent the endogeneity problem and can also produce both the long-run and the short-run estimates of the model concurrently. Also, Marques et al., (2016), and Pesaran et al., (2001) maintain that the ARDL bounds methods are not affected when dummy variables are included in the model. More so, the variables of the model could have different lag lengths when using the ARDL technique, but this is not obtainable when using the conventional Johansen method of cointegration for analysis (Yakubu, 2014).

Given the fact that the nature, sample size of our data and the necessary tests were in line with all the underlying assumptions that could necessitate the use of the ARDL technique as presented by Pesaran et al., (2001); Ghatak and Siddiki, (2001); Pesaran and Smith, (1998); Pesaran and Pesaran (1997). The outcome of these analyses carried out through the ARDL technique enabled us to take our decisions, draw our inferences, proffer policy measures and for forecasting the future values of our variables. These findings are presented in the subsequent sections.

In this section, which involves the analyses of the secondary data, it is imperative to show the linkages between the examinable hypotheses, the research objectives and the theoretical framework employed in this study. Figure 5.4 below shows the interconnections of the research objectives, the examinable hypotheses and the theories inherent in this research.

*Figure 5. 4: Interconnections between the Research Objectives, Examinable Hypotheses and the Theories*




Source: Author's design

Apart from showing how these entities interconnect, it is essential also to know if one of the main goals of this research is achieved; that is whether the answers to the research questions are feasible through the analyses carried out or not. However, this would, in turn, enable us to either reject or not reject the null hypotheses postulated from the literature review chapters. The next subsection entails the examination of the unit root properties of the variables of the model.

### 5.3.1 Examination of the Unit Root Properties of the Variables

Modern developments in econometrics have shown that most macroeconomic variables are not stationary as different time series often exhibit different features over time (Nkoro and Uko, 2016). These features are also exhibited in all the line graphs of all the variables of the model for the three countries in figures 5.1, 5.2 and 5.3 above. While some time series diverge entirely away from their mean, others converge towards the mean. However, those time series that move away from the mean over time are said to be non-stationary and when used for model estimation, produce spurious regression and highly misleading results and inferences which of course would not be viable for policy implementation.

Nkoro and Uko, (2016) demonstrated that most time series variables are usually non-stationary and could only be stationary when differenced and this entails the loss of some vital long-run properties which are often retrieved through cointegration. The primary sources of non-stationarity are unit roots and so, engaging time series with unit roots in any regression analyses would undoubtedly yield misleading results. As a result of the above, the unit root properties of all the macroeconomic variables used for analyses in this study were tested first, using Augmented Dickey-Fuller (ADF, 1981) and Phillip-

Perron (PP, 1988) for robustness which has enabled us to understand how many times some of the variables were differenced to become stationary. Although both methods produce similar results, the Augmented Dickey-Fuller (ADF) test is often considered to be more superior over the Phillips-Perron (PP) test mainly due to its simple applicability and popularity (Nkoro and Uko, 2016). Hence, both were used for robustness. The unit root tests for Nigeria, Venezuela and Norway are as presented in the subsections below.

#### 5.3.1.1 Unit Root Test Result for Nigeria

The unit root statistics (Augmented Dickey-Fuller test – ADF and Phillips–Perron PP) test for Nigeria is presented in Table 5.4. From the table, we cannot reject the null hypothesis that government expenditure (AEXP), government revenue (AREV), exchange rate (EXCR), external reserves (EXTR), Gross Domestic Product (GDP), oil price (OILP) unemployment rate (UEMR) are not stationary at level, when the ADF unit root test with intercept and trend was considered.

On the other hand, at the first difference, all indicators are statistically significant. This suggests that the series are integrated of order one "I (1)," i.e. at first difference. On the other hand, both the ADF unit root tests show that inflation is stationary at level. This implies that inflation is integrated of order zero "I (0)". A similar result was obtained when we considered the ADF unit root test with intercept.

In addition, the Phillips–Perron (PP) unit root test with intercept show that government expenditure (AEXP), government revenue (AREV), exchange rate (EXCR), external reserves (EXTR), gross domestic product (GDP), oil price (OILP) unemployment rate (UEMR) are stationary at first difference, while inflation rate is stationary at level. A similar result was obtained when we considered the PP unit root test with intercept and trend.

Given the above, we, therefore, cannot reject the null hypothesis that all these macroeconomic variables of the model are not stationary at level. On the other hand, we can reject the null hypothesis that the inflation rate (INFR) is not stationary at level.

***Table 5. 4: Unit Root Test Results for Nigeria***

| | | AUGMENTED DICKEY FULLER TEST (ADF) | | | | | PHILLIPS-PERRON TEST (PPT) | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Intercept | SS | Intercept & Trend | SS | Intercept | SS | Intercept & Trend | SS |
| AEXP | Levels | -1.4287 (-0.5571) | I(1) | -2.5036 (0.3246) | I(1) | -1.6442 (-0.4500) | I(1) | -2.5483 (0.3047) | I(1) |
| | 1st Diff (Δ) | -5.0703 (0.0002)*** | | -5.0615 (0.0013)*** | | -5.0695 (0.0002)*** | | 5.0638 (0.0013)*** | |
| AREV | Levels | -1.5258 (0.509) | I(1) | -2.7351 (0.2296) | I(1) | -1.5555-0.4942 | I(1) | -2.7618-0.22 | I(1) |
| | 1st Diff (Δ) | -5.6861 (0.0000)*** | | -5.5714 (0.0003)*** | | -5.6847 (0.0000)*** | | -5.5691 (0.0003)*** | |
| EXCR | Levels | 1.3201 (0.9983) | I(1) | -1.3836 (0.8483) | I(1) | 1.1539 (0.9972) | I(1) | -1.6077 (0.7694) | I(1) |
| | | -3.6446 (0.0099)*** | | -3.9728 (0.0194)** | | -3.6461 (0.0098)*** | | -3.9535 (0.0203)** | |
| EXTR | Levels | -0.7569 (0.8188) | I(1) | -3.0458 (0.1353) | I(1) | -0.6412 (0.8484) | I(1) | -3.2476 (0.092) | I(1) |
| | 1st Diff (Δ) | -5.3132 (0.0001)*** | | -5.1938 (0.0009)*** | | -6.1528 (0.0000)*** | | -5.9165 (0.0001)*** | |
| GDP | Levels | 1.2298 (0.9977) | I(1) | -2.2842 (0.4311) | I(1) | 1.0614 (0.9964) | I(1) | -2.2683 (0.4392) | I(1) |
| | 1st Diff (Δ) | -4.3395 (0.0016)*** | | -4.6559 (0.0037)*** | | -4.3264 (0.0017)*** | | -4.6126 (0.0041)*** | |
| INFR | Levels | -3.2528 (0.0252)** | I(0) | -4.213 (0.0110)** | I(0) | -3.1537 (0.0316)** | I(0) | -3.064 (0.1304) | I(0) |
| | 1st Diff (Δ) | -5.7672 (0.0000)*** | | -5.6834 (0.0003)*** | | -9.1203 (0.0000)*** | | -9.2336 (0.0000)*** | |
| OILP | Levels | -1.1285 (0.6934) | NS | -2.1248 (0.5147) | I(1) | -1.1657 (0.678) | I(1) | -2.159 (0.4965) | I(1) |
| | 1st Diff (Δ) | -5.5017-0.0001 | | -5.4213 (0.0005)*** | | -5.5012 (0.0001)*** | | -5.421 (0.0005)*** | |
| UEMR | Levels | -2.0115 (0.2808) | I(1) | -2.5197 (0.3173) | I(1) | -1.9036 (0.3269) | I(1) | -2.4906 (0.3305) | I(1) |
| | 1st Diff (Δ) | -6.606 (0.0000)*** | | -6.4986 (0.0000)*** | | -6.7082 (0.0000)*** | | -6.5908 (0.0000)*** | |

***, ** and *denote the significant level at 1%, 5% and 10% respectively

**Source: Author's Computation using E-Views 10.0**

#### 5.3.1.2 Unit Root Test Results for Venezuela

The Augmented Dickey-Fuller test (ADF) and Phillips–Perron (PP) test are presented in Table 5.6. As depicted in the table, all the macroeconomic variables are not stationary at level but are stationary at first difference. In particular, government expenditure, government revenue, exchange rate, external reserves, GDP, inflation rate, oil price and unemployment rate are not stationary at level but are stationary at first difference. This implies that the series are integrated of order one "I(1)". A similar result was obtained when the ADF unit root test with intercept and trend was considered.

In the case of Phillips–Perron (PP) unit root test, the results show that all the macroeconomic variables considered in this study are not stationary at level but are stationary at first difference. This suggests that the indicators are integrated of order one 'I(1)". A similar result was obtained when the Phillips–Perron (PP) unit root test with intercept and trend was considered. We, therefore, cannot reject the null hypothesis that all the variables of the model are not stationary at level, which signifies that there is a present of a unit root in each of the variables.

*Table 5. 5: The Unit Root Test Result for Venezuela*

| | | AUGMENTED DICKEY FULLER TEST (ADF) | | | | PHILLIPS-PERRON TEST (PPT) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Intercept | SS | Intercept & Trend | SS | Intercept | SS | Intercept & Trend | SS |
| AEXP | Levels | 0.7017 (0.99) | I(1) | -1.088-0.9133 | I(1) | 0.6219 (0.9878) | I(1) | -1.4327 (0.8283) | I(1) |
| | 1st Diff (Δ) | -3.3295 (0.0234)** | | -3.3107 (0.0859)* | | -3.3295 (0.0234)** | | -3.3107 (0.0859)* | |
| AREV | Levels | -0.456 (0.8857) | I(1) | -2.4786-0.3352 | I(1) | -0.4613 (0.8847) | I(1) | -2.4786 (0.3352) | I(1) |
| | 1st Diff (Δ) | -4.1843 (0.0031)*** | | -3.953 (0.0234)** | | -4.132 (0.0036)*** | | -3.8762 (0.0275)** | |
| EXCR | Levels | 4.3278 (1.00) | NS | 2.6425 (1.00) | I(1) | 4.0762 (1.00) | I(1) | 1.7404 (1.00) | I(1) |
| | 1st Diff (Δ) | -0.1182-0.9362 | | -3.6448 (0.0469)** | | -3.86 (0.0068)*** | | -5.3595 (0.0009)*** | |
| EXTR | Levels | -1.7539-0.3945 | I(1) | -0.2861 (0.987) | I(1) | -1.909 (0.3236) | I(1) | -0.5557 (0.974) | I(1) |
| | 1st Diff (Δ) | -3.9901 (0.0050)*** | | -4.5735 (0.0059)*** | | -3.9702 (0.0053)*** | | -4.5785 (0.0058)*** | |
| GDP | Levels | -0.6605 (0.8409) | I(1) | -2.6619 (0.2586) | I(1) | -0.5882 (0.858) | I(1) | -2.3408 (0.4001) | I(1) |
| | 1st Diff (Δ) | -4.4635 (0.0016)*** | | -4.3774 (0.0092)*** | | -4.4531 (0.0016)*** | | -4.3614 (0.0095)*** | |
| INFR | Levels | -1.0922-0.7039 | I(1) | -0.4159-0.9817 | I(1) | -0.6204 (0.8506) | I(1) | -0.6471 (0.9676) | I(1) |
| | 1st Diff (Δ) | -4.6278 (0.0010)*** | | -5.3797 (0.0009)*** | | -4.7046 (0.0009)*** | | -5.3214 (0.0010)*** | |
| OILP | Levels | -1.3124-0.6095 | I(1) | -1.2191 (0.8868) | I(1) | -1.3531 (0.5903) | I(1) | -1.4665 (0.8171) | I(1) |
| | 1st Diff (Δ) | -4.3832 (0.0019)*** | | -4.3613 (0.0095)*** | | -4.3384 (0.0021)*** | | -4.3212 (0.0104)** | |
| UEMR | Levels | -1.8178-0.3643 | I(1) | -1.8762 (0.6399) | I(1) | -1.4659 (0.5357) | I(1) | -2.036 (0.5572) | I(1) |
| | 1st Diff (Δ) | -4.0688 (0.0041)*** | | -3.9024 (0.0260)** | | -4.0506 (0.0043)*** | | -3.868 (0.0280)** | |

***, ** and *denote the significant level at 1%, 5% and 10% respectively

Source: Author's Computation using E-Views 10.0

#### 5.3.1.3 Unit Root Test Results for Norway

The Augmented Dickey-Fuller test – ADF and Phillips–Perron test – PP unit root test results for Norway are presented in Table 5.5. As depicted in the table, the test results accept the null hypothesis that government revenue, external reserves, GDP, oil price and unemployment are not stationary at level. The results indicate that government revenue, external reserves, GDP, oil price and unemployment are stationary at first difference. Hence the variables are integrated of order one "I(1)".

On the other hand, government expenditure, exchange rate and inflation rate are stationary at level. This implies that the variables are integrated of order zero "I(0)". A similar result was obtained, when the ADF unit root test with intercept and trend model was considered.

The Phillips–Perron (PP) unit root test for Norway shows that most variables are stationary at first difference. Specifically, exchange rate, external reserves, GDP, oil price and unemployment rate are not stationary at level, but stationary at first difference. This indicates that the series are integrated of order one "I(1)". On the contrary, government expenditure, government revenue and inflation rate are stationary at level. This implies that the series are integrated of order zero "I(0)". Again, a similar result is obtained when the Phillips–Perron (PP) unit root test with intercept and trend was considered.

*Table 5. 6: Unit Root Test Result for Norway*

| | | AUGMENTED DICKEY FULLER TEST (ADF) | | | | PHILLIPS-PERRON TEST (PPT) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Intercept | SS | Intercept & Trend | SS | Intercept | SS | Intercept & Trend | SS |
| AEXP | Levels | -3.0372 (0.0411)** | I(0) | -3.2302 (0.0947)* | I(0) | -2.7417 (0.0770)* | I(0) | -3.568 (0.0471)** | I(0) |
| | 1st Diff (Δ) | -6.9214 (0.0000)*** | | -7.9568 (0.0000)*** | | -6.8275 (0.0000)*** | | -7.9013 (0.0000)*** | |
| AREV | Levels | -2.2276 (0.2005) | I(1) | -1.4003 (0.8439) | I(1) | -2.8199 (0.0655)* | I(0) | -1.3998 (0.844) | I(1) |
| | 1st Diff (Δ) | -4.9323 (0.0003)*** | | -5.3479 (0.0006)*** | | -4.8439 (0.0004)*** | | -6.9206 (0.0000)*** | |
| EXCR | Levels | -3.1465 (0.0322)** | I(0) | -3.1216 (0.1172) | I(1) | -2.5768 (0.107) | I(1) | -2.5831 (0.2897) | I(1) |
| | 1st Diff (Δ) | -4.1244 (0.0028)*** | | -4.0486 (0.0160)** | | -3.9669 (0.0042)*** | | -3.8692 (0.0243)** | |
| EXTR | Levels | -1.3258 (0.6069) | I(1) | -2.8316 (0.1959) | I(1) | -1.3258 (0.6069) | I(1) | -2.7933 (0.2088) | I(1) |
| | 1st Diff (Δ) | -6.6245 (0.0000)*** | | -6.6748 (0.0000)*** | | -6.6376 (0.0000)*** | | -6.6955 (0.0000)*** | |
| GDP | Levels | -1.8291 (0.3608) | I(1) | -1.4682 (0.8215) | I(1) | -2.2721 (0.1861) | I(1) | -0.5206 (0.9778) | NS |
| | 1st Diff (Δ) | -2.9083 (0.0545)* | | -3.3367 (0.0770)* | | -3.0149 (0.0432)** | | -3.1952-0.1019 | |
| INFR | Levels | -2.9556 (0.0489)** | I(0) | -3.8091 (0.0275)** | I(0) | -2.7903 (0.0697)* | I(0) | -3.9113 (0.0218)** | I(0) |
| | 1st Diff (Δ) | -10.5441 (0.0000)*** | | -10.7476 (0.0000)*** | | -10.9633 (0.0000)*** | | -11.9205 (0.0000)*** | |
| OILP | Levels | -1.144 (0.6875) | I(1) | -2.0783 (0.54) | I(1) | -1.179 (0.6728) | I(1) | -2.1202 (0.5176) | I(1) |
| | 1st Diff (Δ) | -5.6267 (0.0000)*** | | -5.5531 (0.0003)*** | | -5.6263 (0.0000)*** | | -5.5529 (0.0003)*** | |
| UEMR | Levels | -2.3965 (0.15) | I(1) | -2.325 (0.4103) | I(1) | -2.5911 (0.1041) | I(1) | -2.3364 (0.4048) | I(1) |
| | 1st Diff (Δ) | -4.7694 (0.0005)*** | | -4.7123 (0.0031)*** | | -4.6832 (0.0006)*** | | -4.6077 (0.0040)*** | |

***, ** and *denote the significant level at 1%, 5% and 10% respectively

**Source: Author's Computation using E-Views 10.0**

The stationarity properties of all the macroeconomic variables considered in this study are as presented in Table 5.4 (Nigeria), Table 5.5 (Venezuela) and Table 5.6 (Norway).

The tables present both the Augmented Dickey-Fuller (ADF) and Philip Perron (1989) unit root tests results. As shown in the tables, most of the series are either stationary at level "I (0)" or integrated at first difference, "I(1)" for each country. The stationarity of the variable at different orders (i.e. I(0) and I(1)) but not I(2) supports the use of the ARDL estimation technique. Eviews 10 statistical package was employed, which automatically determine the lag lengths using the Schwarz Information Criteria (SIC). All the detailed tests results of all the unit root tests carried out were attached in the appendix. We then proceed to the reasons for the choice of the ARDL model and its underlying assumptions as outlined below.

### 5.3.2 Underlying Assumptions and the Choice for Autoregressive Distributed Lag (ARDL) Model

Pesaran et al., (2001), Nayaran and Smyth (2005) and Pesaran and Shin, (1999) outlined several strengths, which the ARDL bounds test cointegration and ECM method have over the traditional Engel-Granger and Johansen approach (Engle and Granger, 1987; Johansen and Juselius, 1990). The method helps to prevent the endogeneity problem and also can produce both the long-run and the short-run estimates of the model concurrently. Also, Marques et al., 2016), Fuinhas and Marques, (2012) Hoque and Yusop (2010), Zachariadis, (2007) and Pesaran et al., (2001) maintain that the ARDL bounds methods are not affected when dummy variables are included in the model. More so, the variables of the model could have different lag lengths when using the ARDL technique, but this is not obtainable when using the conventional Johansen method of cointegration for analysis (Yakubu, 2014).

For the ARDL model to be effectively applied and to avoid spurious regression, the following assumptions must be fulfilled:

a. It is assumed that all the variables of the model must be integrated at level I(0) or at first difference I(1) or be integrated of both I(0) and I(1) but not integrated at second difference I(2) because the technique will crash while producing a spurious results.
b. The ARDL model is assumed to be robust when it is applied to a single long-run relationship between the underlying variables.
c. It is also assumed that the sample size of the variables are relatively small for it to produce a viable result.
d. While there are multiple cointegrating vectors, the ARDL approach is assumed to be able to identify the cointegrating vectors.

If the assumptions are not fulfilled, it may bring about unrealistic and inefficient estimates, misspecification of the model and subsequently, inconsistent results which would in-turn produce an adverse effect on policy and forecasting.

When all the assumptions are met while applying the ARDL approach to cointegration, the result produced would indeed be realistic, efficient and highly effective for policy and forecasting (Nkoro and Uko, 2016; Margues et al., 2016). As all the variables used in this study fulfilled all the above-outlined assumptions, we, therefore, use the ARDL method of cointegration in this study. The next sub-section presents the underlying ARDL model estimation for Nigeria, Venezuela and Norway.

### 5.3.3 Estimation of the Underlying ARDL Model

The unrestricted error correction ARDL model is specified below, for the AREV variable:

$$\Delta lnAREV_t = \alpha_0 + \sum_{i=1}^{p} \alpha_1 \Delta lnAREV_{t-i} + \sum_{i=0}^{q} \alpha_2 \Delta lnAEXP_{t-i} + \sum_{i=0}^{r} \alpha_3 \Delta lnOILP_{t-i}$$

$$+ \sum_{i=0}^{s} \alpha_4 \Delta lnGDP_{t-i} + \sum_{i=0}^{u} \alpha_5 \Delta lnEXTR_{t-i} + \sum_{i=0}^{v} \alpha_6 \Delta lnINFR_{t-i}$$

$$+ \sum_{i=0}^{w} \alpha_7 \Delta lnUEMR_{t-i} + \sum_{i=0}^{z} \alpha_8 \Delta lnEXCR_{t-i} + \lambda_1 lnAREV_{t-1} + \lambda_2 lnAEXP_{t-1}$$

$$+ \lambda_3 lnOILP_{t-1} + \lambda_4 lnGDP_{t-1} + \lambda_5 lnEXTR_{t-1} + \lambda_6 lnINFR_{t-1}$$

$$+ \lambda_7 lnUEMR_{t-1} + \lambda_8 lnEXCR_{t-1} + \lambda_9 D$$

$$+ \mathcal{U}_{tI} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots 1$$

The details of all the model specification for each of the variables estimated are outlined in the methodology chapter. The following relationships among the variables of the model were estimated for each of the countries: Nigeria, Venezuela and Norway.

$AREV \text{ and } OILP$

$\Longrightarrow H_1 \text{ with } \alpha \text{ denoted as the coefficient in the short}$

$- \text{run part of the main ARDL equation.}$

$AEXP \text{ and } OILP$

$\Longrightarrow H_2 \text{ with } \beta \text{ denoted as the coefficient in the short}$

$- \text{run part of the main ARDL equation.}$

$GDP \text{ and } OILP$

$\Longrightarrow H_3 \text{ with } \gamma \text{ denoted as the coefficient in the short}$

$- \text{run part of the main ARDL equation.}$

$EXTR\ and\ OILP$

$$\Longrightarrow\ H_4\ with\ \ \theta\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

$INFR\ and\ OILP$

$$\Longrightarrow\ H_5\ with\ \ \pi\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

$$UEMR\ and\ OILP\ \ \Longrightarrow\ H_6\ with\ \ \rho\ denoted\ as\ the\ coefficient\ in\ the\ short - run\ part\ of\ the\ main\ ARDL\ equation.$$

The next subsection presents all the diagnostic tests which were carried out before the estimation of the ARDL models for the three economies.

### 5.3.4 Diagnostic Tests

In order to be consistent with the diagnosis of the econometric requirements before the estimation of the underlying ARDL model, all the diagnostic tests were adequately carried out. The diagnostic tests include structural and dynamic stability tests (CUSUM and CUSUM SQUARES); Residual Diagnostics (Heteroscedasticity; Serial correlation, Normality tests); Coefficient Diagnostics (Long-Run Form and Bound Test, Error Correction Form (Short-Run Test)). The detailed results of all the diagnostic tests carried out in these analyses are presented in the appendix.

#### 5.3.4.1 Stability Diagnostics (Structural and Dynamic Stability)

Bahmani-Oskooee (2001) maintain that using the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) for the stability test of all the long-run and short-run coefficients are very necessary when using time series data which changes over time. The stability test would be able to show if the regression equations are stable over time. However, if the plotted graph lies within the critical boundaries at 5 per cent significant level, then we cannot reject the null hypothesis which states that all the coefficients of the Error Correction Models, are stable at that level (Thao and Hua, 2016; Yakubu et al., 2014; Bahmani-Oskooee and Wing 2002).

The structural and dynamic stability of all the coefficients of the models were tested using the cumulative sum of recursive residuals (CUSUM) and the recursive squared residuals (CUSUMSQ) which were proposed by Brown et al., (1975). More so, all the plotted graphs of the CUSUM and CUSUMSQ of squares, which were used to examine the stability of all the parameters of the ARDL models indicate that the models are very stable during all the sample periods as all the curves lie within the critical boundary of 5 per cent. Hence, we cannot reject the null hypothesis that all the coefficients of the model are stable throughout the sample period. All the plots of the recursive residuals carried out would be attached in the appendix while the CUSUM and CUSUM of squares graphs of equation 1 (Nigeria), equation 2 (Venezuela) and equation 3 (Norway) are as shown below. From the graphs, the red lines indicate the critical boundaries at 5 per cent level of significance (Orhunbilge and Tas, 2014). However, the plots indicate that all the parameters of the models in this study are stable within the 5 per cent critical boundaries.

*Figure 5. 5: The Nigeria CUSUM Equation 1*

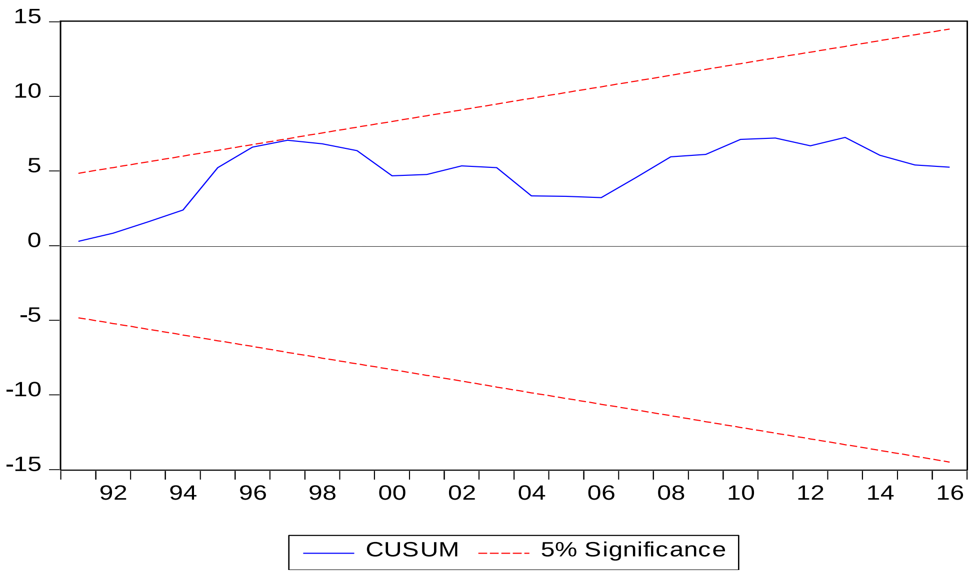
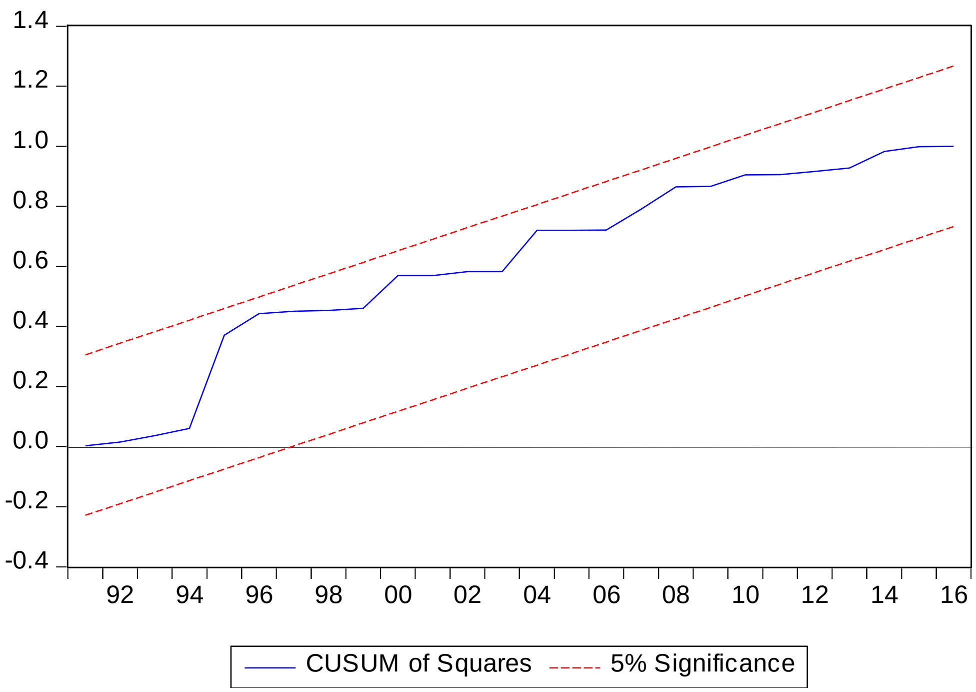



*Figure 5. 6: Nigeria CUSUM of Squares Equation 1*




**Source: Author's Construction using E-Views 10.0**

***Figure 5. 7: Venezuela CUSUM Equation 2***

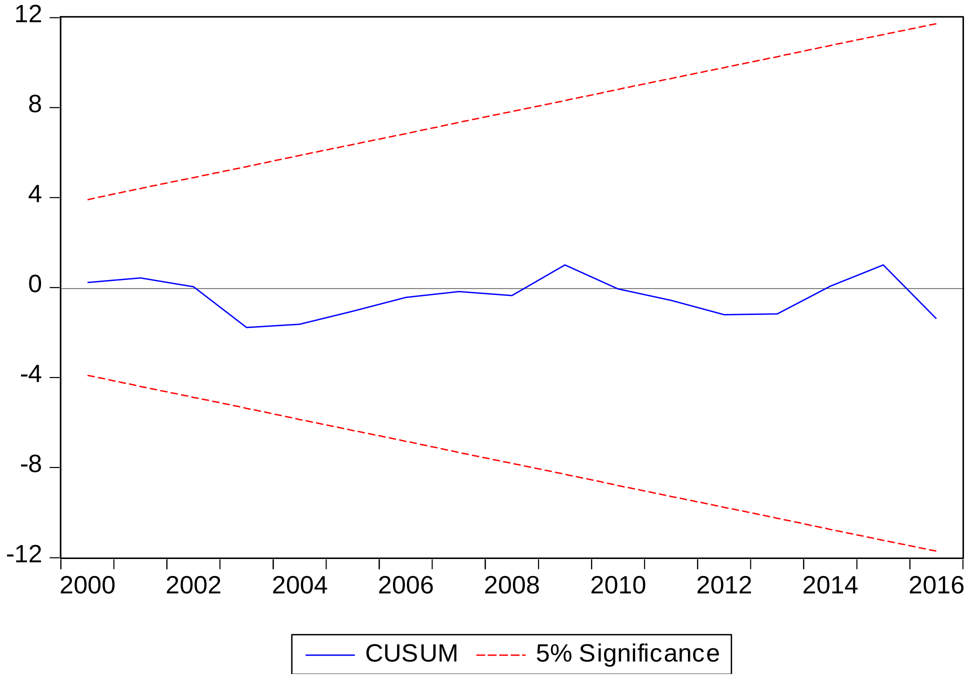
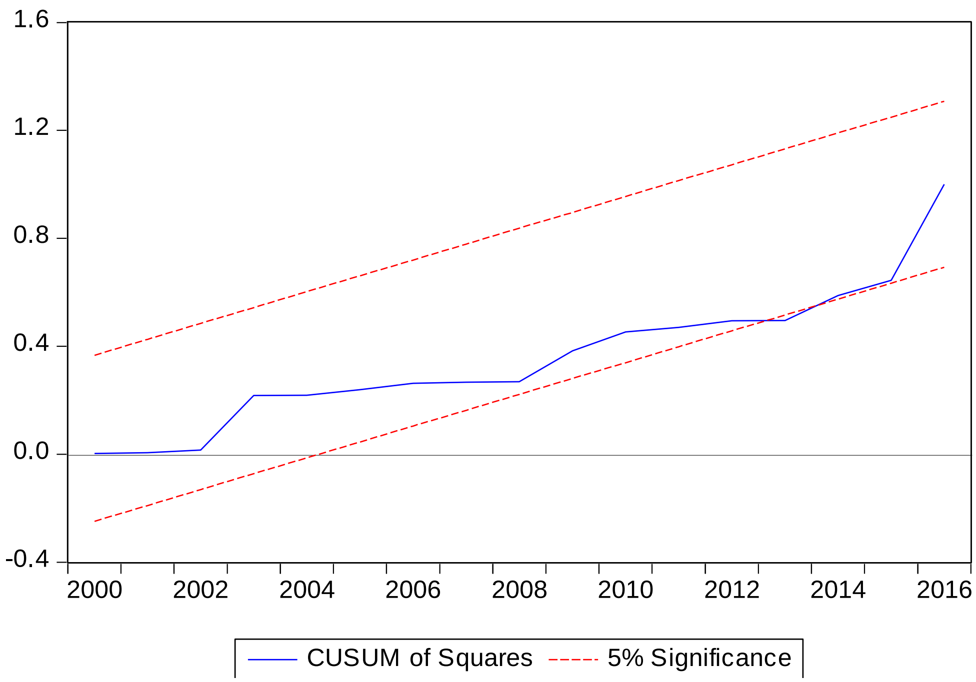



***Figure 5. 8: Venezuela CUSUM of Squares Equation 2***




**Source: Author's Construction using E-Views 10.0**

*Figure 5. 9: Norway CUSUM Equation 3*

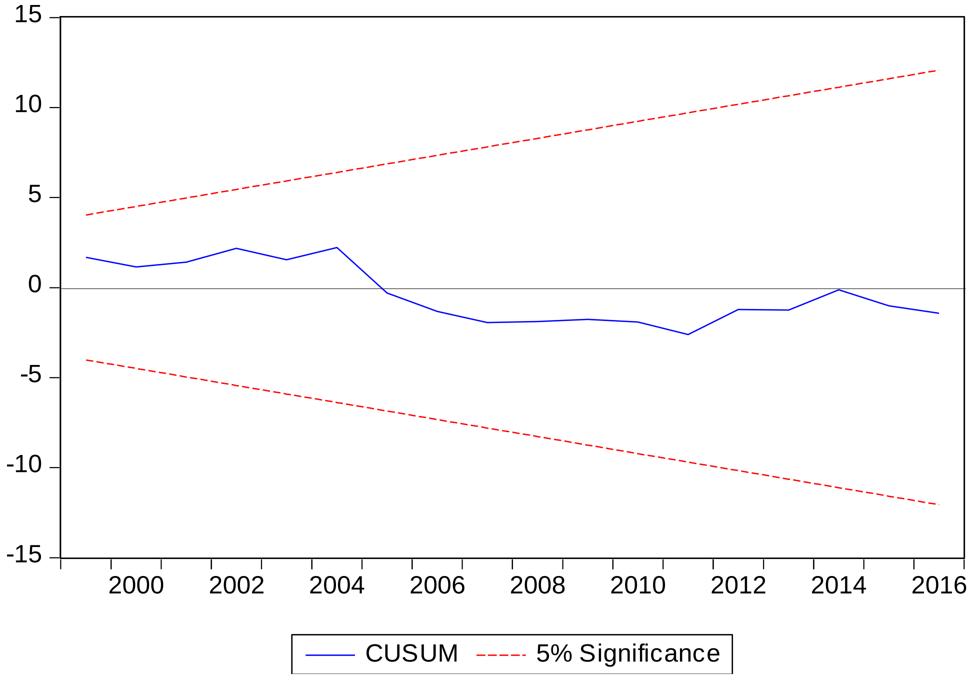
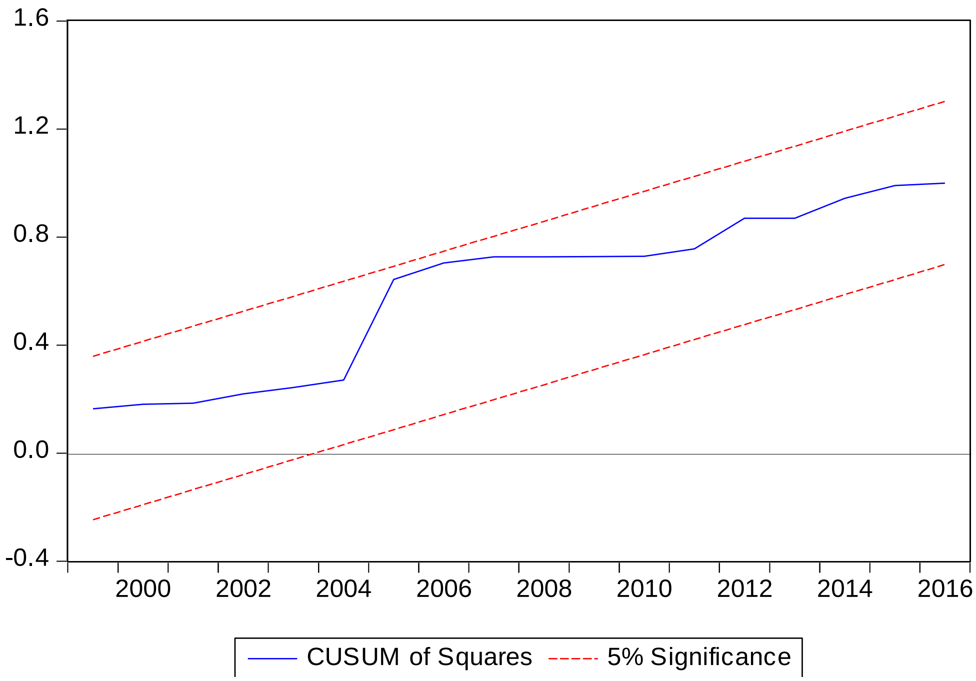



*Figure 5. 10: Norway CUSUM of Squares Equation 3*




**Source: Author's Construction using E-Views 10.0**

After the stability tests, we proceed to the residual diagnostic tests as in the next sub-section.

#### 5.3.4.2 Residual Diagnostics

The residual diagnostic tests involved in the study are the heteroscedasticity tests, the serial correlation tests and the normality tests. Tse (2002) maintains that it is imperative to check the accuracy of the fitted model and carry out the diagnostic tests as it would assist in the selection of the best model during the analysis. In addition, the analysis results would only produce reliable estimates and inferences when all the diagnostic tests are adequately carried out (Pagan and Hall, 1983; Wooldridge, 1990). The diagnostic tests are also relevant because it would assist in the examination of the appropriateness of the underlying assumptions of all the ARDL modelling process and as well, also help in tracing the unusual data characteristics which could influence the analyses adversely (Cook and Weisberg, 1983).

When dealing with multiple regression analysis, one of the assumptions is that of homoscedasticity of errors, that is, the errors are assumed to be independently identically distributed (i.i.d.) (Klein et al., 2016p; Yobero, 2016). The errors are said to be homoscedastic when they are i.i.d, and it holds when the variance of the error terms for all the observations in a data set are constant over time. On the other hand, when the errors are not i.i.d., they have different variances, such errors are said to be heteroscedastic which is a severe problem that could lead to misleading results and conclusions because the errors assume a positive value and not constant as should be (Klein et al., 2016). In this study, we followed the Breusch-Pagan test for heteroscedasticity, developed in 1979 for a linear regression model ($H_0$: Constant Variance; $H_a$: Heteroscedasticity). The results reveal that the variances of all the error term are constant over time. As a result, we cannot reject the null hypotheses, which state that the variance of the error terms is constant over time. All the tests for heteroscedasticity for the three countries are attached in the appendix.

Serial correlation occurs whenever the observations of the error term are correlated. We adopted the Breusch-Godfrey LM test for serial correlation in which the null hypotheses states that there is no serial correlation; otherwise, the alternative hypotheses ($H_a$: $\rho_1 \neq 0$). Just like the case of heteroscedasticity, one of the classical assumptions of the ordinary least squares is that the error terms are independent of one another. This means that the observations of the error term in one period must not correlate with the observation of the error term in the next period. Whenever this assumption is violated or does not hold, autocorrelation or serial correlation is said to be present, which makes the observations of the error term to follow certain pattern. We tried to select the best models and as such, the tests of the serial correlation in this study indicate that there is no serial correlation in all the error term observations, hence the null hypotheses ($H_0$: $\rho_1 = 0$) cannot be rejected, that there is no serial correlation in the error term series. All the serial correlation tests are attached in the appendix.

Bera and Jarque (1982) reveal that homoscedasticity and the independence of the observations of the error term in any regression analysis would produce the wrong result under non-normality condition. One of the conventional statistical assumptions is that all the observations for the analyses are normally distributed. Das and Imon, (2016) maintain that non-normality distributions are common in practice than previously assumed and the tests need to be carried out before embarking on the analyses. Consistently, Oztuna et al. (2006) also show that so many methods of analyses rely on the assumption that the data are sampled from a normal distribution. However, no significant departure from normality was found. Hence the sampled data passed all the normality tests and would be presented in the appendix. We then proceed to the next section of carrying out the coefficient diagnostics by empirically analysing both the long-run relationships and short-run dynamics of the ARDL models for the three countries: Nigeria, Venezuela and Norway.

### 5.3.4.3. Coefficient Diagnostics

Both the Long-run (Bounds Test) and the Error Correction Form (Short-run Tests) are the components of the coefficient diagnostics which we carried out, to empirically analyse the long-run relationships and the short-run dynamics among the variables of all the ARDL models of this research. Usually, in the long-run, the general price level fully adjusts to the conditions of the economy as there are no fixed factors at all in the long-run while there exist both fixed and variable factors in the short-run when dealing with the production of goods and services. In this study, the Autoregressive Distributed Lag (ARDL) model is specified in order to establish all the relationship between the declining oil price, oil price fluctuations and the key macroeconomic variables in the selected oil-exporting countries: Nigeria, Venezuela and Norway.

The long-run relationship is also established through the ARDL cointegration bound test which is based on the Wald-test (F-statistics) with two critical values (lower and upper critical values), Pesaran et al., (2001). While the lower critical bound assumes that all the variables of the model are integrated at level I(0), indicating that there is no cointegration among the variables, the upper bound assumes that all the variables are integrated at first difference (1), which means that there is cointegration among the variables of the model. If the calculated F-Statistic is higher than the upper bound critical value, then it leads to the rejection of the null hypothesis ($H_0$), signifying that the variables of the model are cointegrated. Conversely, when the calculated F-statistic is below the lower bound critical value, then we cannot reject the null hypothesis ($H_0$), which indicate that there is no cointegration among the variables of the model. When the calculated F-statistic test lies between lower and upper bound critical values, the results are said to be inconclusive which means that the relationship between the variables of the model cannot be established (Matlasedi, 2017).

The Error Correction Model (ECM), was developed in this study and this is to test for the speed of adjustment and to ascertain how the variables converge towards the equilibrium in the long run. All the tests would be presented in the appendix while these results are tabulated in the next chapter, where all the results from the whole analyses in this study are discussed. The survey data analysis is carried out in this study to supplement secondary data analyses. The next section, therefore, involves the presentation of the primary data and other graphical and statistical analyses carried.

## 5.4 Exploration of Primary Data

### 5.4.1 Introduction

The previous section entails the presentation of data and analyses of the secondary data. It also involves all the statistical and diagnostic tests necessary before the main analysis. This section presents the primary data analysis and discussion for the study. The primary data analysis is aimed at supplementing the outcome from the secondary data analyses.

The primary data were sourced from the budget office and ministry of finance of the countries under study, using questionnaires. From the literature, survey questionnaires were developed based on the kind of information needed to address the research question (Baruch and Holtom, 2008). The design was also adapted from other related studies like Mellor and Morore, (2014); International Budget Partnership, (2011) on "Guide to the open budget questionnaire: An explanation of the questions and the response options"; Revenue Watch index Questionnaire, (2009).

We also followed the guiding principles outlined by Sanchez and Goolsbee, (2010); Malhotra and Birks (2000) by designing questionnaires with the following characteristics:

- Straightforward questions that can be answered easily by the respondents, aimed at providing answers to the research questions.
- Clarity of the questions would help in reducing the response rate error.
- Suitable questions which would motivate the respondents to complete the questionnaires should be considered.
- Sensitive questions that involve personal details of participants should be in the last part of the questionnaire. Although, personal details of respondents are not necessary for this study and as such, not included in the questionnaires.

Frankfort-Nachmias and Nachmias, (2008) outlined the three types of questions: Open-ended questions which allow the respondents to answer in their own words and encourages them to express their feelings, closed-ended questions which are easy and quick to answer and it involves a very straightforward analysis. The third type is the contingency questions, which are special-case closed-ended questions that apply to only a subgroup of respondents. For this study with a total of ten questions, we employed both the closed-ended questions and open-ended questions in the ratio of 2:1 (that is, eight closed-ended questions and two open-ended questions). All the questions aimed at addressing one of the research questions for each of the countries:

$RQ7_a$ – “How does Nigeria attain its budgetary needs during the periods of declining oil revenues?

$RQ7_b$ – “How does Venezuela attain its budgetary needs during the periods of declining oil revenues?

$RQ7_c$ – “How does Norway attain its budgetary needs during the periods of declining oil revenues?

The questionnaires were designed on a 5-point Likert scale order to obtain data that are highly satisfactory and reliable (Mellor and Morore, 2014; Likert, 1932); the Likert scale is frequently used in most survey analysis (Grant, 2010); it is often considered to be of an excellent standard (Hair et al., 2003). The next sub-section presents the sampling technique employed in the study for the primary data analysis.

### 5.4.2 Sampling and Sampling Technique for this Study

Sampling is a technique used by the researcher to select relatively smaller part of the population for the research. Sampling is necessary since it is not possible to test each member of the population under study. There are different types of sampling techniques that are employed for different survey research, such as probability and non-probability sampling. While probability sampling entails a sampling technique in which each member of the population has an equal chance of being chosen independently of other members of the population, a non-probability sampling technique is mainly based on the researcher’s judgement (Sharma, 2017).

Purposive sampling is a non-probability sampling technique, also can be referred to as judgmental, selective or subjective sampling. The selection of the sample to be studied relies on the researcher's judgement. This sampling technique provides the researcher with the justification of drawing conclusions and making a generalisation about the issue under consideration from the sample selected (Sharma, 2017).

For this PhD research, purposive sampling was used in selecting our sample (sub-set of the population) because it enabled us to use our judgement to focus on the part of the population that would help us to gather the needed data for addressing the research question and which also helped us in drawing reasonable conclusion about the entire population. Although the judgemental component of the purposive sampling is the only major disadvantage when the judgement is not based on clear criteria. However, that limitation is overcome by ensuring that the data gathered from the Ministry of Finance and the Budget office of each of these countries where accurate information about the budget of the economies are based. We then proceed to the method and procedure of primary data collection.

### 5.4.3 Questionnaire Administration and the Collection of Data

Since budgetary information of Nigeria, Venezuela and Norway are needed to address one of our research questions, as such, the budget office and the ministry of finance of each of these countries were chosen as our sample. This decision was made because some of their roles are to manage the financial assets of the government, annual fiscal budget preparation and administration, proposal of sound monetary and fiscal policy, to issue adequate regulations for the execution of the budget, they report all the fiscal and economic plans of nations, implementation of the budget, keeping the financial records, debt management functions, business processes based on what is viewed as the best practice (Allen et al., 2015; Andrews 2013; Blommestein 2005).

Survey Monkey platform was used for administering and the collection of the questionnaires (through online). SurveyMonkey, an online survey development cloud-based is a tool, which enables researchers to launch any kind of survey project. This platform allows researchers to tailor the surveys according to the defined target audience. The Survey Monkey features are designed to help in conducting different types of surveys online which enable researchers to reach out to millions of respondents and at the same time, obtain real-time results.

The total number of senior workers in the budget office and ministry of finance in each of the economies are 340 (Nigeria), 230 (Venezuela) and 286 (Norway) (Amadeo, 2018; Norway Ministry of Finance, 2018; Udo, 2014). A total number of 600 questionnaires were distributed, 200 for each country while a total number of 375 were returned. Specifically, 138 responses were returned from Nigeria, 116 were returned from Venezuela while 121 were returned from Norway. Based on the above, the next sub-section presents the response rate in each of the economies concerned.

Purposive Sampling was used in selecting the sample given the fact that 200 is the common figure in each of these three nations. The number of senior workers in budget office and ministry of finance varied diversely across the nations (340 - Nigeria; 282 – Venezuela and 286 – Norway). The purposive sampling enabled the researcher to use her judgement for the best selection criteria. More so, it is a comparative analysis in which all the three economies under study are treated equally.

There are problems associated with using very small samples or very large samples. When a small sample is used, it increases the chances of assuming a false premise to be true or that of true premise to be false. On the other hand, using a sample larger than necessarily has its own effect. However, it is highly unethical to include the number above the population size, which could also lead to substantial increase of the analysis power thereby making what is insignificant to become significant (Faber and Fonseca, 2014). Given the above effects of using small or large samples, the researcher avoided using smaller or larger samples but rather chose the sample size which is common across the three countries.

#### 5.4.4 The Response Rates for Nigeria, Venezuela and Norway

In recently statistical surveys, the response rates are the most widely cited metric (Montgomery et al., 2016). The response rate is calculated when the number of responses returned is divided by the total number of questionnaires administered (Sauro, 2011). Nigeria recorded a response rate of 69%, while the response rate for Venezuela is 58% and 60.5% response rate for Norway, respectively. The response rates calculations for the primary data surveys are as presented in Table 5.7 below.

*Table 5. 7: Response Rate (%)*

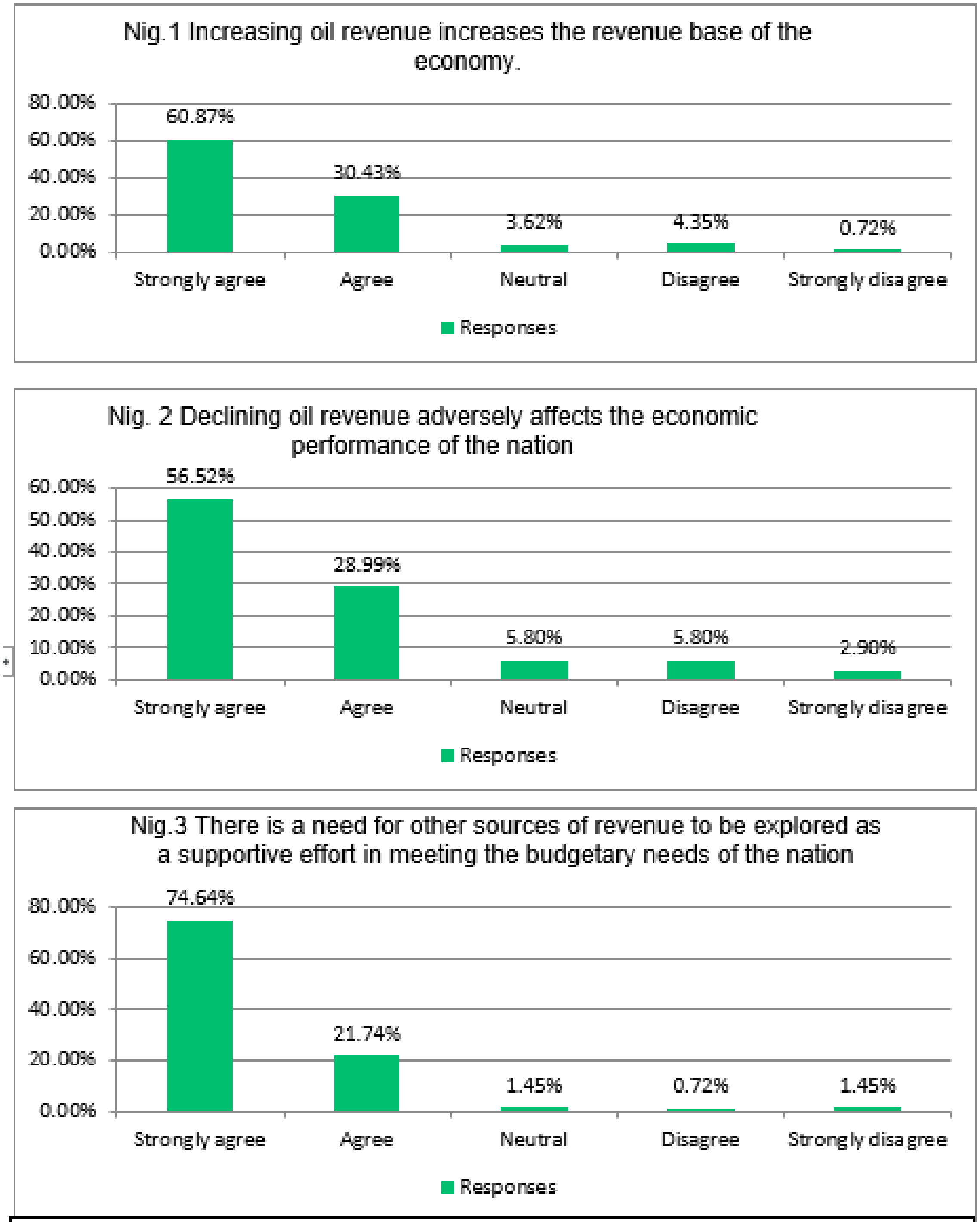
| Country | Total number of Questionnaires Administered | Total Number of Responses Returned | Response Rate (%) |
|---|---|---|---|
| Nigeria | 200 | 138 | (138/200) X 100 = 69% |
| Venezuela | 200 | 116 | (116/200) X 100 = 58% |
| Norway | 200 | 121 | (121/200) X 100 = 60.5% |
| Total | 600 | 375 | (375/600) X 100 = 62.5% |

**Source: Author's computation and design from plotted graphs**

### 5.4.5 Graphs and Descriptive Statistics of the Primary Data

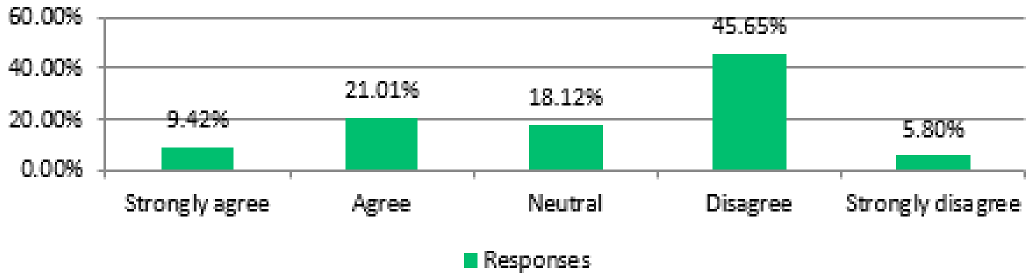
Graphs indicate the direction of the curves while the descriptive statistics summarise the collected data for easier understanding. The graphs showing the responses for each of the countries are as presented in graphs 5.11 (Nigeria), 5.12 (Venezuela) and 5.13 (Norway). More so, each of the graphs labelled Nig.1-Nig.8 represents the outcome for all the closed-ended questions for the Nigerian economy. Similarly, the graphs labelled Ven 1 – Ven 8, are the results for the Venezuelan economy while the graphs that ranged from Nor. 1 – Nor. 8 are the outcome for the Norwegian economy. Each of the questions was analysed independently using SPSS Version 25 and showed graphically the percentage of each point on the Likert scale, which signifies the opinions of all the respondents about each of the questions. The detailed discussion of these results is presented in chapter six. After the graphs, the summary of the graphs for each of the countries is presented.

*Figure 5. 11: Graphs for Nigeria*

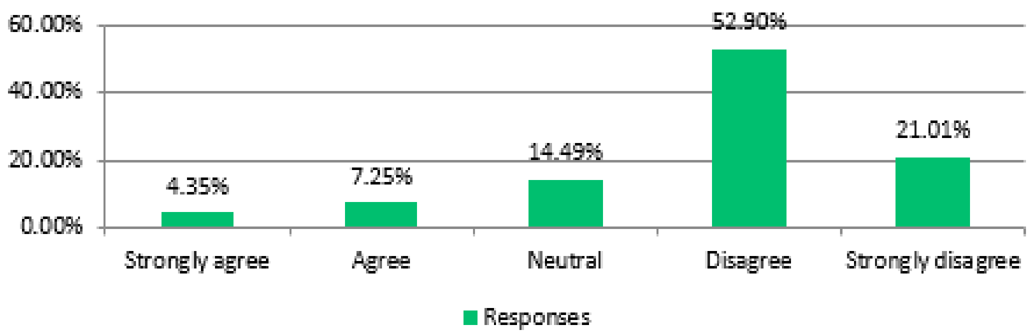



Author's construction using SPSS 25

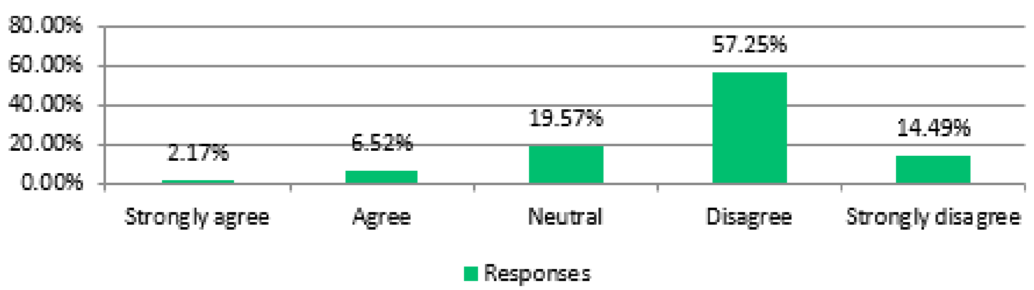
Nig.4 Nigerian government makes adequate efforts to explore alternative means of generating revenue in times of declining oil revenues to meet its budgetary needs



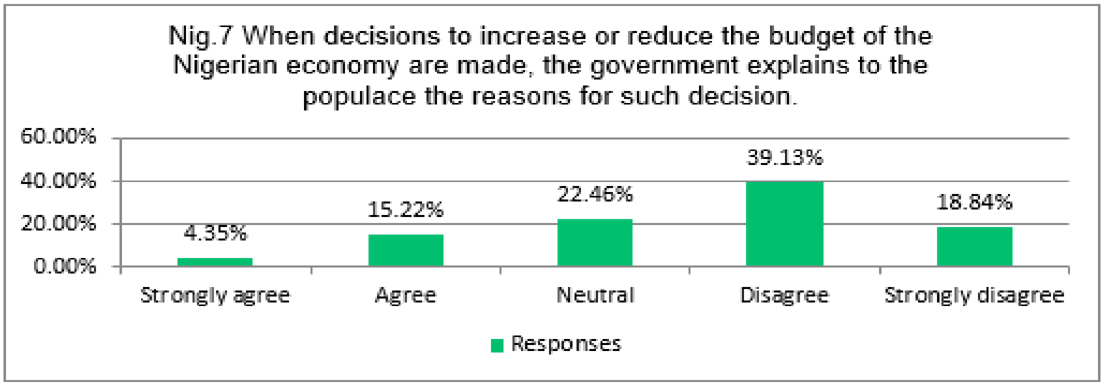

Nig.5 The Nigerian government utilises the nation's natural resources efficiently.




Nig.6 The government handles the nation's budgetary problems effectively.




Author's construction using SPSS 25



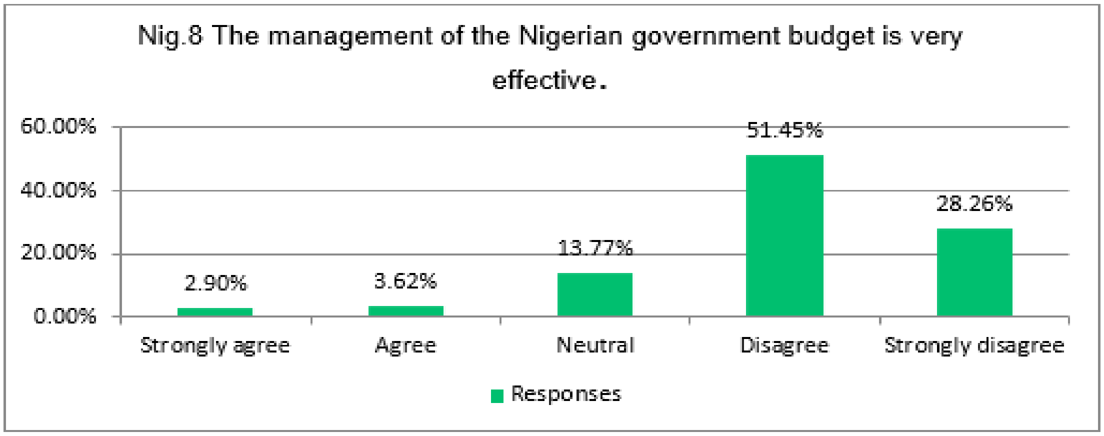
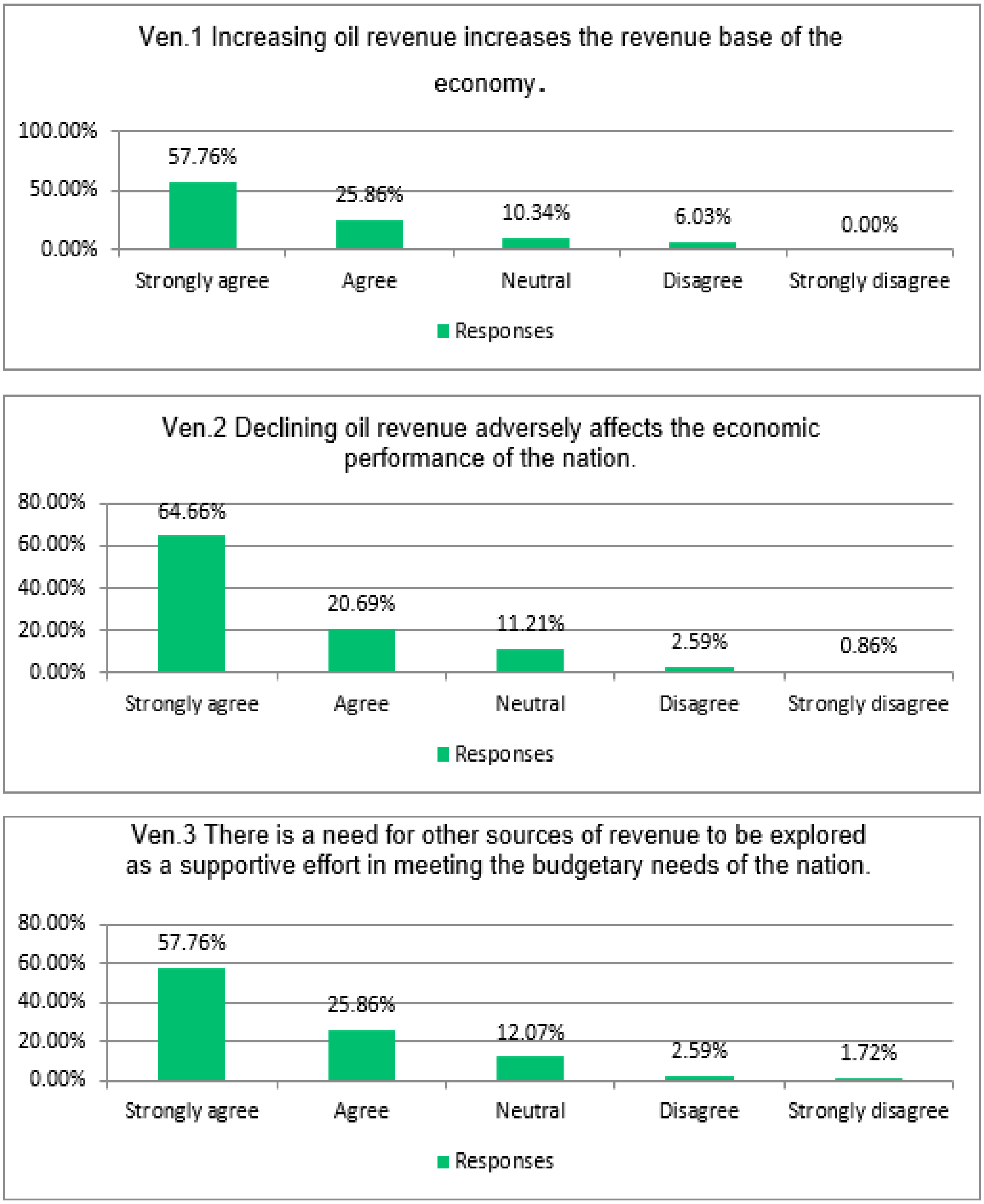



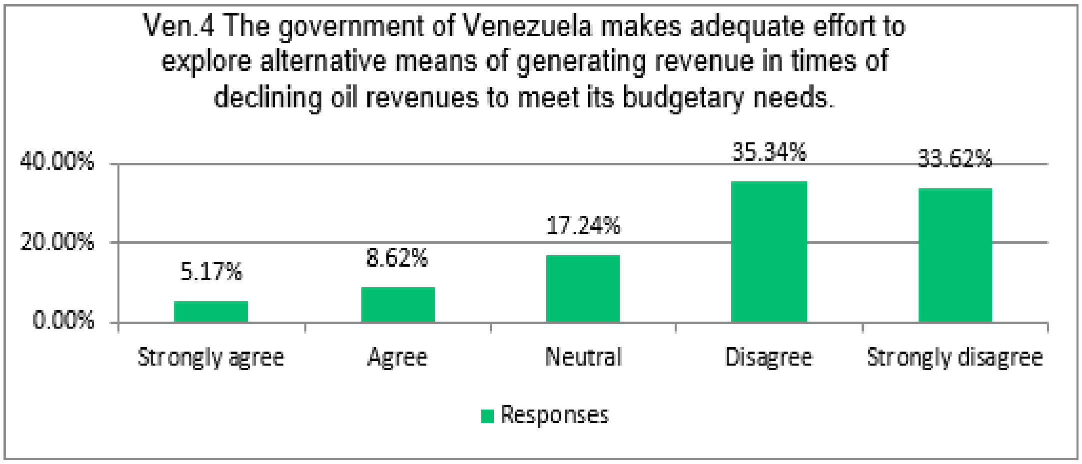

***Table 5. 8: Summary of graphs for Nigeria***

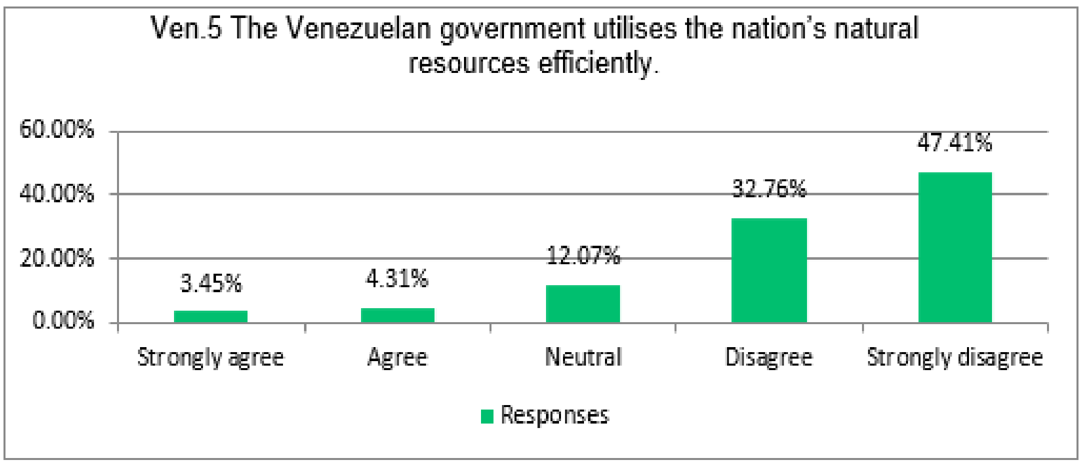
| QUESTION | STRONGLY AGREE (SA %) | AGREE (A %) | NEUTRAL (N %) | DISAGREE (D %) | STRONGLY DISAGREE (SD %) | TOTAL 100% |
|---|---|---|---|---|---|---|
| 1 | 60.87 | 30.43 | 3.62 | 4.35 | 0.72 | 100 |
| 2 | 56.52 | 28.99 | 5.8 | 5.8 | 2.9 | 100 |
| 3 | 74.64 | 21.74 | 1.45 | 0.72 | 1.45 | 100 |
| 4 | 9.42 | 21.01 | 18.12 | 45.65 | 5.8 | 100 |
| 5 | 4.35 | 7.25 | 14.49 | 52.9 | 21.01 | 100 |
| 6 | 2.17 | 6.52 | 19.57 | 57.25 | 14.49 | 100 |
| 7 | 4.35 | 15.22 | 22.46 | 39.13 | 18.84 | 100 |
| 8 | 2.9 | 3.62 | 13.77 | 51.45 | 28.26 | 100 |

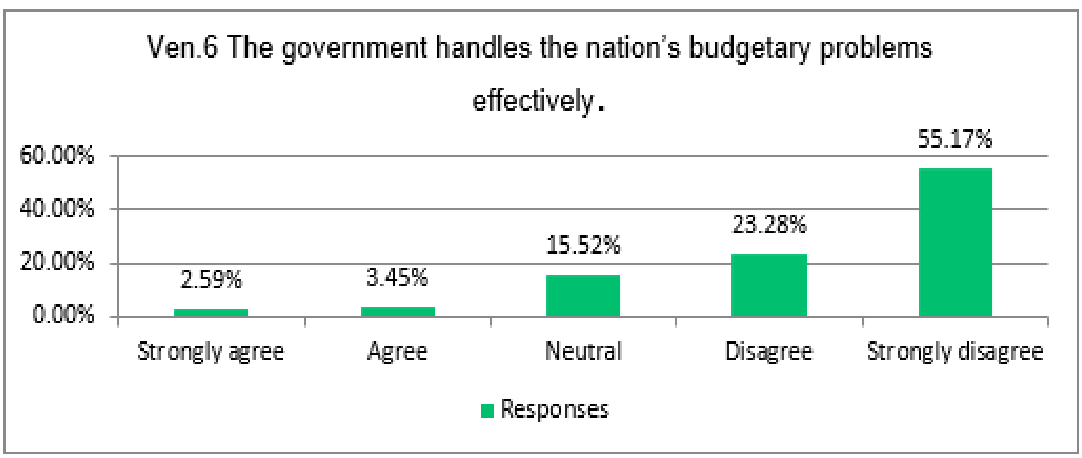
Source: Author's design from plotted graphs

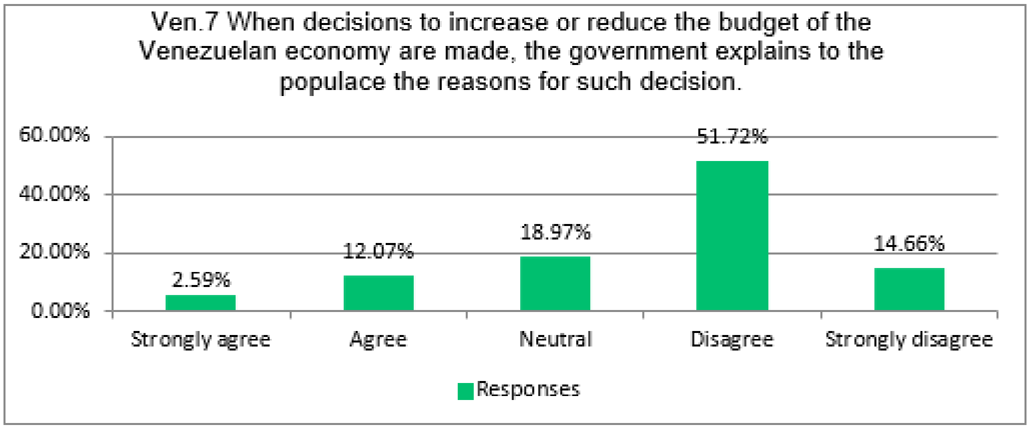
*Figure 5. 12: Graphs for Venezuela*




Ven.4 The government of Venezuela makes adequate effort to explore alternative means of generating revenue in times of declining oil revenues to meet its budgetary needs.
40.00%
20.00%
0.00%
5.17%
8.62%
17.24%
35.34%
33.62%
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
Responses


Ven.5 The Venezuelan government utilises the nation's natural resources efficiently.
60.00%
40.00%
20.00%
0.00%
3.45%
4.31%
12.07%
32.76%
47.41%
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
Responses


Ven.6 The government handles the nation's budgetary problems effectively.
60.00%
40.00%
20.00%
0.00%
2.59%
3.45%
15.52%
23.28%
55.17%
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
Responses



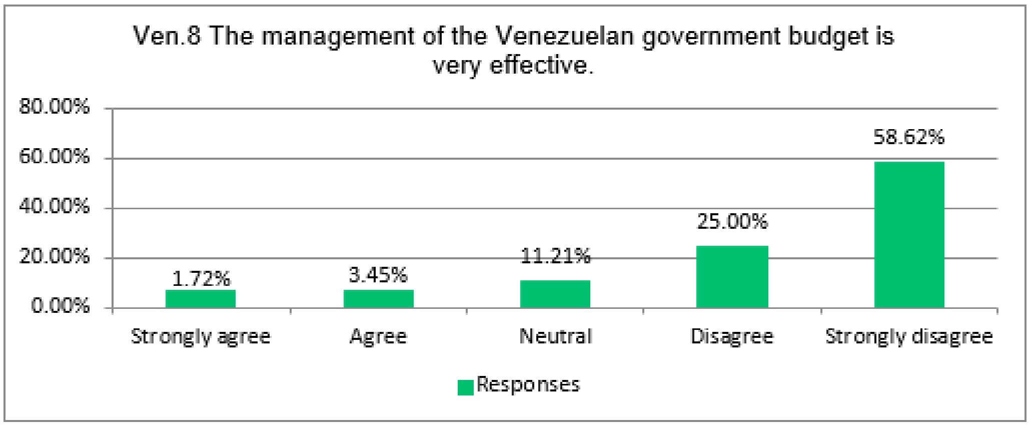
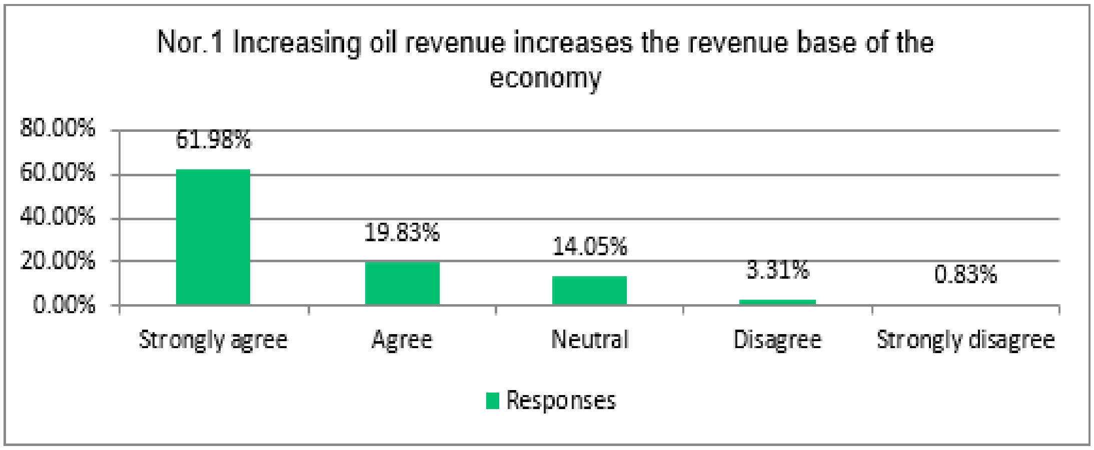



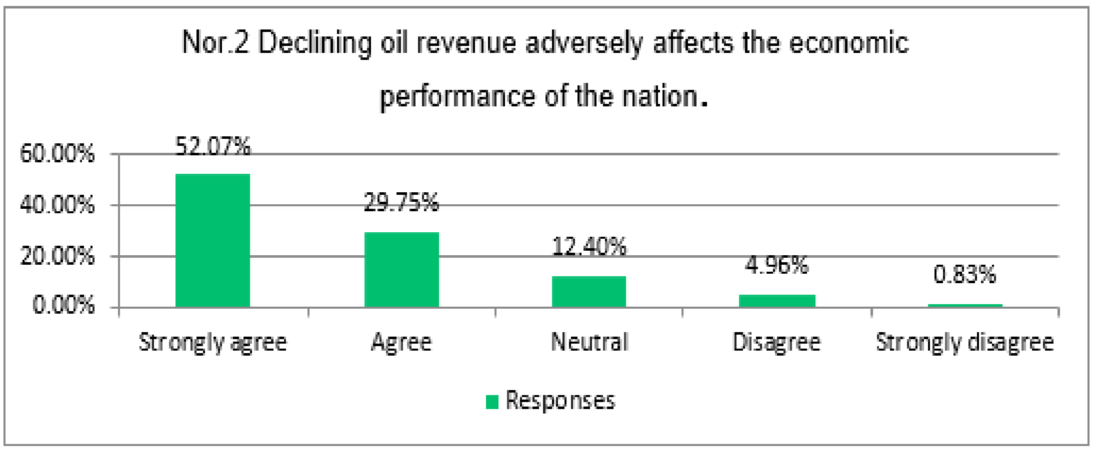

***Table 5. 9: Summary of graphs for Venezuela***

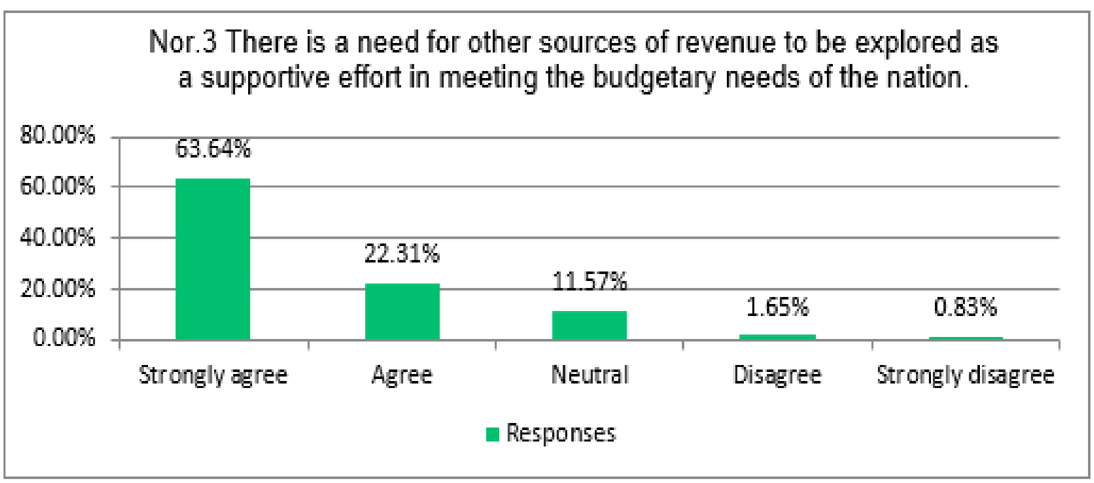
| QUESTION | STRONGLY AGREE (SA) | AGREE (A) | NEUTRAL (N) | DISAGREE (D) | STRONGLY DISAGREE (SD) | TOTAL 100% |
|---|---|---|---|---|---|---|
| 1 | 57.76 | 25.86 | 10.34 | 6.03 | 0 | 100 |
| 2 | 64.66 | 20.69 | 11.21 | 2.59 | 0.86 | 100 |
| 3 | 57.76 | 25.86 | 12.07 | 2.59 | 1.72 | 100 |
| 4 | 5.17 | 8.62 | 17.24 | 35.34 | 33.62 | 100 |
| 5 | 3.45 | 4.31 | 12.07 | 32.76 | 47.41 | 100 |
| 6 | 2.59 | 3.45 | 15.52 | 23.28 | 55.17 | 100 |
| 7 | 2.59 | 12.07 | 18.97 | 51.72 | 14.66 | 100 |
| 8 | 1.72 | 3.45 | 11.21 | 25 | 58.62 | 100 |

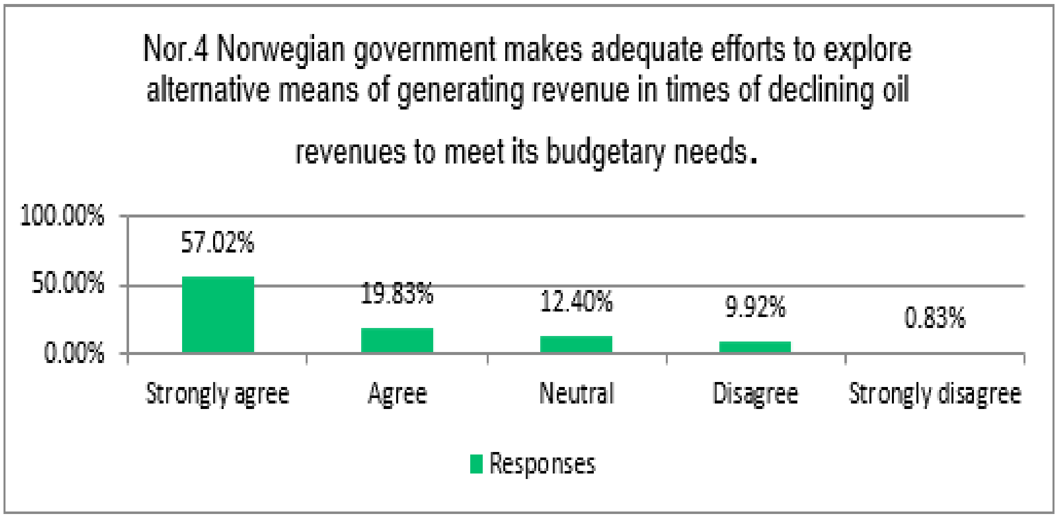
Source: Author's design from plotted graphs

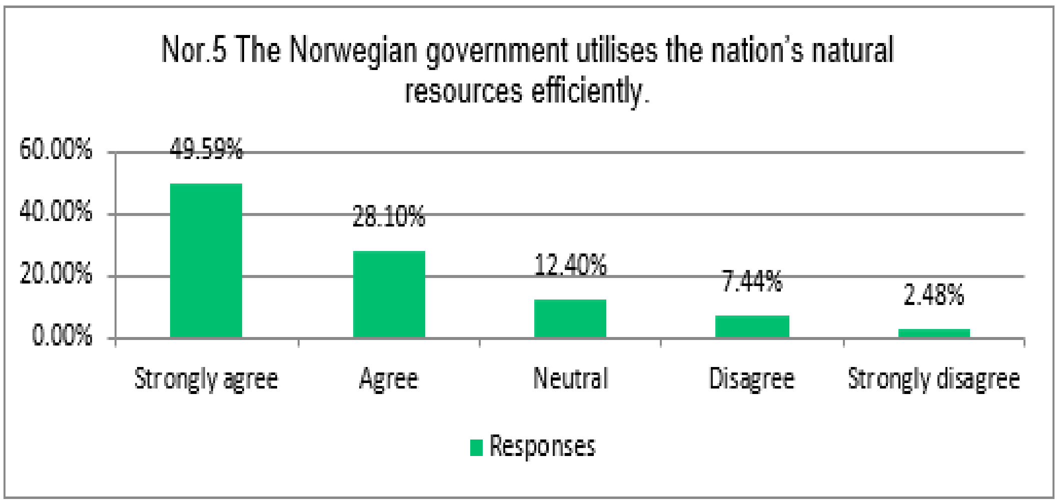
*Figure 5. 13: Graphs for Norway*

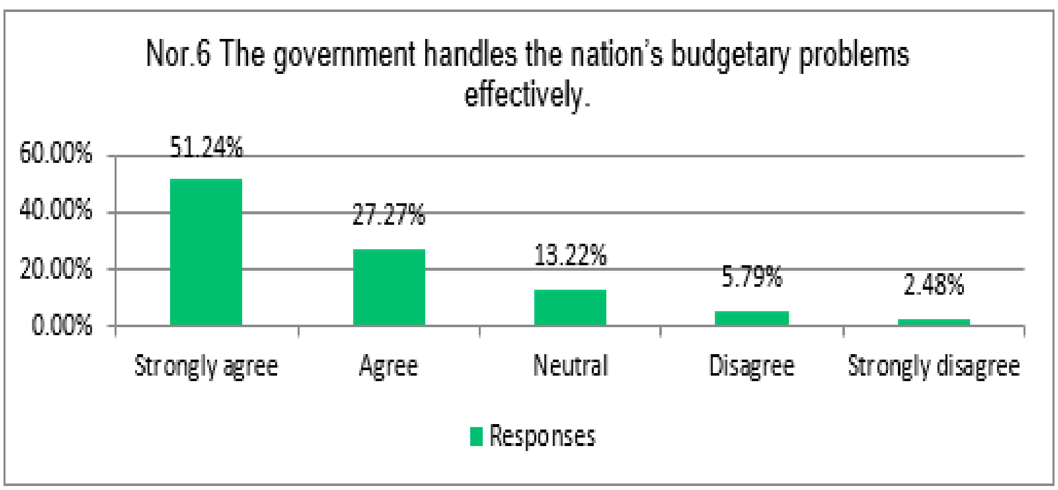


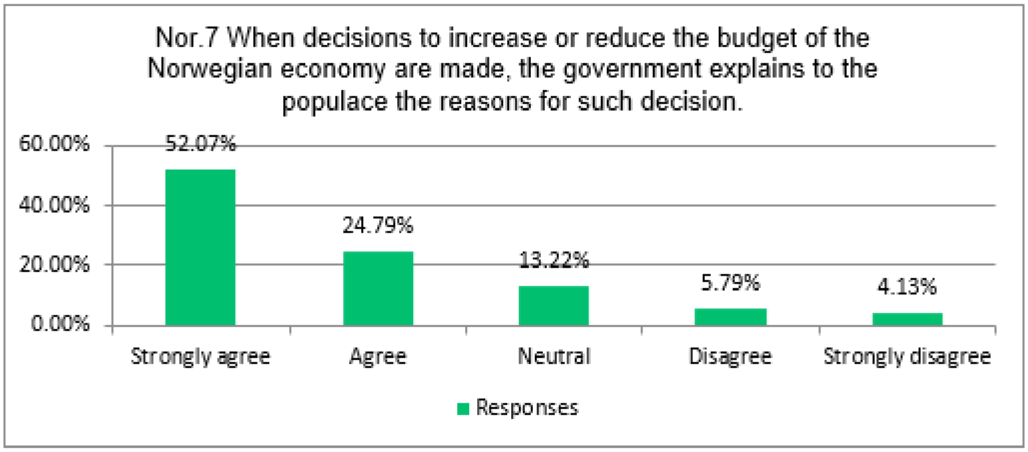




Nor.4 Norwegian government makes adequate efforts to explore alternative means of generating revenue in times of declining oil revenues to meet its budgetary needs.
100.00%
50.00%
0.00%
57.02%
19.83%
12.40%
9.92%
0.83%
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
Responses


Nor.5 The Norwegian government utilises the nation's natural resources efficiently.
60.00%
40.00%
20.00%
0.00%
49.59%
28.10%
12.40%
7.44%
2.48%
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
Responses


Nor.6 The government handles the nation's budgetary problems effectively.
60.00%
40.00%
20.00%
0.00%
51.24%
27.27%
13.22%
5.79%
2.48%
Strongly agree
Agree
Neutral
Disagree
Strongly disagree
Responses



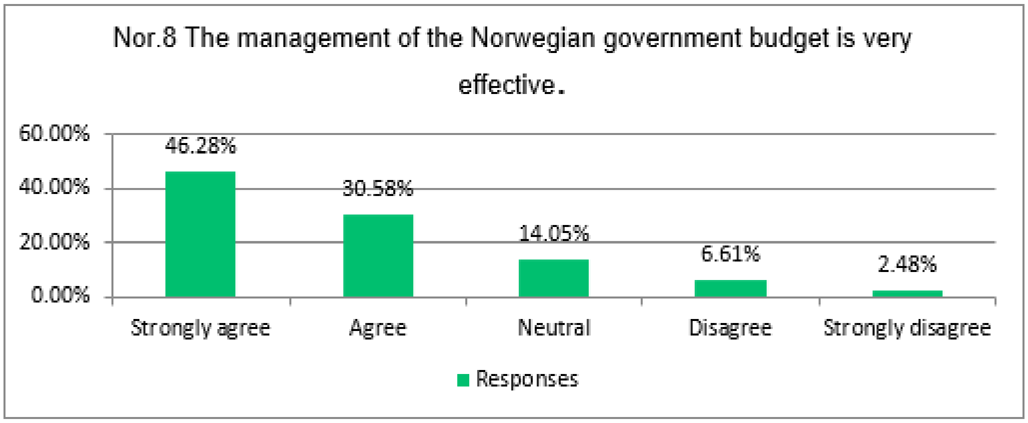




***Table 5. 10: Summary of graphs for Norway***

| QUESTION | STRONGLY AGREE (SA) | AGREE (A) | NEUTRAL (N) | DISAGREE (D) | STRONGLY DISAGREE (SD) | TOTAL 100% |
|---|---|---|---|---|---|---|
| 1 | 61.98 | 19.83 | 14.05 | 3.31 | 0.83 | 100 |
| 2 | 52.07 | 29.73 | 12.4 | 4.96 | 0.83 | 100 |
| 3 | 63.64 | 22.31 | 11.57 | 1.65 | 0.83 | 100 |
| 4 | 57.02 | 19.83 | 12.4 | 9.92 | 0.83 | 100 |
| 5 | 49.59 | 28.1 | 12.4 | 7.44 | 2.48 | 100 |
| 6 | 51.24 | 27.27 | 13.22 | 5.79 | 2.48 | 100 |
| 7 | 52.07 | 24.79 | 13.22 | 5.79 | 4.13 | 100 |
| 8 | 46.28 | 30.58 | 14.05 | 6.61 | 2.48 | 100 |

The next section, however, presents the analyses of the two open-ended questions of the study.

## 5.5 Open-Ended Questions and the Dominant Responses

The survey questions contain eight closed-ended questions and two open-ended questions. The preceding section presents all the results and graphs from the closed-ended questions, while in this section, the outcome for the open-ended questions is presented. Nonetheless, from the gap identified through the various literature reviewed, the primary data, in general, are gathered in order to provide answers to the research question that has been raised and also to fill the identified gaps. It also aims at supplementing the findings obtained from the secondary data analyses.

Unlike the data gathered from the closed-ended questions, the nature and the structure of all the information gathered from the open-ended questions do not require any form of transformation because they are straight-forward answers, which greatly represents the opinions of the respondents. For each of the responses from the three economies, the dominant responses were selected from which conclusions were drawn. The confidentiality and the anonymity of all the respondents are highly conserved. Below are the two questions and the corresponding dominant responses for Nigeria, Venezuela and Norway.

*Table 5. 11: Dominant Responses from the respondents in Nigerian*

| **Question 9:** How does Nigeria attain its budgetary needs during the periods of declining oil revenues? | Frequency | (%) | **Question 10:** What does the Nigerian government need to do to improve its revenue base and budgetary performance in times of declining oil revenue? | Frequency | (%) |
|---|---|---|---|---|---|
| **Responses** | | | **Responses** | | |
| "Internal and external borrowing." | 48 | 34.8 | "Diversification and good governance." | 51 | 37.0 |
| "Dependence on foreign aid." | 28 | 20.3 | "Restore security and fight insecurity problems." | 23 | 16.7 |
| "Cutting civil servants' salaries to percentages" | 23 | 16.7 | "Develop the agricultural sector" | 21 | 15.2 |
| "Relying on money recovered from looters" | 21 | 15.2 | "Improvement of the other sectors." | 20 | 14.5 |
| "External loans from IMF, Paris club etc." | 10 | 7.2 | "Efficient Resource Management and effective utilization of government funds." | 18 | 13.0 |
| Others | 8 | 5.8 | Others | 5 | 3.6 |
| Total | 138 | 100% | Total | 138 | 100% |

Source: Author's design from questionnaire responses

*Table 5. 12: Dominant Responses from the respondents in Venezuela*

| **Question 9:** How does Venezuela attain its budgetary needs during the periods of declining oil revenues? | Frequency | **(%)** | **Question 10:** What does the Venezuelan government need to do to improve its revenue base and budgetary performance in times of declining oil revenue? | Frequency | **(%)** |
|---|---|---|---|---|---|
| **Responses** | | | **Responses** | | |
| "Borrowing and seigniorage." | 47 | 40.5 | "Diversify the economy and reduce over-reliance on oil." | 51 | 44.0 |
| "The government borrow to finance their deficits." | 21 | 18.1 | "Investment in other sectors." | 18 | 15.5 |
| "Dependence on foreign aid." | 18 | 15.5 | "Reduce over-reliance on oil." | 15 | 12.9 |
| "Loans from both internal and external sources." | 15 | 12.9 | "Development of human capacity and wealth creation." | 13 | 11.2 |
| "Borrowing from reserves." | 10 | 8.6 | "Avoid wrong administrative decisions." | 12 | 10.3 |
| Others | 5 | 4.3 | Others | 7 | 6.0 |
| Total | 116 | 100% | Total | 116 | 100% |

Source: Author's design from questionnaire responses

*Table 5. 13: Dominant Responses from the respondents in Norway*

| **Question 9:** How does Norway attain its budgetary needs during the periods of declining oil revenues? | Frequency | **(%)** | **Question 10:** What does the Norwegian government need to do to improve its revenue base and budgetary performance in times of declining oil revenue? | Frequency | **(%)** |
|---|---|---|---|---|---|
| **Responses** | | | **Responses** | | |
| "Sovereign Wealth Fund where oil revenue excess is kept for future use." | 50 | 41.3 | "Continue to diversify the revenue base of the economy." | 48 | 40.0 |
| "The Pension Fund is used." | 19 | 15.7 | "Adjustment of the policy to suit the current situation and continue with their good governance" | 20 | 16.5 |
| "Reserves of the economy." | 17 | 14.0 | "More investment in the economy because the economy is already doing well." | 18 | 14.9 |
| "From the countries reserves." | 16 | 13.2 | "Income tax reduction to encourage foreign investment." | 16 | 13.2 |
| "Oil reserves." | 12 | 10.0 | "Continue to explore other sectors of the economy especially the gas sector" | 11 | 9.1 |
| Others | 7 | 5.8 | Others | 8 | 6.6 |
| Total | 121 | 100% | Total | 121 | 100% |

Source: Author's design from questionnaire responses

### 5.6 Chapter Summary

This chapter is concerned with the presentation of data, the descriptive statistics of the data, the analyses of both the primary and secondary data, the diagnostic tests and other statistical tests carried out during the analyses.

Specifically, section 5.1 is the introduction, while section 5.2 presents the secondary data and the sources of data for each of the oil-exporting countries under study. Mainly all the secondary data were sourced from the World Bank, National Bureau of Statistics, and Central Bank of Nigeria, Banco Central De Venezuela, National Institute of Statistics, Venezuela, Statistics Norway, the ministry of finance and the budget offices of the three economies. The period of coverage is for thirty-six years (1981 to 2016). The Autoregressive Distributed Lag (ARDL) Model is employed for the analyses of the secondary data while SPSS was used for the primary data analyses.

All the descriptive statistics of the data were presented and discussed in section 5.2, while the secondary data analyses, presented in section 5.3. Modern developments in econometrics have shown that most macroeconomic variables are not stationary as different time series often exhibit different features over time and as such all the macroeconomic variables of the models for each of the countries were tested, using Augmented Dickey-Fuller test – ADF and Phillips–Perron PP test. Our results reveal that that government expenditure (AEXP), government revenue (AREV), exchange rate (EXCR), external reserves (EXTR), gross domestic product (GDP), oil price (OILP) unemployment rate (UEMR) are stationary at first difference, while the inflation rate is stationary at level. All the underlying assumptions and estimation of the ARDL model were also outlined in this section. One of the major criteria being that all the variables are integrated of both order I(0) and I(1). More so, this section also presents all the diagnostic tests which reveal that the models are structurally and dynamically stable, free of both serial correlation and heteroscedasticity. The results also reveal that the data are normally distributed.

Section 5.4 presents all the statistical analyses of the primary data, while the open-ended questions and dominant responses are presented in section 5.5. The primary data were sourced using questionnaires, which are made up of both closed-ended and open-ended questions. The primary data analyses were carried out using SPSS 25 statistical package. While section 5.6 summarises the chapter.

All the discussions of findings from both the secondary and primary data analyses are presented in the subsequent chapter six.

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# CHAPTER SIX

## DISCUSSION OF FINDINGS AND THE COMPARATIVE RESULTS

# CHAPTER SIX

# 6.0 Discussion of Findings and the Comparative Results

## 6.1 Introduction

The previous chapter entails the presentation of the data, the descriptive statistics of the data, the diagnostic tests and other statistical tests carried out in the course of the analyses of both the primary and secondary data.

This chapter elucidates the discussion of findings from both the primary and secondary data analyses. The chapter also presents and discusses the comparative tables and finally summarises and concludes the results. With the results obtained, decisions were taken to either reject the null hypotheses or not. Given the fact that the primary data analyses in this study are mainly aimed at supplementing the results of the secondary data analyses, the discussion of the secondary data analyses would always be presented before the primary data analyses for each of the countries under examination. The next section deals with the discussion of findings from the secondary data analyses.

## 6.2 Discussion of findings (Secondary Data Analyses)

This section presents the discussion of all the secondary data analyses carried out in this study comprising of the cointegration results, all the diagnostic test results, the long-run and the short-run results, respectively.

### 6.2.1 Cointegration Test Results and Discussion

In order to examine the long-run relationship among the variables, in each model, this study employed the Pesaran et al. (2001) ARDL bound test approach to cointegration.

Unlike other methods of estimating cointegrating relationships, the ARDL bound test approach to co-integration does not require all variables to be I(1), hence the variables in the cointegrating relationship can be either stationary at level I(0) or first difference I(1) or a combination of both I(0) and I(1).

Table 6.1 reports the results of the ARDL bound test approach to cointegration for each model, in the case of Nigeria. From the table, the high F-statistics value of 13.424 in Model 1 (government expenditure); 3.959 in Model 2 (government revenue); 7.068 in Model 4 (external reserve) and 7.262 in model 5 (inflation) reject the null hypothesis that the series in each model are not cointegrated. This implies that the series in each model have a long-run relationship, and the short-run model in each equation is valid. Model 3 (GDP) and Model 6 relates mainly with the unemployment; the relatively small and insignificant F-statistics values of 1.791 and 1.922 accept the null hypothesis that the series in both models are not cointegrated. However, this suggests that there is no long-run relationship among the series in the GDP and unemployment models.

*Table 6. 1: ARDL bound testing approach to co-integration (Nigeria)*

| Dependent Variable | F-statistics | Intercept | Trend | Lower Bounds (at 90%) | Upper Bound (at 90%) | Decision |
|---|---|---|---|---|---|---|
| AEXP | 13.424 | Yes | No | 2.03 | 3.13 | Cointegrated |
| AREV | 3.959 | Yes | Yes | 2.38 | 3.45 | Cointegrated |
| GDP | 1.791 | Yes | No | 2.03 | 3.13 | Not-cointegrated |
| EXTR | 7.068 | Yes | No | 2.03 | 3.13 | Cointegrated |
| INFR | 7.262 | Yes | No | 2.03 | 3.13 | Cointegrated |
| UEMR | 1.922 | Yes | No | 1.92 | 2.89 | Not-cointegrated |

**Source: Author's Computation using E-Views 10.0**

In the case of Venezuela, the ARDL bound test cointegration result is presented in Table 6.2. As depicted in the table, the significant F-statistics value of 18.645 in the government expenditure model, 7.369 in the government revenue model, 24.692 in the GDP model, 9.052 in the external reserves model, 7.086 in the inflation model and 7.534 in the unemployment model reject the null hypothesis that the series in each model are not cointegrated**.** This implies that the series are cointegrated, and there is a long-run relationship among the series in each model.

*Table 6. 2: ARDL bound testing approach to co-integration (Venezuela)*

| Dependent Variable | F-statistics | Intercept | Trend | Lower Bounds (at 90%) | Upper Bound (at 90%) | Decision |
|---|---|---|---|---|---|---|
| AEXP | 18.645 | Yes | No | 2.03 | 3.13 | Cointegrated |
| AREV | 7.369 | Yes | No | 2.03 | 3.13 | Cointegrated |
| GDP | 24.692 | Yes | No | 2.38 | 3.45 | Cointegrated |
| EXTR | 9.052 | Yes | No | 2.03 | 3.13 | Cointegrated |
| INFR | 7.086 | Yes | No | 1.99 | 2.94 | Cointegrated |
| UEMR | 7.534 | Yes | No | 2.22 | 3.17 | Cointegrated |

**Source: Author's Computation using E-Views 10.0**

In the case of Norway, the ARDL bound test approach to cointegration for each model is presented in Table 6.3 As depicted in the table, the significant F-statistics value of 20.856 in Model 2 (government revenue); 19.104 in Model 3 (GDP); 3.651 in Model 4 (external reserve); 8.273 in Model 5 (inflation) and 7.596 in Model 6 (unemployment) reject the null hypothesis that the series in each model are not cointegrated. This suggests that there is a valid relationship among the series in the long-run, as well as in the short-run. On the other hand, the insignificant F-statistics statistic value of 3.285 in the government expenditure model accepts the null hypothesis that the series in the model are not cointegrated. This implies that there is no long-run relationship among the series in the AEXP model.

*Table 6. 3: ARDL bound testing approach to co-integration (Norway)*

| Dependent Variable | F-statistics | Intercept | Trend | Lower Bounds (at 90%) | Upper Bound (at 90%) | Decision |
|---|---|---|---|---|---|---|
| AEXP | 3.285 | Yes | Yes | 2.38 | 3.45 | Not-cointegrated |
| AREV | 20.856 | Yes | No | 2.3 | 3.606 | Cointegrated |
| GDP | 19.104 | Yes | Yes | 2.72 | 3.45 | Cointegrated |
| EXTR | 3.651 | Yes | Yes | 2.38 | 3.45 | Cointegrated |
| INFR | 8.273 | Yes | No | 2.03 | 3.13 | Cointegrated |
| UEMR | 7.596 | Yes | No | 2.03 | 3.13 | Cointegrated |

**Source: Author's Computation using E-Views 10.0**

### 6.2.2 ARDL Model Results and Discussion

This subsection presents the discussion part of the thesis which reports the impact of declining oil price on key macroeconomic variables in three oil-exporting economies: Nigeria, Venezuela and Norway. The regression diagnostics and results are presented in this section too. Specifically, the section contains the short-run and long-run regression results, which report the impact of declining oil price on key macroeconomic variables. It also shows the determinants of some key macroeconomic variables in these oil-producing economies.

#### 6.2.2.1 The Impact of declining oil revenue on key macroeconomic indicators in Nigeria

The long-run analyses of the impact of declining oil price on government expenditure, revenue, economic growth, external reserves, inflation and unemployment in Nigeria are presented in Table 6.4. As depicted in the table; the oil price fluctuation has a significant negative impact on government expenditure and positive impact on external reserves in the long-run.

The expenditure model (panel 1) reports a significant adjusted R-square value of 0.799 which implies that the explanatory variables account for about 79.9 per cent variation in government expenditure, after controlling for the number of parameters in the model. The significant F-statistics shows that the explanatory variables are jointly statistically significant in influencing government expenditure. The diagnostics results, as presented in Table 6.5, reveals that the error of the expenditure model is normally distributed; there is no heteroskedasticity and free of serial correlation. As depicted in the table, the primary drivers of government expenditure in the long-run are oil price, government revenue, economic growth and exchange rate. Oil price fluctuation has a negative impact on government expenditure in the long run. A percentage increase in oil price will result in 0.772 per cent decline in government expenditure in Nigeria. Therefore, this suggests that dwindling oil price will reduce government spending in the long-run.

This is highly consistent with the studies of Al-Zeaud, (2015); Saeed and Somaye, (2012); which posits that growth in an economy would stimulate through the reduction of the fiscal deficits, i.e. by cutting down government expenditures and increasing revenues. The negative impact of oil price on government spending could be connected to the weak institutions and high rate of corruption in Nigeria. The recently published national corruption survey, National Bureau of Statistics, (2017) shows that the prevalence of bribery in the public sector significantly stood at 32.3 per cent in 2017. The economy experienced a steep decline in oil production resulting from consistent militant attacks. Even though the price of oil increases, the decline in oil production will lead to lower oil revenue and spending too. Government revenue and economic growth have a positive impact on government expenditure, while the exchange rate has an adverse effect on government expenditure. Therefore, a percentage increase in government revenue will increase government spending more proportionally, by 1.065 per cent in the long-run. This suggests that government expenditure in Nigeria is more responsive to changes in government revenue. The positive effect of government revenue on expenditure is reasonable, given that the government finances its expenditure with revenue generated from both oil and non-oil. Although, the revenue from the oil sector outweighs those of the non-oil sector due to the nations over-reliance on oil for over 98% of its exports (Arndt et al., 2018; Abubakar et al., 2016; Joshua et al., 2016; Brock and Cocks 2012; Ross, 2003). The result validates the Friedman (1978) revenue-spend hypothesis, which states that increasing the resources available to the government will only lead to increases in government expenditures. This is also highly consistent with the study of Chang, (2009) which found that increasing revenue leads to increased expenditure, which would, in turn, result in the inability of reducing the budget deficit gap. The validity of the revenue-spend hypothesis suggests that budget deficits can be avoided by implementing policies that stimulate government revenue. The positive impact of revenue on spending is consistent with the findings of Adedokun (2018); Mupimpila et al., (2015); Muhammad et al., (2012); Omo and Taofik (2012); Saeed and Somaye (2012); Al-Khulaifi, (2012); Mohsen et al., (2012); Owoye and Onafowora, (2011); Keho, (2010); Wang and Fasano-Filho (2002); Eita and Mbazima (2008).

Likewise, economic growth exerts a positive impact on government expenditure in the long-run. Government expenditure will increase by 0.784 per cent, given a per cent increase in economic growth. This implies that government expenditure responds to changes in economic growth in the long-run. The result is consistent with our expectation, and it validates the existence of Wagner's law, which posits that public expenditure rises continually as income growth expands. This validates both the exogenous and endogenous growth theories, which state that both internal and external factors are primarily responsible for the economic growth of any nation. Thus, there would be income growth in any nation through the importation and exportation of goods and services in the global market. For the oil-exporting countries, more revenue is possible through their interaction with other economies in the world's oil market. Hence, more revenues, which would in-turn stimulate growth in the economy, when it is wisely spent. The result confirms the findings of previous studies (Katrakilidis and Tsaliki, 2009). The exchange rate is negatively related to government expenditure. A one per cent depreciation in the exchange rate will reduce government expenditure by 0.289 per cent. This indicates that the exchange rate gains from depreciation will translate into increased spending in the long-run.

The revenue model is presented in Panel 2. The high adjusted R-square value of 0.918 implies that the explanatory variables jointly account for over 90 per cent variation in government revenue. The statistically significant F-statistics value implies that the explanatory variables are jointly statistically significant in the government revenue model.

The diagnostics results, as presented in Table 6.5, show that the error of the revenue model is normally distributed, free of heteroskedasticity and serial correlation. While the oil price has no significant direct influence on government revenue, government expenditure and unemployment are the major determinants of government revenue in the long-run. Government expenditure is positively associated with government revenue, while unemployment is negatively associated with government revenue. A percentage increase in government expenditure will result in 0.673 per cent increase in government revenue. This suggests that higher government spending will lead to more revenue. This is reasonable given that government spending on both capital and recurrent activities will increase taxable income, and this will, in turn, increase government revenue. However, this result supports the spend-revenue hypothesis, and it is in consonant with the literature and with the findings of Lukovic and Grbic, (2014); Kaya, (2013); Richter and Dimitrios, (2013); Saysombath and kyophilayong, (2013); Lusinyan and Thornton, (2012); Zafarullah and Haru, (2012); Eita and Mbazima (2008); Carneiro, (2005); Moalusi (2004) and Oshikoya and Tarawalie (2009). In line with expectation, the higher unemployment rate will lower government revenue. The lower revenue could be attributed to low consumer spending power resulting from the high unemployment rate in Nigeria. The result indicates that the high unemployment rate will reduce consumer income, lower taxable income, as well as government revenue in the long-run.

Panel 3 presents the influence of declining oil price and other macroeconomic indicators on economic growth. The adjusted R-square statistics value of 0.433 shows that the explanatory variables can only account for 43.3 per cent variation in growth. The significant F-statistic value of 14.00 indicates that independent variables are jointly statistically significant. The error term in the GDP model is normally distributed, free of heteroskedasticity and free of serial correlation, as reported in the diagnostic result (see Table 6.5). The result shows that government revenue, expenditure, oil price, external reserves, inflation, unemployment and exchange rate are not significant drivers of economic growth in the long-run. Specifically, the results reveal there is the positive and insignificant effect of oil price fluctuation on growth in Nigeria, both in the long-run and short run. Hence, we cannot reject the null hypothesis ($H_{07}$) which states: there is no effect of declining oil price on the economic growth of Nigeria.

The above result is in line with the previous studies in the literature which reveal that the interaction between oil price fluctuation and economic growth is not proven in most of the oil-exporting countries but only proven for the G-7 group (Ghalayini, 2011). Consistently, Gonzalez, (2009) maintain that changes in oil prices dampen growth in most oil-exporting countries through different channels while Auzer, (2017) and Hammon (2011) reveal that the increased political control over companies in Angola and Venezuela encourages corruption in those nations which hampers growth. The studies also reveal that the negative and insignificant effect of oil revenue on growth in Nigeria is due to inefficiency in domestic investments and low-quality projects as such, Nigeria is now one of the most cited examples of a corrupted nation with regards to oil revenues.

This result could also be as a result of the “Resource Curse Syndrome” and “Dutch Disease (economic dimension of resource curse)” whereby most economies which are abundantly blessed with natural resources usually experience low economic growth more than those of them with fewer natural resources (Auzer, 2017; Auty, 1993; Cordon and

Neary, 1982). Although, the success stories of Norway and Botswana that are also blessed abundantly with natural resources have shown that natural resource abundance is not always a curse as observed in other countries with the more natural resource (Auzer, 2017). The case of Nigeria is mainly due to mismanagement of the petroleum resources by those in authority, high level of corruption, negligence of the agricultural sector and other non-oil sectors of the economy, which in-turn adversely reflect in the economic activities of the nation. This is highly consistent with the studies of Okonkwo et al., (2016); Madujibeya, (2014) and Holden, (2011) which maintain that economic growth in Nigeria has been highly insignificant despite the abundance of crude oil and its high oil revenue. The results further reveal that there is no direct causal relationship between declining oil price and economic growth in Nigeria; which is consistent with the cointegration results, the long run and the short-run results. However, the declining oil price has an indirect effect on the economic growth in the long run through the exchange rate depreciation, as shown in table 6.4. From the result, one per cent increase in exchange rate depreciation will lead to 0.219 per cent decrease in the economic growth of the Nigerian economy in the long run. This result is consistent with the finding of Razzaque et al. (2017), on the exchange rate and economic growth in Bangladesh. The study reveals that in the short-run, the real exchange rate depreciation led to a half per cent decline in economic growth.

Although, exchange rate depreciation is supposed to boost economic growth instead due to the fact that the exchange rate makes export cheaper which would enable the oil-exporting countries to export more goods (Oil exports), and this would, in turn, increase the revenue base thereby improving the economic activities of the nation, hence, increase in economic growth (Pettinger, 2017). The reasons for the contrary outcome in the case of the Nigerian economy could probably be due to poor management systems inherent in the economy was supported by the views of Holden, (2011); (Okonjo-Iweala and Osafo-Kwaako, 2007) which reveal that most economies that are abundantly blessed with natural resources have been detrimental to economic development. The studies also reveal that despite all the windfall from oil, the Nigerian economy has continued to experience stagnation and increasing poverty. However, our result is also highly consistent with the findings of Abubakar et al., (2016) who found a highly insignificant relationship between oil revenue impact and key economic sectors in Nigeria.

The result of the impact of declining oil price and key macroeconomic indicators on the external reserve is Panel 4. The high adjusted R-square value of 0.725 indicate that the explanatory variables explain over 72 per cent variation in external reserves, while the significant F-statistics suggest that the explanatory variables are jointly significant in explaining changes in external reserves. In addition, the diagnostic results, reported in Table 6.5, indicate that the error term in the external reserve model is normally distributed, free of heteroskedasticity and serial correlation. The result shows a positive impact of oil price on external reserves and a negative impact of inflation on external reserves in the long-run. Specifically, a percentage increase (or decrease) in oil price will result in 0.532 per cent increase (or decrease) in external reserves in Nigeria. However, the result is line with both the endogenous and exogenous growth theories which maintain that economic growth originates from both inside and outside a system; this is often exhibited through the interaction of the economy (through the importation and exportation of goods and services) with other nations in the global oil market. As more revenue is generated through the exportation of crude oil, it leads to high external reserves as well. The positive effect of oil price on external reserve is consistent with our expectation and also confirms the findings of previous studies Nwachukwu et al. (2016). This is reasonable given that Nigeria is an oil-exporting country and oil revenue account for over 90 per cent of its foreign exchange earnings (Nwachukwu et al., 2016).

On the other hand, a higher inflation rate will reduce external reserve. A percentage increase in the inflation rate will cause an external reserve to decrease marginally by 0.015 per cent. The negative impact of inflation on external reserves suggests that periods of rising consumer prices correspond with reduced external reserves. However, exchange rate depreciation will lead to an increase in foreign reserves in Nigeria. Specifically, foreign reserves will increase by 0.298 per cent for every one per cent depreciation of the Naira. This is because crude oil exports would be relatively cheaper, thereby attracting more markets, leading to higher revenue and hence, higher external reserves.

Panel 5 presents the impact of declining oil price and key macroeconomic indicators on inflation rate in Nigeria. The adjusted R-square statistic is high at 0.687, suggesting that the independent variables account for 68.7 per cent variation in inflation, while the significant F-statistics value of 38.300 suggests that the explanatory variables are jointly significant in influencing inflation in the long-run. Other diagnostic results, as shown in Table 6.5, show that the error term in the inflation model is normally distributed, free of heteroskedasticity and serial correlation. As depicted in the table, external reserves and exchange rate are the key determinants of inflation in Nigeria. However, while external reserves tend to decrease the inflation rate, exchange rate depreciation will lead to a higher inflation rate. In particular, a one per cent exchange rate depreciation will result to 7.61 per cent rise in inflation rate because there would be more money in the economy due to more exportation of goods and services to other countries brought about by relative cheaper oil prices. However, exchange rate depreciation will lead to higher import prices and lower export prices, which will attract more markets; hence, more money in circulation.

Given that the Nigerian economy is an oil-exporting country, lower export prices of crude due to exchange rate depreciation will result in higher inflation in the economy as revealed from the result. Given the above result, we can, therefore, reject the null hypothesis ($H_{013}$) which states: there is no impact of oil price fluctuation on the inflation rate in Nigeria.

This result is consistent with the findings of Pettinger, (2017); Bada et al., (2016); Monetary Policy Report, (2016); Imimole and Enoma, (2011). However, it is also consistent with the findings of Farzanegan and Markwardt (2009); they employed the VAR framework for the Iranian economy to analyse the dynamic relationship between oil price fluctuations and macroeconomic variables. Their result indicates that both positive and negative oil shocks increase inflation. More so, a percentage increase in external reserves would reduce the inflation rate by 31.586% in the long run. As such, the Nigerian economy should aim at policy measures that would help in building up the foreign reserves, which would, in turn, keep lower the inflation rate. In addition, government revenue, expenditure, oil price, external reserves, economic growth, inflation and exchange rate are not significant determinants of the unemployment rate in Nigeria, as depicted in Panel 6.

### *Table 6. 4: Long run regression estimates of the impact of declining oil price on key macroeconomic indicators in Nigeria*

| | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOG(AREV) | 1.065***(0.216) | | -0.175(0.324) | -0.024(0.321) | -1.67(14.107) | 4.482(8.779) | 0.917***(0.259) | | 0.181(0.148) | -0.082(0.301) | 7.449(11.79) | 0.705(5.833) |
| LOG(AEXP) | | 0.673***(0.187) | 0.127(0.285) | 0.288(0.29) | -4.037(12.827) | -3.401(6.952) | | 0.566**(0.204) | -0.236(0.163) | 0.624*(0.335) | -11.846(12.179) | -0.907(5.585) |
| LOG(OILP) | -0.772***(0.23) | 0.148(0.252) | 0.38(0.227) | 0.532*(0.307) | 9.595(13.531) | 5.374(6.075) | | | | | | |
| LOG(GDP) | 0.784**(0.368) | 0.232(0.74) | | 0.473(0.469) | 30.954(23.688) | | -0.369(0.506) | 0.106(0.358) | | 2.366***(0.739) | 42.937**(17.886) | -7.125(8.376) |
| LOG(EXTR) | 0.282(0.2) | 0.016(0.144) | 0.126(0.209) | | -31.514***(7.775) | 2.329(3.932) | 0.328(0.267) | 0.185(0.197) | 0.161(0.105) | | -31.586***(8.182) | 4.924(4.245) |
| INFR | 0.009(0.006) | -0.001(0.004) | 0.001(0.005) | -0.015***(0.004) | | 0.007(0.106) | 0.01(0.008) | 0.002(0.005) | 0.003(0.003) | -0.015***(0.004) | | -0.01(0.11) |
| UEMR | -0.007(0.016) | -0.027*(0.015) | 0.003(0.018) | 0.021(0.015) | 0.005(0.771) | | -0.028(0.02) | -0.007(0.018) | 0.005(0.009) | 0.024(0.016) | 0.198(0.79) | |
| LOG(EXCR) | -0.289***(0.078) | 0.195(0.195) | 0.144(0.096) | 0.298***(0.086) | 9.553**(4.263) | 1.967(2.225) | -0.122(0.087) | 0.006(0.079) | -0.219**(0.08) | 0.598**(0.235) | 7.61**(3.081) | 0.595(1.666) |
| Oil dummy | No | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |

### *Table 6. 5: Diagnostic test results for Nigeria*

| Diagnostics | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normality test, JB- test | 1.123(0.570) | 2.289(0.318) | 65.936(0.000) | 1.140(0.566) | 0.375(0.829) | 3.315(0.191) | 1.232(0.540) | 1.132(0.568) | 26.094(0.000) | 1.844(0.398) | 0.221(0.895) | 11.309(0.004) |
| Heteroskedasticity | 1.359(0.252) | 0.116(0.736) | 0.052(0.821) | 0.230(0.635) | 2.615(0.116) | 0.011(0.917) | 2.525(0.122) | 0.148(0.703) | 0.118(0.734) | 0.024(0.879) | 3.577(0.068) | 0.213(0.648) |
| Serial Correlation | 2.003(0.157) | 0.883(0.433) | 1.689(0.207) | 1.554(0.235) | 1.157(0.332) | 1.414(0.265) | 1.548(0.233) | 1.916(0.170) | 0.933(0.408) | 1.130(0.343) | 1.183(0.324) | 0.986(0.388) |

***, ** and *denote the significant level at 1%, 5% and 10% respectively

Source: Author's computation from ARDL analyses using E-views 10.0

The results of the short-run model are presented in Table 6.6 Panel 1 shows that impact of declining oil price and key macroeconomic indicators on government expenditure in the short-run. From the result, the speed of adjustment coefficient of -0.444 is negative, less than one (in the absolute term) and statistically significant. This suggests that the model converges to a steady-state long-run equilibrium. In the short-run, the declining in oil price significantly influence the changes in government expenditure. Precisely, in Nigeria, one per cent decline in oil price will increase government expenditure by 0.113 per cent in the short run. Also, from the long run results, the main determinant of government expenditures is government revenue. A one per cent increase in government revenue led 0.917 per cent increase in government expenditures, which supports the Revenue-Spend Hypothesis. Hence, we can reject the null hypothesis ($H_{04}$) in favour of the alternative hypothesis, which states: there is no impact of declining oil price on the actual expenditures of Nigeria.

However, this is contrary to our expectation because since Nigeria depends on oil revenue for more than 98 per cent of its export (Arndt et al., 2018; Abubakar et al., 2016; Joshua et al., 2016; Brock and Cocks 2012; Ross, 2003); it is expected that as oil price declines, oil revenue would in-turn decline which would also affect the government expenditures adversely. This contrary result of increasing government expenditure amid low oil price (oil revenue) could be as a result of many other factors. First, the Nigerian government tends to finance its budget deficits through borrowing from both internal and external sources and secondly, through the recovered loots. Paiko, (2012) revealed that the nation tries to finance its budget deficits by borrowing from the commercial banks, non-banking public, by issuing of short-term bonds and monetary instruments, which affects the economy negatively. Consistent with the above is the studies of Nwoba et al., (2017) who maintain that Nigeria finances its budget deficits from recovered loot and as such tend increasing its expenditures amidst declining oil price.

From the preceding, deficit financing through borrowing encourage more government spending as our findings revealed and this also exerts a negative impact on the economy by crowding out the private investments and increasing the external debt burden due to debt servicing. Our finding is also consistent with the study of Nwaeke and Korgbeelo, (2016) who revealed different sources of financing budget deficits in Nigeria. The study identified external loans, Domestic Banking System and Non-Bank Public as the major sources of financing budget deficits in Nigeria.  However, it leads to higher government spending and has an insignificant negative effect on economic growth.

The short-run effect of declining oil price and key macroeconomic indicators on government revenue is presented in Panel 2. The significant speed of adjustment coefficient of -0.699 suggests that the model quickly adjusts to long-run equilibrium. The key drivers of government revenue in the short-run are oil price, government expenditure and exchange rate. In line with our expectation, oil price exerts a significant impact on government revenue in the short-run. While a percentage increase in oil price will result to 0.804 per cent increase in government revenue, a similar increase in one period lag of oil price will increase government revenue by 0.359 per cent in the short-run. This implies that one period lag of oil price will exert a lesser impact on government revenue in the short-run. The positive effect of oil price on government revenue is not surprising, as oil

& gas revenue constitute a major share of government revenue in Nigeria. The positive impact of oil price on government revenue is highly consistent with the literature and with previous studies, such as (Adedokun, 2018; Eltony and Al-Awadi, 2001; Lorde et al., 2009).

In addition, the result shows that substantial oil price decline is associated with declining government revenue in the short-run. In particular, oil revenue will drop by 0.292 per cent for every substantial decline in oil price. This shows that negative oil shocks negatively lower government revenue. Also, one percent increase in government expenditures will increase the government revenues by 0.566 per cent in the long-run which validates the Spend-Revenue Hypothesis. Hence, we, therefore, can reject the null hypothesis ($H_{01}$) as against the alternative hypothesis which states: there is no effect of declining oil price on the actual revenues of Nigeria

This is reasonable and highly consistent with our expectation, given that oil revenue, which is a major component of government revenue, is determined by changes in oil price as well as oil production. This is highly in consonance with the findings in the literature and highly consistent with the studies of Nwoba et al., (2017). Kitous et al., (2016); Yusuf, (2015). The studies reveal that the decrease in oil price has affected most of the oil-exporting countries adversely as it has reduced their revenue base adversely.

While current government expenditure will result in higher government revenues, it's one-period lag will significantly lower government revenue. This suggests that the current level of government expenditure is a key driver of government revenue and a percentage increase in current government expenditure will increase government revenue by 0.218

per cent in the short-run. This validates the spend-revenue hypothesis in the short-run, and it is consistent with the long-run result. The result is reasonable given that an increase in government expenditure will increase taxable income as well as government revenue. Conversely, the one-period lag value of government expenditure is negatively related to government revenue. One per cent increase in the one-period lag of government expenditure will reduce government revenue by 0.464 per cent in the short run. However, the result confirms Barro (1979) argument that increased government expenditures financed by borrowing will translate into higher future tax liability for the public.

The short-run regression result, which shows the impact of declining oil price and key macroeconomic indicators on economic growth, is presented in Panel 3. Although the speed of adjustment coefficient of 0.182 is negative, less than unity (in the absolute term) and statistically significant, the result of the ARDL bound cointegration test suggests that the variables in the growth model are not-cointegrated, hence the short-run result is not valid. This infers that the model does not adjust to equilibrium in the short run.

The impact of declining oil price and key macroeconomic indicators on external reserve is presented in Panel 4. As indicated in the table, the high speed of adjustment coefficient of 0.975 per cent suggests that the model adjusts quickly to equilibrium. The result shows that government expenditure and one period lag of external reserves are key drivers of the current level of external reserves. External reserves will respond positively to higher government expenditure in the short-run. One percent increase in government expenditure will lead to 0.71 per cent rise in external reserves. The positive association between government expenditure and external reserves could be linked to the increase in foreign investment resulting from higher capital expenditure on infrastructure. Also, an increase in the previous level of external reserves will result in 0.278 per cent rise in the current level of external reserves. This suggests that current external reserves are affected by the previous level of external reserves.

However, the high speed of adjustment coefficient of 0.894 per cent suggests that the model adjusts quickly to equilibrium. Nevertheless, in line with expectation, a significant decline in oil price will cause external reserves to shrink by 0.226 per cent in the short-run while it increases by 0.532 per cent in the long-run, for one per cent rise in oil price. It, therefore, shows that oil price and external reserves are directly proportional. At this juncture, we, therefore, can reject the null hypothesis ($H_{010}$) which states: there is no impact of declining oil price on Nigeria's external reserves.

The above outcome infers that the two variables (declining oil price and external reserves) are negatively correlated, and as such, government should try and focus on the policy measures which would help the economy to still generate more revenues even as oil price declines so as to help strengthen its reserves for the "rainy days". Additionally, it is because oil receipts, which is affected by oil price and output, constitute a major component of external reserves in Nigeria as oil revenue constitutes about 90 per cent of its external reserves (Nwachukwu et al., 2016). The study also revealed that Nigeria's external reserves have been on declining in response to the declining oil price, which has a direct effect on the oil revenue of the country. Consistently, Azar and Aboukhodor, (2016) found a positive relationship between foreign exchange reserves and oil prices, which indicate that as oil price increases, external reserves also increases and decreases correspondingly with the decline in oil price, hence, it is in great agreement with our findings.

Panel 5 reports the impact of declining oil price and key macroeconomic indicators on inflation in the short-run. The result shows that government expenditure is the major driver of inflation in Nigeria. Higher government expenditure is associated with increased inflation. Specifically, inflation will rise by 17.331 per cent, given a 1 per cent increase in government expenditure. This suggests that increased government spending will significantly lead to rising consumer prices in the short-run. The result is in agreement with the findings of Han and Mulligan (2008) that found a positive relationship between government expenditure and inflation. However, government spending would bring about economic growth and development in an economy which would in-turn lead to the growth of the money supply in the Central Banks thereby leading to inflation. Although the government does not directly affect inflation, it could happen in two ways; first, since government expenditures are usually directed towards scarce resources, the increase in demand coupled with the non-elastic short-term supply would lead to the increase in prices of those given resources thereby resulting to inflation. Secondly, if the government decides to finance its expenditures through its power to mint money or through borrowing as indicated in THISDAY, 28th of June, (2018), where the government intends to borrow $2.8 billion to finance its 2018 budgets, the rational economic agents would definitely anticipate depreciation of the currency which would lead to increase in prices, hence, inflation.

Panel 6 reports the impact of declining oil price and key macroeconomic indicators on the unemployment rate in the short-run. Though the speed of adjustment coefficient of 0.508 satisfies all conditions (negative, less than unity and statistically significant), the result of the ARDL bound test approach to cointegration shows that the variables are not cointegrated, hence the short-run model is not valid as also revealed in table 6.6. It shows that there is no significant effect of oil price fluctuation on the unemployment rate in Nigeria. Hence, we cannot reject the null hypothesis ($H_{016}$) as against the alternative, which states: There is no effect of dwindling oil price on the unemployment rates of Nigeria.

The above result indicates that there is no significant impact of oil price fluctuation and the unemployment rate in Nigeria. This is contrary to our expectation as we anticipate the adverse effect of oil price fluctuation (especially declining oil prices) on the unemployment rate. Notwithstanding, our result is consistent with the findings of Uri, (1996) who examined the impact of crude oil volatility on the unemployment rate in the United States. The study shows that three full years are required before the measurable impact of oil price fluctuation could be experienced. Another study who could not find any relationship between oil price fluctuation and unemployment rate include, Trang et al., (2017) who also found an unclear relationship between oil price fluctuation and unemployment in Vietnam. However, the reason could probably be because these countries deal with both the exportation and importation of crude, thereby making the relationship not to be clear at all or insignificant.

***Table 6. 6: Short-run regression estimates of the impact of declining oil price on key macroeconomic indicators in Nigeria***

| | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | -13.084*** (1.212) | 1.024*** (0.131) | 4.135*** (0.954) | 1.529*** (0.174) | -0.061 (1.496) | 285.019 (234.777) | 1.753*** (0.177) | 2.747*** (0.416) | 7.564*** (1.791) | -45.287*** (5.953) | -225.937*** (27.926) | 80.791 (123.669) |
| DL(AEXP) | | 0.218* (0.108) | | 0.71*** (0.148) | 17.331*** (6.167) | | | | | | 10.138 (5.949) | |
| DL(AEXP(-1)) | | -0.464*** (0.106) | | | | | | | | | | |
| DL(OILP) | | 0.804*** (0.077) | | | | | | | | | | |
| DL(OILP(-1)) | | 0.359*** (0.1) | | | | | | | | | | |
| OILD | | | | | | | 0.113** (0.051) | -0.292*** (0.065) | 0.00 (0.019) | -0.226** (0.084) | 1.925 (3.185) | 1.051 (0.788) |
| DL(EXCR) | | -0.406*** (0.107) | -0.044 (0.030) | | | 5.003*** (1.444) | | -0.571*** (0.108) | | 0.049 (0.157) | | 7.194***(1.507) |
| DL(EXCR(-1)) | | -0.523*** (0.123) | | | | | | | | 0.266*** (0.091) | | |
| DL(EXTR(-1)) | | | | 0.278*** (0.093) | | | | | | | | |
| DL(AREV) | | | | | | -2.954** (1.303) | | | | | | |
| Ect | -0.519*** (0.044) | -0.699*** (0.105) | -0.182*** (0.043) | -0.975*** (0.114) | -0.765*** (0.089) | -0.508*** (0.106) | -0.444*** (0.045) | -0.691*** (0.117) | -0.329*** (0.078) | -0.894*** (0.116) | -0.735***(0.092) | -0.502***(0.112) |
| | | | | | | | | | | | | |
| R2 | 0.805 | 0.938 | 0.46 | 0.750 | 0.705 | 0.603 | 0.756 | 0.780 | 0.486 | 0.776 | 0.701 | 0.527 |
| AdjR2 | 0.799 | 0.918 | 0.433 | 0.725 | 0.687 | 0.578 | 0.741 | 0.759 | 0.436 | 0.736 | 0.673 | 0.498 |
| F-stat | 136.315 (0.000) | 47.245 (0.000) | 13.974 (0.000) | 30.005 (0.000) | 38.300 (0.000) | | 49.630 (0.000) | 36.630 (0.000) | 9.751 (0.000) | 19.406 (0.000) | 24.273 (0.000) | |

Source: Author's computation from ARDL analyses using E-views 10.0

***, ** and *denote the significant level at 1%, 5% and 10% respectively

### 6.2.2.2 The Impact of declining oil revenue on key macroeconomic indicators in Venezuela.

The previous subsection dealt with the discussion of the impact of declining oil revenue implication on the budgetary objectives of the Nigerian economy. This section, however, entails the impact of declining oil revenue on the key macroeconomic indicators of the Venezuelan economy.

The long-run results of the impact of declining oil revenue on key macroeconomic indicators (government expenditure, revenue, economic growth, external reserves, inflation and unemployment) for Venezuela is presented in Table 6.7. The results of each model are presented in Panel 1-6.

Panel 1 report the impact of key macroeconomic indicators on government expenditure in the long-run. The high adjusted R-square value of 0.883 shows that the explanatory variables explain 88.3 per cent variation in government expenditure. The statistically significant F-statistics value of 204.117 indicates that the regressors are jointly statistically significant. Also, the diagnostic results, reported in Table 6.8, indicates that the error term in the government expenditure model is normally distributed, have an absence of heteroskedasticity and free of serial correlation. As depicted in the table, declining oil price exerts no significant influence on government expenditure in the long-run. The major determinants of government expenditure are government revenue, unemployment rate and external reserves. Specifically, government revenue exerts a positive effect on government expenditure in the long-run. One percent increase in government revenue will increase expenditure by 1.078 per cent. This implies that government expenditure responds more proportionally to changes in government revenue. The positive impact of government revenue on expenditure validates Friedman (1978) revenue-spend hypothesis in Venezuela. This suggests that more revenue will stimulate government spending in Venezuela. The result is consistent with the findings of Adedokun, (2018); Wang and Fasano-Filho (2002); Eita and Mbazima (2008).

On the other hand, external reserves and unemployment will reduce government spending in the long-run. A percentage increase in the unemployment rate will lower government spending by 0.102 per cent in the long-run. The negative effect of unemployment on government spending suggests unemployment reduces government spending. This is reasonable given that unemployment reduces income tax generation, reduces revenue and forces the government to cut down on spending.

Similarly, a percentage increase in external reserves will reduce government spending by 0.422 per cent in the long-run. However, this is realistic because the more the government keep or preserve in the form of savings, the less would be made available for spending hence, leading to a reduction in government expenditure as indicated above. Other macroeconomic indicators have no significant impact on government expenditure in the long-run.

The regression result showing the impact of key macroeconomic indicators on government revenue is presented in Panel 2. The adjusted R-square statistics value of 0.946 shows that the explanatory variables can account for 94.6 per cent variation in government revenue. Also, the significant F-statistic value of 160.087 indicates that the independent variables are jointly statistically significant. The error term of the government revenue model is normally distributed, free of heteroskedasticity and free of serial correlation, as presented in the diagnostic result in Table 6.8). From the result, inflation is the major driver of government revenue. A percentage increase in consumer prices will marginally increase government revenue by 0.008 per cent in the long-run. Other macroeconomic indicators exert no significant impact on government revenue in the long-run.

Panel 3 shows the impact of key macroeconomic indicators on economic growth in the long-run. The adjusted R-square statistic is high at 0.913, suggesting that the independent variables account for 91.3 per cent variation in the Gross Domestic Product (GDP), while the significant F-statistics value of 71.868 suggests that the explanatory variables are jointly significant in influencing inflation in the long-run. Other diagnostic results, as depicted in Table 6.8, show that the error term in the inflation model is normally distributed, free of heteroskedasticity and free of serial correlation. As depicted in the table, the key factors affecting growth are oil prices, government expenditure and unemployment. Oil price is a positive driver of economic growth in the long-run. A percentage increase in oil price will grow the economy by 0.093 per cent. The positive impact of oil price fluctuation on growth suggests that higher oil price will improve growth while a percentage increase in government revenue will lead to 0.142 per cent in the long run. However, declining oil price exerts a negative and significant effect on economic growth through the external reserves, which are the major determinant of growth in the short run. Specifically, the Venezuelan economic growth will decrease by 0.074 per cent for a percentage increase in external reserves in the short run. Therefore, we can reject the null hypothesis ($H_{08}$), which states: there is no effect of declining oil price on the economic growth of Venezuela.

The result validates the findings of previous studies (Trang et al., 2017; Alley et al., 2014; Izatov, 2015; Al-mulali, 2010 and Al-mulali and Sab, 2010) which focused on oil-producing economies. Although the negative effect of declining oil price on the economic in the short run is consistent with the findings of Alabi et al., (2017) who also found a negative and insignificant effect of external reserves on economic growth in Nigeria.  The result is also as expected since the economy relies on oil for over 96 per cent of its revenue but increasing oil price is supposed to improve growth but perhaps the economy is also affected by the resource curse syndrome which is mostly distressing most nations that are greatly endowed with abundant natural resources as revealed by Holden, (2011). However, since in the long run, government revenue exerts a positive and significant effect of the economic growth of Venezuela, the government should then focus on expanding other sectors of the economy for more revenue which would then be channelled into the economic activities of the nation and hence, more growth in the economy.

Similarly, government expenditure exerts a positive effect on economic growth in the long-run. Precisely, a one per cent increase in government expenditure will increase growth by 0.168 per cent in the long-run. This is reasonable given that more government expenditure will increase consumer spending, economic activities as well as output expansion. The positive effect of government expenditure on economic growth suggests that the government engages in productive expenditure. This result is consistent with the findings Angelopoulos et al. (2007); Devarajan et al. (1996) and Barro (1990).

On the other hand, unemployment is negatively related to economic growth. One per cent increase in the unemployment rate will reduce growth by 0.026 per cent in the long-run. However, the negative association between unemployment and economic growth agrees with the Okun's law which maintains that if unemployment increases by 1 per cent, that the Gross Domestic Product will reduce by 2 per cent, hence, an inverse relationship.

The impact of key macroeconomic indicators on external reserves is presented in Panel 4. The high adjusted R-square value of 0.793 shows that the explanatory variables account for 79.3 per cent variation in external reserves, while the significant F-statistics value suggests that the explanatory variables are jointly statistically significant. Although the error term is normally distributed, free of heteroskedasticity and free of serial correlation (as shown in Table 6.8), the result shows that government expenditure, revenue, economic growth, inflation, unemployment and exchange rate have no influence on the foreign reserves in the long-run. This suggests that foreign reserves do not respond to long-run changes in key macroeconomic indicators in Venezuela.

Panel 5 reports the impact of key macroeconomic indicators on the inflation rate. The high adjusted R-square value of 0.807 indicates that the independent variables jointly account for 80.7 per cent variation in inflation. The result of the diagnostic test reveals that the error of the expenditure model is normally distributed, free of heteroskedasticity and free of serial correlation. As depicted in the table, the result shows that the exchange rate and oil price are the major determinants of inflation in the long-run. Both oil price and exchange rate negatively affect inflation in the long-run. Specifically, a one per cent increase in oil price will result in a more proportional decrease in inflation by 56.89 per cent and vice versa. This implies that higher prices will lower growth in consumer prices in the long-run and otherwise during periods of declining oil price in which oil revenue declines as well.

Similarly, in the short-run, as oil price declines, one per cent exchange rate depreciation affects inflation rate positively as it rises to 19.17 per cent while in the long run, a percentage increase in unemployment leads to 0.165 per cent decrease in the inflation rate. Therefore, we can reject the null hypothesis ($H_{014}$), which states: there is no impact of declining oil price on the inflation rates of Venezuela.

However, this is very reasonable because, all things being equal and following the law of demand which states that price and demand for that commodity are inversely related, meaning that at higher prices, there would be lower demand and vice versa. When oil price increases, the demand for oil would reduce correspondingly, thereby reducing the oil income, which would in-turn reduce the economic activities and the money in circulation, hence, reducing inflation as well. The reverse happens when oil price declines. However, the Phillips curves support the negative and significant result obtained in the long run, which shows that unemployment and inflation are inversely related (Phillips, 1958).

Likewise, one per cent rise in the exchange rate will lower inflation by 18.855 per cent in the long-run. This suggests that growth in the exchange rate will slow during the period of high inflation. Other indicators such as government revenue, expenditure, economic growth, exchange rate and external reserves have no significant effect on long-run inflation.

The long-run determinants of unemployment are presented in Panel 6. The adjusted R-square statistic is high at 0.852, suggesting that the independent variables account for 85.2 per cent variation unemployment, while the significant F-statistics value of 52.734 suggests that the explanatory variables are jointly significant in influencing unemployment in the long-run. Other diagnostic results, as depicted in Table 6.8, show that the error term in the inflation model is normally distributed, free of heteroskedasticity and free of serial correlation. As depicted in the table, economic growth and inflation are the major determinants of unemployment in the long run. As depicted in the table, one per cent increase in economic growth will result in a more proportional reduction in unemployment. This is reasonable given that more economic activities will improve demand for labour and reduce the unemployment rate in the long-run. However, the result confirms the existence of Okun law, which states that both unemployment and growth exhibits an inverse relationship, and it is in line with our expectation. Previous studies have also found higher GDP to reduce unemployment (see Villaverde and Maza, 2007; Ting and Ling, 2011; Arshad, 2010). Likewise, inflation exerts a negative impact on the unemployment rate. A percentage increase in inflation will lead to a less proportional reduction in unemployment in the long-run.

***Table 6. 7: Long-run regression estimates of the impact of declining oil price on key macroeconomic indicators in Venezuela***

| | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOG(AEXP) | | 0.328(0.348) | 0.168*(0.092) | -4.367(4.141) | 35.853(73.756) | 3.34(3.746) | | -1.076(3.76) | -0.081(0.069) | -1.479*(0.819) | -142.059(109.198) | -3.664**(1.319) |
| LOG(OILP) | 0.038(0.124) | 0.339(0.292) | **0.093**(0.036)** | 2.787(3.03) | -56.887**(26.625) | -0.3(1.359) | | | | | | |
| LOG(GDP) | -1.335(1.148) | 0.027(1.394) | | -10.02(12.846) | -349.173(252.73) | -25.847***(4.502) | -3.331*(1.742) | 4.702(7.857) | | -0.955(3.891) | 607.758(612.193) | -18.733***(2.933) |
| LOG(EXTR) | -0.422***(0.137) | 0.058(0.245) | 0.039(0.036) | | -47.357(41.571) | -0.821(1.049) | -0.339**(0.147) | -0.636(1.499) | 0.055(0.046) | | 127.033(116.629) | -2.234**(0.814) |
| INFR | 0(0.002) | 0.008*(0.004) | 0(0) | 0.019(0.027) | | -0.031*(0.015) | -0.339**(0.147) | -0.636(1.499) | 0.055(0.046) | | 127.033(116.629) | -2.234**(0.814) |
| UEMR | -0.102**(0.041) | 0.01(0.058) | -0.026***(0.005) | -0.295(0.327) | | | 0.044(0.109) | -0.03***(0.006) | -0.166(0.139) | 23.234(21.502) | -0.165**(0.06) | |
| LOG(EXCR) | 0.142(0.222) | 0.803(0.487) | 0.039(0.04) | 3.272(3.604) | -18.855**(8.919) | -0.282(2.086) | 0.166(0.224) | 1.473(2.416) | 0.006(0.049) | 0.234(0.48) | 7.247(85.574) | 2.62**(0.997) |
| LOG(AREV) | 1.078***(0.178) | | -0.007(0.073) | 2.259(2.461) | 11.013(79.197) | 1.807(2.345) | 1.22***(0.172) | | 0.142*(0.081) | 1.513(1.028) | 75.548(91.824) | 3.548**(1.624) |
| Oil dummy | No | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |

***Table 6. 8: Diagnostic test results for Venezuela***

| Diagnostics | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normality test, JB- test | 6.850 (0.033) | 0.355 (0.837) | 0.186 (0.911) | 1.095 (0.578) | 1.368 (0.505) | 1.878 (0.391) | 1.073 (0.585) | 0.933 (0.627) | 0.406 (0.816) | 0.095 (0.954) | 1.231 (0.540) | 1.367 (0.505) |
| Heteroskedasticity | 0.410 (0.528) | 0.357 (0.556) | 0.713 (0.406) | 0.049 (0.827) | 0.002 (0.964) | 0.629 (0.435) | 0.914 (0.348) | 0.145 (0.707) | 0.571 (0.457) | 0.013 (0.912) | 1.385 (0.251) | 1.185 (0.287) |
| Serial Correlation | 1.758 (0.202) | 2.002 (0.170) | 0.861 (0.444) | 2.116 (0.153) | 1.930 (0.176) | 1.101 (0.360) | 0.596 (0.564) | 0.814 (0.463) | 2.058 (0.160) | 0.776 (0.489) | 1.539 (0.251) | 0.557 (0.584) |

Source: Author's computation from ARDL analyses using E-views 10.0 ***, ** and *denote the significant level at 1%, 5% and 10% respectively

The short-run impact of declining oil price on key macroeconomic indicators in Venezuela is presented in Table 6.9 Panel 1 reports the effect of key macroeconomic indicators on government expenditure in the short-run. From the result, the speed of adjustment coefficient of -0.602 is less than unity in absolute term, negative, and statistically significant. This shows that the government expenditure model converges to a steady-state long-run equilibrium. The result shows that declining oil price has a positive impact on government expenditure in the short-run. A significant decline in oil revenue will increase government expenditure by 0.066 per cent in the short-run, and a percentage increase in government revenue increases the government expenditures by 1.22 per cent in the long run which supports the revenue-spend hypothesis. Therefore, we can reject the null hypothesis ($H_{05}$), which states:  there is no impact of oil declining oil price on the actual expenditures of Venezuela.

However, this suggests that the Venezuelan government generates more expenditure during periods of significant oil price decline and this is indeed a serious problem for the nation. Just like the Nigerian economy, a similar result was obtained, this could probably be because of the government financing deficits through borrowing, which adversely affects the economy.  The result is consistent with the findings of Diego, (2018); Nelson, (2018) who maintain that in recent times, the Venezuelan government expenditures has been increasing while the government finance its deficits by seigniorage and borrowing which is indeed a serious issue for the nation due to the inherent increasing debt profile. However, the result also shows that the other key macroeconomic variables considered in this study do not affect changes in government expenditure in the short-run.

The result of the impact of key macroeconomic indicators on government revenue is depicted in Panel 2. The negative and statistically significant speed of adjustment coefficient (-0.446) suggests that the government revenue model converges to a steady state long-run equilibrium. From the result, the key determinant of government revenue in the short-run is government expenditure and oil price. Both government expenditure and oil price exert a positive influence on government revenue in the short-run. One percent increase in government expenditure will increase government revenue by 0.526 per cent. This implies that more spending will increase taxable income as well as government revenue. This result validates the Barro (1979) argument that increased government expenditures financed by borrowing will translate into higher future tax revenue. In line with our previous result, this validates the spend-revenue hypothesis, and the result is consistent with the findings of Eita and Mbazima (2008); Moalusi (2004) and Oshikoya and Tarawalie (2009). Likewise, a one per cent increase in oil price will lead to more government revenue. This is plausible given that Venezuela is an oil-producing economy and higher oil price will result in more oil income, which in turn will increase government revenue. This result is consistent with the findings of Eltony and Al-Awadi (2001) and Lorde et al. (2009).

Consistently, the declining oil price has a significantly negative impact on government revenue in Venezuela. From table 6.9 panel 2 of the analysis with a dummy, the negative and statistically significant speed of adjustment coefficient of (-0.26) suggests that the government revenue model converges to a steady-state long-run equilibrium. The result reveals that a one per cent decline in oil price leads to a corresponding reduction of the Venezuelan government revenue by 0.167 per cent. However, this is very reasonable as the result clearly shows that there would be a drastic reduction of government revenue when the oil price falls because Venezuela relies on oil revenue for over 90 per cent of its exports earnings (Diego, 2018); Nelson, (2018). However, as oil price declines, one per cent increase in the unemployment rate would also lead to a drastic reduction of the government revenue by 0.03 per cent in the long run. The results are consistent with the findings of Pettinger (2017). More so, the increase in unemployment level would also lead to the reduction in taxable income for the economy, hence, a decrease in government revenue as well. Therefore, we can reject the null hypothesis ($H_{02}$), which states: there is no effect of declining oil price on the actual revenues of Venezuela.

The above result is very reasonable, given that the economy is overwhelmingly depending on oil for its sustainability while oil contributes to the major part of its revenue. The result is consistent with the study of Nwoba et al., 2017 for the Nigerian economy. The study reveals that the revenue base of the oil-exporting countries declines drastically with the crash in crude oil prices, especially as oil contributes the highest percentage of the revenues. More so, the result implies that the increase in unemployment reduces the tax revenues of the nation, which in turn affect the government revenue adversely. The government should, therefore, focus also on the projects that would improve and drastically reduce the unemployment level in the economy as it diversifies the economy to reduce its overwhelming dependence on oil.

The impact of key macroeconomic indicators on economic growth is presented in Panel 3. The high speed of adjustment coefficient of -0.833 is less than unity (in the absolute term), statistically significant and negative. This implies that that growth model converges to a steady-state long-run equilibrium. From the result, government expenditure and external reserves are the key determinants of economic growth in the short-run. While government expenditure exerts a positive impact on economic growth, a negative effect is observed in the case of external reserves. Specifically, a one per cent increase in external reserve will slow growth by 0.068 per cent in the short-run.

Panel 4 with dummy presents the impact of declining oil price and other key macroeconomic indicators on external reserves in the short term. The significant speed of adjustment coefficient of -0.598 suggests that the model quickly adjusts to equilibrium. From table 6.9, the key drivers of external reserves in this model are falling oil price, economic growth and government revenue. The result shows that one per cent decrease in oil price would reduce the foreign exchange reserves by 0.375 per cent while in the long run, one per cent increase in government expenditures will shrink the external reserves by 1.479 per cent. Hence, we can reject the null hypothesis ($H_{011}$) which states: there is no impact of declining oil price on Venezuela's external reserves.

This is very reasonable, given that oil revenue constitutes the major part of government revenue in Venezuela, the fall in oil price would undoubtedly lead to a reduction of the external reserves. More so, the increasing government expenditures by the Venezuelan economy would also contribute largely to the decrease in the external reserves of the nation. The above result is consistent with the findings of Azar and Aboukhodor, (2016) and Nwachukwu et al., (2016).

The result of the impact of key macroeconomic indicators on inflation rate is presented in Panel 5, while Panel 6 reports the impact of key macroeconomic indicators on the unemployment rate in the short-run. The speed of adjustment coefficient of -0.515 and -0.895 indicate that both the inflation and unemployment models converge to a steady-state long-run equilibrium. In line with expectation, government revenue exerts a positive impact on inflation in the short-run. One per cent increase in government revenue will lead to a more proportional rise in inflation by 53.38 per cent. This suggests that higher government revenue increases consumer prices in the short-run. Similarly, a one per cent depreciation in the domestic exchange rate will increase in unemployment by 2.419 per cent in the long-run. However, this shows that unemployment responds to exchange rate movement in the short-run.

In addition, considering panel 6 with a dummy, the result shows the effect of a declining oil price on the unemployment rate in Venezuela. The high and significant speed of adjustment coefficient of -0.996, which is less than unity in absolute term, statistically significant and negative indicates that the model converges to a steady state long-run equilibrium. From the result, declining oil revenue exerts a positive impact on the unemployment rate in Venezuela. Specifically, one per cent decline in oil revenue will increase the unemployment rate by 1.09 per cent and 3.548 per cent in the short run and long run, respectively. Hence, we can reject the null hypothesis ($H_{017}$), which states: there is no effect of declining oil price on the unemployment rates of Venezuela.

The above is reasonable, given the fact that Venezuela is relying on oil revenue for over 96 per cent of its exports (Monaldi, 2015). If revenue from oil declines, the nation would not have more revenue to revive the economy or to engage in more economic activities that would help in creating jobs for the citizens which would cause an increase in the unemployment rate.  During periods of declining oil revenues, there would not be enough revenue to settle workers, and as such most workers lose their jobs during such periods.

### *Table 6. 9: Short-run regression estimates of the impact of declining oil price on key macroeconomic indicators in Venezuela*

| | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | 27.785***(1.919) | 5.704***(0.631) | 18.562***(1.101) | 57.835***(5.77) | 9639.788(6524.755) | 540.747***(53.653) | 55.977***(3.733) | -16.38***(2.181) | 24.046***(1.374) | 50.469(98.491) | 4935.032***(423.801) | 562.197***(46.52) |
| DLOG(AEXP) | | 0.526***(0.082) | 0.048***(0.015) | | | -0.891(0.566) | | 0.501***(0.107) | | -0.434(0.247) | | |
| DLOG(OILP) | | 0.405***(0.051) | | | | | | | | | | |
| OILD | | | | | | | 0.066**(0.03) | -0.167***(0.037) | -0.004(0.008) | -0.375***(0.074) | -2.146(5.043) | -0.779***(0.254) |
| DLOG(GDP) | | | | | | | -0.872*(0.422) | | | -3.644***(0.88) | | |
| DLOG(EXTR) | | | -0.068***(0.017) | | | | | 0.089(0.086) | -0.074***(0.023) | | 19.263(12.747) | |
| | | | | | | | | | | | | |
| DLOG(EXCR) | | | | 0.113(0.087) | | 2.419***(0.589) | | | | 0.243(0.185) | 19.172*(10.542) | |
| DLOG(AREV) | | | | | 53.383***(6.265) | | | | | 0.464*(0.235) | | 1.09**(0.414) |
| @TREND | No | No | Yes | No | No | No | No | No | No | No | No | No |
| CointEq(-1)* | -0.621***(0.043) | -0.446***(0.049) | -0.833***(0.049) | -0.173***(0.017) | -0.515***(0.058) | -0.895***(0.089) | -0.602***(0.04) | -0.26***(0.034) | -0.806***(0.06) | -0.598***(0.134) | 0.278***(0.024) | -0.996***(0.082) |
| R-squared | 0.887 | 0.952 | 0.926 | 0.809 | 0.814 | 0.868 | 0.911 | 0.947 | 0.871 | 0.823 | 0.923 | 0.866 |
| Adjusted R-squared | 0.883 | 0.946 | 0.913 | 0.793 | 0.807 | 0.852 | 0.895 | 0.935 | 0.861 | 0.745 | 0.904 | 0.849 |
| F-statistic | 204.117 (0.000) | 160.087 (0.000) | 71.868 (0.000) | 52.822 (0.000) | | 52.734 (0.000) | 58.600 (0.000) | 78.790 (0.000) | | | 50.219 (0.000) | 51.482 (0.000) |

***, ** and *denote the significant level at 1%, 5% and 10% respectively

Source: Author’s computation from ARDL analyses using E-views 10.0

#### 6.2.2.3 The Impact of declining oil revenue on key macroeconomic indicators in Norway

The previous subsections dealt with the discussion of the impact of declining oil revenue implication on the budgetary objectives of Nigerian and the Venezuelan economies. This section, however, entails the impact of declining oil revenue on the key macroeconomic indicators of the Norwegian economy.

Table 6.10 reports the long-run results of the impact of declining oil price on government expenditure, revenue, economic growth, external reserves, inflation and unemployment in Norway. The high and significant adjusted R-square value of 0.835 suggests that the explanatory variables account for 83.5 per cent variation in government expenditure, as depicted in Panel 1. The significant F-statistics value of 10.815 indicates that the explanatory variables are jointly statistically significant in influencing the government expenditure in the long run, while the result of the diagnostic reveals that the error of the expenditure model is normally distributed, free of heteroskedasticity and free of serial correlation (Table 6.11). As depicted in Panel 1, oil price, GDP and government revenue are key determinants of government expenditure in the long-run. While oil price and GDP have negative impacts on government expenditure, government revenue stimulates government expenditure. Specifically, a one per cent increase in oil price will reduce government expenditure by 0.19 per cent in the long run.

Although the higher oil price is expected to increase government revenue and stimulate government spending, the negative impact of oil price on government spending suggests that the Norwegian government will cut expenditure following an increase in oil price. This is also reasonable given that the government do not spend more than 4 per cent of its revenue every year irrespective of the enormous revenue derived from the numerous natural resources the nation is blessed with (Doyle, 2014). More so, in the short-run, a similar result was obtained, as shown in panel 1 of table 6.12 as government expenditures will reduce by 0.113 for any 1 per cent increase in oil price. However, these results have really proven that the Norwegian economy does not lavish their windfall gains from oil but rather save for the future and for some economic emergencies like the case of falling oil price which is hitting hard on most oil-exporting countries that are relying on oil revenue for the maintenance of the nations.

Consistently, the effect of declining oil price on Norway's government expenditures is insignificant in both the long run and the short run. Therefore, we cannot reject the null hypothesis ($H_{06}$) that: there is no impact of declining oil price on the actual expenditures of Norway.

The reason for this could be as a result of the excess and huge savings that the Norwegian government have for its citizen in the Sovereign Wealth Fund, which is the highest in the whole world. However, as oil price falls, the impact is insignificant since they have enough windfall gains to lean on. These results are consistent with the findings of Moses and Letnes, (2017); Holden, (2011). The study maintains that the Norwegian government try to avoid the paradox of plenty, which is inherent in most countries that greatly endowed with abundant natural resources. However, the effect of the declining oil price on Norway's expenditure is different probably due to its responsible fiscal policies and its ability to tap into their well-reserved Sovereign Wealth Fund.

Similarly, government expenditure responds negatively to an increase in economic activities (GDP). A percentage increase in economic growth will lead to a more proportional reduction of 1.414 per cent in government expenditure in the long-run. As expected, the result shows that higher government revenue will result in more government spending in the long-run, thus supporting the revenue-spend hypothesis. The positive influence of government revenue on spending is consistent with the Friedman (1978) revenue-spend hypothesis which states that increasing the resources available to the government by increasing tax revenues will only lead to increases in government expenditures. Also, in line with the result for Nigeria, a percentage increase in government revenue will lead to a more proportional increase in government expenditure in the long-run. This is plausible given that the Norwegian government finances its expenditure with revenue generated from both oil and non-oil sectors. The positive influence of government revenue on spending on government expenditure is in line with the findings of Wang and Fasano-Filho (2002); Eita and Mbazima (2008).

Panel 2 reports the influence of declining oil price and key macroeconomic indicators on government revenue in the long-run. The high adjusted R-square value of 0.937 indicates that the independent variables jointly account for 93.7 per cent variation in government revenue, while the significant F-statistics value of 123.293 indicates that the independent variables are jointly statistically significant in affecting government revenue in the long run. The result of the diagnostic test in table 6.11 reveals that the error of the expenditure model is normally distributed, free of heteroskedasticity and free of serial correlation.

As depicted in the table (6.10), the key determinants of government revenue in Norway are oil price, government expenditure, GDP, inflation and domestic exchange rate. In line with expectation, the government will generate higher revenue during periods of higher oil prices. In particular, one per cent rise in oil price will increase government revenue by 0.104 per cent in the long-run.  Also, table 6.12 indicates that one per cent decline in oil price would reduce government revenue by 0.095 per cent in the short run, which signifies that there would be a reduction in the revenue generated from oil. Also, the revenue increases by 0.104 per cent in the long run for a percentage increase in oil price and this indicates that oil price is directly proportional to government revenue in Norway because oil contributes over half of its export earnings (Moses and Letnes, 2017). Hence, we can reject the null hypothesis ($H_{03}$) that:  there is no effect of declining oil price on the actual revenues of Norway.

The above findings are highly reasonable given that oil constitutes a significant bulk of Norwegian government revenue, hence higher oil price will boost total government revenue and vice versa. The positive effect of oil price on government revenue is consistent with the findings of Eltony and Al-Awadi (2001) and Lorde et al. (2009). The negative effect of oil price on government revenue is highly consistent with the findings of Kitous et al. (2016).

Government spending exerts a positive impact on government revenue in the long-run. A percentage increase in government expenditure will raise revenue in the current period by 0.532 per cent. The higher revenue resulting from increased expenditure justifies the spend-revenue hypothesis, and it is consistent with the findings of Furstenberg (1986);

Fasano and Wang (2002). Also, higher GDP will increase government revenue by 1.066 per cent in the long run. The result shows that a percentage increase in economic growth will boost government revenue more proportionally in the long-run. The positive impact of GDP on government revenue implies that improved economic activities will increase taxable income as well as total government revenue. In addition, inflation and exchange rate have a positive impact on government revenue in the long-run. The positive impact of inflation and exchange rate on government revenue suggests that government revenue responds to changes in inflation as well as the exchange rate.

The effect of declining oil price and key macroeconomic indicators on economic growth is presented in Panel 3. The adjusted R-square value of 0.929 shows that the explanatory variables account for 92.9 per cent variation in the economic growth, while the significant F-statistics shows that the explanatory variables are jointly statistically significant in influencing changes in economic growth. Also, the error term of the GDP model is normally distributed and robust to both heteroskedasticity and serial correlation (see Table 6.11).

From the result, the key determinants of economic growth are government expenditure, revenue and inflation. While government revenue increases economic growth, government expenditure and inflation weaken growth in the long-run. However, from panel 3 with a dummy, the effect of declining oil price on the economic growth of Norway is negative and insignificant in the short run while in the long run, a percentage increase in external reserves and government revenue leads to an increase in economic growth by 0.077 per cent and 0.22 per cent respectively. Hence, we cannot reject the null hypothesis ($H_{09}$) which states: there is no effect of declining oil price on the economic growth of Norway

The above result is reasonable given that the Norwegian economy has sufficient savings in its Sovereign wealth fund account which the country relies on during periods of economic crisis like this. More so, the windfall gains from oil during the periods of high oil prices could be one of the reasons why the effect of the declining oil price is not significant on growth in the short run. More so, the Norwegian economy is known to have the highest savings in the Sovereign Wealth Fund all over the world and have been working harder to avoid the resource curse syndrome as it generates more revenues from its other resources apart from the oil sector. However, this result is highly consistent with the study of Holden (2011) which maintain that the Norwegian economy does not fit into the picture of resource curse syndrome since the nation is highly blessed with abundant natural resources which contribute over half of its exports. Also, the high revenue generation from the oil sector is often reflected through its high economic development, more welfare and high living standard in the lives of the Norwegian citizens.

Additionally, the positive impact of government revenue on economic growth suggests that higher revenue will promote economic activities and foster growth. The result is also in agreement with our expectation and further confirms the findings of previous studies (see Chang and Chiang, 2009). On the other hand, inflation has a negative impact on economic growth. The negative association between inflation and economic growth suggests that rising consumer prices will slow economic growth in the long-run. Higher inflation reduces consumer purchasing power, lowers aggregate demand as well as reduce economic activities. The adverse effect of inflation on economic growth is in line with the findings of Barro (1995); Malla (1997); Faria and Carneiro (2001) and Smyth (1992).

Similarly, higher government expenditure will lead to a less proportional reduction in economic growth. The decline in economic growth could be attributed to higher inflation resulting from increased government spending in the long-run. Other macroeconomic indicators such as oil price, exchange rate, unemployment and external reserves are not major determinants of economic growth in the long-run.

The influence of key macroeconomic indicators on external reserves is presented in Panel 4. The high adjusted R-square value of 0.575 implies that the independent variables jointly account for 57.5 per cent variation in external reserves. Also, the error term of the external reserve model is normally distributed and free from heteroskedasticity and serial correlation (see Table 6.11). Although government expenditure exerts a negative effect on external reserves, most macroeconomic indicators have no significant effect on external reserves in the long-run. Specifically, oil price, GDP, government revenue, exchange rate depreciation (appreciation), inflation and unemployment have no influence on external reserves in the long-run. However, the negative effect of government expenditure on external reserves implies that higher government spending depletes total foreign reserves in the long-run. This is very reasonable because more expenditures reduce savings.

Panel 5 shows the impact of declining oil price and key macroeconomic indicators on inflation in the long-run. The high adjusted R-square value of 0.787 suggests that the explanatory variables account for 78.9 per cent variation in the inflation model, while the statistically significant F-statistic suggests that the independent variables are jointly significant in affecting inflation in the long-run. Also, the error term of the inflation model is normally distributed and free from both heteroscedasticity and serial correlation (see Table 6.11). From the result, the key determinants of inflation rate are oil prices, exchange rate, external reserves and government revenue. While oil prices, exchange rate and external reserves lead to rising inflation, government revenue exerts a negative influence on inflation. The result shows that a percentage increase in oil price will lead to a more proportional rise in inflation.

Similarly, the higher external reserve is associated with rising inflation. The result shows that a one per cent increase in external reserves will lead to a more proportional rise in inflation. This is consistent with previous findings (see Meiselman, 1975 and Heller, 1976). In addition, the positive influence of exchange rate on inflation suggests that one per cent depreciation of the domestic exchange rate will spur inflation in the long-run, while the negative effect of government revenue on inflation suggests that higher revenue reduces consumer prices in the long-run.

The effect of declining oil price and key macroeconomic indicators on the unemployment rate is presented in Panel 6. As depicted in the table, the major determinants of the unemployment rate are government expenditure, GDP, external reserves, inflation rate and exchange rate. GDP has a negative impact on unemployment in the long-run. In particular, a one percent increase in GDP will lead to a more proportional reduction in unemployment. This result confirms the existence of Okun law, and it suggests that more economic activities will increase the demand for labour and reduce the unemployment rate in the long-run. Previous studies have also found higher GDP to reduce unemployment (see Villaverde and Maza, 2007; Ting and Ling, 2011; Arshad, 2010). Likewise, government revenue exerts a negative impact on the unemployment rate. Increased government revenue will increase the level of spending, and more spending will promote economic activates, which will, in turn, increase job demand and reduce unemployment in the long-run. The result is consistent with the findings of Abubakar (2016). Also, inflation exerts a negative impact on the unemployment rate. The result shows that increasing consumer prices will reduce the demand for labour and raise unemployment in the long-run. Other macroeconomic indicators such as government expenditure, external reserves and exchange rate are positive determinants of unemployment in the long-run.

### *Table 6. 10: Long-run regression estimates of the impact of declining oil price on key macroeconomic indicators in Norway*

| | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LOG(AEXP) | | 0.532***(0.073) | -0.654***(0.18) | -4.831*(2.655) | 2.899(2.792) | 20.182**(9.269) | | 0.678***(0.185) | -0.719***(0.252) | -1.739(1.483) | -1.399(4.245) | 12.467***(4.209) |
| LOG(OILP) | -0.193**(0.08) | 0.104***(0.017) | -0.033(0.031) | -0.182(0.395) | 2.227**(0.981) | 3.386(2.317) | | | | | | |
| LOG(GDP) | -1.414**(0.463) | 1.066***(0.194) | | -3.044(3.59) | 0.721(8.679) | -37.402*(19.336) | 0.108(0.579) | 1.915**(0.778) | | -4.001(3.569) | -7.69(7.833) | -22.488(13.284) |
| LOG(EXTR) | -0.13(0.135) | 0.056(0.033) | 0.059(0.041) | | 3.385*(1.78) | 9.206**(4.187) | -0.194*(0.11) | -0.311(0.216) | 0.077*(0.041) | | 2.321(1.792) | -0.702(1.818) |
| INFR | 0.011(0.026) | 0.012**(0.006) | -0.021***(0.006) | -0.007(0.058) | | -0.798**(0.293) | 0.051**(0.021) | 0.046*(0.025) | -0.022***(0.007) | 0.004(0.071) | | -0.444**(0.162) |
| UEMR | 0.013(0.015) | -0.008(0.008) | 0.016(0.01) | 0.141(0.097) | -0.361(0.268) | | 0.065***(0.02) | -0.005(0.022) | 0.032**(0.012) | 0.011(0.085) | -0.356(0.356) | |
| LOG(EXCR) | -0.213(0.218) | 0.095*(0.049) | 0.116(0.083) | 0.706(0.954) | 7.036***(2.096) | 21.073*(10.838) | -0.073(0.151) | -0.678**(0.284) | 0.203***(0.041) | 0.604(0.804) | 3.152(2.082) | 4.379(2.984) |
| LOG(AREV) | 1.238*(0.606) | | 0.231*(0.11) | 3.55(2.363) | -10.199*(5.161) | -17.991(10.458) | 1.086***(0.229) | | 0.227**(0.084) | 3.933*(2.131) | 0.157(4.247) | -3.273(4.182) |
| Control for oil dummy | No | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |

### *Table 6. 11: Diagnostic test results for Norway*

| Diagnostics | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Normality test, JB- test | 1.181 (0.554) | 0.827 (0.661) | 3.065 (0.216) | 0.331 (0.848) | 1.500 (0.472) | 6.653 (0.036) | 32.141 (0.000) | 0.772 (0.680) | 2.702 (0.260) | 0.866 (0.649) | 0.584 (0.747) | 1.615 (0.446) |
| Heteroskedasticity | 0.229 (0.635) | 1.328 (0.258) | 0.386 (0.539) | 0.204 (0.654) | 2.252 (0.143) | 0.027 (0.870) | 0.111 (0.741) | 0.454 (0.506) | 0.955 (0.336) | 1.626 (0.212) | 0.469 (0.498) | 0.009 (0.926) |
| Serial Correlation | 0.606 (0.572) | 0.176 (0.840) | 1.433 (0.268) | 1.258 (0.309) | 1.737 (0.200) | 0.711 (0.512) | 0.923 (0.414) | 0.364 (0.700) | 0.564 (0.579) | 0.922 (0.416) | 2.826 (0.081) | 0.750 (0.483) |
| | No | No | No | No | No | No | Yes | Yes | Yes | Yes | Yes | Yes |

Source: Author's computation from ARDL analyses using E-views 10.0

***, ** and *denote the significant level at 1%, 5% and 10% respectively

Table 6.12 reports the results of the short-run models for Norway. Panel 1 presents the impact of declining oil price and key macroeconomic indicators on government expenditure in the short-run. The speed of adjustment coefficient of -0.915 is negative, less than one (in the absolute term) and statistically significant. This implies that the model converges to a steady-state long-run equilibrium in the short-run. Although the speed of adjustment coefficient is correctly signed and statistically significant, the ARDL bound test approach to cointegration shows no cointegration in the aggregate expenditure model. This suggests no long-run relationship between the variables. Hence the short-run model is not valid because the model does not adjust to equilibrium in the short run.

Panel 2 reports the impact of declining oil price and key macroeconomic indicators on government revenue in the short-run. The speed of adjustment coefficient of -0.763 is negative, less than unity (in the absolute term) and statistically significant. This indicates that the model adjusts quickly to equilibrium. From the result, the major determinants of government revenue are one-period lag government revenue and oil price. Changes in oil price will positively affect government revenue. In line with expectation, one per cent increase in oil price will lead to more government revenue in the short-run. This is reasonable given that oil constitutes a large proportion of total oil revenue in Norway. The positive impact of oil prices on government revenue is in agreement with the findings of Eltony and Al-Awadi (2001) and Lorde et al. (2009). Likewise, a significant oil price decline (OILD) reduces government revenue. This suggests that government generates lesser revenue during the period of oil price decline. Specifically, government revenue will decline by 0.095 per cent for every substantial decline in oil price. Also, a period lag government revenue has a positive impact on current government revenue. One per cent increase in lagged government revenue will lead to a less proportional increase in the current level of government revenue. This implies that government revenue responds positively to its lags in the short-run.

The impact of key macroeconomic indicators on economic growth is presented in Panel 3. The speed of adjustment value of -0.289 suggests that the model adjusts slowly to equilibrium. As depicted in the table, the current government expenditure, one-period lag GDP and a period lag unemployment rate are major determinants of economic growth in the short-run. Precisely, government expenditure is negatively associated with economic growth in the short-run. This is because increased government spending could increase inflation and reduce economic growth. In line with expectation, the current level of growth is positively associated with one-period lag GDP growth. A percentage increase in one-period lag economic growth will lead to a less proportional increase in current growth rate. This suggests that changes in growth are positively related to the overall state of the economy. In addition, a percentage increase in government expenditure will result in a less proportional slowdown in growth. Likewise, unemployment is negatively associated with economic growth. One per cent increase in one period lag unemployment rate will slow growth. This suggests that a higher unemployment rate will result to lower economic activities and growth.

Panel 4 shows the impact of macroeconomic indicators on external reserves in the short-run. The significant speed of adjustment coefficient of -0.547 suggests that the model quickly adjusts to equilibrium. From the result, the major determinants of external reserves are changes in government revenue, and changes in one period lag exchange rate. While the current level of government revenue is associated with increased external reserves, a period lag in government revenue will lower external reserves in the short-run. Specifically, one per cent increase in government revenue will lead to a more proportional increase in external reserves and a similar change in one-period lag government revenue will lead to a more proportional reduction in external reserves.

Similarly, from panel 4 with a dummy, the impact of declining oil price on the external reserves shows that external reserves will decrease by 0.14 per cent for every substantial decline in oil price in the short run. Also, a percentage increase in government revenue will increase external reserves by 3.933 per cent in the long run, which shows a direct proportionality between oil price and external reserves in Norway. Hence we can reject the null hypothesis ($H_{012}$) that: there is no impact of declining oil price on Norway's external reserves.

The result above is reasonabl, given that the external reserves are normally built up through the revenue generation from the importation and exportation of goods and services in the global market. Since the Norwegian economy depends on oil for over half of its exports, it, therefore, means that when oil price increases, oil revenue increases which would, in turn, increase the external reserves and the reverse happens when oil price declines. Oil revenue decreases with the decline in oil price, and this could deplete the reserves. The above outcome agrees with the findings of Moses and Letnes (2017).

However, an increase in government revenue results in the increase of the external reserves in Norway probably because the Norwegian economy usually do not withdraw more than 4 per cent of its revenue and are not in the habit of spending all their revenues as they believe more in reserves for future generations, thereby building up the nation's reserves. This is consistent with the findings of Hsieh, (2013, 2018), on "What Norway did with its oil, and we did not". Also, external reserves respond to changes in the exchange rate. A percentage depreciation in the one-period lag exchange rate will lead to a less proportional reduction in external reserves because currency depreciation entails the loss of value of a country's currency relative to other currencies. However, when the country's currency depreciates, it means that its export prices would be relatively lower thereby reducing the country's foreign exchange reserves.

The determinants of inflation rate are presented in Panel 5. The high speed of adjustment value of -0.845 implies that the model adjusts quickly to its short-run equilibrium. The results show that government expenditure and GDP are the major determinants of the inflation rate. One per cent increase in government expenditure will lead to a more proportional increase in inflation. This suggests that more spending in society will increase the amount of money in circulation, hence higher inflation.

On the other hand, GDP has a negative impact on the inflation rate. One per cent increase in economic growth will lead to a more proportional reduction in inflation. This suggests that growth in consumer prices will slow down during the period of high economic growth.

In addition, the short-run result in table 6.12 also reveals that declining oil price has a positive effect on the inflation rate. Specifically, a proportionate decline in oil price would increase inflation by 0.701 per cent. However, when oil price declines, it encourages exports as it attracts more markets, thereby abiding by the law of demand. The higher demand would in-turn generate more revenue for the exporting economy, thereby providing more money in circulation, hence increased inflation. The above finding is highly consistent with the findings of Pettinger (2017). However, the effect of declining oil price on inflation rate is insignificant in the long run. Therefore, we can reject the null hypothesis ($H_{015}$) which states that: there is no impact of oil price fluctuations on the inflation rates of Norway

However, consistent with the above result are the contributions of Hamilton, (1983) that brought about linking oil price fluctuations with inflation, exchange rate, interest rate, stock market activities and industrial production by several other studies such as Abu-Bakar and Masih, (2018); Salisu and Isah, (2017); Cross and Nguyen, (2017); Narayan and Gupta, (2014); Narayan and Gupta, (2014) and Wei and Guo, (2016). From the existing literature emanates the argument that the negative effect of oil price fluctuation is mainly due to over-dependency on oil by most oil exporters (Hamilton, 1996). Some other studies from the literature contend that increasing or decreasing oil prices have a similar effect on the inflation rate (Abu-Bakar and Masih, 2018). Also consistent with our findings are those of Long and Liang, (2018) and Ibrahim, (2015) which reveal that there is a little or insignificant association between oil prices and the inflation rate.

Panel 6 reports the influence of key macroeconomic indicators on the unemployment rate. As indicated in the table, the high speed of adjustment coefficient of -0.557 per cent suggests that the model adjusts to equilibrium in the short-run. From the result, one-period lag government expenditure, oil price, one-period lag oil price, one-period lag external reserves, inflation, the lag of unemployment rate and lag of exchange rate are major determinants of the current unemployment rate. The result shows that government expenditure reduces the unemployment rate. The negative impact of changes in government expenditure on unemployment rate suggests that higher spending increases economic activities increase demand for labour and reduces the unemployment rate in the short-run.

However, the declining oil price (OILD) lowers the unemployment rate. Specifically, declining oil price lowers unemployment in Norway by 0.399 per cent in the short run while in the long run, one per cent rise in inflation rate reduces the unemployment rate by 0.44 per cent. Hence, we can reject the null hypothesis ($H_{018}$) which states that: there is no effect of dwindling oil price on the unemployment rates of Norway

The result, therefore, shows that the Norwegian economy utilizes its resources from the petroleum sector effectively to continue with the economic activities of the nation, which in-turn lower the unemployment level in the society. Also, the inflation rate is negatively related to the unemployment rate. One per cent increase in the inflation rate will lead to a less proportional reduction in the unemployment rate in the short-run. However, this is highly consistent with the Philips curves which reveal that inflation and unemployment are inversely related as an increase in inflation will lead to a reduction in unemployment and vice versa (Phillips, 1958).

## *Table 6. 12: Short-run regression estimates of the impact of declining oil price on key macroeconomic indicators in Norway*

| | AEXP | AREV | GDP | EXTR | INFR | UEMR | AEXP | AREV | GDP | EXTR | INFR | UEMR |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| C | 31.468*** (4.592) | -13.23*** (0.895) | 10.327*** (0.707) | 73.637*** (11.628) | 69.89*** (7.614) | 374.745*** (38.765) | -0.27*** (0.047) | -15.679*** (1.936) | 8.689***(0. 631) | 31.194*** (5.352) | 120.87*** (13.956) | |
| DLOG(AEXP) | | | -0.056** (0.023) | | 16.894*** (3.242) | -1.07 (1.929) | | | -0.027 (0.025) | -2.814*** (0.585) | 18.334*** (3.431) | |
| DsLOG(AEXP(-1)) | 0.029 (0.123) | | | | | -12.831*** (2.445) | | | | | | |
| DLOG(AREV) | 0.76*** (0.109) | | | 1.699*** (0.35) | | | 0.289*** (0.069) | | | 1.284*** (0.435) | | |
| DLOG(AREV(-1)) | -0.463*** (0.138) | 0.162** (0.063) | | -1.473*** (0.335) | | | -0.318*** (0.072) | 0.413*** (0.087) | | -1.905*** (0.356) | | |
| DLOG(OILP) | -0.113*** (0.025) | 0.17*** (0.011) | 0.003 (0.003) | | | 3.039*** (0.385) | | | | | | |
| DLOG(OILP(-1)) | -0.007 (0.026) | 0.072*** (0.016) | | | | 1.618*** (0.355) | | | | | | |
| OILD | | | | | | | -0.003 (0.009) | -0.095*** (0.013) | -0.003 (0.002) | -0.14*** (0.047) | 0.701** (0.283) | -0.399*** (0.134) |
| DLOG(GDP) | -0.478 (0.391) | | | | -41.954*** (8.305) | | | | | 0.178 (1.599) | -36.687*** (8.31) | |
| DLOG(GDP(-1)) | 1.275** (0.432) | | 0.167** (0.066) | | | | | | | 5.683*** (1.525) | | |
| DLOG(EXTR) | -0.089*** (0.022) | | -0.002 (0.006) | | 0.075 (0.775) | -0.093 (0.412) | | 0.058* (0.032) | 0.003 (0.006) | | | |
| DLOG(EXTR(-1)) | 0.06** (0.026) | | | | | -3.84*** (0.487) | | 0.204*** (0.032) | | | | |
| D(INFR) | 0.003 (0.004) | | | | | -0.247*** (0.06) | | | | | | |
| D(INFR(-1)) | -0.003 (0.003) | | | | | | | | | | | |
| D(UEMR) | 0.004 (0.006) | | -0.001 (0.001) | 0.009 (0.03) | | | | | | | | |
| D(UEMR(-1)) | 0.00 (0.005) | | -0.006*** (0.001) | | | -0.455*** (0.115) | 0.003 (0.006) | | -0.001 (0.001) | | | |
| D(UEMR(-2)) | | | | | | -0.363*** (0.107) | | | -0.009*** (0.001) | | | |
| DLOG(EXCR) | -0.109** (0.044) | | | 0.01 (0.231) | | 6.199*** (0.891) | | 0.001 (0.073) | | | | |
| DLOG(EXCR(-1)) | -0.049 (0.051) | | | -0.808*** (0.251) | | -3.708*** (0.91) | | 0.186*** (0.064) | | | | |
| CointEq(-1)* | -0.915*** (0.134) | -0.763*** (0.051) | -0.289*** (0.02) | -0.547*** (0.087) | -0.845*** (0.091) | -0.557*** (0.058) | -0.349*** (0.050) | -0.471*** (0.058) | -0.236*** (0.017 | -0.450*** (0.077) | -0.674*** (0.077) | -0.389*** (0.061) |
| R-squared | 0.920 | 0.944 | 0.946 | 0.666 | 0.867 | 0.768 | 0.703 | 0.855 | 0.931 | 0.699 | 0.748 | 0.550 |
| Adjusted R-squared | 0.835 | 0.937 | 0.929 | 0.575 | 0.787 | 0.737 | 0.650 | 0.816 | 0.913 | 0.618 | 0.714 | 0.536 |
| F-statistic | 10.815 (0.000) | 123.293 (0.000) | 55.231 (0.000) | 7.390 (0.000) | 10.863 (0.000) | 24.794 (0.000) | 13.260 (0.000) | 21.971 (0.000) | 50/331 (0.000) | 8.638 (0.000) | 22.221 (0.000) | N.A |

Source: Author's computation from ARDL analyses using E-views 10.0 ***, ** and *denote the significant level at 1%, 5% and 10% respectively

## 6.3 Discussion of the Primary Data

The previous section entails the discussion of all the secondary data analyses. This section presents a discussion of the primary data presented above. All the primary data, sourced through the questionnaires, are presented in chapter five. Each of the countries under study is discussed in turns. Given that the previous chapter presents the data and other statistical tests, as the discussion demands, we would be referring to those tables presented in chapter five.

### 6.3.1 Nigeria

Table 5.8 in chapter five presents the summary of the graphs for the Nigerian economy, which summarised all the results obtained from the closed-ended questions. The 5-point Likert scale was used to assess the respondent's opinions about the questions presented while Table 5.11 presents the dominant responses from the two open-ended questions, which enables the respondents to present their opinion in their own words and to offer them the opportunity to air their views about the questions. Similarly, table 6.13 below is derived from table 5.8 for easy understanding and interpretation as we merged the "Strongly Agree" (SA) + "Agree" (A) = "Agreed" (A) while "Strongly Disagree" (SD) + "Disagree" (D) = "Disagreed" (D). The same process was applied to table 6.14 (Venezuela) and table 6.15 (Norway).

Question1 seeks to find out whether increasing oil revenue increases the revenue base of the Nigerian economy. The results reveal that 91.3 per cent agreed, while 5.07 per cent disagreed, and the remaining 3.62 per cent were neutral. This is very reasonable since Nigeria as an oil-exporting nation is highly dependent on oil for over 98 per cent of its exports (Abubakar et al., 2016; Joshua et al., 2016; Akinlo, 2012). This result is also highly consistent with the findings from the secondary data analyses which revealed that a per centage increase in oil price would increase oil revenue by 0.804 per cent while a percentage increase in one period lag of oil price will also increase the oil revenue by 0.359 per cent. Similarly, the result reveals that a one per cent decline in oil price will lead to a corresponding decline in oil revenue of 0.292 per cent (see table 6.6.). However, this result indicates that the oil price is directly proportional to oil revenue in Nigeria.

Question 2 is the direct opposite of the above, which seeks to find out if declining oil revenue adversely affects the economic performance of the Nigerian economy. 85.51 per cent agreed while 8.7 per cent disagreed, and 5.8 remain neutral. The result shows that declining oil revenue adversely affects the economic performance of the Nigerian economy and it is highly consistent with the findings from the secondary data as revealed above. However, 96.38 per cent of the respondents agreed that there is a need for other sources of revenue to be explored as a supportive effort in meeting the budgetary needs of the nation as indicated in question 3. From this result, the respondents opine the need for the Nigerian economy to widen their horizon by expanding the nation's revenue base by giving attention to other sectors of the economy other than the oil sector. It calls for a way to reduce over-dependence on oil which is always the case since the discovery of oil.

Conversely, questions 4, 5, 6, 7 and 8 followed the same trend as most of the respondents disagreed in each case as indicated in the table below. Specifically, 51.45 per cent of the respondents disagreed that the Nigerian government are not making adequate efforts to explore alternative means of generating revenues in times of declining oil revenues to meet its budgetary needs while 30.45 per cent agreed to that. It is consistent with the result obtained in question 3 above, as there is every need for the expansion of another revenue base in Nigeria. Also, 71.74 per cent of the respondents disagreed that the government utilize the nations natural resources efficiently given that Nigeria is endowed with other natural resources Abubakar et al., (2016); Hassan (2013). 71.74 per cent disagreed that the government handles the nation's budgetary problems effectively while 79.71 per cent disagreed that the management of the budget is very effective. This result is consistent with the findings of Nwankpa and Okeke, (2017); Igbara et al., (2016) and Olaoye (2014) who revealed that the Nigerian budgetary processes are characterised by indiscipline, deficient governance and implementation crises which have prevented the actualisation of the long-expected goals. They advocate for a disciplined-based process in the Nigerian budgetary system. However, there is a need for effective management of the Nigerian budgetary system as also outlined by Sam-Tsokwa and Ngara, (2016) and Ekeocha, (2012).

In addition, results from Table 5.11 in chapter five reveal the dominant responses for questions 9 and ten which aim at finding out how Nigeria attain its budgetary needs during periods of declining oil revenues and what the government need to do to improve the revenue base and budgetary performance in times of declining oil revenue. However, the dominance response obtained for question 9 is that the government resort to internal and external borrowing in order to finance the budget deficits during the periods of declining oil revenue. Hence, this outcome has provided the answer to our research question, raised in the literature review:

RQ: How does Nigeria attain its budgetary needs during the periods of declining oil revenues?

Nevertheless, resorting to the borrowing of any kind is not the best because most loans are collected based on the interest to be paid subsequently, which will increase the debt burden in the economy. Debt servicing will also affect the nation's revenue base adversely. This result is also in consonance with the findings of Nwoba et al., (2017) and Paiko, (2012). To improve the revenue base of the economy, it is highly recommended that Nigeria diversify its revenue base, restore security which will attract foreign investors, develop the agricultural sector which was the mainstay of the economy before the discovery of oil, manage the other natural resources efficiently and utilise government funds effectively.

***Table 6. 13: Frequency Distribution Table for Nigeria***

| QUESTION | MEAN & MEDIAN | SA + A (AGREED) (%) | NEUTRAL (%) | D + SD (DISAGREED) (%) | MAXIMUM & MINIMUM |
|---|---|---|---|---|---|
| 1 | 5.0 | 91.3 | 3.62 | 5.07 | SA |
| 2 | 5.0 | 85.51 | 5.8 | 8.7 | SA |
| 3 | 5.0 | 96.38 | 1.45 | 2.17 | SA |
| 4 | 2.0 | 30.43 | 18.12 | 51.45 | D |
| 5 | 2.0 | 11.6 | 14.49 | 73.91 | D |
| 6 | 2.0 | 8.69 | 19.57 | 71.74 | D |
| 7 | 2.0 | 19.57 | 22.46 | 57.97 | D |
| 8 | 2.0 | 6.52 | 13.77 | 79.71 | D |

Source: Author's computation from plotted graphs using SPSS 25

### 6.3.2 Venezuela

For the Venezuelan economy, table 5.9 in chapter five summarised all the results obtained from the closed-ended questions while the dominant responses from the open-ended questions for the Venezuelan economy are presented in table 5.12. From table 6.14 below, Venezuela obtained similar results like that of the Nigerian economy in all the questions 1 – 8. Specifically, in questions 1, 2 and 3, the response rates of the agreed respondents are 83.62 per cent, 85.35 per cent and 83.62 per cent respectively as against 6.03 per cent, 3.45 per cent and 4.31 per cent of the respondents who disagreed with the questions. The results indicate that Venezuela, as an oil-exporting nation, increases its revenue base with the increase in oil revenue while declining oil revenue adversely affects economic performance. This result is very reasonable because the literature reveals that Venezuela relies so much on oil revenue for over 96 per cent of its revenue and as such would be affected either positively or negatively with the fluctuations in oil price. The outcome also supports the need for the Venezuelan economy to discover other sources of revenue apart from oil by developing other sectors of the economy and widening the revenue base. The results are consistent with our results from the secondary data analyses and in consonance with the findings of Monaldi, (2015). Nevertheless, the study is historical as no analysis was carried out.

On the contrary, the response rates for questions 4, 5, 6, 7 and 8 are 13.79 per cent, 7.76 per cent, 6.04 per cent, 14.66 per cent and 5.17 respectively agreed as against the disagreed response rates of 68.96 per cent, 80.17 per cent, 78.45 per cent, 66.38 per cent and 83.62 per cent. The results imply that the Venezuelan government are not making adequate efforts in exploring alternative means of generating revenue to meet its budgetary needs in times of declining oil revenue. It also implies that the government are not utilizing the nation's natural resources efficiently and not handling the nation's budgetary problems effectively. The result further reveals that the management of Venezuela's government budget is not effective. The above outcome is also consistent with the studies of Monaldi, (2015), Holden, (2011), Weisbrot and Sandoval, (2008).

Furthermore, table 5.12 in chapter five presents the dominant responses from the open-ended questions 9 and 10 which seeks the information about how Venezuela attain its budgetary needs during the periods of declining oil revenues and what the economy needs do to improve its revenue base during periods of economic crisis. Just like the outcome obtained for the Nigerian economy, the dominant responses indicate that during periods of declining oil revenue, the Venezuelan government engage in borrowing to finance their budget deficits. They also resort to seigniorage, a situation where the economy spends to produce money used in running the affairs of he nation which often result to economic losses for Venezuela even though the cost of producing the currency is always less than the market value (Diego, 2018). However, this has answered the research question raised from the literature:

RQ: How does Venezuela attain its budgetary needs during the periods of declining oil revenues?

These results are consistent with the studies of Nelson, (2018); Diego, (2018); Ellis, (2017) which reveal that there is serious economic and political instability in Venezuela, combined with very high debt profile as the nation relies on the International Monetary Fund (IMF) for financial assistance. However, the economy needs also to widen its horizon as diversification is the watchword from most of the respondents regarding what the country needs do to improve its revenue base during the periods of declining oil revenue. There is also every need to reduce its dependence on oil by supporting other sectors of the economy.

***Table 6. 14: Frequency Distribution Table for Venezuela***

| QUESTION | MEAN & MEDIAN | SA + A (AGREED) (%) | NEUTRAL (%) | D + SD (DISAGREED) (%) | MAXIMUM & MINIMUM |
|---|---|---|---|---|---|
| 1 | 5.0 | 83.62 | 10.34 | 6.03 | SA |
| 2 | 5.0 | 85.35 | 11.21 | 3.45 | SA |
| 3 | 5.0 | 83.62 | 12.07 | 4.31 | SA |
| 4 | 2.0 | 13.79 | 17.24 | 68.96 | D |
| 5 | 1.0 | 7.76 | 12.07 | 80.17 | SD |
| 6 | 1.0 | 6.04 | 15.52 | 78.45 | SD |
| 7 | 2.0 | 14.66 | 18.97 | 66.38 | D |
| 8 | 1.0 | 5.17 | 11.21 | 83.62 | SD |

Source: Author's computation from plotted graphs using SPSS 25

### 6.3.3 Norway

The summary of the graphs (closed-ended questions) for the Norwegian economy is presented in table 5.10 in chapter five, while the dominant responses from the open-ended questions are presented in table 5.13 of chapter five. The results for the Norwegian economy as shown in Table 6.16 below indicate that all the respondents agreed to all the questions 1 to 8 with very high response rates for each of the questions as against the response rates for the disagreed column.

However, these outcomes signify that increasing oil price affects the oil revenue positively and affects it negatively when the oil price falls. They also agree that there is still a need for more sources of revenue to be explored in Norway to continue to support the economy during periods of declining oil revenues. This also shows that Norway truly depends on oil revenue for over half of its exports as revealed in the literature and through the studies of Buvarp, (2015); Holden, (2011). The above result is also consistent with our findings from the secondary data analyses.

In addition, the results for questions 4, 5, 6, 7 and 8 of the Norwegian economy differ significantly from the results obtained for Nigeria and Venezuela. Table 6.15 reveals that the respondents agreed to all the questions with 76.85 per cent, 77.69 per cent, 78.51 per cent, 76.86 per cent and 76.86 per cent respectively for question 8. However, these contrary results of Norway relative to those of Nigeria and Venezuela signify that there is still need for the Norwegian economy to continue to explore other sources of revenue other than oil to enable it to meet the budgetary needs of the nations during periods of declining oil revenues. The results also show that Norway makes adequate effort to explore alternative means of generating revenues and are utilizing the nation's natural resources efficiently, also managing its budgetary process effectively. These results have confirmed our findings from the literature and consistent with the studies of Moses and Letnes, (2017); The Guardian, (2017); Buvarp, (2015); Koranyi, (2014).

The dominant responses for the Norwegian economy presented in Table 5.13 in chapter five reveal that during periods of declining oil revenue, Norway does not resort to borrowing like Nigeria and Venezuela but rather finance their budgets through its Sovereign Wealth Fund and the government's Pension Funds. Hence, this has provided the answer to the research question:

RQ: How does Norway attain its budgetary needs during periods of declining oil revenues?

It was further revealed that Norway could continue to improve its revenue base by continuous diversification of other sectors of the economy, through the adjustment of its policy to suit the current situation. Most of the responses have the word "continue to" which shows that the respondents believe that the economy has been doing well and needed to continue. The results are also consistent with the literature and with the findings of Buvarp, (2015) and Holden, (2011). The studies reveal that even as oil is the backbone of the Norwegian economy, during periods of increasing oil price which increase their revenue base, Norway does not spend more than 4 per cent of its oil revenue while the rest are being saved for the future generations and periods of economic crises. Norway tries to avoid the paradox of plenty and is not having the resource curse syndrome that befalls most economies that are blessed abundantly with natural resources.

*Table 6. 15: Frequency Distribution Table for Norway*

| QUESTION | MEAN & MEDIAN | SA + A (AGREED) (%) | NEUTRAL (%) | D + SD (DISAGREED) (%) | MAXIMUM & MINIMUM |
|---|---|---|---|---|---|
| 1 | 5.0 | 81.81 | 14.05 | 4.14 | SA |
| 2 | 5.0 | 81.8 | 12.4 | 5.79 | SA |
| 3 | 5.0 | 85.95 | 11.57 | 2.48 | SA |
| 4 | 5.0 | 76.85 | 12.4 | 10.75 | SA |
| 5 | 5.0 | 77.69 | 12.4 | 9.92 | SA |
| 6 | 5.0 | 78.51 | 13.22 | 8.27 | SA |
| 7 | 5.0 | 76.86 | 13.22 | 9.92 | SA |
| 8 | 5.0 | 76.86 | 14.05 | 9.09 | SA |

Source: Author's computation from plotted graphs using SPSS 25

The findings from the primary data for Nigeria, Venezuela and Norway agree with the theories of budgetary decision making of oil revenue decline which assume that decision-makers have all the necessary information at their disposal which would enable them to make policy choices to determine the budget of the nations. The budget makers are assumed to think and act rationally about the future and are expected to use the previous decisions to determine the government's current budget. The theory further argues that decision making in any society is highly complex at all times and requires the development of a shortcut which would aid in facilitating decision making in any society. The declining oil price is affecting all the oil-exporting countries, but it is so glaring that the Norwegian economy acts differently regarding its management of the oil rent and are exempted from the resource curse syndrome which befalls most of the oil-exporting countries as supported by (Holden, 2011). The budget makers need to understand the impact of the declining oil revenues on their economic performance which would aid them to make policy choices which would help the nation function effectively like those of the Norwegian economy.

## 6.4 Chapter Summary and Conclusion

This chapter presents the detailed discussions of all the findings from both the primary and secondary data, through which all the research questions raised in the literature review chapters were answered. From the research findings, all the null hypotheses were also tested against the alternative hypotheses, which enabled us to either reject or accept the null hypothesis in each case. While section 6.2 contains the discussion of the secondary data analyses, the primary data analyses are discussed in section 6.3.

However, all the research findings for both the primary and secondary data analyses carried out for Nigeria, Venezuela and Norway are summarised in the comparative tables 6.16 and 6.17 below.

*Table 6. 16: Comparative Table for the Primary Data Results*

| QUESTION | RESULTS | | |
|---|---|---|---|
| | NIGERIA | VENEZUELA | NORWAY |
| 1. Increasing oil price increases the revenue base of the economy. | A | A | A |
| 2. Declining oil revenue adversely affects the economic performance of the nation. | A | A | A |
| 3. There is a need for other sources of revenue to be explored as a supportive effort in meeting the budgetary needs of the nation. | A | A | A |
| 4. The government makes adequate efforts to explore alternative means of generating revenue in times of declining oil revenues to meet its budgetary needs. | D | D | A |
| 5. The government utilizes the nation's natural resources efficiently. | D | D | A |
| 6. The government handles the nation's budgetary problems effectively. | D | D | A |
| 7. When decisions to increase or reduce the budget of the Nigerian economy are made, the government explains to the populace the reasons for such decision. | D | D | A |
| 8. The management of the government budget is very effective. | D | D | A |
| 9. How does the economy attain its budgetary needs during the periods of declining oil revenues? | Borrowing | Borrowing & Seigniorage | Sovereign Wealth Fund (SWF) & Pension Funds |
| 10. What does the government need to do to improve its revenue base and budgetary performance in times of declining oil revenue? | Diversification & good governance/ management practice | Diversification & good governance | Continue to diversify the nation and maintain the successful Norwegian model. |

Source: Author's design

The primary data results, as presented in table 6.16 above reveal that both the Nigeria and Venezuela's results follow the same trend while the Norwegian result differs completely. Specifically, for the closed-ended questions 1 to 3, it reveals that in the three economies, declining oil price reduces the revenue base of each of the economies while increasing oil price have a positive impact in their revenue base since oil constitute the major part of the revenue in each of these countries. The results also show that there is a need for other sources of revenues in each of these nations.

The results for question 4-8 reveal that in both Nigeria and Venezuela, the economies are not making an adequate effort in exploring alternative sources of revenues and are not utilising the natural resources efficiently while the management of the government's budget in the two countries is not very effective. More so, the two open-ended questions reveal that while Nigeria resorts more to borrowing and using money recovered from looters to finance its budget deficits, Venezuela relies more on borrowing and Seigniorage to finance its budget deficits. The results further reveal that there is a need for Venezuela to diversify its economy and improve other non-oil sectors of the economy.

To improve the revenue base of the economy, it is highly recommended that Nigeria diversify its revenue base, restore security which will attract foreign investors, develop the agricultural sector which was the primary source of revenue for the economy before the discovery of oil, manage the other natural resources efficiently and utilise government funds effectively

On the contrary, results for questions 4-8 for the Norwegian economy reveal that Norway makes adequate effort to explore other alternative sources of generating revenue in the country. It also indicates that the Norwegian government utilise the nation's natural resources efficiently while the government handles its budgetary problems effectively. The result also reveals that Norway manages its government budget very effectively.

Unlike Nigeria and Venezuela, the two open-ended questions reveal that the Norwegian government utilise its reserves from the Sovereign Wealth Fund and the Pension Funds to finance its budgets and never from borrowing. The reason for this is that Norway does not spend more than 4 per cent of its revenues every year while the rest are being saved for the “rainy days” and as such have the largest Sovereign Wealth Fund in the whole world.

Based on the above findings, the Norwegian economy should serve as a reference to best practice for both Nigeria and Venezuela. Norway should also continue with the model that has been working effectively for the nation because, even though Norway is abundantly blessed with natural resources, it has not been involved with the “paradox of plenty” as in the case of most of the oil-exporting countries.

However, the comparative results of all the secondary data analyses are as presented in the table below:

*Table 6. 17: Comparative Table for the Secondary Data Results*

| VARIABLES OF THE MODEL | THE EFFECT OF DECLINING OIL PRICE ON THE MACROECONOMIC VARIABLES IN NIGERIA, VENEZUELA AND NORWAY | | |
|---|---|---|---|
| | **NIGERIA** | **VENEZUELA** | **NORWAY** |
| GOVERNMENT REVENUE | Government revenue will drop by 0.292% for every substantial decline in oil price in the S-R. In the L-R, government expenditure is a determinant of revenue. As oil price declines, a percentage rise in government expenditures will lead to 0.566% increase in government revenue in the L-R, which supports the spend-revenue hypothesis. | A percentage decline in oil price reduces government revenue by 0.167% in the S-, while unemployment is the main determinant of government revenue in the L-R. A percentage increase in unemployment will lead to a 0.03% decrease in government revenue in the L-R. | A percentage decline in oil price would reduce government revenue by 0.095% in the S-R, and it rises by 1.04% in the L-R for every percentage rise in oil price. This indicates that oil price is directly proportional to government revenue in Norway. |
| GOVERNMENT EXPENDITURES | One per cent decline in oil price will increase government expenditure by 0.113% in the S-R while a percentage increase in government revenue will boost government expenditures by 0.917% in the L-R (which supports the revenue-spend hypothesis) | The decline in oil revenue will increase government expenditures by 0.066% and 1.22% in the S-R and L-R, respectively. | The effect of declining oil price on Norway's government expenditures is insignificant in both the S-R and the L-R. |

| | | | |
|---|---|---|---|
| ECONOMIC GROWTH | There is a positive and insignificant effect of oil price fluctuation on growth in both the L-R and S-R. | Declining oil price exerts a negative and significant effect on economic growth through the external reserves in the S-R. A percentage increase in external reserves will shrink the economic growth by 0.074% while a percentage increase in government revenue will lead to 0.142% rise in economic growth in the L-R. | The effect of declining oil price on the economic growth of Norway is insignificant in the S-R while in the L-R, a percentage increase in external reserves and government revenues leads to an increase in economic growth by 0.077% and 0.22% respectively. |
| EXTERNAL RESERVES | For a significant decline in oil price, external Reserves will shrink by 0.226% in the S-R and increases by 0.532% in the L-R for a percentage rise in the oil price (oil price and external reserves are directly proportional). | Declining oil price decreases external reserves by 0.375% in the S-R while in the L-R, a percentage increase in government expenditures will shrink the external reserves by 1.479%. | External reserves decrease by 0.14% for every decline in oil price in the S-R while in the L-R, a percentage increase in government revenue increases external reserves by 3.933%. This shows a direct proportionality between oil price and external reserves in Norway. |
| INFLATION RATE | There is a positive and insignificant effect of declining oil price on inflation rate in the S-R.<br>Exchange rate and external reserves are the main determinants of inflation in the L-R. As oil price declines, one | 1% exchange rate depreciation affects the inflation rate positively as it rises by 19.17% in the S-R while in the L-R, one per cent increase in unemployment will lead to a | The declining oil price has a positive and significant effect on inflation. Inflation rises by 0.701% for a percentage drop in oil price while the effect of declining oil price on inflation rate is insignificant in the L-R. |

| | | | |
|---|---|---|---|
| | per cent exchange rate depreciation will lead to 7.61% rise in inflation, but it reduces by 31.586% for a percentage increase in external reserves in the L-R. | reduction of the inflation rate by 0.165%. | |
| EXCHANGE RATE | A control Variable | A control Variable | A control Variable |
| UNEMPLOYMENT | There is a positive and insignificant effect of dwindling oil price on the unemployment rate in Nigeria. | Declining oil revenue affects the unemployment rate positively and significantly. A percentage decline in oil revenue increases the unemployment rate by 1.09% in the S-R and by 3.548% in the L-R | Decreasing oil price lowers the unemployment rate by 0.399% in the S-R while in the L-R, a percentage rise in the inflation rate reduces the unemployment rate by 0.444%. |

Source: Author's design from the ARDL analyses results using E-Views 10

### 6.4.3 SUMMARY OF THE COMPARATIVE ANALYSIS OF THE SECONDARY DATA RESULTS

**GOVERNMENT REVENUE**

The comparative analyses of declining oil price on the key macroeconomic indicators (government revenue, government expenditures, economic growth, external reserves, inflation rate and unemployment) of Nigeria, Venezuela and Norway are as presented in table 6.17. In the short run, declining oil price significantly affected the revenue base of Nigeria, Venezuela and Norway but the magnitude of the effect is higher in Nigeria because as oil price drops, Nigerian government revenue dropped by 0.292%, Venezuela decreased by 0.167% while Norway dropped by 0.095% respectively. This implies that the government revenue of these countries is very sensitive to oil price shocks. The higher negative coefficient of -0.292 suggests that government revenue in Nigeria is more susceptible to negative oil price shocks when compared to the government revenue in Venezuela. Although the effect on the Norwegian government revenue is lower probably because Norway is utilising other natural resources, they are endowed with even though oil contributes over half of its export earnings. In line with expectation, government revenue in Nigeria, Venezuela and Norway are driven by changes in oil price.

However, in the long run, oil price and government revenue are directly proportional in Norway as a one per cent increase in oil price led to a 1.04% increase in the Norwegian government revenue. As oil price declines, there is a need for the Norwegian government to continue to expand its horizon by continuing focusing more on generating revenues through other non-oil sectors of the nation. For the Venezuelan economy, unemployment is the main determinant of government revenue in the long run. Precisely, as oil price declines, one per cent rise in unemployment would result in 0.03% decrease in government revenue. The result implies that the increase in unemployment reduces the tax revenues of the nation, which in turn affects the government revenue adversely in the long run. The government should, therefore, focus also on the projects that would improve and drastically reduce the unemployment level in the economy as it diversifies the economy to reduce its overwhelming dependence on oil.

Additionally, for the Nigerian economy, government expenditures are the main determinant of government revenue in the long run. One per cent increase in the government expenditures will result in 0.566% increase in government revenue in the long run. This suggests that higher government spending will lead to more revenue. This is reasonable given that government spending on both capital and recurrent activities will increase taxable income, and this will, in turn, increase government revenue.

However, this supports the spend-revenue hypothesis proposed by Peacock and Wiseman, (1979) which states that temporary increase in government expenditures due to political or economic crises will lead to a permanent increase in government revenues. It is highly consistent with Barro (1979), which argues that current deficit-financed expenditure indicates increased tax liabilities in the future. In other words, increased current expenditures would lead to increased future tax. However, this hypothesis implies that decreasing expenditure should be a desirable solution to mitigate the deficit budget.

These results also show that these economies are highly depending on the revenues from oil in order to run the affairs of the nations. Thus, the government of these countries could focus more on non-oil revenue components to increase the total revenue of the nations in the long run. The Nigerian and the Venezuelan government can also plan their long-term revenue projections with less dependence on oil prices. This would help these nations to avoid the uncertainties associated with oil price fluctuations immensely.

**GOVERNMENT EXPENDITURES**

For the Nigerian and the Venezuelan economy, declining oil price exerts a positive and significant effect on government expenditures as one per cent decline in oil price increases the government expenditures by 0.113% and 0.066% for Nigeria and Venezuela in the short run. Venezuela's government expenditures also rise by 1.22% in the long run for a percentage drop in oil price. Though, as oil price declines, it is expected that the government expenditures of the economies reduce as well since they rely on oil for a higher percentage of their revenues. The high government expenditures during declining oil revenue imply that the government of these nations have either deep hand more into their foreign reserves or resorted to borrowing in order to finance their budget deficits. However, deficit financing through borrowing encourages more government spending as our findings revealed and this also exerts a negative impact on the economy by crowding out the private investments and increasing the external debt burden due to debt servicing. The government of Nigeria and Venezuela need to guard against all these due to the adverse effect on the economic performance of the nations.

In addition, percentage increase in government revenue in Nigeria will boost government expenditures by 0.917% in the long run. This suggests that government expenditure in Nigeria is more responsive to changes in government revenue and it supports the revenue-spend hypothesis which states that increasing the resources available to the government will only lead to increases in government expenditures which will in turn result to the inability of reducing the budget deficit gap. However, the validity of the revenue-spend hypothesis suggests that budget deficits can be avoided by implementing policies that would stimulate more government revenues. This additional revenue could emanate through the diversification of the non-oil sectors of the nations.

The effect of the declining oil price on the government expenditures of the Norwegian economy is insignificant in both the short run and the long run. It merely suggests that the Norwegian government's expenditures are insensitive to lower oil price. It also implies that the Norwegian government are not affected at all by the declining oil price since the nation has always been in the habit of saving most of its windfall gains from oil. As such, they have surplus balance in their Sovereign Wealth Fund (SWF) which enables them to be able to "weather the storm" during periods of economic crisis. From the literature, it was revealed that even when the oil price was high and the Norwegian government revenues increase, the economy has always been in the habit of not spending more than 4% of their income while the remaining goes into their savings and as such, Norway's Sovereign Wealth Fund is the highest in the whole world.

**ECONOMIC GROWTH**

There is a positive and insignificant effect of oil price fluctuation on growth in both the long run and the short run in Nigeria. The effect on the Venezuelan economic growth is negative and significant because external reserves are the primary driver of economic growth in Venezuela in the short-run (a percentage increase in external reserves leads to 0.074% decrease in growth). The literature revealed that most economies that are richly blessed with natural resources are not experiencing the expected growth during periods of increasing oil prices which increases their revenues how much more would the effect be when oil price declines. However, the result could still be as a result of the “Resource Curse Syndrome” and “Dutch Disease (economic dimension of resource curse)” whereby most economies which are abundantly blessed with natural resources usually experience low economic growth more than those of them with fewer natural resources. Although the success story of Norway has shown that natural resource abundance is not really a curse but largely entails how the economy can effectively manage its natural resources. The case of Nigeria and Venezuela is likely due to mismanagement of the petroleum resources by those in authority, high level of corruption, negligence of the agricultural sector and other non-oil sectors of the economies, which in-turn adversely reflect in the economic activities of the nations. The Norwegians economic growth is not responsive to declining oil price in the short run while in the long run, a percentage increase in the external reserves and government revenue leads to 0.077% and 0.22% growth. This implies that the economy is shielded from the adverse effect of oil price decline due to its ability to continue to tap from other natural resources of the economy other than oil and due to its vast reserves.

**EXTERNAL RESERVES**

In the short run, the external reserves for the three countries shrunk for one per cent decline in oil price. The large negative coefficients of -0.375 and -0.226 for Venezuela and Nigeria imply that the declining oil price will have more effect on Venezuela and Nigeria’s external reserves compared to Norway which decreased by -0.14%. Although, all the results entail that these nation’s reserves are highly sensitive to the declining oil price, which also indicate that oil constitutes the major part of their foreign reserves. More so, government expenditures are the primary determinant of external reserves of the Venezuelan economy in the long run, and it decreases by 1.479% for a percentage increase in government expenditures. The economy, therefore, needs to engage in more activities that would help in building up the revenue base through increased revenue.

On the other hand, the Nigerian and Norwegian external reserves increase for a percentage increase in the oil price, which shows that both oil price and external reserves are directly proportional in the long run. It also indicates that the highest percentage of the export earnings of these nations emanates from oil. There is an absolute need for diversifying the economies to improve the foreign reserves through other sectors rather than oil alone.

**INFLATION**

In the short run, the effect of declining oil price on the inflation rate of the Nigerian economy is insignificant but exchange rate and external reserves are the main determinants of inflation in the long run as a percentage increase in external reserves reduced the inflation rate by 32% while a percentage exchange rate depreciation will lead to 8% rise in inflation. It implies that exchange rate depreciation would make export cheaper while import becomes more expensive, thereby encouraging more exports, which will lead to more revenue available in the economy, hence, higher inflation. Although the more the Nigerian economy save as their reserves, the less the inflation rate. It, therefore, becomes imperative for this nation to continue to improve its reserves to keep the inflation rate at a reasonable level.

However, the effect of the declining oil price on Venezuela's inflation rate has similar effect as that of the Nigerian economy because one percentage exchange rate depreciation increases the inflation rate to 19.17% in the short run but in the long run, inflation is inversely related to the unemployment rate, which supports the Phillips curve. As oil price declines, one per cent increase in the unemployment rate would cause a reduction of the inflation rate, and as such, there is a need for the government to think of possible means to reduce the unemployment rate in a way that would encourage moderate inflation rate since they are inversely related.

Although the effect of declining, oil price also has a positive and significant effect on the Norwegian inflation rate as it rises by 0.701% in the short run but insignificant in the long run. However, the magnitude of the effect is lower in Norway when compared to Nigeria and Venezuela probably because of the Norwegian saving habit which compels the nation to spend only 4% of its revenue while the rest of the funds goes to the Sovereign Wealth Fund for future use. Nigeria and Venezuela, on the other hand, spend more of their revenues and even resort to borrowing to finance their budget deficits which also tend to make more money available in circulation, thereby increasing the inflation rate.

**UNEMPLOYMENT**

There is a positive and insignificant effect of dwindling oil price on the unemployment rate in Nigeria, which implies that unemployment is not responsive to oil price changes in Nigeria. In Venezuela however, declining oil revenue caused the unemployment rate to increase by 1.09% in the short run and by 3.548% in the long run which implies that the rate of unemployment is being determined by government revenue. Therefore, improving the revenue base of the Venezuelan government through diversifying the economy would help in improving their revenue and reduce the unemployment level as well. However, when compared to the Norwegian economy, the effect of declining oil rice on the unemployment rate is quite distinct because of unemployment rate declines by 0.399% in the short run as oil price declines in the short run and further declines by 0.444% in the long run for a percentage rise in inflation. This result, therefore, shows that the Norwegian economy utilises its resources from the petroleum sector effectively to continue with the economic activities of the nation, which in-turn lower the unemployment level in the society. Also, the inflation rate is negatively related to the unemployment rate. A percentage increase in the inflation rate will lead to a less proportional reduction in the unemployment rate in the short-run. However, this is highly consistent with the Philips curves which reveal that inflation and unemployment are inversely related as an increase in inflation will lead to a reduction in unemployment and vice versa (Phillips, 1958).

Overall, this chapter presents a detailed discussion of both the primary and secondary data analyses from which all the research hypotheses derived through the literature were either rejected or not rejected. More so, from the chapter and other chapters, overall conclusions of the entire thesis were drawn and presented in the next chapter seven.

# CHAPTER SEVEN

## Summary, Conclusion and Recommendations

# CHAPTER SEVEN

# 7.0 Summary, Conclusion and Recommendations

## 7.1 Introduction

The preceding chapters' entails the presentation of data, descriptive statistics of the data, the diagnostic and other statistical tests carried out during the analyses. The chapters also present all the analyses of results from both the primary and secondary data and the discussions of the findings from the entire analyses carried out.

This chapter, however, presents the summary of the entire thesis and the conclusions that are drawn from the main findings of both the secondary and the primary data analyses of the research. It also re-examines the research objectives, evaluates the contribution of the thesis to the body of knowledge, the limitations of the research and suggestions for further research were also highlighted. The chapter also presents the developed economic model for Nigeria and Venezuela and finally outlined the recommendations and policy implications of the research. However, the next section presents a summary of the study.

## 7.2 Summary of the Study

This study entails the evaluation of the impact of declining oil revenue implications on mono-economy budgetary objectives of Nigeria, Venezuela and Norway for comparative analysis. Revenue from oil and gas play a very significant role in the structure of these oil-exporting countries as these nations are overwhelmingly depending on oil revenue for over half of their export earnings. Changes in oil prices have been a constant occurrence since February 1949 when the oil price was as low as $1.17 per barrel to July 2008 when oil price reached its peak of $145.31 per barrel.

At the moment, oil price is trading at an average of $50.00 per barrel which is lower than the price of oil that most of the oil-exporting countries need to balance their budgets. The magnitude of the changes in oil price differs across nations depending on whether the economy is oil importers or oil exporters. The oil-exporting countries find oil prices very critical in dealing with the affairs of the nations as oil serves as a good source of revenue generation and as such, the fluctuations in oil prices affects the market sides especially as oil price declines and even lower than the break-even oil price of most of the oil-exporting countries.

However, in recent periods, the Nigerian economy is facing declining oil revenue, which has resulted in the inability of the nation to finance its fiscal needs. The economy is also experiencing acute exchange rate volatility, fiscal imbalance, and serious macroeconomic instability. However, Nigeria is heavily dependent on the importation of goods and services even when the oil revenue declines, and it has raised the exchange rate of the Naira against the other major currencies in the world as a result of the scarce foreign currencies associated with the declining oil price which has drastically reduced the government revenue. The exchange rate crisis further affected the inflation rate adversely (Adedokun, 2018).

For the Venezuelan economy, crude oil comprises 25% of the nation's gross domestic product and over 95% of its export earnings. The economy is overwhelmingly depending on oil revenue for its sustainability. The declining oil revenue brought about the economic crisis as residents lack access to basic foods, medication and necessities of life while millions of the nationals have migrated to other countries for a greener pasture (Depersio, 2018).

The Norwegian economy is not left out as the economy depends so much on the petroleum sector for over half of its exports and is also affected adversely by the declining oil revenue. The share of the gross domestic product from the petroleum sector reached its peak of 25% in 2008 and 2012; it declined to 22%. However, it further declined to 15% in 2015. The revenue from the oil sector declined from 33% to 20% from the year 2012 to 2015. Norway's share of investment in the petroleum sector declined from 29% in 2014 to 26% in the year 2015 (Seeking Alpha, 2016)

Given some of the above-outlined issues associated with the declining oil revenues in most of the oil-exporting countries, it becomes highly imperative to carry out a comprehensive analysis of the consequences of the declining oil revenues on the fiscal performance of the oil-exporting countries. Mainly due to the continuous decline of oil price, leading to decreasing oil revenues. Hence, the need to understand the extent to which the declining oil revenue has affected the oil-exporting countries and how these nations would be able to meet with the budgetary needs in this new paradigm shift to oil revenue, necessitated by the depressed crude oil prices.

Besides, the study is concerned with the evaluation of the impact of declining oil price on the macroeconomic variables of Nigeria, Venezuela and Norway given that from the literature, most of the related studies have diverse views and divergent conclusions as regards to the impact of the oil price fluctuations and most macroeconomic variables. Hooker (1996) found no relationship between oil price and macroeconomic variables.

However, in 1999, Hooker maintained that this relationship might be very difficult to identify due to the behavioural nature of time series data of oil price. Taghizadeh-Hesari and Yoshino (2015); Yoshino and Taghizadeh-Hesary, (2014) in examining this effect in the USA, China and Japan found out that there exists a relationship between oil price fluctuations and macroeconomic variables. Aliyan (2013) posits that this relationship is highly unpredictable since both oil importers and oil exporters are affected differently. Shi and Sun (2012) in examining this effect in China and India, concluded that there is no substantial causality between oil price fluctuation and most macroeconomic variables. Nzimande and Msomis, 2016 in examining this effect in South Africa concluded that both increasing and decreasing oil prices have no impact on economic activities. Also, Adedokun, (2018) in examining the effect of oil shocks in Nigeria using SVAR, found that oil price shocks could not predict the variation in government expenditure in the short run while the predictive power of the oil revenue shock is strong in both the short run and long run.

Given this background and having examined different other related studies with diverse views and conclusions as to the impact of oil price fluctuations and macroeconomic variables, it gave rise to the null hypotheses ($H_0$) of the research which were tested as against the alternative hypotheses ($H_1$).

The study also examined the trends of the oil prices at different periods, from 1946 when the oil price was as low as $1.117 per barrel to this present time and also presents the overviews of all the oil-exporting countries under examination – Nigeria, Venezuela and Norway.

It is shown from the literature that when the sample size is small, Engle and Granger (1987) cointegration methodology, and maximum likelihood tests associated with Johansen (1988) and Johansen and Juselius (1992) become inappropriate in examining the long-run relationship between oil price fluctuation and economic activities (Babajide and Soile, 2016; Narayan and Smyth, 2005).

In order to avoid the bias associated with the above and to achieve the aims and objectives of the study, the Autoregressive Distributed Lag (ARDL) estimation technique was employed for the analysis of the secondary data due to its numerous advantages over the aforementioned estimation techniques. Yearly data were employed while the period of coverage is for thirty-six years, from 1981 to 2016. The method helped to prevent the endogeneity problem and was able to produce both the long-run and the short-run estimates of the model concurrently. The ARDL bound methods are not affected when dummy variables are included in the model, while the variables of the model could have different lag lengths. On the other hand, the primary data analysis was carried out using SPSS version 25.

Prior to all the analyses of both the primary and the secondary data, the unit root tests were carried out using the Augmented Dickey-Fuller (ADF) and Phillips Perron (PP) tests; the descriptive statistics of the data, the diagnostic tests which includes the structural and dynamic stability tests (CUSUM and CUSUM of squares); residual diagnostics (Heteroscedasticity, Serial correlation, Normality tests); Coefficient diagnostics (Long run Form and Bound Test, Error Correction Form (short-run test)) were also carried out. However, all the tests reveal that the models are structurally and dynamically stable; they are normally distributed and are also free of both the serial correlation and heteroscedasticity.

The summary of all the results from both the secondary and primary data analyses are as presented in the next sub-sections.

## 7.3 Summary of Findings from the Secondary Data Analyses

The results from the secondary data analyses are summarised for each of the countries under study and are presented in the next subsections.

### 7.3.1 Summary of Findings for the Nigerian Economy

For the Nigerian economy, the results reveal that declining oil revenues have a significant impact on government revenues, government expenditures and most of the macroeconomic variables of the nation. Specifically, declining oil revenue has a negative but significant impact on government revenue and external reserves in the short term while in the long run, a percentage increase in government expenditures exerts a positive and significant impact on government revenue which supports the spend-revenue hypothesis. Also, in the long run, the increasing oil price has a positive and significant impact on external reserves. However, this implies that the government revenue and external reserves of the Nigerian economy are highly responsive to oil price shocks and have direct proportionality. On the other hand, the declining oil price has a positive and significant impact on government expenditure in the short run. It implies that the economy either uses more of its reserves or resort to borrowing in order to finance its fiscal needs. In the long run, a percentage increase in government revenue also exerts a positive and significant effect on the government expenditures, which supports the revenue-spend hypothesis. On the contrary, declining oil price exerts a positive and insignificant effect on economic growth and unemployment in both the short run and long run. It also has a positive and insignificant effect on the inflation rate in the short run, while the exchange rate and external reserves were the main determinants of inflation in the long run.

### 7.3.2 Summary of Findings for the Venezuelan Economy

The results for the Venezuelan economy reveal that declining oil price has a negative and significant impact on government revenue, economic growth, and external reserves in the short run. While in the long run, unemployment is the main determinant of government revenue as government revenue decreases for a percentage increase in the rate of unemployment while external reserves and government revenue are the main determinants of economic growth. Also, a percentage increase in government expenditure shrinks the external reserves in the long run. The government, therefore, needs to adopt more alternative means of revenue generation rather than borrowing and depletion of its reserves in financing its budget deficits.

In addition, the results further show that declining oil revenue exerts a positive and significant effect on government expenditures and unemployment in both the short run and long run which also indicate that the government finance its budget deficits mainly through borrowing from both the internal and external sources. It also implies that declining oil revenue has a significant impact on the unemployment rate of the economy. More so, the result also shows that exchange rate and unemployment rate are the main determinants of inflation in both the short run and long run.

### 7.3.3 Summary of Findings for the Norwegian Economy

The results for the Norwegian economy reveal that declining oil revenue exhibits a dynamic impact on government revenue, government expenditure and on all the other macroeconomic variables inherent in the economic models, except the government expenditures which is insignificant in both the short run and long run. The findings further reveal that declining oil revenue has a negative and significant impact on government revenue and external reserves in the short run while in the long run, a percentage increase in oil price, exerts a positive and significant effect on both the government revenue and external reserves. It implies that oil price is directly proportional to government revenue and external reserves in Norway as an increase or decrease in oil price affects these variables proportionately. Also, the effect of declining oil price on the Norwegian's economic growth is insignificant in the short run, while external reserves and government revenues were the main determinants of growth in the long run.

Nevertheless, the declining oil price has a positive and significant effect on inflation and unemployment in the short run. In the long run, its impact on the inflation rate is insignificant, while the inflation rate is the main determinant of the unemployment rate in the long run as well. The next section presents the summary of findings from the primary data analysis.

### 7.4 Summary of Findings from the Primary Data Analysis

The primary data analyses reveal that both increasing and decreasing oil price affects oil revenues of the Nigerian economy, Venezuela and Norway proportionately. The results also revealed that the three economies under study need to explore other sources of revenue as a supportive effort in meeting with the budgetary needs of the nations.

The results further show that the Norwegian government makes adequate efforts in exploring alternative sources of generating revenues during periods of declining oil price which enables the economy in meeting with its budgetary needs while Nigeria and Venezuela's governments are not making adequate efforts in this exploration of alternative sources of revenue generation. Although the nations may have been engaged in some ways to expand the revenue source, but this study reveals that such efforts are not adequately carried out and not enough.

The results also reveal that during periods of declining oil revenues, Nigeria attains its budgetary needs through borrowing, Venezuela attains its nations budgetary needs through borrowing and Seigniorage while Norway utilises its savings with the Sovereign Wealth Fund (SWF) and Pension Funds in meeting with its budgetary needs during periods of declining oil revenue. It also shows that both the Nigerian and Venezuela's government need to diversify the economy by investing on other sectors of the economy other than oil, practice good governance and manage the nation's resources effectively, efficiently while the Norwegian government continue with its diversification process and also continue to maintain the successful Norwegian model practice.

From the results and findings of the study from both the primary and secondary data analyses, we can, therefore, draw the following conclusions, that:

(i) The Nigeria, Venezuela and Norway are highly dependent on oil revenue as revealed from the results which indicate that oil revenue increases with the increase in oil price and reduces drastically as oil price declines.

(ii) Nigeria and Venezuela finance their budgetary needs through internal and external borrowing, in addition to that, Venezuela also finances its fiscal needs through seigniorage. This was revealed through the increasing government expenditures in the midst of declining oil revenues while the Norwegian government's expenditures are not affected by the declining oil revenue, since the economy has enough reserves in its Sovereign Wealth Funds (SWF) and Pension Funds during periods of windfall gains from oil and does not spend more than 4 per cent of its revenues on a yearly basis.

(iii) The external reserves of Nigeria, Venezuela and Norway, are highly affected by oil price fluctuations as it increases with the increasing oil price and declines as oil price falls. Thus, oil price and external reserves for each of these economies are directly proportional.

(iv) The government revenues, government expenditures and all the macroeconomic variables inherent in the models for this study are very sensitive to oil price fluctuations experienced at various periods.

(v) We can also conclude that there is an absolute need for Nigeria, Venezuela and Norway to adequately explore other sources of revenue which should serve as a supportive effort to meet the budgetary needs of the nations.

(vi) The Nigerian and Venezuela's governments are not utilising the nations natural resources efficiently, whereas the Norwegian government does.

(vii) Nigeria and Venezuela need to diversify the economies, practice the act of good governance and efficient management of the resources while the Norwegian economy continues to diversify its economy and continue to maintain the successful Norwegian economic model which has been working effectively for the nation all these years.

## 7.5 Reconsideration of the Research Objectives

The analyses of both the secondary and primary data carried out in this study are aimed at achieving the main aim of the study, which is to evaluate the consequences of declining oil revenue on the economic performance of Nigeria, Venezuela and Norway for comparative analysis. Other specific objectives of the study are as outlined below:

i. To evaluate the effects of dwindling oil price on the actual revenues of Nigeria, Venezuela and Norway. (Negative but significant impact on all the economies)

ii. To examine the impact of changes in oil price on the actual expenditures of Nigeria, Venezuela and Norway. (Positive and significant impact on Nigeria and Venezuela's economies but insignificant on the Norwegian economy)

iii. To evaluate the effects of oil price fluctuation on Nigeria, Venezuela and Norwegian's economic growth. (Positive and insignificant in Nigeria, Negative and significant in Venezuela, Positive and significant in Norway)

iv. To assess the impact of declining oil price on Nigeria, Venezuela and Norway's external reserves. (Negative and significant impact on all the economies).

v. To examine the impact of declining oil price on the inflation rate of these economies. (Positive and insignificant for Nigeria while it exerts Positive and significant effect on Venezuela's and Norwegian economies)

vi. To evaluate the effects of declining oil price on the unemployment rate of Nigeria, Venezuela and Norway. (Positive and insignificant in Nigeria, Positive and significant in Venezuela but Negative and significant in Norway.

vii. To assess how Nigeria, Venezuela and Norway attain their budgetary needs during the periods of declining oil revenues. (Nigeria – Borrowing; Venezuela – Borrowing & Seigniorage; Norway – Sovereign Wealth Fund or through its Pension Funds

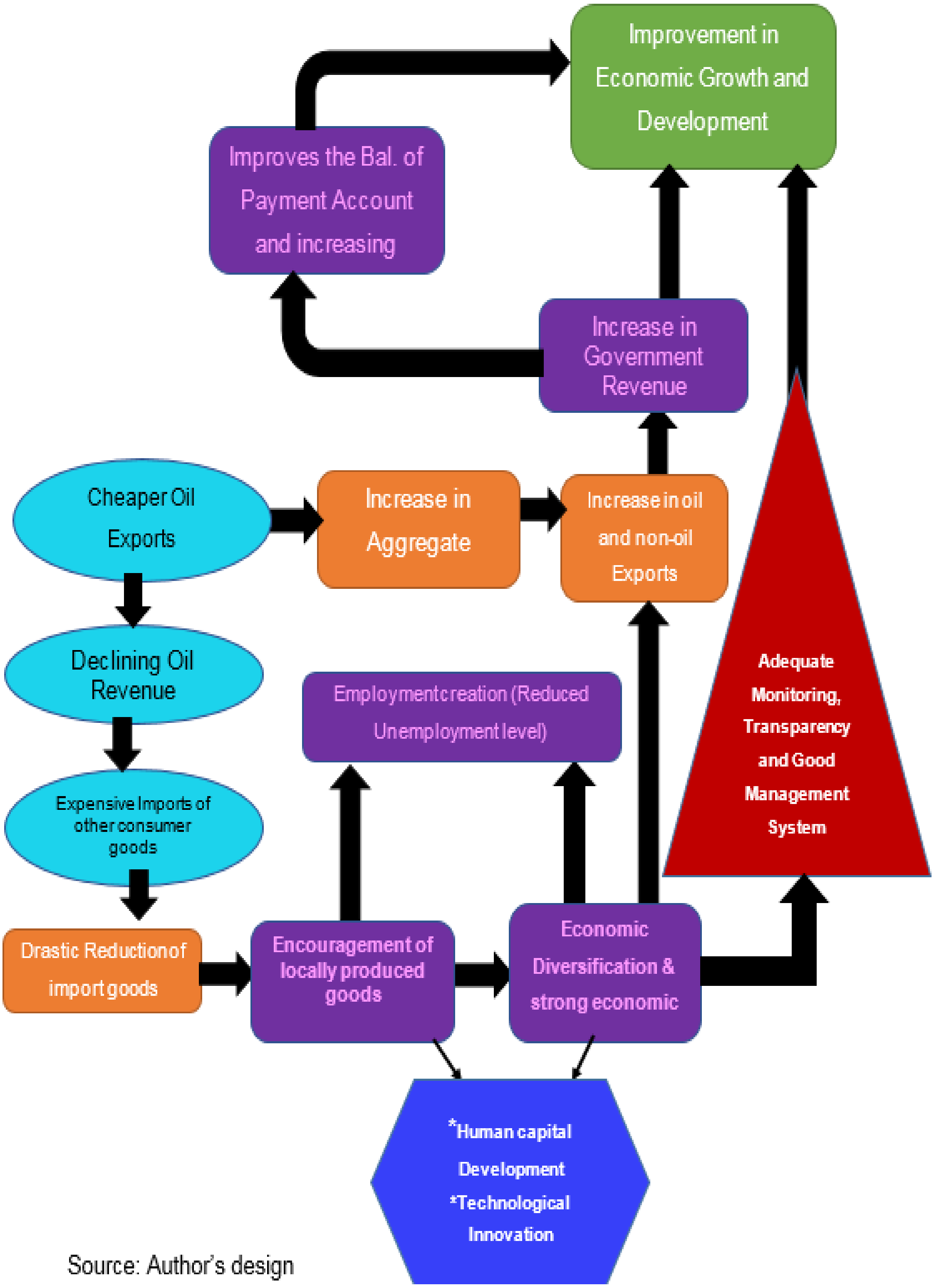
All the results obtained in all the analyses carried out provides substantial evidence which indicates that all the objectives of this study have been achieved as outlined in chapter five and six. Specifically, the main aim of the study and objectives (i-vi) were achieved through the Autoregressive Distributed Lag (ARDL) estimation method that was employed while the empirical analyses were carried out using yearly time series data for 36 years (1981 – 2016) for Nigeria, Venezuela and Norway. Given that the

ARDL Bound Test Approach requires that all the variables of the model are either stationary at level, stationary at first difference or stationary at both level and at first difference, unit root tests were carried out using the Augmented Dickey-Fuller (ADF) and Phillips Peron's (PP) Tests. The obtained results reveal that all the variables of the model are stationary at levels and at first difference, hence the choice of the ARDL estimation technique employed for this study. However, all the results of the secondary data analyses for Nigeria, Venezuela and Norway indicate that all the objectives (i-vi) as outlined above were achieved.

Furthermore, objective (vii) was addressed in this study as well through the survey data analysis carried out. The data for the analyses were gathered using questionnaires which were distributed and collected from the budget office and the ministry of finance for each of the countries under examination – Nigeria, Venezuela and Norway. SPSS version 25 was used in running the analyses for each of the countries, and the results obtained as outlined in chapter five and six, clearly shows that the objective (vii) was achieved.

Hence, all the objectives of the study were achieved through the primary and secondary data analyses carried out for Nigeria, Venezuela and Norway as presented and discussed in chapters five and six of this thesis. Given the outcome of the results for the three economies, an economic model was designed for both the Nigerian and Venezuelan economy and presented in the next section.

*Figure 7. 1: Proposed Economic Model for Nigeria and Venezuela*




Source: Author's design

An economic model is a simplified way of explaining the real world and its complex nature, which is often too difficult to understand literally. Economic models are usually subjective as different economists have different views and different judgements regarding the interpretation of what reality entails (Ouliaris, 2018). Also, Basu, (2009) also referred to a model building in economics as the fruitful area of economic, which is designed to solve real-world problems by the use of all available methods without distinctions.

Economic models are the primary tools economists employ in explaining economic issues or in making predictions about economic problems and solution. This could be applied using words, mathematics or visually/graphically as the case may be. An economic model could also be referred to as a simplified structure that describes the workings of the economy, given that the world and its settings are too complex with too many data. An economic model is therefore regarded as a very simplified version of the real world as it helps us understand better how the economy works through the interaction of different variables. It is often designed to produce testable hypotheses about economic behaviours.

Milton Friedman, among other economists, contends that economic models cannot just be tested by inquiring into the reality of its assumptions. These economists conclude that the validity of any economic model can be tested when it is capable of explaining and forecasting real-world activities. Friedman maintains that the ultimate test of any economic model is when it is faced with the data from the economy (Nicholson, 2007).

However, the above economic model is developed for both the Nigerian and the Venezuelan economy, which is aimed at closing the revenue gaps in these oil-dependent nations. The Norwegian economy already has an existing model which is working so effectively and as such do not need the above designed economic model.

The starting point of this model, however, is the cheap oil export, brought about by the declining oil price. The cheap oil exports led to the declining oil revenues, hence, the inability of these nations to meet with the fiscal needs of the economies. The weak exchange rate amid the low oil revenue makes import of consumer goods to be more expensive while increasing the aggregate demand for oil. The first law of demand is obeyed at this point which states that at higher prices, lower quantity of the commodity in question is demanded and the lower the price, the higher the quantity of the product demanded and as such, price and quantity demanded are inversely related (Hutchinson, 2016).

The expensive imports metamorphose into the drastic reduction of import goods which should in-turn encourage the production of locally manufactured goods. This would lead to economic diversification whereby the economies are shifted away from a single product source of revenue (for example, oil) to multiple sources of revenue by developing and investing on other sectors of the economies other than oil. For instance, in the late 1960s, agriculture has been the primary source of revenue for Nigeria before the discovery of oil as the nation is blessed with good fertile lands. Agriculture contributes more than 65% to the Gross Domestic Product of Nigeria in the 1960s but continuously declined to 48% in the 1970s, 20% in 1980 and further to 19% in 1985 due to the discovery of oil and economic mismanagement (Ekperiware and Olomu, 2015). Chukwuma (2018) also contends that agriculture and solid minerals contributed over 90% to Nigeria’s economic growth before the discovery of oil. Nigeria is endowed with other natural resources such as Coal, Bitumen, Iron Ore, Gypsum, Gold, Talc, Lead/Zinc, Bentonite and Barite, Gemstones, Kaolin, Rock Salt, Limestone, Cotton, Glass-Sand, Bauxite, Clay, Lignite, Marble, Salt and Uranium (Nigeria Finder, 2018; Yahaya, 2017).

On the other hand, Venezuela is also endowed with other mineral resources aside petroleum such as Diamonds, Bauxite, Gold, Iron Ore, Natural Gas, and Aluminium of which Venezuela can harness and invest into these resources for more revenues (AzoMining, 2018). Norway already has diverse geologic terrain which contains a broad spectrum of mineral resources for possible exploration, development and more revenues, including industrial minerals, metals and mineral fuels. Other mineral resources available in Norway apart from petroleum are natural gas, stone, iron ore, coal, nickel, titanium, sand and gravel (Newman, 2015). The Norwegian government have continued to expand other sectors of the economy even though the petroleum sector has been contributing to the major part of its revenues. However, in anticipation to an eventual decline in oil price, the Norwegian government has been saving a significant part of its oil revenues with the Sovereign Wealth Fund (SWF) which was valued at more than $700 billion (Newman, 2015).

Nigeria and Venezuela could invest and diversify other sectors of the economy, thereby encouraging the production of more locally manufactured goods, hence, creating more employment and reduction of unemployment level. There would then be an increase of oil and non-oil exports thereby increasing the government revenues of the nations and hence, improve the balance of payment account and increase the external reserves which would, in turn, lead to the improvement in economic growth and development of the nations. However, adequate monitoring, transparency and sound management system would have to be put in place in order to attain the desired goal. Although, the underlying assumptions upon which the above model is based include the following:

i. The underlying assumption is that the economies are highly dependent on one primary source of revenue, say oil.

ii. It is also assumed that the price of oil is on the decrease, thereby leading to declining oil revenue.

iii. We assume that the nations are also endowed with other natural/mineral resources other than oil, from which to harness.

iv. We also assume that the economies are willing to change or to move from mono-economy nations to more diversified nations in order to broaden the revenue base.

v. It is also assumed that the nations are highly vulnerable to oil price fluctuations, especially to negative oil price shocks.

## 7.6 Recommendations and Policy Implications

From the results and the findings of this study, the following policy implications and recommendations were deduced:

i. For Nigeria, Venezuela and Norway, the declining oil price has a negative but significant effect on government revenues. That is, the revenues of each of these economies dropped significantly due to the decrease in oil price. However, this calls for good policy reforms to promote economic diversification in all these nations highly dependent on oil revenue. We, therefore, recommend that the government of these nations should strengthen its drive towards moving away entirely from a mono-economy (oil-based nations) to other sectors, to broaden the revenue base of the nations. For instance to invest and develop the agricultural sector, Manufacturing and Mining. Although the Norwegian economy is affected too but not as much as Nigeria and Venezuela. We, however, recommend that Norway continue to diversify as the nation is into it already and continue to invest in other sectors of the economy for more revenue generation as it always does. Norway should also continue with its saving habit, which helps insulate the nation against any form of financial crisis or economic uncertainty of any sort.

ii. The effect of declining oil price on the government expenditures of Nigeria and Venezuela is positive and significant but insignificant on the Norwegian government expenditures. The results further reveal that the budget deficits for Nigeria are mainly financed through internal and external borrowing while Venezuela carries out its deficit financing through borrowing and Seigniorage. On the contrary, the Norwegian government finance its fiscal budget through the Government Pension Fund - Global of Norway and this spending is usually guided by the fiscal rule which states that the average spending must be less than the expected real return on the fund. It was estimated at 4% since 2001 but was reviewed in 2017, currently reduced to 3% (Oslen, 2018, Ministry of Finance Norway, 2018). This fiscal rule was first introduced in 1999 by the Social Democratic Government and was headed by Jens Stoltenberg, which outlined the detailed specification of how the oil revenues would be spent (Holden, 2011). The fiscal rule in Norway enabled the nation to avoid the Dutch disease.

However, just like the Norwegian economy, it would be necessary for Nigeria and Venezuela's government to include some fiscal rules into the policy measures which would help reshape the nations' spending habit to a specified percentage and ensure that such rules are strictly observed. Also, the Nigerian and Venezuelan government should further redirect the fiscal policy to maintain low fiscal deficits and discourage high government expenditures.

iii. The result also reveals that the effect of declining oil price on the external reserves of Nigeria, Venezuela and Norway is negative and significant as it drops significantly when the oil price falls and increase for a percentage increase in oil price. The results also indicate that oil price and external reserves are directly proportional. However, there is a need for the encouragement and implementation of proper policy measures in Nigeria and Venezuela in order to enhance the countries relationship with foreign investors. The essence is for more investment opportunities since external reserves can also be improved through foreign direct investment and serve as part of the diversification process.

iv. The government of Nigeria and Venezuela are also encouraged for policy measures which would lay more emphasis on supporting domestic investments like growing industries in the counties, provide credit with less collateral for small and medium scale enterprises as this will definitely boost the level of domestic output in general and also increase the number of export goods.

v. The literature and findings reveal that the Norwegian economy has the capacity of avoiding the Paradox of Plent, which has invariably affected most of the abundant resource nations due to some institutions and policies Norway put in place. Taping from its deep Sovereign Wealth Fund helped in minimising economic pain of declining oil revenue and subsequently transiting away from oil to its other vast sectors of the economy (Moses and Letnes, 2017). However, this study recommends that Nigeria and Venezuela should give priority to policies that address the enhancement of human and social capital which is more about administrative and human capacity building. It will help to minimise the negative impact of resource abundance in these nations and as well provide the right incentives to all the players of other sectors of the economies.

vi. Overall, it is highly recommended that Nigeria and Venezuela take expedient government actions to redirect the economies from oil dependency to other less volatile sources of revenue to avoid the adverse long-run effects of relying on one source of revenue as in the case of the oil sector.

vii. Since Nigeria, Venezuela and Norway are blessed with other mineral resources aside oil; it is recommended that the government of these nations through their best policy objectives, take a detailed inventory of the mineral resource potentials and promote its development for both local and international markets. This will, however, encourage the development of raw materials for the local industries and hence, reduce the rate to unemployment in these nations, especially in Nigeria and Venezuela.

viii. For the Nigerian economy to continue with the improvement of the revenue base of the nation, it is recommended that the nation aside diversification of its economy, it is essential the nation restores the strength of the security which will, in turn, attract foreign investors for more economic development.

ix. There is a need for the Nigerian and Venezuelan economies also to have policy measures which would assist the nation in managing the other natural resources efficiently and also to utilise the government funds effectively.

x. From the literature, it is evident that Nigeria as the only member of OPEC that still imports fuel had spent over $5.8 billion on the importation of fuel since late 2017 (Carsten and Evans, 2018). As a result, there is a need for the Nigerian economy to also give priority to policies that would be geared towards the encouragement of local refineries across different parts of the nation. This would drastically reduce the importation of fuel if not completely eradicated as the resultant effect would also generate more revenue for the nation and also create employment opportunities.

xi. Finally, another policy implication of the findings of this research which shows evidence of revenue-spend hypothesis and spend-revenue hypothesis is for the Nigerian government to consider determining the revenues and expenditures of the economy jointly since it would effectively help in restraining the budget deficits. Independent determination of the revenues and the expenditures of the economy would always metamorphose into high expenditures which have been affecting the nation adversely.

## 7.7 Contribution of the Study to the Body of Knowledge

Oil-related studies are not new, considering all the available works reviewed. Generally, there are quite a few publications as regards the topic under examination in these countries, but it is when disaggregated that one can find some perfectly related studies. This study has made enormous contributions to the already existing literature as it focuses on the impact of declining oil revenue implications on mono-economy budgetary objectives, a comparative analysis of Nigeria, Venezuela and Norway. No previous study had carried out these analyses for Nigeria, Venezuela and Norway, to the best of my knowledge. There are no comparative analyses of this study in existence before now.

The existing literature, however, has made several attempts in studying the impact of oil price fluctuations on the economic performance of both oil importing and oil-exporting nations. It is very evident that most economies under consideration are developed nations such as Mohaddesay and Raissib, (2016) - USA; Yoshino and Alakhina, (2016) - Russia; Fay, (2016) - Canada; Taghizade-Hesari and Yoshino, (2015) - USA, Japan and China; Kaplan, (2015) - Russia; Saha, (2015) - Indonesia; Yoshino and Hesary, (2014) - USA, Japan and China; Holden, (2013) – Norway; Hesary et al., (2013) - Iran, Canada and Russia; Aron, (2013) - Russia; Hamdi and Sbia, (2013) – Bahrain; Lusinyan and Thornton, (2012) - United Kingdom; Thurber et al., (2011); Hamilton, (2011, 2009, 2008, 2005, 2003 and 1983) - USA; Kilian (2010) - USA; Blanchard and Gali, (2010) - USA; Lorenzo et al., (2008) – Mexico; Gounder and Bartleet, (2007) - New Zealand; Li, (2001) – China; Hooker, (1997) - USA and Ghali, (1997) - Saudi Arabia.

However, this study is different from the previous studies as it is a comparative analysis of three different oil-exporting/dependent economies, Nigeria, Venezuela and

Norway from diverse areas of the world: Nigeria – West Africa (Developing), Venezuela – South America (Developing) and Norway – Northern Europe (Developed). Oil accounts for more than 85% of Nigeria's revenues and more than 90-95% of foreign exchange earnings(Nwoba, Nwonu and Agbaeze, 2017; Adamu, 2015), over 96% of Venezuela's export earnings (OPEC Annual Statistical Bulletin, 2016; Monaldi, 2015; Schipani, 2015; Pettinger, 2015) and over 57% of the Norwegians export earnings (Hass et al., 2017; Holden, 2011). It enabled us to understand the different effects of oil revenue decline across these nations.

Furthermore, this study, however, has also made several contributions to the current literature as regards to the impact of oil price fluctuation on most macroeconomic variables which is far from reaching a compromise as outlined in the earlier part of this chapter. It has been established in this study that oil price fluctuation has a significant effect on most macroeconomic variables.

The existing literature has tried in making attempts in exploring the impact of oil price fluctuations on most of the oil-exporting countries, but only very limited studies focused on the impact of declining oil price on the oil-exporting countries as revealed in this study. Positive oil price shocks and the macroeconomy are mainly the issues of concern in most of the studies. Some of these studies include: Nzimande and Msomi (2016); Eltejaei (2015) Taghizadeh-Hesary and Yoshino (2015); Emmanuel, (2015); Ibrahim, (2014); Allegret et al., (2014); Ogundipe et al., (2014); Yoshino and Hesary (2014); Dizaji (2014); Hesary et al., (2013); Ali and Harvie (2013); Hamdi and Sbia (2013); Oriakhi and Iyoha (2013); Shi and Sun, (2012); Emami and Adibpour (2012); Asekunowo and Alaiya (2012); Hamilton, (2011, 2009, 2008, 2005, 2003, 1983); Farzanegan (2011); Farzanegan and Markwardt (2009); Jones et al., (2004); Hamilton and Herrera, (2004) and Hooker, (1997).

All the studies, as mentioned above, laid more emphasis on an oil price increase and did not consider the periods of declining oil price. Also, Morks (1983) was more of a theoretical study and just an extension of Hamilton's work, which was not specific on what the actual price of oil was at the time. Nonetheless, IEA Washington DC (2016), Hamilton (2011), Bowen (2011), Williams (2011, 2007, 1999), Barsky and Kilian (2004) gave a well-articulated historical account of the changes in oil price at different periods. Other related studies are mainly historical in nature without any rigorous analysis carried out, such as Fay et al., (2016); Syne and Hruby, (2016); Itumo, (2016); Husain et al., (2015); Francisco, (2015); Sabitovaa and Shavaleyeva, (2015); Idrisov et al., (2015); Hajduchova et al., (2015); Adamu, (2015); Yanar, (2014); Grinkevich et al., (2014); Holden, (2013); Aron, (2013); Idemudia, (2012); Thurber et al., (2011); Hamilton, (2011, 2009, 2005, 1983); Kilian, (2010); Stevens, (2009); Wierts and Schotten, (2008); Hamilton and Herrera, (2004); Jones et al., (2004) and Tatom, (1987).

However, this study differs entirely from the previous studies in that it involves historical aspects of the subject in one of the literature review chapters while the empirical and the analytical perspectives, carried out respectively.

This study also made an immense contribution to the body of knowledge through its application of rigorous econometric techniques while the empirical findings have provided an essential and better understanding of the impact of declining oil revenues in all the oil-exporting economies under study. More so, the study involves updated yearly time series data from 1981 to 2016 and a wider variety of econometric techniques; hence, superior estimates of the parameters of the models have been produced through the analyses carried out for the three economies. No previous study has carried out this rigorous analyses for Nigeria, Venezuela and Norway, to the best of my knowledge, not even as a comparative analyses, before now.

This study has also brought about the enhancement of the understanding of the impact of declining oil revenues on the mono-economy budgetary objectives of Nigeria, Venezuela and Norway as a comparative analysis. The findings and the information from the study have contributed immensely to the ongoing debate in the world's oil market while it would help all the oil-exporting countries examined to know the best policy measures to adopt for better economic performance.

Another area through which this research contributes to knowledge is that it involves the use of primary data which was used to provide answers to one of the research questions for the three economies under study. The use of primary data in this study is indeed one of the novelties of this research and highly distinctive because to the best of my knowledge, none of the previous related studies used survey data analyses. The survey data analyses involved in this study provided first-hand information on how Nigeria, Venezuela and Norway finance the fiscal needs of the nations during periods of declining oil revenues. More so, an economic model was developed which would help in closing the revenue gap in the oil-exporting nations.

## 7.8 Limitations of the Study and Suggestions for Future Research

This research entails an analysis of declining oil revenue implications on mono-economy budgetary objectives, a comparative analysis of Nigeria, Venezuela and Norway. However, one of the limitations of this research is that only a few of the budgetary objectives were considered, such as economic stability and economic growth using the macroeconomic variables. Other budgetary objectives could be considered for future research such as reallocation of resources, reducing inequalities in income and wealth, management of public enterprises, and reducing regional disparities (Chand, 2015).

Given that oil is one of the most dynamically transacted commodities all over the world while the changes in oil price have become a regular phenomenon which affects both oil importers and oil exporters.  However, the impact of declining oil revenue on oil-dependent nations remains an ongoing issue which would continue attracting the attention of scholars and policymakers of the economies concerned, hence, an attractive area for future research.

Besides, another limitation is in the area of the methodology, data, findings and conclusions of this research, which was explicitly carried out for just three oil-exporting/dependent nation, Nigeria, Venezuela and Norway. A possible area for future research could be to select other oil-exporting nations to understand the impact of declining oil revenues on the economies selected for more understanding of its effects on other oil-exporting countries other than the ones examined in this study.

Furthermore, the possible extension could be made to this research through the inclusion of more variables to the set of data and to examine the effect of declining oil revenues on oil-importing nations.  It would add a lot to the already existing literature on the subject, thereby revealing the effects on oil importers since both oil exporters and oil importers are affected by fluctuations in oil price.  The analyses would help in providing a more precise outcome.

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# Appendices

## Appendix A: Unit Root Tests

## Appendix A1: Unit Root for Nigeria

### *Appendix A11: Nigeria Augmented Dickey-Fuller (ADF) Tests*

### *Variable 1: Nigeria Augmented Dickey-Fuller (ADF) Tests*

### *NIG AEXP AFI*

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.070292 | 0.0002 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/24/18 Time: 20:46
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.902205 | 0.177939 | -5.070292 | 0.0000 |
| C | 0.003142 | 0.049324 | 0.063692 | 0.9496 |

| | | | |
|---|---|---|---|
| R-squared | 0.445483 | Mean dependent var | -0.005853 |
| Adjusted R-squared | 0.428154 | S.D. dependent var | 0.380081 |
| S.E. of regression | 0.287419 | Akaike info criterion | 0.401271 |
| Sum squared resid | 2.643509 | Schwarz criterion | 0.491057 |
| Log likelihood | -4.821605 | Hannan-Quinn criter. | 0.431890 |
| F-statistic | 25.70786 | Durbin-Watson stat | 1.952909 |
| Prob(F-statistic) | 0.000016 | | |

## *NIG AEXP AFT*

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.061490 | 0.0013 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/24/18 Time: 19:53
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.925649 | 0.182881 | -5.061490 | 0.0000 |
| C | -0.060560 | 0.107401 | -0.563870 | 0.5769 |
| @TREND("1981") | 0.003456 | 0.005164 | 0.669268 | 0.5083 |

| | | | |
|---|---|---|---|
| R-squared | 0.453381 | Mean dependent var | -0.005853 |
| Adjusted R-squared | 0.418115 | S.D. dependent var | 0.380081 |
| S.E. of regression | 0.289931 | Akaike info criterion | 0.445749 |
| Sum squared resid | 2.605857 | Schwarz criterion | 0.580428 |
| Log likelihood | -4.577729 | Hannan-Quinn criter. | 0.491678 |
| F-statistic | 12.85613 | Durbin-Watson stat | 1.936300 |
| Prob(F-statistic) | 0.000086 | | |

## *NIG AEXP ALI*

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.428657 | 0.5571 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/24/18 Time: 19:45
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.119843 | 0.083885 | -1.428657 | 0.1625 |
| C | 2.795516 | 1.955356 | 1.429671 | 0.1622 |

| | | | |
|---|---|---|---|
| R-squared | 0.058248 | Mean dependent var | 0.002779 |
| Adjusted R-squared | 0.029710 | S.D. dependent var | 0.280262 |
| S.E. of regression | 0.276067 | Akaike info criterion | 0.319101 |
| Sum squared resid | 2.515034 | Schwarz criterion | 0.407978 |
| Log likelihood | -3.584272 | Hannan-Quinn criter. | 0.349782 |
| F-statistic | 2.041060 | Durbin-Watson stat | 1.686353 |
| Prob(F-statistic) | 0.162500 | | |

### *NIG AEXP ALT*

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.503632 | 0.3246 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/24/18 Time: 19:49
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.247181 | 0.098729 | -2.503632 | 0.0176 |
| C | 5.549943 | 2.244496 | 2.472690 | 0.0189 |
| @TREND("1981") | 0.011831 | 0.005438 | 2.175584 | 0.0371 |

| | | | |
|---|---|---|---|
| R-squared | 0.179595 | Mean dependent var | 0.002779 |
| Adjusted R-squared | 0.128320 | S.D. dependent var | 0.280262 |
| S.E. of regression | 0.261663 | Akaike info criterion | 0.238300 |
| Sum squared resid | 2.190966 | Schwarz criterion | 0.371616 |
| Log likelihood | -1.170250 | Hannan-Quinn criter. | 0.284320 |
| F-statistic | 3.502561 | Durbin-Watson stat | 1.721079 |
| Prob(F-statistic) | 0.042117 | | |

### *Variable 2: Nigeria Augmented Dickey-Fuller (ADF) Tests*

### *NIG AREV AFI*

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.686063 | 0.0000 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/24/18 Time: 21:01
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -1.023144 | 0.179939 | -5.686063 | 0.0000 |
| C | 0.008515 | 0.066938 | 0.127203 | 0.8996 |

| | | | |
|---|---|---|---|
| R-squared | 0.502575 | Mean dependent var | -0.006909 |
| Adjusted R-squared | 0.487030 | S.D. dependent var | 0.544511 |
| S.E. of regression | 0.389989 | Akaike info criterion | 1.011625 |
| Sum squared resid | 4.866919 | Schwarz criterion | 1.101411 |
| Log likelihood | -15.19762 | Hannan-Quinn criter. | 1.042244 |
| F-statistic | 32.33131 | Durbin-Watson stat | 1.967697 |
| Prob(F-statistic) | 0.000003 | | |

## NIG AREV AFT

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.571376 | 0.0003 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/24/18 Time: 21:03
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -1.021640 | 0.183373 | -5.571376 | 0.0000 |
| C | 0.021694 | 0.145210 | 0.149395 | 0.8822 |
| @TREND("1981") | -0.000714 | 0.006947 | -0.102715 | 0.9189 |
| R-squared | 0.502744 | Mean dependent var | | -0.006909 |
| Adjusted R-squared | 0.470663 | S.D. dependent var | | 0.544511 |
| S.E. of regression | 0.396162 | Akaike info criterion | | 1.070108 |
| Sum squared resid | 4.865263 | Schwarz criterion | | 1.204787 |
| Log likelihood | -15.19184 | Hannan-Quinn criter. | | 1.116037 |
| F-statistic | 15.67108 | Durbin-Watson stat | | 1.970919 |
| Prob(F-statistic) | 0.000020 | | | |

## NIG AREV ALI

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.525829 | 0.5090 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/24/18 Time: 20:58
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.131902 | 0.086446 | -1.525829 | 0.1366 |
| C | 3.135849 | 2.055390 | 1.525671 | 0.1366 |
| R-squared | 0.065901 | Mean dependent var | | 0.001156 |
| Adjusted R-squared | 0.037595 | S.D. dependent var | | 0.380708 |
| S.E. of regression | 0.373483 | Akaike info criterion | | 0.923558 |
| Sum squared resid | 4.603159 | Schwarz criterion | | 1.012435 |
| Log likelihood | -14.16226 | Hannan-Quinn criter. | | 0.954238 |
| F-statistic | 2.328153 | Durbin-Watson stat | | 1.868047 |
| Prob(F-statistic) | 0.136581 | | | |

## NIG AREV ALT

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.735108 | 0.2296 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/24/18 Time: 21:00
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.365429 | 0.133607 | -2.735108 | 0.0101 |
| C | 8.301381 | 3.040136 | 2.730595 | 0.0102 |
| @TREND("1981") | 0.021352 | 0.009661 | 2.210093 | 0.0344 |

| | | | |
|---|---|---|---|
| R-squared | 0.189601 | Mean dependent var | 0.001156 |
| Adjusted R-squared | 0.138951 | S.D. dependent var | 0.380708 |
| S.E. of regression | 0.353269 | Akaike info criterion | 0.838645 |
| Sum squared resid | 3.993576 | Schwarz criterion | 0.971960 |
| Log likelihood | -11.67628 | Hannan-Quinn criter. | 0.884665 |
| F-statistic | 3.743358 | Durbin-Watson stat | 1.731918 |
| Prob(F-statistic) | 0.034609 | | |

## Variable 3: Nigeria Augmented Dickey-Fuller (ADF) Tests

## NIG EXCR AFI

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.644593 | 0.0099 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/24/18 Time: 21:20
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.760503 | 0.208666 | -3.644593 | 0.0009 |
| C | 6.084641 | 3.116167 | 1.952604 | 0.0597 |

| | | | |
|---|---|---|---|
| R-squared | 0.293334 | Mean dependent var | 1.793999 |
| Adjusted R-squared | 0.271251 | S.D. dependent var | 19.70747 |
| S.E. of regression | 16.82364 | Akaike info criterion | 8.540469 |
| Sum squared resid | 9057.111 | Schwarz criterion | 8.630255 |
| Log likelihood | -143.1880 | Hannan-Quinn criter. | 8.571089 |
| F-statistic | 13.28306 | Durbin-Watson stat | 1.751710 |
| Prob(F-statistic) | 0.000940 | | |

## *NIG EXCR AFT*

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.972837 | 0.0194 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/24/18 Time: 21:21
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.824201 | 0.207459 | -3.972837 | 0.0004 |
| C | -2.268385 | 6.012069 | -0.377305 | 0.7085 |
| @TREND("1981") | 0.470940 | 0.292389 | 1.610666 | 0.1174 |

| | | | |
|---|---|---|---|
| R-squared | 0.347905 | Mean dependent var | 1.793999 |
| Adjusted R-squared | 0.305834 | S.D. dependent var | 19.70747 |
| S.E. of regression | 16.41959 | Akaike info criterion | 8.518925 |
| Sum squared resid | 8357.694 | Schwarz criterion | 8.653604 |
| Log likelihood | -141.8217 | Hannan-Quinn criter. | 8.564854 |
| F-statistic | 8.269536 | Durbin-Watson stat | 1.783106 |
| Prob(F-statistic) | 0.001324 | | |

## *NIG EXCR ALI*

Null Hypothesis: EXCR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 1.320067 | 0.9983 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/24/18 Time: 21:17
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | 0.056511 | 0.042809 | 1.320067 | 0.1959 |
| C | 3.189585 | 4.140475 | 0.770343 | 0.4466 |

| | | | |
|---|---|---|---|
| R-squared | 0.050157 | Mean dependent var | 7.224987 |
| Adjusted R-squared | 0.021374 | S.D. dependent var | 16.70054 |
| S.E. of regression | 16.52110 | Akaike info criterion | 8.502599 |
| Sum squared resid | 9007.242 | Schwarz criterion | 8.591476 |
| Log likelihood | -146.7955 | Hannan-Quinn criter. | 8.533279 |
| F-statistic | 1.742576 | Durbin-Watson stat | 1.495481 |
| Prob(F-statistic) | 0.195897 | | |

## NIG EXCR ALT

Null Hypothesis: EXCR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.383627 | 0.8483 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/24/18 Time: 21:19
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | -0.177300 | 0.128141 | -1.383627 | 0.1760 |
| C | -8.818031 | 7.394763 | -1.192470 | 0.2418 |
| @TREND("1981") | 1.594654 | 0.827665 | 1.926690 | 0.0629 |

| | | | |
|---|---|---|---|
| R-squared | 0.148889 | Mean dependent var | 7.224987 |
| Adjusted R-squared | 0.095695 | S.D. dependent var | 16.70054 |
| S.E. of regression | 15.88137 | Akaike info criterion | 8.449987 |
| Sum squared resid | 8070.975 | Schwarz criterion | 8.583303 |
| Log likelihood | -144.8748 | Hannan-Quinn criter. | 8.496008 |
| F-statistic | 2.798963 | Durbin-Watson stat | 1.402182 |
| Prob(F-statistic) | 0.075819 | | |

## Variable 4: Nigeria Augmented Dickey-Fuller (ADF) Tests

## NIG EXTR AFI

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.313161 | 0.0001 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/24/18 Time: 21:33
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.887252 | 0.166991 | -5.313161 | 0.0000 |
| C | 0.074091 | 0.078185 | 0.947639 | 0.3504 |

| | | | |
|---|---|---|---|
| R-squared | 0.468700 | Mean dependent var | 0.021451 |
| Adjusted R-squared | 0.452097 | S.D. dependent var | 0.610934 |
| S.E. of regression | 0.452216 | Akaike info criterion | 1.307709 |
| Sum squared resid | 6.543981 | Schwarz criterion | 1.397495 |
| Log likelihood | -20.23106 | Hannan-Quinn criter. | 1.338329 |
| F-statistic | 28.22968 | Durbin-Watson stat | 2.011743 |
| Prob(F-statistic) | 0.000008 | | |

## NIG EXTR AFT

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.193818 | 0.0009 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/24/18 Time: 21:34
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.885988 | 0.170585 | -5.193818 | 0.0000 |
| C | 0.084606 | 0.168261 | 0.502828 | 0.6186 |
| @TREND("1981") | -0.000572 | 0.008075 | -0.070889 | 0.9439 |

| | | | |
|---|---|---|---|
| R-squared | 0.468787 | Mean dependent var | 0.021451 |
| Adjusted R-squared | 0.434515 | S.D. dependent var | 0.610934 |
| S.E. of regression | 0.459415 | Akaike info criterion | 1.366371 |
| Sum squared resid | 6.542920 | Schwarz criterion | 1.501050 |
| Log likelihood | -20.22830 | Hannan-Quinn criter. | 1.412300 |
| F-statistic | 13.67848 | Durbin-Watson stat | 2.014024 |
| Prob(F-statistic) | 0.000055 | | |

## NIG EXTR ALI

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.756932 | 0.8188 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/24/18 Time: 21:30
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.043889 | 0.057983 | -0.756932 | 0.4545 |
| C | 1.052546 | 1.318378 | 0.798364 | 0.4304 |

| | | | |
|---|---|---|---|
| R-squared | 0.017066 | Mean dependent var | 0.056418 |
| Adjusted R-squared | -0.012720 | S.D. dependent var | 0.464741 |
| S.E. of regression | 0.467687 | Akaike info criterion | 1.373411 |
| Sum squared resid | 7.218129 | Schwarz criterion | 1.462288 |
| Log likelihood | -22.03468 | Hannan-Quinn criter. | 1.404091 |
| F-statistic | 0.572947 | Durbin-Watson stat | 1.631947 |
| Prob(F-statistic) | 0.454461 | | |

## *NIG EXTR ALT*

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.045756 | 0.1353 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/24/18 Time: 21:32
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.428734 | 0.140764 | -3.045756 | 0.0048 |
| D(LOG(EXTR(-1))) | 0.262887 | 0.159237 | 1.650916 | 0.1092 |
| C | 8.794406 | 2.863556 | 3.071149 | 0.0045 |
| @TREND("1981") | 0.054510 | 0.019456 | 2.801711 | 0.0088 |

| | | | |
|---|---|---|---|
| R-squared | 0.247037 | Mean dependent var | 0.080780 |
| Adjusted R-squared | 0.171741 | S.D. dependent var | 0.448472 |
| S.E. of regression | 0.408149 | Akaike info criterion | 1.155762 |
| Sum squared resid | 4.997568 | Schwarz criterion | 1.335334 |
| Log likelihood | -15.64795 | Hannan-Quinn criter. | 1.217001 |
| F-statistic | 3.280867 | Durbin-Watson stat | 1.896095 |
| Prob(F-statistic) | 0.034344 | | |

## *Variable 5: Nigeria Augmented Dickey-Fuller (ADF) Tests*

## *NIG GDP AFI*

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.339476 | 0.0016 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 12:06
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.742678 | 0.171145 | -4.339476 | 0.0001 |
| C | 0.028535 | 0.012995 | 2.195817 | 0.0355 |

| | | | |
|---|---|---|---|
| R-squared | 0.370464 | Mean dependent var | -0.000145 |
| Adjusted R-squared | 0.350791 | S.D. dependent var | 0.080973 |
| S.E. of regression | 0.065243 | Akaike info criterion | -2.564369 |
| Sum squared resid | 0.136213 | Schwarz criterion | -2.474583 |
| Log likelihood | 45.59428 | Hannan-Quinn criter. | -2.533750 |
| F-statistic | 18.83105 | Durbin-Watson stat | 1.977170 |
| Prob(F-statistic) | 0.000134 | | |

## *NIG GDP AFT*

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.655918 | 0.0037 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 12:07
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.860515 | 0.184822 | -4.655918 | 0.0001 |
| C | -0.001524 | 0.023535 | -0.064767 | 0.9488 |
| @TREND("1981") | 0.001871 | 0.001232 | 1.518966 | 0.1389 |

| | | | |
|---|---|---|---|
| R-squared | 0.414073 | Mean dependent var | -0.000145 |
| Adjusted R-squared | 0.376271 | S.D. dependent var | 0.080973 |
| S.E. of regression | 0.063950 | Akaike info criterion | -2.577334 |
| Sum squared resid | 0.126778 | Schwarz criterion | -2.442655 |
| Log likelihood | 46.81467 | Hannan-Quinn criter. | -2.531404 |
| F-statistic | 10.95380 | Durbin-Watson stat | 1.899103 |
| Prob(F-statistic) | 0.000252 | | |

## *NIG GDP ALI*

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 1.229830 | 0.9977 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 12:03
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | 0.028096 | 0.022846 | 1.229830 | 0.2275 |
| C | -0.691905 | 0.592849 | -1.167085 | 0.2515 |

| | | | |
|---|---|---|---|
| R-squared | 0.043824 | Mean dependent var | 0.037071 |
| Adjusted R-squared | 0.014849 | S.D. dependent var | 0.066016 |
| S.E. of regression | 0.065524 | Akaike info criterion | -2.557365 |
| Sum squared resid | 0.141681 | Schwarz criterion | -2.468488 |
| Log likelihood | 46.75390 | Hannan-Quinn criter. | -2.526685 |
| F-statistic | 1.512482 | Durbin-Watson stat | 1.571153 |
| Prob(F-statistic) | 0.227457 | | |

## NIG GDP ALT

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.284151 | 0.4311 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 12:05
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.131259 | 0.057465 | -2.284151 | 0.0291 |
| C | 3.295252 | 1.444747 | 2.280851 | 0.0294 |
| @TREND("1981") | 0.008191 | 0.002758 | 2.969269 | 0.0056 |

| | | | |
|---|---|---|---|
| R-squared | 0.250362 | Mean dependent var | 0.037071 |
| Adjusted R-squared | 0.203510 | S.D. dependent var | 0.066016 |
| S.E. of regression | 0.058917 | Akaike info criterion | -2.743575 |
| Sum squared resid | 0.111077 | Schwarz criterion | -2.610259 |
| Log likelihood | 51.01256 | Hannan-Quinn criter. | -2.697554 |
| F-statistic | 5.343649 | Durbin-Watson stat | 1.718664 |
| Prob(F-statistic) | 0.009945 | | |

## Variable 6: Nigeria Augmented Dickey-Fuller (ADF) Tests

## NIG INFR AFI

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.767191 | 0.0000 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 12:28
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.999089 | 0.173237 | -5.767191 | 0.0000 |
| C | 0.020979 | 0.122790 | 0.170855 | 0.8654 |

| | | | |
|---|---|---|---|
| R-squared | 0.509657 | Mean dependent var | 0.045556 |
| Adjusted R-squared | 0.494334 | S.D. dependent var | 1.006257 |
| S.E. of regression | 0.715551 | Akaike info criterion | 2.225496 |
| Sum squared resid | 16.38444 | Schwarz criterion | 2.315282 |
| Log likelihood | -35.83343 | Hannan-Quinn criter. | 2.256116 |
| F-statistic | 33.26050 | Durbin-Watson stat | 1.775762 |
| Prob(F-statistic) | 0.000002 | | |

## *NIG INFR AFT*

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.683408 | 0.0003 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 12:30
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.999492 | 0.175861 | -5.683408 | 0.0000 |
| C | 0.076007 | 0.265894 | 0.285854 | 0.7769 |
| @TREND("1981") | -0.002975 | 0.012698 | -0.234290 | 0.8163 |

| | | | |
|---|---|---|---|
| R-squared | 0.510524 | Mean dependent var | 0.045556 |
| Adjusted R-squared | 0.478945 | S.D. dependent var | 1.006257 |
| S.E. of regression | 0.726358 | Akaike info criterion | 2.282550 |
| Sum squared resid | 16.35548 | Schwarz criterion | 2.417229 |
| Log likelihood | -35.80336 | Hannan-Quinn criter. | 2.328480 |
| F-statistic | 16.16653 | Durbin-Watson stat | 1.778364 |
| Prob(F-statistic) | 0.000016 | | |

## *NIG INFR ALI*

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.252786 | 0.0252 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 12:25
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.482199 | 0.148242 | -3.252786 | 0.0026 |
| C | 1.285898 | 0.411878 | 3.122037 | 0.0037 |

| | | | |
|---|---|---|---|
| R-squared | 0.242783 | Mean dependent var | -0.008060 |
| Adjusted R-squared | 0.219837 | S.D. dependent var | 0.715098 |
| S.E. of regression | 0.631624 | Akaike info criterion | 1.974400 |
| Sum squared resid | 13.16531 | Schwarz criterion | 2.063277 |
| Log likelihood | -32.55200 | Hannan-Quinn criter. | 2.005080 |
| F-statistic | 10.58062 | Durbin-Watson stat | 1.593680 |
| Prob(F-statistic) | 0.002637 | | |

## NIG INFR ALT

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.213042 | 0.0110 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 12:26
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.705899 | 0.167551 | -4.213042 | 0.0002 |
| D(LOG(INFR(-1))) | 0.353760 | 0.164648 | 2.148588 | 0.0399 |
| C | 2.251517 | 0.559055 | 4.027360 | 0.0004 |
| @TREND("1981") | -0.018104 | 0.010843 | -1.669634 | 0.1054 |

| | | | |
|---|---|---|---|
| R-squared | 0.372835 | Mean dependent var | 0.020957 |
| Adjusted R-squared | 0.310119 | S.D. dependent var | 0.704627 |
| S.E. of regression | 0.585257 | Akaike info criterion | 1.876598 |
| Sum squared resid | 10.27576 | Schwarz criterion | 2.056170 |
| Log likelihood | -27.90217 | Hannan-Quinn criter. | 1.937837 |
| F-statistic | 5.944771 | Durbin-Watson stat | 1.670030 |
| Prob(F-statistic) | 0.002624 | | |

## Variable 7: Nigeria Augmented Dickey-Fuller (ADF) Tests

## NIG OILP AFI

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.501669 | 0.0001 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 12:53
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.977843 | 0.177736 | -5.501669 | 0.0000 |
| C | 0.008021 | 0.047540 | 0.168715 | 0.8671 |

| | | | |
|---|---|---|---|
| R-squared | 0.486095 | Mean dependent var | -0.002826 |
| Adjusted R-squared | 0.470036 | S.D. dependent var | 0.380457 |
| S.E. of regression | 0.276967 | Akaike info criterion | 0.327188 |
| Sum squared resid | 2.454749 | Schwarz criterion | 0.416974 |
| Log likelihood | -3.562196 | Hannan-Quinn criter. | 0.357808 |
| F-statistic | 30.26837 | Durbin-Watson stat | 1.987693 |
| Prob(F-statistic) | 0.000005 | | |

## *NIG OILP AFT*

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.421329 | 0.0005 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 12:55
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.983512 | 0.181415 | -5.421329 | 0.0000 |
| C | -0.018188 | 0.103175 | -0.176286 | 0.8612 |
| @TREND("1981") | 0.001420 | 0.004942 | 0.287365 | 0.7757 |

| | | | |
|---|---|---|---|
| R-squared | 0.487461 | Mean dependent var | -0.002826 |
| Adjusted R-squared | 0.454394 | S.D. dependent var | 0.380457 |
| S.E. of regression | 0.281025 | Akaike info criterion | 0.383351 |
| Sum squared resid | 2.448227 | Schwarz criterion | 0.518030 |
| Log likelihood | -3.516971 | Hannan-Quinn criter. | 0.429281 |
| F-statistic | 14.74158 | Durbin-Watson stat | 1.982161 |
| Prob(F-statistic) | 0.000032 | | |

## *NIG OILP ALI*

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.128483 | 0.6934 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 12:47
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.076531 | 0.067818 | -1.128483 | 0.2673 |
| C | 0.272914 | 0.241199 | 1.131487 | 0.2660 |

| | | | |
|---|---|---|---|
| R-squared | 0.037156 | Mean dependent var | 0.005574 |
| Adjusted R-squared | 0.007979 | S.D. dependent var | 0.269235 |
| S.E. of regression | 0.268158 | Akaike info criterion | 0.260967 |
| Sum squared resid | 2.372994 | Schwarz criterion | 0.349844 |
| Log likelihood | -2.566927 | Hannan-Quinn criter. | 0.291648 |
| F-statistic | 1.273474 | Durbin-Watson stat | 1.865815 |
| Prob(F-statistic) | 0.267253 | | |

## NIG OILP ALT

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.124795 | 0.5147 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 12:48
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.201743 | 0.094947 | -2.124795 | 0.0414 |
| C | 0.504133 | 0.265405 | 1.899481 | 0.0665 |
| @TREND("1981") | 0.011454 | 0.006283 | 1.822887 | 0.0777 |

| | | | |
|---|---|---|---|
| R-squared | 0.127733 | Mean dependent var | 0.005574 |
| Adjusted R-squared | 0.073217 | S.D. dependent var | 0.269235 |
| S.E. of regression | 0.259191 | Akaike info criterion | 0.219314 |
| Sum squared resid | 2.149761 | Schwarz criterion | 0.352630 |
| Log likelihood | -0.837997 | Hannan-Quinn criter. | 0.265335 |
| F-statistic | 2.343016 | Durbin-Watson stat | 1.824547 |
| Prob(F-statistic) | 0.112302 | | |

## Variable 8: Nigeria Augmented Dickey-Fuller (ADF) Tests

## NIG UEMR AFI

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.605953 | 0.0000 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 13:24
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -1.164901 | 0.176341 | -6.605953 | 0.0000 |
| C | 0.037936 | 0.074965 | 0.506046 | 0.6163 |

| | | | |
|---|---|---|---|
| R-squared | 0.576936 | Mean dependent var | 0.010998 |
| Adjusted R-squared | 0.563715 | S.D. dependent var | 0.660803 |
| S.E. of regression | 0.436473 | Akaike info criterion | 1.236840 |
| Sum squared resid | 6.096268 | Schwarz criterion | 1.326626 |
| Log likelihood | -19.02629 | Hannan-Quinn criter. | 1.267460 |
| F-statistic | 43.63861 | Durbin-Watson stat | 2.035834 |
| Prob(F-statistic) | 0.000000 | | |

## NIG UEMR AFT

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.498615 | 0.0000 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 13:35
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -1.164529 | 0.179196 | -6.498615 | 0.0000 |
| C | 0.025803 | 0.162492 | 0.158796 | 0.8749 |
| @TREND("1981") | 0.000655 | 0.007753 | 0.084526 | 0.9332 |

| | | | |
|---|---|---|---|
| R-squared | 0.577033 | Mean dependent var | 0.010998 |
| Adjusted R-squared | 0.549745 | S.D. dependent var | 0.660803 |
| S.E. of regression | 0.443406 | Akaike info criterion | 1.295433 |
| Sum squared resid | 6.094863 | Schwarz criterion | 1.430112 |
| Log likelihood | -19.02237 | Hannan-Quinn criter. | 1.341363 |
| F-statistic | 21.14590 | Durbin-Watson stat | 2.036848 |
| Prob(F-statistic) | 0.000002 | | |

## NIG UEMR ALI

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.011493 | 0.2808 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 13:12
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.225473 | 0.112092 | -2.011493 | 0.0525 |
| C | 0.463064 | 0.224420 | 2.063377 | 0.0470 |

| | | | |
|---|---|---|---|
| R-squared | 0.109218 | Mean dependent var | 0.033836 |
| Adjusted R-squared | 0.082225 | S.D. dependent var | 0.429191 |
| S.E. of regression | 0.411167 | Akaike info criterion | 1.115812 |
| Sum squared resid | 5.578930 | Schwarz criterion | 1.204689 |
| Log likelihood | -17.52670 | Hannan-Quinn criter. | 1.146492 |
| F-statistic | 4.046102 | Durbin-Watson stat | 2.063464 |
| Prob(F-statistic) | 0.052499 | | |

## NIG UEMR ALT

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.519689 | 0.3173 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 13:21
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.331097 | 0.131404 | -2.519689 | 0.0169 |
| C | 0.450075 | 0.220710 | 2.039211 | 0.0498 |
| @TREND("1981") | 0.011892 | 0.008067 | 1.474178 | 0.1502 |

| | | | |
|---|---|---|---|
| R-squared | 0.165866 | Mean dependent var | 0.033836 |
| Adjusted R-squared | 0.113733 | S.D. dependent var | 0.429191 |
| S.E. of regression | 0.404048 | Akaike info criterion | 1.107249 |
| Sum squared resid | 5.224145 | Schwarz criterion | 1.240564 |
| Log likelihood | -16.37685 | Hannan-Quinn criter. | 1.153269 |
| F-statistic | 3.181574 | Durbin-Watson stat | 1.982544 |
| Prob(F-statistic) | 0.054925 | | |

## Appendix A12: Nigeria Phillips-Perron (PP) Tests

## Variable 1: Nigeria Phillips-Perron (PP) Tests

## NIG AEXP PFI

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.069457 | 0.0002 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.077750 |
| HAC corrected variance (Bartlett kernel) | 0.077587 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/24/18 Time: 20:00
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.902205 | 0.177939 | -5.070292 | 0.0000 |
| C | 0.003142 | 0.049324 | 0.063692 | 0.9496 |

| | | | |
|---|---|---|---|
| R-squared | 0.445483 | Mean dependent var | -0.005853 |
| Adjusted R-squared | 0.428154 | S.D. dependent var | 0.380081 |
| S.E. of regression | 0.287419 | Akaike info criterion | 0.401271 |
| Sum squared resid | 2.643509 | Schwarz criterion | 0.491057 |
| Log likelihood | -4.821605 | Hannan-Quinn criter. | 0.431890 |
| F-statistic | 25.70786 | Durbin-Watson stat | 1.952909 |
| Prob(F-statistic) | 0.000016 | | |

## *NIG AEXP PFT*

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.063807 | 0.0013 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.076643 |
| HAC corrected variance (Bartlett kernel) | 0.077046 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/24/18 Time: 20:02
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.925649 | 0.182881 | -5.061490 | 0.0000 |
| C | -0.060560 | 0.107401 | -0.563870 | 0.5769 |
| @TREND("1981") | 0.003456 | 0.005164 | 0.669268 | 0.5083 |

| | | | |
|---|---|---|---|
| R-squared | 0.453381 | Mean dependent var | -0.005853 |
| Adjusted R-squared | 0.418115 | S.D. dependent var | 0.380081 |
| S.E. of regression | 0.289931 | Akaike info criterion | 0.445749 |
| Sum squared resid | 2.605857 | Schwarz criterion | 0.580428 |
| Log likelihood | -4.577729 | Hannan-Quinn criter. | 0.491678 |
| F-statistic | 12.85613 | Durbin-Watson stat | 1.936300 |
| Prob(F-statistic) | 0.000086 | | |

## *NIG AEXP PLI*

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.644165 | 0.4500 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.071858 |
| HAC corrected variance (Bartlett kernel) | 0.095278 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/24/18 Time: 19:57
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.119843 | 0.083885 | -1.428657 | 0.1625 |
| C | 2.795516 | 1.955356 | 1.429671 | 0.1622 |

| | | | |
|---|---|---|---|
| R-squared | 0.058248 | Mean dependent var | 0.002779 |
| Adjusted R-squared | 0.029710 | S.D. dependent var | 0.280262 |
| S.E. of regression | 0.276067 | Akaike info criterion | 0.319101 |
| Sum squared resid | 2.515034 | Schwarz criterion | 0.407978 |
| Log likelihood | -3.584272 | Hannan-Quinn criter. | 0.349782 |
| F-statistic | 2.041060 | Durbin-Watson stat | 1.686353 |
| Prob(F-statistic) | 0.162500 | | |

## NIG AEXP PLT

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.548294 | 0.3047 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.062599 |
| HAC corrected variance (Bartlett kernel) | 0.069405 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/24/18 Time: 19:59
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.247181 | 0.098729 | -2.503632 | 0.0176 |
| C | 5.549943 | 2.244496 | 2.472690 | 0.0189 |
| @TREND("1981") | 0.011831 | 0.005438 | 2.175584 | 0.0371 |

| | | | |
|---|---|---|---|
| R-squared | 0.179595 | Mean dependent var | 0.002779 |
| Adjusted R-squared | 0.128320 | S.D. dependent var | 0.280262 |
| S.E. of regression | 0.261663 | Akaike info criterion | 0.238300 |
| Sum squared resid | 2.190966 | Schwarz criterion | 0.371616 |
| Log likelihood | -1.170250 | Hannan-Quinn criter. | 0.284320 |
| F-statistic | 3.502561 | Durbin-Watson stat | 1.721079 |
| Prob(F-statistic) | 0.042117 | | |

## Variable 2: Nigeria Phillips-Perron (PP) Tests

## NIG AREV PFI

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.684673 | 0.0000 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.143145 |
| HAC corrected variance (Bartlett kernel) | 0.141442 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/24/18 Time: 21:07
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -1.023144 | 0.179939 | -5.686063 | 0.0000 |
| C | 0.008515 | 0.066938 | 0.127203 | 0.8996 |

| | | | |
|---|---|---|---|
| R-squared | 0.502575 | Mean dependent var | -0.006909 |
| Adjusted R-squared | 0.487030 | S.D. dependent var | 0.544511 |
| S.E. of regression | 0.389989 | Akaike info criterion | 1.011625 |
| Sum squared resid | 4.866919 | Schwarz criterion | 1.101411 |
| Log likelihood | -15.19762 | Hannan-Quinn criter. | 1.042244 |
| F-statistic | 32.33131 | Durbin-Watson stat | 1.967697 |
| Prob(F-statistic) | 0.000003 | | |

## NIG AREV PFT

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.569055 | 0.0003 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.143096 |
| HAC corrected variance (Bartlett kernel) | 0.141284 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/24/18 Time: 21:08
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -1.021640 | 0.183373 | -5.571376 | 0.0000 |
| C | 0.021694 | 0.145210 | 0.149395 | 0.8822 |
| @TREND("1981") | -0.000714 | 0.006947 | -0.102715 | 0.9189 |

| | | | |
|---|---|---|---|
| R-squared | 0.502744 | Mean dependent var | -0.006909 |
| Adjusted R-squared | 0.470663 | S.D. dependent var | 0.544511 |
| S.E. of regression | 0.396162 | Akaike info criterion | 1.070108 |
| Sum squared resid | 4.865263 | Schwarz criterion | 1.204787 |
| Log likelihood | -15.19184 | Hannan-Quinn criter. | 1.116037 |
| F-statistic | 15.67108 | Durbin-Watson stat | 1.970919 |
| Prob(F-statistic) | 0.000020 | | |

## NIG AREV PLI

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.555494 | 0.4942 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.131519 |
| HAC corrected variance (Bartlett kernel) | 0.137098 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/24/18 Time: 21:04
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.131902 | 0.086446 | -1.525829 | 0.1366 |
| C | 3.135849 | 2.055390 | 1.525671 | 0.1366 |

| | | | |
|---|---|---|---|
| R-squared | 0.065901 | Mean dependent var | 0.001156 |
| Adjusted R-squared | 0.037595 | S.D. dependent var | 0.380708 |
| S.E. of regression | 0.373483 | Akaike info criterion | 0.923558 |
| Sum squared resid | 4.603159 | Schwarz criterion | 1.012435 |
| Log likelihood | -14.16226 | Hannan-Quinn criter. | 0.954238 |
| F-statistic | 2.328153 | Durbin-Watson stat | 1.868047 |
| Prob(F-statistic) | 0.136581 | | |

## NIG AREV PLT

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.761777 | 0.2200 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.114102 |
| HAC corrected variance (Bartlett kernel) | 0.117619 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/24/18 Time: 21:05
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.365429 | 0.133607 | -2.735108 | 0.0101 |
| C | 8.301381 | 3.040136 | 2.730595 | 0.0102 |
| @TREND("1981") | 0.021352 | 0.009661 | 2.210093 | 0.0344 |

| | | | |
|---|---|---|---|
| R-squared | 0.189601 | Mean dependent var | 0.001156 |
| Adjusted R-squared | 0.138951 | S.D. dependent var | 0.380708 |
| S.E. of regression | 0.353269 | Akaike info criterion | 0.838645 |
| Sum squared resid | 3.993576 | Schwarz criterion | 0.971960 |
| Log likelihood | -11.67628 | Hannan-Quinn criter. | 0.884665 |
| F-statistic | 3.743358 | Durbin-Watson stat | 1.731918 |
| Prob(F-statistic) | 0.034609 | | |

## Variable 3: Nigeria Phillips-Perron (PP) Tests

## NIG EXCR PFI

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.646131 | 0.0098 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 266.3856 |
| HAC corrected variance (Bartlett kernel) | 266.6386 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/24/18 Time: 21:24
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.760503 | 0.208666 | -3.644593 | 0.0009 |
| C | 6.084641 | 3.116167 | 1.952604 | 0.0597 |

| | | | |
|---|---|---|---|
| R-squared | 0.293334 | Mean dependent var | 1.793999 |
| Adjusted R-squared | 0.271251 | S.D. dependent var | 19.70747 |
| S.E. of regression | 16.82364 | Akaike info criterion | 8.540469 |
| Sum squared resid | 9057.111 | Schwarz criterion | 8.630255 |
| Log likelihood | -143.1880 | Hannan-Quinn criter. | 8.571089 |
| F-statistic | 13.28306 | Durbin-Watson stat | 1.751710 |
| Prob(F-statistic) | 0.000940 | | |

## *NIG EXCR PFT*

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.953490 | 0.0203 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 245.8145 |
| HAC corrected variance (Bartlett kernel) | 242.3781 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/24/18 Time: 21:26
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.824201 | 0.207459 | -3.972837 | 0.0004 |
| C | -2.268385 | 6.012069 | -0.377305 | 0.7085 |
| @TREND("1981") | 0.470940 | 0.292389 | 1.610666 | 0.1174 |

| | | | |
|---|---|---|---|
| R-squared | 0.347905 | Mean dependent var | 1.793999 |
| Adjusted R-squared | 0.305834 | S.D. dependent var | 19.70747 |
| S.E. of regression | 16.41959 | Akaike info criterion | 8.518925 |
| Sum squared resid | 8357.694 | Schwarz criterion | 8.653604 |
| Log likelihood | -141.8217 | Hannan-Quinn criter. | 8.564854 |
| F-statistic | 8.269536 | Durbin-Watson stat | 1.783106 |
| Prob(F-statistic) | 0.001324 | | |

## *NIG EXCR PLI*

Null Hypothesis: EXCR has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | 1.153873 | 0.9972 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 257.3498 |
| HAC corrected variance (Bartlett kernel) | 290.5855 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/24/18 Time: 21:22
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | 0.056511 | 0.042809 | 1.320067 | 0.1959 |
| C | 3.189585 | 4.140475 | 0.770343 | 0.4466 |

| | | | |
|---|---|---|---|
| R-squared | 0.050157 | Mean dependent var | 7.224987 |
| Adjusted R-squared | 0.021374 | S.D. dependent var | 16.70054 |
| S.E. of regression | 16.52110 | Akaike info criterion | 8.502599 |
| Sum squared resid | 9007.242 | Schwarz criterion | 8.591476 |
| Log likelihood | -146.7955 | Hannan-Quinn criter. | 8.533279 |
| F-statistic | 1.742576 | Durbin-Watson stat | 1.495481 |
| Prob(F-statistic) | 0.195897 | | |

## NIG EXCR PLT

Null Hypothesis: EXCR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.607726 | 0.7694 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 230.5993 |
| HAC corrected variance (Bartlett kernel) | 268.2986 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/24/18 Time: 21:23
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | -0.177300 | 0.128141 | -1.383627 | 0.1760 |
| C | -8.818031 | 7.394763 | -1.192470 | 0.2418 |
| @TREND("1981") | 1.594654 | 0.827665 | 1.926690 | 0.0629 |

| | | | |
|---|---|---|---|
| R-squared | 0.148889 | Mean dependent var | 7.224987 |
| Adjusted R-squared | 0.095695 | S.D. dependent var | 16.70054 |
| S.E. of regression | 15.88137 | Akaike info criterion | 8.449987 |
| Sum squared resid | 8070.975 | Schwarz criterion | 8.583303 |
| Log likelihood | -144.8748 | Hannan-Quinn criter. | 8.496008 |
| F-statistic | 2.798963 | Durbin-Watson stat | 1.402182 |
| Prob(F-statistic) | 0.075819 | | |

## Variable 4: Nigeria Phillips-Perron (PP) Tests

## NIG EXTR PFI

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant
Bandwidth: 17 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -6.152815 | 0.0000 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.192470 |
| HAC corrected variance (Bartlett kernel) | 0.058776 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/24/18 Time: 21:38
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.887252 | 0.166991 | -5.313161 | 0.0000 |
| C | 0.074091 | 0.078185 | 0.947639 | 0.3504 |

| | | | |
|---|---|---|---|
| R-squared | 0.468700 | Mean dependent var | 0.021451 |
| Adjusted R-squared | 0.452097 | S.D. dependent var | 0.610934 |
| S.E. of regression | 0.452216 | Akaike info criterion | 1.307709 |
| Sum squared resid | 6.543981 | Schwarz criterion | 1.397495 |
| Log likelihood | -20.23106 | Hannan-Quinn criter. | 1.338329 |
| F-statistic | 28.22968 | Durbin-Watson stat | 2.011743 |
| Prob(F-statistic) | 0.000008 | | |

## NIG EXTR PFT

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 17 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.916468 | 0.0001 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.192439 |
| HAC corrected variance (Bartlett kernel) | 0.058832 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/24/18 Time: 21:39
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.885988 | 0.170585 | -5.193818 | 0.0000 |
| C | 0.084606 | 0.168261 | 0.502828 | 0.6186 |
| @TREND("1981") | -0.000572 | 0.008075 | -0.070889 | 0.9439 |

| | | | |
|---|---|---|---|
| R-squared | 0.468787 | Mean dependent var | 0.021451 |
| Adjusted R-squared | 0.434515 | S.D. dependent var | 0.610934 |
| S.E. of regression | 0.459415 | Akaike info criterion | 1.366371 |
| Sum squared resid | 6.542920 | Schwarz criterion | 1.501050 |
| Log likelihood | -20.22830 | Hannan-Quinn criter. | 1.412300 |
| F-statistic | 13.67848 | Durbin-Watson stat | 2.014024 |
| Prob(F-statistic) | 0.000055 | | |

## NIG EXTR PLI

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -0.641196 | 0.8484 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.206232 |
| HAC corrected variance (Bartlett kernel) | 0.169452 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/24/18 Time: 21:36
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.043889 | 0.057983 | -0.756932 | 0.4545 |
| C | 1.052546 | 1.318378 | 0.798364 | 0.4304 |

| | | | |
|---|---|---|---|
| R-squared | 0.017066 | Mean dependent var | 0.056418 |
| Adjusted R-squared | -0.012720 | S.D. dependent var | 0.464741 |
| S.E. of regression | 0.467687 | Akaike info criterion | 1.373411 |
| Sum squared resid | 7.218129 | Schwarz criterion | 1.462288 |
| Log likelihood | -22.03468 | Hannan-Quinn criter. | 1.404091 |
| F-statistic | 0.572947 | Durbin-Watson stat | 1.631947 |
| Prob(F-statistic) | 0.454461 | | |

## NIG EXTR PLT

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.247633 | 0.0920 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.156896 |
| HAC corrected variance (Bartlett kernel) | 0.162705 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/24/18 Time: 21:37
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.388119 | 0.120056 | -3.232827 | 0.0028 |
| C | 7.939972 | 2.465317 | 3.220669 | 0.0029 |
| @TREND("1981") | 0.051412 | 0.016207 | 3.172160 | 0.0033 |

| | | | |
|---|---|---|---|
| R-squared | 0.252212 | Mean dependent var | 0.056418 |
| Adjusted R-squared | 0.205475 | S.D. dependent var | 0.464741 |
| S.E. of regression | 0.414252 | Akaike info criterion | 1.157130 |
| Sum squared resid | 5.491343 | Schwarz criterion | 1.290446 |
| Log likelihood | -17.24978 | Hannan-Quinn criter. | 1.203151 |
| F-statistic | 5.396444 | Durbin-Watson stat | 1.524692 |
| Prob(F-statistic) | 0.009560 | | |

## Variable 5: Nigeria Phillips-Perron (PP) Tests

## NIG GDP PFI

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.326390 | 0.0017 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.004006 |
| HAC corrected variance (Bartlett kernel) | 0.003925 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 12:12
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.742678 | 0.171145 | -4.339476 | 0.0001 |
| C | 0.028535 | 0.012995 | 2.195817 | 0.0355 |

| | | | |
|---|---|---|---|
| R-squared | 0.370464 | Mean dependent var | -0.000145 |
| Adjusted R-squared | 0.350791 | S.D. dependent var | 0.080973 |
| S.E. of regression | 0.065243 | Akaike info criterion | -2.564369 |
| Sum squared resid | 0.136213 | Schwarz criterion | -2.474583 |
| Log likelihood | 45.59428 | Hannan-Quinn criter. | -2.533750 |
| F-statistic | 18.83105 | Durbin-Watson stat | 1.977170 |
| Prob(F-statistic) | 0.000134 | | |

## NIG GDP PFT

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.612594 | 0.0041 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003729 |
| HAC corrected variance (Bartlett kernel) | 0.003482 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 12:13
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.860515 | 0.184822 | -4.655918 | 0.0001 |
| C | -0.001524 | 0.023535 | -0.064767 | 0.9488 |
| @TREND("1981") | 0.001871 | 0.001232 | 1.518966 | 0.1389 |

| | | | |
|---|---|---|---|
| R-squared | 0.414073 | Mean dependent var | -0.000145 |
| Adjusted R-squared | 0.376271 | S.D. dependent var | 0.080973 |
| S.E. of regression | 0.063950 | Akaike info criterion | -2.577334 |
| Sum squared resid | 0.126778 | Schwarz criterion | -2.442655 |
| Log likelihood | 46.81467 | Hannan-Quinn criter. | -2.531404 |
| F-statistic | 10.95380 | Durbin-Watson stat | 1.899103 |
| Prob(F-statistic) | 0.000252 | | |

## NIG GDP PLI

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | 1.061359 | 0.9964 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.004048 |
| HAC corrected variance (Bartlett kernel) | 0.004809 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 12:08
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | 0.028096 | 0.022846 | 1.229830 | 0.2275 |
| C | -0.691905 | 0.592849 | -1.167085 | 0.2515 |

| | | | |
|---|---|---|---|
| R-squared | 0.043824 | Mean dependent var | 0.037071 |
| Adjusted R-squared | 0.014849 | S.D. dependent var | 0.066016 |
| S.E. of regression | 0.065524 | Akaike info criterion | -2.557365 |
| Sum squared resid | 0.141681 | Schwarz criterion | -2.468488 |
| Log likelihood | 46.75390 | Hannan-Quinn criter. | -2.526685 |
| F-statistic | 1.512482 | Durbin-Watson stat | 1.571153 |
| Prob(F-statistic) | 0.227457 | | |

## NIG GDP PLT

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.268345 | 0.4392 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003174 |
| HAC corrected variance (Bartlett kernel) | 0.003525 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 12:10
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.131259 | 0.057465 | -2.284151 | 0.0291 |
| C | 3.295252 | 1.444747 | 2.280851 | 0.0294 |
| @TREND("1981") | 0.008191 | 0.002758 | 2.969269 | 0.0056 |

| | | | |
|---|---|---|---|
| R-squared | 0.250362 | Mean dependent var | 0.037071 |
| Adjusted R-squared | 0.203510 | S.D. dependent var | 0.066016 |
| S.E. of regression | 0.058917 | Akaike info criterion | -2.743575 |
| Sum squared resid | 0.111077 | Schwarz criterion | -2.610259 |
| Log likelihood | 51.01256 | Hannan-Quinn criter. | -2.697554 |
| F-statistic | 5.343649 | Durbin-Watson stat | 1.718664 |
| Prob(F-statistic) | 0.009945 | | |

## Variable 6: Nigeria Phillips-Perron (PP) Tests

## NIG INFR PFI

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant
Bandwidth: 25 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -9.120253 | 0.0000 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.481895 |
| HAC corrected variance (Bartlett kernel) | 0.062311 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 12:34
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.999089 | 0.173237 | -5.767191 | 0.0000 |
| C | 0.020979 | 0.122790 | 0.170855 | 0.8654 |

| | | | |
|---|---|---|---|
| R-squared | 0.509657 | Mean dependent var | 0.045556 |
| Adjusted R-squared | 0.494334 | S.D. dependent var | 1.006257 |
| S.E. of regression | 0.715551 | Akaike info criterion | 2.225496 |
| Sum squared resid | 16.38444 | Schwarz criterion | 2.315282 |
| Log likelihood | -35.83343 | Hannan-Quinn criter. | 2.256116 |
| F-statistic | 33.26050 | Durbin-Watson stat | 1.775762 |
| Prob(F-statistic) | 0.000002 | | |

## NIG INFR PFT

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 24 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -9.233586 | 0.0000 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.481044 |
| HAC corrected variance (Bartlett kernel) | 0.056478 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 12:35
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.999492 | 0.175861 | -5.683408 | 0.0000 |
| C | 0.076007 | 0.265894 | 0.285854 | 0.7769 |
| @TREND("1981") | -0.002975 | 0.012698 | -0.234290 | 0.8163 |

| | | | |
|---|---|---|---|
| R-squared | 0.510524 | Mean dependent var | 0.045556 |
| Adjusted R-squared | 0.478945 | S.D. dependent var | 1.006257 |
| S.E. of regression | 0.726358 | Akaike info criterion | 2.282550 |
| Sum squared resid | 16.35548 | Schwarz criterion | 2.417229 |
| Log likelihood | -35.80336 | Hannan-Quinn criter. | 2.328480 |
| F-statistic | 16.16653 | Durbin-Watson stat | 1.778364 |
| Prob(F-statistic) | 0.000016 | | |

## NIG INFR PLI

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.153653 | 0.0316 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.376152 |
| HAC corrected variance (Bartlett kernel) | 0.334534 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 12:32
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.482199 | 0.148242 | -3.252786 | 0.0026 |
| C | 1.285898 | 0.411878 | 3.122037 | 0.0037 |

| | | | |
|---|---|---|---|
| R-squared | 0.242783 | Mean dependent var | -0.008060 |
| Adjusted R-squared | 0.219837 | S.D. dependent var | 0.715098 |
| S.E. of regression | 0.631624 | Akaike info criterion | 1.974400 |
| Sum squared resid | 13.16531 | Schwarz criterion | 2.063277 |
| Log likelihood | -32.55200 | Hannan-Quinn criter. | 2.005080 |
| F-statistic | 10.58062 | Durbin-Watson stat | 1.593680 |
| Prob(F-statistic) | 0.002637 | | |

### *NIG INFR PLT*

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 7 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.064027 | 0.1304 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.368308 |
| HAC corrected variance (Bartlett kernel) | 0.264197 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 12:33
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.521475 | 0.156376 | -3.334746 | 0.0022 |
| C | 1.556990 | 0.528338 | 2.946959 | 0.0059 |
| @TREND("1981") | -0.009205 | 0.011151 | -0.825504 | 0.4152 |

| | | | |
|---|---|---|---|
| R-squared | 0.258572 | Mean dependent var | -0.008060 |
| Adjusted R-squared | 0.212232 | S.D. dependent var | 0.715098 |
| S.E. of regression | 0.634695 | Akaike info criterion | 2.010471 |
| Sum squared resid | 12.89079 | Schwarz criterion | 2.143786 |
| Log likelihood | -32.18324 | Hannan-Quinn criter. | 2.056491 |
| F-statistic | 5.579971 | Durbin-Watson stat | 1.577566 |
| Prob(F-statistic) | 0.008339 | | |

### *Variable 7: Nigeria Phillips-Perron (PP) Tests*

### *NIG OILP PFI*

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.501155 | 0.0001 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.072198 |
| HAC corrected variance (Bartlett kernel) | 0.071991 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 13:05
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.977843 | 0.177736 | -5.501669 | 0.0000 |
| C | 0.008021 | 0.047540 | 0.168715 | 0.8671 |

| | | | |
|---|---|---|---|
| R-squared | 0.486095 | Mean dependent var | -0.002826 |
| Adjusted R-squared | 0.470036 | S.D. dependent var | 0.380457 |
| S.E. of regression | 0.276967 | Akaike info criterion | 0.327188 |
| Sum squared resid | 2.454749 | Schwarz criterion | 0.416974 |
| Log likelihood | -3.562196 | Hannan-Quinn criter. | 0.357808 |
| F-statistic | 30.26837 | Durbin-Watson stat | 1.987693 |
| Prob(F-statistic) | 0.000005 | | |

## NIG OILP PFT

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.421035 | 0.0005 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.072007 |
| HAC corrected variance (Bartlett kernel) | 0.071916 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 13:06
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.983512 | 0.181415 | -5.421329 | 0.0000 |
| C | -0.018188 | 0.103175 | -0.176286 | 0.8612 |
| @TREND("1981") | 0.001420 | 0.004942 | 0.287365 | 0.7757 |

| | | | |
|---|---|---|---|
| R-squared | 0.487461 | Mean dependent var | -0.002826 |
| Adjusted R-squared | 0.454394 | S.D. dependent var | 0.380457 |
| S.E. of regression | 0.281025 | Akaike info criterion | 0.383351 |
| Sum squared resid | 2.448227 | Schwarz criterion | 0.518030 |
| Log likelihood | -3.516971 | Hannan-Quinn criter. | 0.429281 |
| F-statistic | 14.74158 | Durbin-Watson stat | 1.982161 |
| Prob(F-statistic) | 0.000032 | | |

## NIG OILP PLI

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.165727 | 0.6780 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.067800 |
| HAC corrected variance (Bartlett kernel) | 0.072164 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 12:57
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.076531 | 0.067818 | -1.128483 | 0.2673 |
| C | 0.272914 | 0.241199 | 1.131487 | 0.2660 |

| | | | |
|---|---|---|---|
| R-squared | 0.037156 | Mean dependent var | 0.005574 |
| Adjusted R-squared | 0.007979 | S.D. dependent var | 0.269235 |
| S.E. of regression | 0.268158 | Akaike info criterion | 0.260967 |
| Sum squared resid | 2.372994 | Schwarz criterion | 0.349844 |
| Log likelihood | -2.566927 | Hannan-Quinn criter. | 0.291648 |
| F-statistic | 1.273474 | Durbin-Watson stat | 1.865815 |
| Prob(F-statistic) | 0.267253 | | |

## NIG OILP PLT

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.158987 | 0.4965 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.061422 |
| HAC corrected variance (Bartlett kernel) | 0.065412 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 13:01
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.201743 | 0.094947 | -2.124795 | 0.0414 |
| C | 0.504133 | 0.265405 | 1.899481 | 0.0665 |
| @TREND("1981") | 0.011454 | 0.006283 | 1.822887 | 0.0777 |

| | | | |
|---|---|---|---|
| R-squared | 0.127733 | Mean dependent var | 0.005574 |
| Adjusted R-squared | 0.073217 | S.D. dependent var | 0.269235 |
| S.E. of regression | 0.259191 | Akaike info criterion | 0.219314 |
| Sum squared resid | 2.149761 | Schwarz criterion | 0.352630 |
| Log likelihood | -0.837997 | Hannan-Quinn criter. | 0.265335 |
| F-statistic | 2.343016 | Durbin-Watson stat | 1.824547 |
| Prob(F-statistic) | 0.112302 | | |

## Variable 8: Nigeria Phillips-Perron (PP) Tests

## NIG UEMR PFI

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -6.708183 | 0.0000 |
| Test critical values: | 1% level | -3.639407 | |
| | 5% level | -2.951125 | |
| | 10% level | -2.614300 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.179302 |
| HAC corrected variance (Bartlett kernel) | 0.148843 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 13:42
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -1.164901 | 0.176341 | -6.605953 | 0.0000 |
| C | 0.037936 | 0.074965 | 0.506046 | 0.6163 |

| | | | |
|---|---|---|---|
| R-squared | 0.576936 | Mean dependent var | 0.010998 |
| Adjusted R-squared | 0.563715 | S.D. dependent var | 0.660803 |
| S.E. of regression | 0.436473 | Akaike info criterion | 1.236840 |
| Sum squared resid | 6.096268 | Schwarz criterion | 1.326626 |
| Log likelihood | -19.02629 | Hannan-Quinn criter. | 1.267460 |
| F-statistic | 43.63861 | Durbin-Watson stat | 2.035834 |
| Prob(F-statistic) | 0.000000 | | |

## *NIG UEMR PFT*

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -6.590754 | 0.0000 |
| Test critical values: | 1% level | -4.252879 | |
| | 5% level | -3.548490 | |
| | 10% level | -3.207094 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.179261 |
| HAC corrected variance (Bartlett kernel) | 0.148698 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 13:43
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -1.164529 | 0.179196 | -6.498615 | 0.0000 |
| C | 0.025803 | 0.162492 | 0.158796 | 0.8749 |
| @TREND("1981") | 0.000655 | 0.007753 | 0.084526 | 0.9332 |

| | | | |
|---|---|---|---|
| R-squared | 0.577033 | Mean dependent var | 0.010998 |
| Adjusted R-squared | 0.549745 | S.D. dependent var | 0.660803 |
| S.E. of regression | 0.443406 | Akaike info criterion | 1.295433 |
| Sum squared resid | 6.094863 | Schwarz criterion | 1.430112 |
| Log likelihood | -19.02237 | Hannan-Quinn criter. | 1.341363 |
| F-statistic | 21.14590 | Durbin-Watson stat | 2.036848 |
| Prob(F-statistic) | 0.000002 | | |

## *NIG UEMR PLI*

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.903578 | 0.3269 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.159398 |
| HAC corrected variance (Bartlett kernel) | 0.140770 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 13:36
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.225473 | 0.112092 | -2.011493 | 0.0525 |
| C | 0.463064 | 0.224420 | 2.063377 | 0.0470 |

| | | | |
|---|---|---|---|
| R-squared | 0.109218 | Mean dependent var | 0.033836 |
| Adjusted R-squared | 0.082225 | S.D. dependent var | 0.429191 |
| S.E. of regression | 0.411167 | Akaike info criterion | 1.115812 |
| Sum squared resid | 5.578930 | Schwarz criterion | 1.204689 |
| Log likelihood | -17.52670 | Hannan-Quinn criter. | 1.146492 |
| F-statistic | 4.046102 | Durbin-Watson stat | 2.063464 |
| Prob(F-statistic) | 0.052499 | | |

**NIG UEMR PLT**

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.490566 | 0.3305 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.149261 |
| HAC corrected variance (Bartlett kernel) | 0.144655 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 13:38
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.331097 | 0.131404 | -2.519689 | 0.0169 |
| C | 0.450075 | 0.220710 | 2.039211 | 0.0498 |
| @TREND("1981") | 0.011892 | 0.008067 | 1.474178 | 0.1502 |

| | | | |
|---|---|---|---|
| R-squared | 0.165866 | Mean dependent var | 0.033836 |
| Adjusted R-squared | 0.113733 | S.D. dependent var | 0.429191 |
| S.E. of regression | 0.404048 | Akaike info criterion | 1.107249 |
| Sum squared resid | 5.224145 | Schwarz criterion | 1.240564 |
| Log likelihood | -16.37685 | Hannan-Quinn criter. | 1.153269 |
| F-statistic | 3.181574 | Durbin-Watson stat | 1.982544 |
| Prob(F-statistic) | 0.054925 | | |

**Appendix A2: Unit Root for Venezuela**

**Appendix A21 Venezuela Augmented Dickey-Fuller (ADF) Tests**

**Variable 1: Venezuela Augmented Dickey-Fuller (ADF) Tests**

**VEN AEXP AFI**

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.329527 | 0.0234 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 14:33
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.782877 | 0.235132 | -3.329527 | 0.0027 |
| C | 0.286322 | 0.092573 | 3.092925 | 0.0048 |

| | | | |
|---|---|---|---|
| R-squared | 0.307206 | Mean dependent var | 0.019195 |
| Adjusted R-squared | 0.279494 | S.D. dependent var | 0.282721 |
| S.E. of regression | 0.239981 | Akaike info criterion | 0.054670 |
| Sum squared resid | 1.439767 | Schwarz criterion | 0.150658 |
| Log likelihood | 1.261959 | Hannan-Quinn criter. | 0.083212 |
| F-statistic | 11.08575 | Durbin-Watson stat | 1.760465 |
| Prob(F-statistic) | 0.002701 | | |

## *VEN AEXP AFT*

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.310717 | 0.0859 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 14:34
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.775287 | 0.234175 | -3.310717 | 0.0029 |
| C | 0.185640 | 0.129458 | 1.433982 | 0.1645 |
| @TREND("1988") | 0.006539 | 0.005905 | 1.107372 | 0.2791 |

| | | | |
|---|---|---|---|
| R-squared | 0.340883 | Mean dependent var | 0.019195 |
| Adjusted R-squared | 0.285957 | S.D. dependent var | 0.282721 |
| S.E. of regression | 0.238902 | Akaike info criterion | 0.078912 |
| Sum squared resid | 1.369779 | Schwarz criterion | 0.222893 |
| Log likelihood | 1.934694 | Hannan-Quinn criter. | 0.121725 |
| F-statistic | 6.206181 | Durbin-Watson stat | 1.859741 |
| Prob(F-statistic) | 0.006723 | | |

## *VEN AEXP ALI*

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 0.701668 | 0.9900 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 14:28
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | 0.012444 | 0.017735 | 0.701668 | 0.4891 |
| C | 0.065841 | 0.430468 | 0.152953 | 0.8796 |

| | | | |
|---|---|---|---|
| R-squared | 0.018584 | Mean dependent var | 0.366218 |
| Adjusted R-squared | -0.019163 | S.D. dependent var | 0.236831 |
| S.E. of regression | 0.239090 | Akaike info criterion | 0.044793 |
| Sum squared resid | 1.486260 | Schwarz criterion | 0.139950 |
| Log likelihood | 1.372900 | Hannan-Quinn criter. | 0.073883 |
| F-statistic | 0.492337 | Durbin-Watson stat | 1.416101 |
| Prob(F-statistic) | 0.489120 | | |

## VEN AEXP ALT

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.087960 | 0.9133 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 14:32
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.204315 | 0.187796 | -1.087960 | 0.2870 |
| C | 4.302339 | 3.679182 | 1.169374 | 0.2533 |
| @TREND("1988") | 0.068669 | 0.059231 | 1.159336 | 0.2573 |

| | | | |
|---|---|---|---|
| R-squared | 0.068655 | Mean dependent var | 0.366218 |
| Adjusted R-squared | -0.005852 | S.D. dependent var | 0.236831 |
| S.E. of regression | 0.237523 | Akaike info criterion | 0.063854 |
| Sum squared resid | 1.410432 | Schwarz criterion | 0.206591 |
| Log likelihood | 2.106038 | Hannan-Quinn criter. | 0.107490 |
| F-statistic | 0.921457 | Durbin-Watson stat | 1.275858 |
| Prob(F-statistic) | 0.411036 | | |

## Variable 2: Venezuela Augmented Dickey-Fuller (ADF) Tests

## VEN AREV AFI

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.184277 | 0.0031 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 15:00
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.872694 | 0.208565 | -4.184277 | 0.0003 |
| C | 0.294016 | 0.089359 | 3.290271 | 0.0030 |

| | | | |
|---|---|---|---|
| R-squared | 0.411878 | Mean dependent var | 0.006714 |
| Adjusted R-squared | 0.388353 | S.D. dependent var | 0.379964 |
| S.E. of regression | 0.297162 | Akaike info criterion | 0.482108 |
| Sum squared resid | 2.207630 | Schwarz criterion | 0.578096 |
| Log likelihood | -4.508457 | Hannan-Quinn criter. | 0.510650 |
| F-statistic | 17.50817 | Durbin-Watson stat | 1.822918 |
| Prob(F-statistic) | 0.000308 | | |

## VEN AREV AFT

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.952962 | 0.0234 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 15:01
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.851619 | 0.215438 | -3.952962 | 0.0006 |
| C | 0.227418 | 0.156049 | 1.457349 | 0.1580 |
| @TREND("1988") | 0.003977 | 0.007584 | 0.524411 | 0.6048 |

| | | | |
|---|---|---|---|
| R-squared | 0.418541 | Mean dependent var | 0.006714 |
| Adjusted R-squared | 0.370086 | S.D. dependent var | 0.379964 |
| S.E. of regression | 0.301567 | Akaike info criterion | 0.544789 |
| Sum squared resid | 2.182620 | Schwarz criterion | 0.688770 |
| Log likelihood | -4.354645 | Hannan-Quinn criter. | 0.587602 |
| F-statistic | 8.637723 | Durbin-Watson stat | 1.873900 |
| Prob(F-statistic) | 0.001494 | | |

## VEN AREV ALI

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.455984 | 0.8857 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 14:57
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.010777 | 0.023635 | -0.455984 | 0.6522 |
| C | 0.611864 | 0.569996 | 1.073454 | 0.2929 |

| | | | |
|---|---|---|---|
| R-squared | 0.007934 | Mean dependent var | 0.353305 |
| Adjusted R-squared | -0.030223 | S.D. dependent var | 0.302388 |
| S.E. of regression | 0.306923 | Akaike info criterion | 0.544310 |
| Sum squared resid | 2.449245 | Schwarz criterion | 0.639467 |
| Log likelihood | -5.620333 | Hannan-Quinn criter. | 0.573400 |
| F-statistic | 0.207922 | Durbin-Watson stat | 1.518258 |
| Prob(F-statistic) | 0.652187 | | |

## *VEN AREV ALT*

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.478635 | 0.3352 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 14:59
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.368328 | 0.148601 | -2.478635 | 0.0203 |
| C | 7.597803 | 2.919541 | 2.602397 | 0.0153 |
| @TREND("1988") | 0.109801 | 0.045146 | 2.432121 | 0.0225 |

| | | | |
|---|---|---|---|
| R-squared | 0.197752 | Mean dependent var | 0.353305 |
| Adjusted R-squared | 0.133572 | S.D. dependent var | 0.302388 |
| S.E. of regression | 0.281469 | Akaike info criterion | 0.403366 |
| Sum squared resid | 1.980615 | Schwarz criterion | 0.546102 |
| Log likelihood | -2.647117 | Hannan-Quinn criter. | 0.447001 |
| F-statistic | 3.081221 | Durbin-Watson stat | 1.379852 |
| Prob(F-statistic) | 0.063659 | | |

## *Variable 3: Venezuela Augmented Dickey-Fuller (ADF) Tests*

## *VEN EXCR AFI*

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.118193 | 0.9362 |
| Test critical values: | 1% level | -3.752946 | |
| | 5% level | -2.998064 | |
| | 10% level | -2.638752 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 15:30
Sample (adjusted): 1994 2016
Included observations: 23 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.052976 | 0.448215 | -0.118193 | 0.9073 |
| D(EXCR(-1),2) | -1.002105 | 0.367242 | -2.728732 | 0.0143 |
| D(EXCR(-2),2) | -0.237067 | 0.401439 | -0.590544 | 0.5626 |
| D(EXCR(-3),2) | 0.167934 | 0.457091 | 0.367397 | 0.7179 |
| D(EXCR(-4),2) | -1.046494 | 0.393280 | -2.660941 | 0.0165 |
| C | 0.130766 | 0.136962 | 0.954760 | 0.3531 |

| | | | |
|---|---|---|---|
| R-squared | 0.814329 | Mean dependent var | 0.128291 |
| Adjusted R-squared | 0.759720 | S.D. dependent var | 0.927796 |
| S.E. of regression | 0.454791 | Akaike info criterion | 1.481500 |
| Sum squared resid | 3.516190 | Schwarz criterion | 1.777716 |
| Log likelihood | -11.03725 | Hannan-Quinn criter. | 1.555997 |
| F-statistic | 14.91194 | Durbin-Watson stat | 2.089827 |
| Prob(F-statistic) | 0.000011 | | |

## *VEN EXCR AFT*

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.644766 | 0.0469 |
| Test critical values: | 1% level | -4.394309 | |
| | 5% level | -3.612199 | |
| | 10% level | -3.243079 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 15:30
Sample (adjusted): 1993 2016
Included observations: 24 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -1.763139 | 0.483746 | -3.644766 | 0.0019 |
| D(EXCR(-1),2) | 0.143833 | 0.429104 | 0.335193 | 0.7414 |
| D(EXCR(-2),2) | 0.569673 | 0.405318 | 1.405498 | 0.1769 |
| D(EXCR(-3),2) | 1.198421 | 0.312612 | 3.833579 | 0.0012 |
| C | -0.436806 | 0.255784 | -1.707716 | 0.1049 |
| @TREND("1988") | 0.056099 | 0.018844 | 2.976978 | 0.0081 |

| | | | |
|---|---|---|---|
| R-squared | 0.822211 | Mean dependent var | 0.123399 |
| Adjusted R-squared | 0.772825 | S.D. dependent var | 0.907719 |
| S.E. of regression | 0.432645 | Akaike info criterion | 1.374519 |
| Sum squared resid | 3.369268 | Schwarz criterion | 1.669032 |
| Log likelihood | -10.49422 | Hannan-Quinn criter. | 1.452653 |
| F-statistic | 16.64872 | Durbin-Watson stat | 1.426987 |
| Prob(F-statistic) | 0.000003 | | |

## *VEN EXCR ALI*

Null Hypothesis: EXCR has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 4.327823 | 1.0000 |
| Test critical values: | 1% level | -3.737853 | |
| | 5% level | -2.991878 | |
| | 10% level | -2.635542 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 15:13
Sample (adjusted): 1993 2016
Included observations: 24 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | 0.413690 | 0.095589 | 4.327823 | 0.0004 |
| D(EXCR(-1)) | -0.901832 | 0.204966 | -4.399910 | 0.0003 |
| D(EXCR(-2)) | 0.018443 | 0.257404 | 0.071649 | 0.9437 |
| D(EXCR(-3)) | 0.031866 | 0.276717 | 0.115159 | 0.9096 |
| D(EXCR(-4)) | -1.553505 | 0.289691 | -5.362621 | 0.0000 |
| C | 0.035154 | 0.111371 | 0.315652 | 0.7559 |

| | | | |
|---|---|---|---|
| R-squared | 0.797517 | Mean dependent var | 0.382873 |
| Adjusted R-squared | 0.741272 | S.D. dependent var | 0.727397 |
| S.E. of regression | 0.369993 | Akaike info criterion | 1.061651 |
| Sum squared resid | 2.464102 | Schwarz criterion | 1.356164 |
| Log likelihood | -6.739810 | Hannan-Quinn criter. | 1.139785 |
| F-statistic | 14.17927 | Durbin-Watson stat | 1.889662 |
| Prob(F-statistic) | 0.000010 | | |

## *VEN EXCR ALT*

Null Hypothesis: EXCR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | 2.642502 | 1.0000 |
| Test critical values: | 1% level | -4.394309 | |
| | 5% level | -3.612199 | |
| | 10% level | -3.243079 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 15:29
Sample (adjusted): 1993 2016
Included observations: 24 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | 0.548609 | 0.207610 | 2.642502 | 0.0171 |
| D(EXCR(-1)) | -0.967785 | 0.226213 | -4.278201 | 0.0005 |
| D(EXCR(-2)) | -0.073089 | 0.288994 | -0.252908 | 0.8034 |
| D(EXCR(-3)) | -0.117151 | 0.346010 | -0.338578 | 0.7391 |
| D(EXCR(-4)) | -1.646288 | 0.319488 | -5.152897 | 0.0001 |
| C | 0.278412 | 0.349801 | 0.795914 | 0.4371 |
| @TREND("1988") | -0.025714 | 0.035001 | -0.734679 | 0.4725 |

| | | | |
|---|---|---|---|
| R-squared | 0.803748 | Mean dependent var | 0.382873 |
| Adjusted R-squared | 0.734483 | S.D. dependent var | 0.727397 |
| S.E. of regression | 0.374816 | Akaike info criterion | 1.113728 |
| Sum squared resid | 2.388274 | Schwarz criterion | 1.457327 |
| Log likelihood | -6.364732 | Hannan-Quinn criter. | 1.204885 |
| F-statistic | 11.60389 | Durbin-Watson stat | 2.037821 |
| Prob(F-statistic) | 0.000033 | | |

## *Variable 4: Venezuela Augmented Dickey-Fuller (ADF) Tests*

## *VEN EXTR AFI*

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.990083 | 0.0050 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 15:41
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.846874 | 0.212245 | -3.990083 | 0.0005 |
| C | 0.001756 | 0.046470 | 0.037789 | 0.9702 |

| | | | |
|---|---|---|---|
| R-squared | 0.389063 | Mean dependent var | -0.020064 |
| Adjusted R-squared | 0.364626 | S.D. dependent var | 0.300825 |
| S.E. of regression | 0.239788 | Akaike info criterion | 0.053068 |
| Sum squared resid | 1.437463 | Schwarz criterion | 0.149056 |
| Log likelihood | 1.283584 | Hannan-Quinn criter. | 0.081610 |
| F-statistic | 15.92077 | Durbin-Watson stat | 1.858229 |
| Prob(F-statistic) | 0.000508 | | |

## *VEN EXTR AFT*

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.573493 | 0.0059 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 15:42
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.970943 | 0.212298 | -4.573493 | 0.0001 |
| C | 0.173702 | 0.100797 | 1.723273 | 0.0977 |
| @TREND("1988") | -0.011250 | 0.005926 | -1.898319 | 0.0697 |

| | | | |
|---|---|---|---|
| R-squared | 0.468820 | Mean dependent var | -0.020064 |
| Adjusted R-squared | 0.424555 | S.D. dependent var | 0.300825 |
| S.E. of regression | 0.228200 | Akaike info criterion | -0.012751 |
| Sum squared resid | 1.249804 | Schwarz criterion | 0.131231 |
| Log likelihood | 3.172138 | Hannan-Quinn criter. | 0.030062 |
| F-statistic | 10.59122 | Durbin-Watson stat | 1.872051 |
| Prob(F-statistic) | 0.000505 | | |

## *VEN EXTR ALI*

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.753853 | 0.3945 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 15:38
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.168111 | 0.095852 | -1.753853 | 0.0912 |
| C | 3.981408 | 2.265112 | 1.757709 | 0.0906 |

| | | | |
|---|---|---|---|
| R-squared | 0.105792 | Mean dependent var | 0.009437 |
| Adjusted R-squared | 0.071399 | S.D. dependent var | 0.233963 |
| S.E. of regression | 0.225456 | Akaike info criterion | -0.072636 |
| Sum squared resid | 1.321588 | Schwarz criterion | 0.022522 |
| Log likelihood | 3.016903 | Hannan-Quinn criter. | -0.043545 |
| F-statistic | 3.075999 | Durbin-Watson stat | 1.537697 |
| Prob(F-statistic) | 0.091238 | | |

## VEN EXTR ALT

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.286105 | 0.9870 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 15:39
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.040736 | 0.142380 | -0.286105 | 0.7772 |
| C | 1.108400 | 3.280571 | 0.337868 | 0.7383 |
| @TREND("1988") | -0.009414 | 0.007835 | -1.201528 | 0.2408 |

| | | | |
|---|---|---|---|
| R-squared | 0.154610 | Mean dependent var | 0.009437 |
| Adjusted R-squared | 0.086979 | S.D. dependent var | 0.233963 |
| S.E. of regression | 0.223556 | Akaike info criterion | -0.057348 |
| Sum squared resid | 1.249437 | Schwarz criterion | 0.085388 |
| Log likelihood | 3.802877 | Hannan-Quinn criter. | -0.013712 |
| F-statistic | 2.286079 | Durbin-Watson stat | 1.816357 |
| Prob(F-statistic) | 0.122521 | | |

## Variable 5: Venezuela Augmented Dickey-Fuller (ADF) Tests

## VEN GDP AFI

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.463477 | 0.0016 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:02
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.822774 | 0.184335 | -4.463477 | 0.0001 |
| C | 0.020872 | 0.012093 | 1.725948 | 0.0967 |

| | | | |
|---|---|---|---|
| R-squared | 0.443488 | Mean dependent var | 0.003648 |
| Adjusted R-squared | 0.421227 | S.D. dependent var | 0.078278 |
| S.E. of regression | 0.059552 | Akaike info criterion | -2.732762 |
| Sum squared resid | 0.088660 | Schwarz criterion | -2.636774 |
| Log likelihood | 38.89229 | Hannan-Quinn criter. | -2.704220 |
| F-statistic | 19.92263 | Durbin-Watson stat | 1.677515 |
| Prob(F-statistic) | 0.000150 | | |

## VEN GDP AFT

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.377366 | 0.0092 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:03
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.819141 | 0.187131 | -4.377366 | 0.0002 |
| C | 0.032862 | 0.025421 | 1.292717 | 0.2084 |
| @TREND("1988") | -0.000804 | 0.001494 | -0.538547 | 0.5952 |

| | | | |
|---|---|---|---|
| R-squared | 0.450133 | Mean dependent var | 0.003648 |
| Adjusted R-squared | 0.404310 | S.D. dependent var | 0.078278 |
| S.E. of regression | 0.060416 | Akaike info criterion | -2.670700 |
| Sum squared resid | 0.087601 | Schwarz criterion | -2.526718 |
| Log likelihood | 39.05445 | Hannan-Quinn criter. | -2.627887 |
| F-statistic | 9.823443 | Durbin-Watson stat | 1.700707 |
| Prob(F-statistic) | 0.000764 | | |

## VEN GDP ALI

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.660450 | 0.8409 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 15:55
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.037552 | 0.056859 | -0.660450 | 0.5148 |
| C | 1.014719 | 1.505407 | 0.674050 | 0.5062 |

| | | | |
|---|---|---|---|
| R-squared | 0.016500 | Mean dependent var | 0.020504 |
| Adjusted R-squared | -0.021327 | S.D. dependent var | 0.062215 |
| S.E. of regression | 0.062875 | Akaike info criterion | -2.626594 |
| Sum squared resid | 0.102784 | Schwarz criterion | -2.531437 |
| Log likelihood | 38.77232 | Hannan-Quinn criter. | -2.597504 |
| F-statistic | 0.436194 | Durbin-Watson stat | 1.493826 |
| Prob(F-statistic) | 0.514774 | | |

## VEN GDP ALT

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.661860 | 0.2586 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 16:00
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.373013 | 0.140132 | -2.661860 | 0.0139 |
| D(LOG(GDP(-1))) | 0.361728 | 0.180421 | 2.004908 | 0.0569 |
| C | 9.772586 | 3.659062 | 2.670790 | 0.0137 |
| @TREND("1988") | 0.008252 | 0.003655 | 2.258042 | 0.0337 |

| | | | |
|---|---|---|---|
| R-squared | 0.271573 | Mean dependent var | 0.024582 |
| Adjusted R-squared | 0.176561 | S.D. dependent var | 0.059465 |
| S.E. of regression | 0.053960 | Akaike info criterion | -2.865175 |
| Sum squared resid | 0.066970 | Schwarz criterion | -2.673200 |
| Log likelihood | 42.67987 | Hannan-Quinn criter. | -2.808091 |
| F-statistic | 2.858301 | Durbin-Watson stat | 1.696205 |
| Prob(F-statistic) | 0.059135 | | |

## Variable 6: Venezuela Augmented Dickey-Fuller (ADF) Tests

## VEN INFR AFI

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.627755 | 0.0010 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 16:34
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.869353 | 0.187856 | -4.627755 | 0.0001 |
| C | 0.034052 | 0.083770 | 0.406498 | 0.6878 |

| | | | |
|---|---|---|---|
| R-squared | 0.461394 | Mean dependent var | -0.011622 |
| Adjusted R-squared | 0.439850 | S.D. dependent var | 0.577542 |
| S.E. of regression | 0.432251 | Akaike info criterion | 1.231566 |
| Sum squared resid | 4.671021 | Schwarz criterion | 1.327554 |
| Log likelihood | -14.62614 | Hannan-Quinn criter. | 1.260108 |
| F-statistic | 21.41611 | Durbin-Watson stat | 1.361374 |
| Prob(F-statistic) | 0.000098 | | |

## *VEN INFR AFT*

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.379654 | 0.0009 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 16:35
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.943913 | 0.175460 | -5.379654 | 0.0000 |
| C | -0.316451 | 0.166800 | -1.897192 | 0.0699 |
| @TREND("1988") | 0.023628 | 0.009975 | 2.368628 | 0.0262 |

| | | | |
|---|---|---|---|
| R-squared | 0.563446 | Mean dependent var | -0.011622 |
| Adjusted R-squared | 0.527066 | S.D. dependent var | 0.577542 |
| S.E. of regression | 0.397177 | Akaike info criterion | 1.095568 |
| Sum squared resid | 3.785984 | Schwarz criterion | 1.239550 |
| Log likelihood | -11.79017 | Hannan-Quinn criter. | 1.138382 |
| F-statistic | 15.48799 | Durbin-Watson stat | 1.524687 |
| Prob(F-statistic) | 0.000048 | | |

## *VEN INFR ALI*

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.092166 | 0.7039 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 16:32
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.181384 | 0.166078 | -1.092166 | 0.2856 |
| D(LOG(INFR(-1))) | 0.251411 | 0.217362 | 1.156648 | 0.2588 |
| C | 0.662569 | 0.581496 | 1.139421 | 0.2658 |

| | | | |
|---|---|---|---|
| R-squared | 0.065429 | Mean dependent var | 0.040916 |
| Adjusted R-squared | -0.012452 | S.D. dependent var | 0.427937 |
| S.E. of regression | 0.430594 | Akaike info criterion | 1.257135 |
| Sum squared resid | 4.449859 | Schwarz criterion | 1.401117 |
| Log likelihood | -13.97132 | Hannan-Quinn criter. | 1.299948 |
| F-statistic | 0.840114 | Durbin-Watson stat | 1.394078 |
| Prob(F-statistic) | 0.443965 | | |

## VEN INFR ALT

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -0.415902 | 0.9817 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 16:33
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.064679 | 0.155514 | -0.415902 | 0.6810 |
| C | 0.107881 | 0.597418 | 0.180579 | 0.8582 |
| @TREND("1988") | 0.013468 | 0.010965 | 1.228339 | 0.2308 |

| | | | |
|---|---|---|---|
| R-squared | 0.070674 | Mean dependent var | 0.077062 |
| Adjusted R-squared | -0.003672 | S.D. dependent var | 0.461443 |
| S.E. of regression | 0.462289 | Akaike info criterion | 1.395705 |
| Sum squared resid | 5.342785 | Schwarz criterion | 1.538441 |
| Log likelihood | -16.53987 | Hannan-Quinn criter. | 1.439341 |
| F-statistic | 0.950611 | Durbin-Watson stat | 1.518287 |
| Prob(F-statistic) | 0.400037 | | |

## Variable 7: Venezuela Augmented Dickey-Fuller (ADF) Tests

## VEN OILP AFI

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.383199 | 0.0019 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:49
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.875384 | 0.199714 | -4.383199 | 0.0002 |
| C | 0.026558 | 0.052796 | 0.503040 | 0.6193 |

| | | | |
|---|---|---|---|
| R-squared | 0.434548 | Mean dependent var | -0.014164 |
| Adjusted R-squared | 0.411930 | S.D. dependent var | 0.352155 |
| S.E. of regression | 0.270053 | Akaike info criterion | 0.290789 |
| Sum squared resid | 1.823213 | Schwarz criterion | 0.386777 |
| Log likelihood | -1.925647 | Hannan-Quinn criter. | 0.319331 |
| F-statistic | 19.21243 | Durbin-Watson stat | 1.954922 |
| Prob(F-statistic) | 0.000184 | | |

## *VEN OILP AFT*

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.361261 | 0.0095 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:50
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.888800 | 0.203794 | -4.361261 | 0.0002 |
| C | 0.085778 | 0.116270 | 0.737748 | 0.4678 |
| @TREND("1988") | -0.003906 | 0.006809 | -0.573720 | 0.5715 |

| | | | |
|---|---|---|---|
| R-squared | 0.442198 | Mean dependent var | -0.014164 |
| Adjusted R-squared | 0.395715 | S.D. dependent var | 0.352155 |
| S.E. of regression | 0.273751 | Akaike info criterion | 0.351241 |
| Sum squared resid | 1.798546 | Schwarz criterion | 0.495223 |
| Log likelihood | -1.741756 | Hannan-Quinn criter. | 0.394055 |
| F-statistic | 9.513021 | Durbin-Watson stat | 1.957653 |
| Prob(F-statistic) | 0.000907 | | |

## *VEN OILP ALI*

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.312441 | 0.6095 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 16:47
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.089894 | 0.068494 | -1.312441 | 0.2008 |
| C | 0.357928 | 0.248415 | 1.440846 | 0.1616 |

| | | | |
|---|---|---|---|
| R-squared | 0.062134 | Mean dependent var | 0.038356 |
| Adjusted R-squared | 0.026062 | S.D. dependent var | 0.263792 |
| S.E. of regression | 0.260332 | Akaike info criterion | 0.215029 |
| Sum squared resid | 1.762088 | Schwarz criterion | 0.310187 |
| Log likelihood | -1.010410 | Hannan-Quinn criter. | 0.244120 |
| F-statistic | 1.722501 | Durbin-Watson stat | 1.676445 |
| Prob(F-statistic) | 0.200840 | | |

## *VEN OILP ALT*

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.219116 | 0.8868 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 16:48
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.183931 | 0.150872 | -1.219116 | 0.2342 |
| C | 0.555793 | 0.377536 | 1.472159 | 0.1535 |
| @TREND("1988") | 0.009409 | 0.013416 | 0.701344 | 0.4896 |

| | | | |
|---|---|---|---|
| R-squared | 0.080230 | Mean dependent var | 0.038356 |
| Adjusted R-squared | 0.006649 | S.D. dependent var | 0.263792 |
| S.E. of regression | 0.262913 | Akaike info criterion | 0.266974 |
| Sum squared resid | 1.728087 | Schwarz criterion | 0.409710 |
| Log likelihood | -0.737630 | Hannan-Quinn criter. | 0.310609 |
| F-statistic | 1.090361 | Durbin-Watson stat | 1.564444 |
| Prob(F-statistic) | 0.351550 | | |

## *Variable 8: Venezuela Augmented Dickey-Fuller (ADF) Tests*

## *VEN UEMR AFI*

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.068776 | 0.0041 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 20:30
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.720089 | 0.176979 | -4.068776 | 0.0004 |
| C | -0.010865 | 0.027450 | -0.395815 | 0.6956 |

| | | | |
|---|---|---|---|
| R-squared | 0.398387 | Mean dependent var | -0.008905 |
| Adjusted R-squared | 0.374322 | S.D. dependent var | 0.180293 |
| S.E. of regression | 0.142611 | Akaike info criterion | -0.986205 |
| Sum squared resid | 0.508448 | Schwarz criterion | -0.890217 |
| Log likelihood | 15.31377 | Hannan-Quinn criter. | -0.957663 |
| F-statistic | 16.55494 | Durbin-Watson stat | 1.758613 |
| Prob(F-statistic) | 0.000415 | | |

## *VEN UEMR AFT*

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.902366 | 0.0260 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 20:31
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.730510 | 0.187197 | -3.902366 | 0.0007 |
| C | 0.000817 | 0.062401 | 0.013088 | 0.9897 |
| @TREND("1988") | -0.000781 | 0.003727 | -0.209458 | 0.8359 |

| | | | |
|---|---|---|---|
| R-squared | 0.399485 | Mean dependent var | -0.008905 |
| Adjusted R-squared | 0.349442 | S.D. dependent var | 0.180293 |
| S.E. of regression | 0.145419 | Akaike info criterion | -0.913957 |
| Sum squared resid | 0.507520 | Schwarz criterion | -0.769975 |
| Log likelihood | 15.33842 | Hannan-Quinn criter. | -0.871144 |
| F-statistic | 7.982833 | Durbin-Watson stat | 1.749409 |
| Prob(F-statistic) | 0.002199 | | |

## *VEN UEMR ALI*

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.817832 | 0.3643 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 17:00
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.183623 | 0.101012 | -1.817832 | 0.0816 |
| D(LOG(UEMR(-1))) | 0.378393 | 0.177801 | 2.128188 | 0.0438 |
| C | 0.407379 | 0.231573 | 1.759183 | 0.0913 |

| | | | |
|---|---|---|---|
| R-squared | 0.200974 | Mean dependent var | -0.011627 |
| Adjusted R-squared | 0.134389 | S.D. dependent var | 0.146671 |
| S.E. of regression | 0.136460 | Akaike info criterion | -1.041129 |
| Sum squared resid | 0.446913 | Schwarz criterion | -0.897147 |
| Log likelihood | 17.05524 | Hannan-Quinn criter. | -0.998316 |
| F-statistic | 3.018286 | Durbin-Watson stat | 1.761629 |
| Prob(F-statistic) | 0.067722 | | |

## VEN UEMR ALT

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=6)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.876208 | 0.6399 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 20:29
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.197342 | 0.105182 | -1.876208 | 0.0723 |
| C | 0.532518 | 0.257433 | 2.068567 | 0.0491 |
| @TREND("1988") | -0.005917 | 0.003557 | -1.663673 | 0.1087 |

| | | | |
|---|---|---|---|
| R-squared | 0.168403 | Mean dependent var | -0.000490 |
| Adjusted R-squared | 0.101875 | S.D. dependent var | 0.155526 |
| S.E. of regression | 0.147392 | Akaike info criterion | -0.890491 |
| Sum squared resid | 0.543107 | Schwarz criterion | -0.747755 |
| Log likelihood | 15.46687 | Hannan-Quinn criter. | -0.846855 |
| F-statistic | 2.531314 | Durbin-Watson stat | 1.263508 |
| Prob(F-statistic) | 0.099750 | | |

## Appendix A22 Venezuela Phillips-Perron (PP) Tests

## Variable 1: Venezuela Phillips-Perron (PP) Tests

## VEN AEXP PFI

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.329527 | 0.0234 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.053325 |
| HAC corrected variance (Bartlett kernel) | 0.053325 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 14:48
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.782877 | 0.235132 | -3.329527 | 0.0027 |
| C | 0.286322 | 0.092573 | 3.092925 | 0.0048 |

| | | | |
|---|---|---|---|
| R-squared | 0.307206 | Mean dependent var | 0.019195 |
| Adjusted R-squared | 0.279494 | S.D. dependent var | 0.282721 |
| S.E. of regression | 0.239981 | Akaike info criterion | 0.054670 |
| Sum squared resid | 1.439767 | Schwarz criterion | 0.150658 |
| Log likelihood | 1.261959 | Hannan-Quinn criter. | 0.083212 |
| F-statistic | 11.08575 | Durbin-Watson stat | 1.760465 |
| Prob(F-statistic) | 0.002701 | | |

## VEN AEXP PFT

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.310717 | 0.0859 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.050733 |
| HAC corrected variance (Bartlett kernel) | 0.050733 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 14:49
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -0.775287 | 0.234175 | -3.310717 | 0.0029 |
| C | 0.185640 | 0.129458 | 1.433982 | 0.1645 |
| @TREND("1988") | 0.006539 | 0.005905 | 1.107372 | 0.2791 |

| | | | |
|---|---|---|---|
| R-squared | 0.340883 | Mean dependent var | 0.019195 |
| Adjusted R-squared | 0.285957 | S.D. dependent var | 0.282721 |
| S.E. of regression | 0.238902 | Akaike info criterion | 0.078912 |
| Sum squared resid | 1.369779 | Schwarz criterion | 0.222893 |
| Log likelihood | 1.934694 | Hannan-Quinn criter. | 0.121725 |
| F-statistic | 6.206181 | Durbin-Watson stat | 1.859741 |
| Prob(F-statistic) | 0.006723 | | |

## VEN AEXP PLT

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | 0.621934 | 0.9878 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.053081 |
| HAC corrected variance (Bartlett kernel) | 0.060925 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 14:35
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | 0.012444 | 0.017735 | 0.701668 | 0.4891 |
| C | 0.065841 | 0.430468 | 0.152953 | 0.8796 |

| | | | |
|---|---|---|---|
| R-squared | 0.018584 | Mean dependent var | 0.366218 |
| Adjusted R-squared | -0.019163 | S.D. dependent var | 0.236831 |
| S.E. of regression | 0.239090 | Akaike info criterion | 0.044793 |
| Sum squared resid | 1.486260 | Schwarz criterion | 0.139950 |
| Log likelihood | 1.372900 | Hannan-Quinn criter. | 0.073883 |
| F-statistic | 0.492337 | Durbin-Watson stat | 1.416101 |
| Prob(F-statistic) | 0.489120 | | |

### *VEN AEXP PLT*

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.432653 | 0.8283 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.050373 |
| HAC corrected variance (Bartlett kernel) | 0.060022 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 14:47
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.204315 | 0.187796 | -1.087960 | 0.2870 |
| C | 4.302339 | 3.679182 | 1.169374 | 0.2533 |
| @TREND("1988") | 0.068669 | 0.059231 | 1.159336 | 0.2573 |

| | | | |
|---|---|---|---|
| R-squared | 0.068655 | Mean dependent var | 0.366218 |
| Adjusted R-squared | -0.005852 | S.D. dependent var | 0.236831 |
| S.E. of regression | 0.237523 | Akaike info criterion | 0.063854 |
| Sum squared resid | 1.410432 | Schwarz criterion | 0.206591 |
| Log likelihood | 2.106038 | Hannan-Quinn criter. | 0.107490 |
| F-statistic | 0.921457 | Durbin-Watson stat | 1.275858 |
| Prob(F-statistic) | 0.411036 | | |

### *Variable 2: Venezuela Phillips-Perron (PP) Tests*

### *VEN AREV PFI*

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.131976 | 0.0036 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.081764 |
| HAC corrected variance (Bartlett kernel) | 0.074588 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 15:09
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.872694 | 0.208565 | -4.184277 | 0.0003 |
| C | 0.294016 | 0.089359 | 3.290271 | 0.0030 |

| | | | |
|---|---|---|---|
| R-squared | 0.411878 | Mean dependent var | 0.006714 |
| Adjusted R-squared | 0.388353 | S.D. dependent var | 0.379964 |
| S.E. of regression | 0.297162 | Akaike info criterion | 0.482108 |
| Sum squared resid | 2.207630 | Schwarz criterion | 0.578096 |
| Log likelihood | -4.508457 | Hannan-Quinn criter. | 0.510650 |
| F-statistic | 17.50817 | Durbin-Watson stat | 1.822918 |
| Prob(F-statistic) | 0.000308 | | |

## *VEN AREV PFT*

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.876225 | 0.0275 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.080838 |
| HAC corrected variance (Bartlett kernel) | 0.072587 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 15:10
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.851619 | 0.215438 | -3.952962 | 0.0006 |
| C | 0.227418 | 0.156049 | 1.457349 | 0.1580 |
| @TREND("1988") | 0.003977 | 0.007584 | 0.524411 | 0.6048 |

| | | | |
|---|---|---|---|
| R-squared | 0.418541 | Mean dependent var | 0.006714 |
| Adjusted R-squared | 0.370086 | S.D. dependent var | 0.379964 |
| S.E. of regression | 0.301567 | Akaike info criterion | 0.544789 |
| Sum squared resid | 2.182620 | Schwarz criterion | 0.688770 |
| Log likelihood | -4.354645 | Hannan-Quinn criter. | 0.587602 |
| F-statistic | 8.637723 | Durbin-Watson stat | 1.873900 |
| Prob(F-statistic) | 0.001494 | | |

## *VEN AREV PLI*

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -0.461327 | 0.8847 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.087473 |
| HAC corrected variance (Bartlett kernel) | 0.092582 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 15:02
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.010777 | 0.023635 | -0.455984 | 0.6522 |
| C | 0.611864 | 0.569996 | 1.073454 | 0.2929 |

| | | | |
|---|---|---|---|
| R-squared | 0.007934 | Mean dependent var | 0.353305 |
| Adjusted R-squared | -0.030223 | S.D. dependent var | 0.302388 |
| S.E. of regression | 0.306923 | Akaike info criterion | 0.544310 |
| Sum squared resid | 2.449245 | Schwarz criterion | 0.639467 |
| Log likelihood | -5.620333 | Hannan-Quinn criter. | 0.573400 |
| F-statistic | 0.207922 | Durbin-Watson stat | 1.518258 |
| Prob(F-statistic) | 0.652187 | | |

## VEN AREV PLT

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.478635 | 0.3352 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.070736 |
| HAC corrected variance (Bartlett kernel) | 0.070736 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 15:03
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.368328 | 0.148601 | -2.478635 | 0.0203 |
| C | 7.597803 | 2.919541 | 2.602397 | 0.0153 |
| @TREND("1988") | 0.109801 | 0.045146 | 2.432121 | 0.0225 |

| | | | |
|---|---|---|---|
| R-squared | 0.197752 | Mean dependent var | 0.353305 |
| Adjusted R-squared | 0.133572 | S.D. dependent var | 0.302388 |
| S.E. of regression | 0.281469 | Akaike info criterion | 0.403366 |
| Sum squared resid | 1.980615 | Schwarz criterion | 0.546102 |
| Log likelihood | -2.647117 | Hannan-Quinn criter. | 0.447001 |
| F-statistic | 3.081221 | Durbin-Watson stat | 1.379852 |
| Prob(F-statistic) | 0.063659 | | |

## Variable 3: Venezuela Phillips-Perron (PP) Tests

## VEN EXCR PFI

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.860008 | 0.0068 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.462422 |
| HAC corrected variance (Bartlett kernel) | 0.518078 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 15:34
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -1.098537 | 0.304311 | -3.609912 | 0.0013 |
| C | 0.364461 | 0.153266 | 2.377971 | 0.0254 |

| | | | |
|---|---|---|---|
| R-squared | 0.342650 | Mean dependent var | 0.109369 |
| Adjusted R-squared | 0.316356 | S.D. dependent var | 0.854704 |
| S.E. of regression | 0.706693 | Akaike info criterion | 2.214747 |
| Sum squared resid | 12.48539 | Schwarz criterion | 2.310735 |
| Log likelihood | -27.89909 | Hannan-Quinn criter. | 2.243289 |
| F-statistic | 13.03146 | Durbin-Watson stat | 1.434409 |
| Prob(F-statistic) | 0.001339 | | |

## *VEN EXCR PFT*

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.359493 | 0.0009 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.306888 |
| HAC corrected variance (Bartlett kernel) | 0.292998 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 15:35
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -1.500598 | 0.278044 | -5.396974 | 0.0000 |
| C | -0.376798 | 0.247815 | -1.520479 | 0.1415 |
| @TREND("1988") | 0.055641 | 0.015954 | 3.487615 | 0.0019 |

| | | | |
|---|---|---|---|
| R-squared | 0.563747 | Mean dependent var | 0.109369 |
| Adjusted R-squared | 0.527393 | S.D. dependent var | 0.854704 |
| S.E. of regression | 0.587579 | Akaike info criterion | 1.878826 |
| Sum squared resid | 8.285968 | Schwarz criterion | 2.022808 |
| Log likelihood | -22.36415 | Hannan-Quinn criter. | 1.921639 |
| F-statistic | 15.50699 | Durbin-Watson stat | 1.692973 |
| Prob(F-statistic) | 0.000048 | | |

## *VEN EXCR PLI*

Null Hypothesis: EXCR has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | 4.076210 | 1.0000 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.331606 |
| HAC corrected variance (Bartlett kernel) | 0.220864 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 15:31
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | 0.178701 | 0.058325 | 3.063883 | 0.0050 |
| C | 0.016018 | 0.152521 | 0.105018 | 0.9172 |

| | | | |
|---|---|---|---|
| R-squared | 0.265275 | Mean dependent var | 0.330102 |
| Adjusted R-squared | 0.237016 | S.D. dependent var | 0.684142 |
| S.E. of regression | 0.597591 | Akaike info criterion | 1.876928 |
| Sum squared resid | 9.284981 | Schwarz criterion | 1.972085 |
| Log likelihood | -24.27699 | Hannan-Quinn criter. | 1.906018 |
| F-statistic | 9.387377 | Durbin-Watson stat | 2.305602 |
| Prob(F-statistic) | 0.005037 | | |

## VEN EXCR PLT

Null Hypothesis: EXCR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | 1.740381 | 1.0000 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.328227 |
| HAC corrected variance (Bartlett kernel) | 0.224880 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 15:33
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | 0.118046 | 0.133392 | 0.884955 | 0.3846 |
| C | -0.112612 | 0.297017 | -0.379144 | 0.7078 |
| @TREND("1988") | 0.016223 | 0.031975 | 0.507375 | 0.6163 |

| | | | |
|---|---|---|---|
| R-squared | 0.272763 | Mean dependent var | 0.330102 |
| Adjusted R-squared | 0.214584 | S.D. dependent var | 0.684142 |
| S.E. of regression | 0.606312 | Akaike info criterion | 1.938112 |
| Sum squared resid | 9.190346 | Schwarz criterion | 2.080848 |
| Log likelihood | -24.13357 | Hannan-Quinn criter. | 1.981748 |
| F-statistic | 4.688349 | Durbin-Watson stat | 2.239742 |
| Prob(F-statistic) | 0.018662 | | |

## Variable 4: Venezuela Phillips-Perron (PP) Tests

## VEN EXTR PFI

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.970239 | 0.0053 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.053239 |
| HAC corrected variance (Bartlett kernel) | 0.051847 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 15:46
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.846874 | 0.212245 | -3.990083 | 0.0005 |
| C | 0.001756 | 0.046470 | 0.037789 | 0.9702 |

| | | | |
|---|---|---|---|
| R-squared | 0.389063 | Mean dependent var | -0.020064 |
| Adjusted R-squared | 0.364626 | S.D. dependent var | 0.300825 |
| S.E. of regression | 0.239788 | Akaike info criterion | 0.053068 |
| Sum squared resid | 1.437463 | Schwarz criterion | 0.149056 |
| Log likelihood | 1.283584 | Hannan-Quinn criter. | 0.081610 |
| F-statistic | 15.92077 | Durbin-Watson stat | 1.858229 |
| Prob(F-statistic) | 0.000508 | | |

## VEN EXTR PFT

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.578499 | 0.0058 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.046289 |
| HAC corrected variance (Bartlett kernel) | 0.046841 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 15:48
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -0.970943 | 0.212298 | -4.573493 | 0.0001 |
| C | 0.173702 | 0.100797 | 1.723273 | 0.0977 |
| @TREND("1988") | -0.011250 | 0.005926 | -1.898319 | 0.0697 |

| | | | |
|---|---|---|---|
| R-squared | 0.468820 | Mean dependent var | -0.020064 |
| Adjusted R-squared | 0.424555 | S.D. dependent var | 0.300825 |
| S.E. of regression | 0.228200 | Akaike info criterion | -0.012751 |
| Sum squared resid | 1.249804 | Schwarz criterion | 0.131231 |
| Log likelihood | 3.172138 | Hannan-Quinn criter. | 0.030062 |
| F-statistic | 10.59122 | Durbin-Watson stat | 1.872051 |
| Prob(F-statistic) | 0.000505 | | |

## VEN EXTR PLI

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.908965 | 0.3236 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.047200 |
| HAC corrected variance (Bartlett kernel) | 0.064869 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 15:43
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.168111 | 0.095852 | -1.753853 | 0.0912 |
| C | 3.981408 | 2.265112 | 1.757709 | 0.0906 |

| | | | |
|---|---|---|---|
| R-squared | 0.105792 | Mean dependent var | 0.009437 |
| Adjusted R-squared | 0.071399 | S.D. dependent var | 0.233963 |
| S.E. of regression | 0.225456 | Akaike info criterion | -0.072636 |
| Sum squared resid | 1.321588 | Schwarz criterion | 0.022522 |
| Log likelihood | 3.016903 | Hannan-Quinn criter. | -0.043545 |
| F-statistic | 3.075999 | Durbin-Watson stat | 1.537697 |
| Prob(F-statistic) | 0.091238 | | |

## VEN EXTR PLT

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -0.555725 | 0.9740 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.044623 |
| HAC corrected variance (Bartlett kernel) | 0.052066 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 15:45
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.040736 | 0.142380 | -0.286105 | 0.7772 |
| C | 1.108400 | 3.280571 | 0.337868 | 0.7383 |
| @TREND("1988") | -0.009414 | 0.007835 | -1.201528 | 0.2408 |

| | | | |
|---|---|---|---|
| R-squared | 0.154610 | Mean dependent var | 0.009437 |
| Adjusted R-squared | 0.086979 | S.D. dependent var | 0.233963 |
| S.E. of regression | 0.223556 | Akaike info criterion | -0.057348 |
| Sum squared resid | 1.249437 | Schwarz criterion | 0.085388 |
| Log likelihood | 3.802877 | Hannan-Quinn criter. | -0.013712 |
| F-statistic | 2.286079 | Durbin-Watson stat | 1.816357 |
| Prob(F-statistic) | 0.122521 | | |

## Variable 5: Venezuela Phillips-Perron (PP) Tests

## VEN GDP PFI

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.453069 | 0.0016 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003284 |
| HAC corrected variance (Bartlett kernel) | 0.002988 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:09
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.822774 | 0.184335 | -4.463477 | 0.0001 |
| C | 0.020872 | 0.012093 | 1.725948 | 0.0967 |

| | | | |
|---|---|---|---|
| R-squared | 0.443488 | Mean dependent var | 0.003648 |
| Adjusted R-squared | 0.421227 | S.D. dependent var | 0.078278 |
| S.E. of regression | 0.059552 | Akaike info criterion | -2.732762 |
| Sum squared resid | 0.088660 | Schwarz criterion | -2.636774 |
| Log likelihood | 38.89229 | Hannan-Quinn criter. | -2.704220 |
| F-statistic | 19.92263 | Durbin-Watson stat | 1.677515 |
| Prob(F-statistic) | 0.000150 | | |

## VEN GDP PFT

Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.381423 | 0.0095 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003244 |
| HAC corrected variance (Bartlett kernel) | 0.002845 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:10
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.819141 | 0.187131 | -4.377366 | 0.0002 |
| C | 0.032862 | 0.025421 | 1.292717 | 0.2084 |
| @TREND("1988") | -0.000804 | 0.001494 | -0.538547 | 0.5952 |

| | | | |
|---|---|---|---|
| R-squared | 0.450133 | Mean dependent var | 0.003648 |
| Adjusted R-squared | 0.404310 | S.D. dependent var | 0.078278 |
| S.E. of regression | 0.060416 | Akaike info criterion | -2.670700 |
| Sum squared resid | 0.087601 | Schwarz criterion | -2.526718 |
| Log likelihood | 39.05445 | Hannan-Quinn criter. | -2.627887 |
| F-statistic | 9.823443 | Durbin-Watson stat | 1.700707 |
| Prob(F-statistic) | 0.000764 | | |

## VEN GDP PLI

Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -0.588177 | 0.8580 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003671 |
| HAC corrected variance (Bartlett kernel) | 0.003095 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 16:06
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.037552 | 0.056859 | -0.660450 | 0.5148 |
| C | 1.014719 | 1.505407 | 0.674050 | 0.5062 |

| | | | |
|---|---|---|---|
| R-squared | 0.016500 | Mean dependent var | 0.020504 |
| Adjusted R-squared | -0.021327 | S.D. dependent var | 0.062215 |
| S.E. of regression | 0.062875 | Akaike info criterion | -2.626594 |
| Sum squared resid | 0.102784 | Schwarz criterion | -2.531437 |
| Log likelihood | 38.77232 | Hannan-Quinn criter. | -2.597504 |
| F-statistic | 0.436194 | Durbin-Watson stat | 1.493826 |
| Prob(F-statistic) | 0.514774 | | |

## VEN GDP PLT

Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.340800 | 0.4001 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003156 |
| HAC corrected variance (Bartlett kernel) | 0.004002 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 16:07
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.301919 | 0.141478 | -2.134041 | 0.0428 |
| C | 7.906733 | 3.696664 | 2.138883 | 0.0424 |
| @TREND("1988") | 0.007394 | 0.003660 | 2.020156 | 0.0542 |

| | | | |
|---|---|---|---|
| R-squared | 0.154518 | Mean dependent var | 0.020504 |
| Adjusted R-squared | 0.086879 | S.D. dependent var | 0.062215 |
| S.E. of regression | 0.059451 | Akaike info criterion | -2.706376 |
| Sum squared resid | 0.088360 | Schwarz criterion | -2.563640 |
| Log likelihood | 40.88926 | Hannan-Quinn criter. | -2.662740 |
| F-statistic | 2.284458 | Durbin-Watson stat | 1.325856 |
| Prob(F-statistic) | 0.122690 | | |

## Variable 6: Venezuela Phillips-Perron (PP) Tests

## VEN INFR PFI

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.704563 | 0.0009 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.173001 |
| HAC corrected variance (Bartlett kernel) | 0.226794 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 16:39
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.869353 | 0.187856 | -4.627755 | 0.0001 |
| C | 0.034052 | 0.083770 | 0.406498 | 0.6878 |

| | | | |
|---|---|---|---|
| R-squared | 0.461394 | Mean dependent var | -0.011622 |
| Adjusted R-squared | 0.439850 | S.D. dependent var | 0.577542 |
| S.E. of regression | 0.432251 | Akaike info criterion | 1.231566 |
| Sum squared resid | 4.671021 | Schwarz criterion | 1.327554 |
| Log likelihood | -14.62614 | Hannan-Quinn criter. | 1.260108 |
| F-statistic | 21.41611 | Durbin-Watson stat | 1.361374 |
| Prob(F-statistic) | 0.000098 | | |

## VEN INFR PFT

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.321439 | 0.0010 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.140222 |
| HAC corrected variance (Bartlett kernel) | 0.166167 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/25/18 Time: 16:40
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -0.943913 | 0.175460 | -5.379654 | 0.0000 |
| C | -0.316451 | 0.166800 | -1.897192 | 0.0699 |
| @TREND("1988") | 0.023628 | 0.009975 | 2.368628 | 0.0262 |

| | | | |
|---|---|---|---|
| R-squared | 0.563446 | Mean dependent var | -0.011622 |
| Adjusted R-squared | 0.527066 | S.D. dependent var | 0.577542 |
| S.E. of regression | 0.397177 | Akaike info criterion | 1.095568 |
| Sum squared resid | 3.785984 | Schwarz criterion | 1.239550 |
| Log likelihood | -11.79017 | Hannan-Quinn criter. | 1.138382 |
| F-statistic | 15.48799 | Durbin-Watson stat | 1.524687 |
| Prob(F-statistic) | 0.000048 | | |

## VEN INFR PLI

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -0.620381 | 0.8506 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.202330 |
| HAC corrected variance (Bartlett kernel) | 0.202330 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 16:37
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.096091 | 0.154891 | -0.620381 | 0.5404 |
| C | 0.412989 | 0.548624 | 0.752772 | 0.4583 |

| | | | |
|---|---|---|---|
| R-squared | 0.014587 | Mean dependent var | 0.077062 |
| Adjusted R-squared | -0.023314 | S.D. dependent var | 0.461443 |
| S.E. of regression | 0.466791 | Akaike info criterion | 1.382878 |
| Sum squared resid | 5.665236 | Schwarz criterion | 1.478036 |
| Log likelihood | -17.36030 | Hannan-Quinn criter. | 1.411969 |
| F-statistic | 0.384872 | Durbin-Watson stat | 1.383511 |
| Prob(F-statistic) | 0.540407 | | |

## VEN INFR PLT

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -0.647150 | 0.9676 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.190814 |
| HAC corrected variance (Bartlett kernel) | 0.216119 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/25/18 Time: 16:38
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.064679 | 0.155514 | -0.415902 | 0.6810 |
| C | 0.107881 | 0.597418 | 0.180579 | 0.8582 |
| @TREND("1988") | 0.013468 | 0.010965 | 1.228339 | 0.2308 |

| | | | |
|---|---|---|---|
| R-squared | 0.070674 | Mean dependent var | 0.077062 |
| Adjusted R-squared | -0.003672 | S.D. dependent var | 0.461443 |
| S.E. of regression | 0.462289 | Akaike info criterion | 1.395705 |
| Sum squared resid | 5.342785 | Schwarz criterion | 1.538441 |
| Log likelihood | -16.53987 | Hannan-Quinn criter. | 1.439341 |
| F-statistic | 0.950611 | Durbin-Watson stat | 1.518287 |
| Prob(F-statistic) | 0.400037 | | |

## Variable 7: Venezuela Phillips-Perron (PP) Tests

## VEN OILP PFI

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.338389 | 0.0021 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.067526 |
| HAC corrected variance (Bartlett kernel) | 0.058910 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:54
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.875384 | 0.199714 | -4.383199 | 0.0002 |
| C | 0.026558 | 0.052796 | 0.503040 | 0.6193 |

| | | | |
|---|---|---|---|
| R-squared | 0.434548 | Mean dependent var | -0.014164 |
| Adjusted R-squared | 0.411930 | S.D. dependent var | 0.352155 |
| S.E. of regression | 0.270053 | Akaike info criterion | 0.290789 |
| Sum squared resid | 1.823213 | Schwarz criterion | 0.386777 |
| Log likelihood | -1.925647 | Hannan-Quinn criter. | 0.319331 |
| F-statistic | 19.21243 | Durbin-Watson stat | 1.954922 |
| Prob(F-statistic) | 0.000184 | | |

## *VEN OILP PFT*

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.321240 | 0.0104 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.066613 |
| HAC corrected variance (Bartlett kernel) | 0.059442 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/25/18 Time: 16:57
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.888800 | 0.203794 | -4.361261 | 0.0002 |
| C | 0.085778 | 0.116270 | 0.737748 | 0.4678 |
| @TREND("1988") | -0.003906 | 0.006809 | -0.573720 | 0.5715 |

| | | | |
|---|---|---|---|
| R-squared | 0.442198 | Mean dependent var | -0.014164 |
| Adjusted R-squared | 0.395715 | S.D. dependent var | 0.352155 |
| S.E. of regression | 0.273751 | Akaike info criterion | 0.351241 |
| Sum squared resid | 1.798546 | Schwarz criterion | 0.495223 |
| Log likelihood | -1.741756 | Hannan-Quinn criter. | 0.394056 |
| F-statistic | 9.513021 | Durbin-Watson stat | 1.957653 |
| Prob(F-statistic) | 0.000907 | | |

## *VEN OILP PLI*

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.353132 | 0.5903 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.062932 |
| HAC corrected variance (Bartlett kernel) | 0.072377 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 16:52
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.089894 | 0.068494 | -1.312441 | 0.2008 |
| C | 0.357928 | 0.248415 | 1.440846 | 0.1616 |

| | | | |
|---|---|---|---|
| R-squared | 0.062134 | Mean dependent var | 0.038356 |
| Adjusted R-squared | 0.026062 | S.D. dependent var | 0.263792 |
| S.E. of regression | 0.260332 | Akaike info criterion | 0.215029 |
| Sum squared resid | 1.762088 | Schwarz criterion | 0.310187 |
| Log likelihood | -1.010410 | Hannan-Quinn criter. | 0.244120 |
| F-statistic | 1.722501 | Durbin-Watson stat | 1.676445 |
| Prob(F-statistic) | 0.200840 | | |

### VEN OILP PLT

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.466549 | 0.8171 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.061717 |
| HAC corrected variance (Bartlett kernel) | 0.073513 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/25/18 Time: 16:53
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.183931 | 0.150872 | -1.219116 | 0.2342 |
| C | 0.555793 | 0.377536 | 1.472159 | 0.1535 |
| @TREND("1988") | 0.009409 | 0.013416 | 0.701344 | 0.4896 |

| | | | |
|---|---|---|---|
| R-squared | 0.080230 | Mean dependent var | 0.038356 |
| Adjusted R-squared | 0.006649 | S.D. dependent var | 0.263792 |
| S.E. of regression | 0.262913 | Akaike info criterion | 0.266974 |
| Sum squared resid | 1.728087 | Schwarz criterion | 0.409710 |
| Log likelihood | -0.737630 | Hannan-Quinn criter. | 0.310609 |
| F-statistic | 1.090361 | Durbin-Watson stat | 1.564444 |
| Prob(F-statistic) | 0.351550 | | |

## Variable 8: Venezuela Phillips-Perron (PP) Tests

### VEN UEMR PFI

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.050573 | 0.0043 |
| Test critical values: | 1% level | -3.699871 | |
| | 5% level | -2.976263 | |
| | 10% level | -2.627420 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.018831 |
| HAC corrected variance (Bartlett kernel) | 0.017357 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 20:35
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.720089 | 0.176979 | -4.068776 | 0.0004 |
| C | -0.010865 | 0.027450 | -0.395815 | 0.6956 |

| | | | |
|---|---|---|---|
| R-squared | 0.398387 | Mean dependent var | -0.008905 |
| Adjusted R-squared | 0.374322 | S.D. dependent var | 0.180293 |
| S.E. of regression | 0.142611 | Akaike info criterion | -0.986205 |
| Sum squared resid | 0.508448 | Schwarz criterion | -0.890217 |
| Log likelihood | 15.31377 | Hannan-Quinn criter. | -0.957663 |
| F-statistic | 16.55494 | Durbin-Watson stat | 1.758613 |
| Prob(F-statistic) | 0.000415 | | |

## VEN UEMR PFT

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.867977 | 0.0280 |
| Test critical values: | 1% level | -4.339330 | |
| | 5% level | -3.587527 | |
| | 10% level | -3.229230 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.018797 |
| HAC corrected variance (Bartlett kernel) | 0.017204 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/25/18 Time: 20:36
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.730510 | 0.187197 | -3.902366 | 0.0007 |
| C | 0.000817 | 0.062401 | 0.013088 | 0.9897 |
| @TREND("1988") | -0.000781 | 0.003727 | -0.209458 | 0.8359 |

| | | | |
|---|---|---|---|
| R-squared | 0.399485 | Mean dependent var | -0.008905 |
| Adjusted R-squared | 0.349442 | S.D. dependent var | 0.180293 |
| S.E. of regression | 0.145419 | Akaike info criterion | -0.913957 |
| Sum squared resid | 0.507520 | Schwarz criterion | -0.769975 |
| Log likelihood | 15.33842 | Hannan-Quinn criter. | -0.871144 |
| F-statistic | 7.982833 | Durbin-Watson stat | 1.749409 |
| Prob(F-statistic) | 0.002199 | | |

## VEN UEMR PLI

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.465852 | 0.5357 |
| Test critical values: | 1% level | -3.689194 | |
| | 5% level | -2.971853 | |
| | 10% level | -2.625121 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.021544 |
| HAC corrected variance (Bartlett kernel) | 0.021544 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 20:33
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.154483 | 0.105388 | -1.465852 | 0.1547 |
| C | 0.349594 | 0.240555 | 1.453282 | 0.1581 |

| | | | |
|---|---|---|---|
| R-squared | 0.076335 | Mean dependent var | -0.000490 |
| Adjusted R-squared | 0.040809 | S.D. dependent var | 0.155526 |
| S.E. of regression | 0.152320 | Akaike info criterion | -0.856918 |
| Sum squared resid | 0.603235 | Schwarz criterion | -0.761760 |
| Log likelihood | 13.99685 | Hannan-Quinn criter. | -0.827827 |
| F-statistic | 2.148721 | Durbin-Watson stat | 1.191112 |
| Prob(F-statistic) | 0.154679 | | |

## VEN UEMR PLT

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.035967 | 0.5572 |
| Test critical values: | 1% level | -4.323979 | |
| | 5% level | -3.580623 | |
| | 10% level | -3.225334 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.019397 |
| HAC corrected variance (Bartlett kernel) | 0.026275 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/25/18 Time: 20:34
Sample (adjusted): 1989 2016
Included observations: 28 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.197342 | 0.105182 | -1.876208 | 0.0723 |
| C | 0.532518 | 0.257433 | 2.068567 | 0.0491 |
| @TREND("1988") | -0.005917 | 0.003557 | -1.663673 | 0.1087 |

| | | | |
|---|---|---|---|
| R-squared | 0.168403 | Mean dependent var | -0.000490 |
| Adjusted R-squared | 0.101875 | S.D. dependent var | 0.155526 |
| S.E. of regression | 0.147392 | Akaike info criterion | -0.890491 |
| Sum squared resid | 0.543107 | Schwarz criterion | -0.747755 |
| Log likelihood | 15.46687 | Hannan-Quinn criter. | -0.846855 |
| F-statistic | 2.531314 | Durbin-Watson stat | 1.263508 |
| Prob(F-statistic) | 0.099750 | | |

## Appendix A3: Unit Root for Norway

## Appendix A31 Norway Augmented Dickey-Fuller (ADF) Tests

## Variable 1: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR AEXP AFI

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.921434 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 21:12
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -1.158705 | 0.167408 | -6.921434 | 0.0000 |
| C | 0.075910 | 0.013108 | 5.791094 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.592121 | Mean dependent var | -0.002277 |
| Adjusted R-squared | 0.579761 | S.D. dependent var | 0.060682 |
| S.E. of regression | 0.039338 | Akaike info criterion | -3.577825 |
| Sum squared resid | 0.051066 | Schwarz criterion | -3.488948 |
| Log likelihood | 64.61194 | Hannan-Quinn criter. | -3.547145 |
| F-statistic | 47.90625 | Durbin-Watson stat | 1.979066 |
| Prob(F-statistic) | 0.000000 | | |

## NOR AEXP AFT

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -7.956828 | 0.0000 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 21:15
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -1.316603 | 0.165468 | -7.956828 | 0.0000 |
| C | 0.119060 | 0.020379 | 5.842396 | 0.0000 |
| @TREND("1980") | -0.001710 | 0.000651 | -2.628193 | 0.0131 |

| | | | |
|---|---|---|---|
| R-squared | 0.664533 | Mean dependent var | -0.002277 |
| Adjusted R-squared | 0.643566 | S.D. dependent var | 0.060682 |
| S.E. of regression | 0.036228 | Akaike info criterion | -3.716131 |
| Sum squared resid | 0.042000 | Schwarz criterion | -3.582815 |
| Log likelihood | 68.03229 | Hannan-Quinn criter. | -3.670110 |
| F-statistic | 31.69472 | Durbin-Watson stat | 1.975571 |
| Prob(F-statistic) | 0.000000 | | |

## NOR AEXP ALI

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.037177 | 0.0411 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 21:08
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.030941 | 0.010187 | -3.037177 | 0.0047 |
| D(LOG(AEXP(-1))) | -0.335986 | 0.160753 | -2.090080 | 0.0446 |
| C | 0.924258 | 0.279567 | 3.306030 | 0.0023 |

| | | | |
|---|---|---|---|
| R-squared | 0.244341 | Mean dependent var | 0.065201 |
| Adjusted R-squared | 0.197113 | S.D. dependent var | 0.039279 |
| S.E. of regression | 0.035196 | Akaike info criterion | -3.773978 |
| Sum squared resid | 0.039639 | Schwarz criterion | -3.640662 |
| Log likelihood | 69.04461 | Hannan-Quinn criter. | -3.727957 |
| F-statistic | 5.173582 | Durbin-Watson stat | 1.982017 |
| Prob(F-statistic) | 0.011303 | | |

## NOR AEXP ALT

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.230213 | 0.0947 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 21:11
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.230635 | 0.071399 | -3.230213 | 0.0028 |
| C | 6.050861 | 1.844431 | 3.280611 | 0.0024 |
| @TREND("1980") | 0.013069 | 0.004517 | 2.893527 | 0.0067 |

| | | | |
|---|---|---|---|
| R-squared | 0.346789 | Mean dependent var | 0.066820 |
| Adjusted R-squared | 0.307200 | S.D. dependent var | 0.039914 |
| S.E. of regression | 0.033223 | Akaike info criterion | -3.891513 |
| Sum squared resid | 0.036424 | Schwarz criterion | -3.759553 |
| Log likelihood | 73.04724 | Hannan-Quinn criter. | -3.845456 |
| F-statistic | 8.759823 | Durbin-Watson stat | 2.707735 |
| Prob(F-statistic) | 0.000888 | | |

## Variable 2: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR AREV AFI

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.932346 | 0.0003 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 22:01
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.862419 | 0.174850 | -4.932346 | 0.0000 |
| C | 0.054627 | 0.016293 | 3.352885 | 0.0020 |

| | | | |
|---|---|---|---|
| R-squared | 0.424365 | Mean dependent var | -0.003605 |
| Adjusted R-squared | 0.406922 | S.D. dependent var | 0.086252 |
| S.E. of regression | 0.066424 | Akaike info criterion | -2.530066 |
| Sum squared resid | 0.145602 | Schwarz criterion | -2.441189 |
| Log likelihood | 46.27616 | Hannan-Quinn criter. | -2.499386 |
| F-statistic | 24.32804 | Durbin-Watson stat | 1.936729 |
| Prob(F-statistic) | 0.000023 | | |

## *NOR AREV AFT*

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.347898 | 0.0006 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 22:08
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.950881 | 0.177805 | -5.347898 | 0.0000 |
| C | 0.097150 | 0.029589 | 3.283292 | 0.0025 |
| @TREND("1980") | -0.001924 | 0.001130 | -1.701601 | 0.0985 |

| | | | |
|---|---|---|---|
| R-squared | 0.472129 | Mean dependent var | -0.003605 |
| Adjusted R-squared | 0.439137 | S.D. dependent var | 0.086252 |
| S.E. of regression | 0.064595 | Akaike info criterion | -2.559544 |
| Sum squared resid | 0.133520 | Schwarz criterion | -2.426228 |
| Log likelihood | 47.79201 | Hannan-Quinn criter. | -2.513523 |
| F-statistic | 14.31041 | Durbin-Watson stat | 1.962654 |
| Prob(F-statistic) | 0.000036 | | |

## *NOR AREV ALI*

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.227611 | 0.2005 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 21:47
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.031935 | 0.014336 | -2.227611 | 0.0326 |
| C | 0.932281 | 0.389346 | 2.394482 | 0.0223 |

| | | | |
|---|---|---|---|
| R-squared | 0.127360 | Mean dependent var | 0.065278 |
| Adjusted R-squared | 0.101695 | S.D. dependent var | 0.065611 |
| S.E. of regression | 0.062185 | Akaike info criterion | -2.663450 |
| Sum squared resid | 0.131477 | Schwarz criterion | -2.575477 |
| Log likelihood | 49.94211 | Hannan-Quinn criter. | -2.632745 |
| F-statistic | 4.962251 | Durbin-Watson stat | 1.865051 |
| Prob(F-statistic) | 0.032630 | | |

## NOR AREV ALT

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.400260 | 0.8439 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 21:52
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.168668 | 0.120455 | -1.400260 | 0.1708 |
| C | 4.467096 | 3.116264 | 1.433478 | 0.1611 |
| @TREND("1980") | 0.009583 | 0.008383 | 1.143189 | 0.2612 |

| | | | |
|---|---|---|---|
| R-squared | 0.160603 | Mean dependent var | 0.065278 |
| Adjusted R-squared | 0.109730 | S.D. dependent var | 0.065611 |
| S.E. of regression | 0.061906 | Akaike info criterion | -2.646733 |
| Sum squared resid | 0.126469 | Schwarz criterion | -2.514773 |
| Log likelihood | 50.64120 | Hannan-Quinn criter. | -2.600676 |
| F-statistic | 3.156960 | Durbin-Watson stat | 1.701399 |
| Prob(F-statistic) | 0.055650 | | |

## Variable 3: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR EXCR AFI

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.124442 | 0.0028 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 22:24
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.864440 | 0.161098 | -4.124442 | 0.0002 |
| C | 0.046054 | 0.104905 | 0.439005 | 0.6635 |

| | | | |
|---|---|---|---|
| R-squared | 0.340145 | Mean dependent var | -0.013270 |
| Adjusted R-squared | 0.320150 | S.D. dependent var | 0.745596 |
| S.E. of regression | 0.614767 | Akaike info criterion | 1.920297 |
| Sum squared resid | 12.47195 | Schwarz criterion | 2.009174 |
| Log likelihood | -31.60519 | Hannan-Quinn criter. | 1.950977 |
| F-statistic | 17.01102 | Durbin-Watson stat | 1.936289 |
| Prob(F-statistic) | 0.000236 | | |

## NOR EXCR AFT

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.048577 | 0.0160 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 22:25
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.662390 | 0.163611 | -4.048577 | 0.0003 |
| C | -0.005970 | 0.225881 | -0.026430 | 0.9791 |
| @TREND("1980") | 0.002728 | 0.010450 | 0.261109 | 0.7957 |

| | | | |
|---|---|---|---|
| R-squared | 0.341548 | Mean dependent var | -0.013270 |
| Adjusted R-squared | 0.300395 | S.D. dependent var | 0.745596 |
| S.E. of regression | 0.623634 | Akaike info criterion | 1.975311 |
| Sum squared resid | 12.44543 | Schwarz criterion | 2.108627 |
| Log likelihood | -31.56795 | Hannan-Quinn criter. | 2.021332 |
| F-statistic | 8.299430 | Durbin-Watson stat | 1.944259 |
| Prob(F-statistic) | 0.001248 | | |

## NOR EXCR ALI

Null Hypothesis: EXCR has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.146465 | 0.0322 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 22:16
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | -0.338267 | 0.107507 | -3.146465 | 0.0036 |
| D(EXCR(-1)) | 0.481998 | 0.150353 | 3.205781 | 0.0030 |
| C | 2.353156 | 0.739123 | 3.183714 | 0.0032 |

| | | | |
|---|---|---|---|
| R-squared | 0.325024 | Mean dependent var | 0.076014 |
| Adjusted R-squared | 0.282838 | S.D. dependent var | 0.644244 |
| S.E. of regression | 0.545581 | Akaike info criterion | 1.707884 |
| Sum squared resid | 9.525062 | Schwarz criterion | 1.841200 |
| Log likelihood | -26.88797 | Hannan-Quinn criter. | 1.753904 |
| F-statistic | 7.704545 | Durbin-Watson stat | 2.055137 |
| Prob(F-statistic) | 0.001856 | | |

## NOR EXCR ALT

Null Hypothesis: EXCR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.121585 | 0.1172 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 22:20
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | -0.349246 | 0.111881 | -3.121585 | 0.0039 |
| D(EXCR(-1)) | 0.483688 | 0.152360 | 3.174651 | 0.0034 |
| C | 2.505736 | 0.829152 | 3.022045 | 0.0050 |
| @TREND("1980") | -0.004075 | 0.009514 | -0.428342 | 0.6714 |

| | | | |
|---|---|---|---|
| R-squared | 0.328995 | Mean dependent var | 0.076014 |
| Adjusted R-squared | 0.264059 | S.D. dependent var | 0.644244 |
| S.E. of regression | 0.552677 | Akaike info criterion | 1.759126 |
| Sum squared resid | 9.469018 | Schwarz criterion | 1.936880 |
| Log likelihood | -26.78470 | Hannan-Quinn criter. | 1.820486 |
| F-statistic | 5.066461 | Durbin-Watson stat | 2.048956 |
| Prob(F-statistic) | 0.005695 | | |

## Variable 4: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR EXTR AFI

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.624485 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 23:10
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -1.139336 | 0.171989 | -6.624485 | 0.0000 |
| C | 0.071274 | 0.029967 | 2.378415 | 0.0233 |

| | | | |
|---|---|---|---|
| R-squared | 0.570781 | Mean dependent var | 0.001544 |
| Adjusted R-squared | 0.557774 | S.D. dependent var | 0.249610 |
| S.E. of regression | 0.165991 | Akaike info criterion | -0.698324 |
| Sum squared resid | 0.909247 | Schwarz criterion | -0.609447 |
| Log likelihood | 14.22067 | Hannan-Quinn criter. | -0.667644 |
| F-statistic | 43.88380 | Durbin-Watson stat | 2.059684 |
| Prob(F-statistic) | 0.000000 | | |

## NOR EXTR AFT

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -6.674834 | 0.0000 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 23:11
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -1.158617 | 0.173580 | -6.674834 | 0.0000 |
| C | 0.122029 | 0.062260 | 1.959975 | 0.0588 |
| @TREND("1980") | -0.002609 | 0.002804 | -0.930587 | 0.3590 |

| | | | |
|---|---|---|---|
| R-squared | 0.582090 | Mean dependent var | 0.001544 |
| Adjusted R-squared | 0.555971 | S.D. dependent var | 0.249610 |
| S.E. of regression | 0.166329 | Akaike info criterion | -0.667884 |
| Sum squared resid | 0.885289 | Schwarz criterion | -0.534568 |
| Log likelihood | 14.68797 | Hannan-Quinn criter. | -0.621863 |
| F-statistic | 22.28579 | Durbin-Watson stat | 2.085688 |
| Prob(F-statistic) | 0.000001 | | |

## NOR EXTR ALI

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.325795 | 0.6069 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 23:06
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.051096 | 0.038540 | -1.325795 | 0.1937 |
| C | 1.281817 | 0.921279 | 1.391345 | 0.1732 |

| | | | |
|---|---|---|---|
| R-squared | 0.049157 | Mean dependent var | 0.060911 |
| Adjusted R-squared | 0.021191 | S.D. dependent var | 0.163146 |
| S.E. of regression | 0.161408 | Akaike info criterion | -0.755814 |
| Sum squared resid | 0.885783 | Schwarz criterion | -0.667841 |
| Log likelihood | 15.60466 | Hannan-Quinn criter. | -0.725109 |
| F-statistic | 1.757733 | Durbin-Watson stat | 2.272699 |
| Prob(F-statistic) | 0.193747 | | |

## NOR EXTR ALT

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.831610 | 0.1959 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 23:07
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.411949 | 0.145482 | -2.831610 | 0.0078 |
| C | 9.441468 | 3.301309 | 2.859916 | 0.0073 |
| @TREND("1980") | 0.025013 | 0.009775 | 2.558784 | 0.0153 |

| | | | |
|---|---|---|---|
| R-squared | 0.206576 | Mean dependent var | 0.060911 |
| Adjusted R-squared | 0.158490 | S.D. dependent var | 0.163146 |
| S.E. of regression | 0.149660 | Akaike info criterion | -0.881250 |
| Sum squared resid | 0.739135 | Schwarz criterion | -0.749291 |
| Log likelihood | 18.86251 | Hannan-Quinn criter. | -0.835193 |
| F-statistic | 4.295948 | Durbin-Watson stat | 1.897064 |
| Prob(F-statistic) | 0.021970 | | |

## Variable 5: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR GDP AFI

NOR GDP AFI
Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.908253 | 0.0545 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 23:38
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.413549 | 0.142198 | -2.908253 | 0.0065 |
| C | 0.009919 | 0.004219 | 2.351373 | 0.0248 |

| | | | |
|---|---|---|---|
| R-squared | 0.204012 | Mean dependent var | -0.000147 |
| Adjusted R-squared | 0.179892 | S.D. dependent var | 0.015755 |
| S.E. of regression | 0.014268 | Akaike info criterion | -5.606190 |
| Sum squared resid | 0.006718 | Schwarz criterion | -5.517313 |
| Log likelihood | 100.1083 | Hannan-Quinn criter. | -5.575509 |
| F-statistic | 8.457935 | Durbin-Watson stat | 1.722910 |
| Prob(F-statistic) | 0.006455 | | |

## NOR GDP AFT

NOR GDP AFT
Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.336701 | 0.0770 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 23:39
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.494275 | 0.148133 | -3.336701 | 0.0022 |
| C | 0.019362 | 0.007256 | 2.668534 | 0.0119 |
| @TREND("1980") | -0.000394 | 0.000249 | -1.582043 | 0.1235 |

| | | | |
|---|---|---|---|
| R-squared | 0.261754 | Mean dependent var | -0.000147 |
| Adjusted R-squared | 0.215614 | S.D. dependent var | 0.015755 |
| S.E. of regression | 0.013954 | Akaike info criterion | -5.624353 |
| Sum squared resid | 0.006230 | Schwarz criterion | -5.491037 |
| Log likelihood | 101.4262 | Hannan-Quinn criter. | -5.578332 |
| F-statistic | 5.672989 | Durbin-Watson stat | 1.731171 |
| Prob(F-statistic) | 0.007784 | | |

## NOR GDP ALI

NOR GDP ALI
Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.829079 | 0.3608 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 23:34
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.016811 | 0.009191 | -1.829079 | 0.0767 |
| D(LOG(GDP(-1))) | 0.510920 | 0.143471 | 3.561151 | 0.0012 |
| C | 0.457432 | 0.244699 | 1.869362 | 0.0707 |

| | | | |
|---|---|---|---|
| R-squared | 0.402576 | Mean dependent var | 0.024194 |
| Adjusted R-squared | 0.365237 | S.D. dependent var | 0.017304 |
| S.E. of regression | 0.013786 | Akaike info criterion | -5.648483 |
| Sum squared resid | 0.006082 | Schwarz criterion | -5.515167 |
| Log likelihood | 101.8484 | Hannan-Quinn criter. | -5.602462 |
| F-statistic | 10.78165 | Durbin-Watson stat | 1.746442 |
| Prob(F-statistic) | 0.000263 | | |

## NOR GDP ALT

NOR GDP ALT
Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.468243 | 0.8215 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 23:36
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.077788 | 0.052981 | -1.468243 | 0.1521 |
| D(LOG(GDP(-1))) | 0.576515 | 0.153307 | 3.760529 | 0.0007 |
| C | 2.040917 | 1.376871 | 1.482286 | 0.1484 |
| @TREND("1980") | 0.001655 | 0.001417 | 1.168450 | 0.2515 |

| | | | |
|---|---|---|---|
| R-squared | 0.427777 | Mean dependent var | 0.024194 |
| Adjusted R-squared | 0.372401 | S.D. dependent var | 0.017304 |
| S.E. of regression | 0.013708 | Akaike info criterion | -5.634439 |
| Sum squared resid | 0.005825 | Schwarz criterion | -5.456685 |
| Log likelihood | 102.6027 | Hannan-Quinn criter. | -5.573078 |
| F-statistic | 7.724904 | Durbin-Watson stat | 1.801378 |
| Prob(F-statistic) | 0.000540 | | |

## Variable 6: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR INFR AFI

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -10.54415 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/26/18 Time: 01:09
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -1.549709 | 0.146973 | -10.54415 | 0.0000 |
| C | -0.063771 | 0.093754 | -0.680196 | 0.5011 |

| | | | |
|---|---|---|---|
| R-squared | 0.771118 | Mean dependent var | 0.007605 |
| Adjusted R-squared | 0.764182 | S.D. dependent var | 1.139196 |
| S.E. of regression | 0.553206 | Akaike info criterion | 1.709272 |
| Sum squared resid | 10.09921 | Schwarz criterion | 1.798149 |
| Log likelihood | -27.91225 | Hannan-Quinn criter. | 1.739952 |
| F-statistic | 111.1790 | Durbin-Watson stat | 2.228956 |
| Prob(F-statistic) | 0.000000 | | |

## NOR INFR AFT

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -10.74758 | 0.0000 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/26/18 Time: 01:19
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -1.566405 | 0.145745 | -10.74758 | 0.0000 |
| C | -0.298878 | 0.198020 | -1.509331 | 0.1410 |
| @TREND("1980") | 0.012334 | 0.009181 | 1.343328 | 0.1886 |

| | | | |
|---|---|---|---|
| R-squared | 0.783336 | Mean dependent var | 0.007605 |
| Adjusted R-squared | 0.769794 | S.D. dependent var | 1.139196 |
| S.E. of regression | 0.546583 | Akaike info criterion | 1.711556 |
| Sum squared resid | 9.560098 | Schwarz criterion | 1.844871 |
| Log likelihood | -26.95222 | Hannan-Quinn criter. | 1.757576 |
| F-statistic | 57.84704 | Durbin-Watson stat | 2.329008 |
| Prob(F-statistic) | 0.000000 | | |

## NOR INFR ALI

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.955620 | 0.0489 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/26/18 Time: 00:42
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.363982 | 0.123149 | -2.955620 | 0.0056 |
| C | 0.350913 | 0.161557 | 2.172064 | 0.0369 |

| | | | |
|---|---|---|---|
| R-squared | 0.204412 | Mean dependent var | -0.031152 |
| Adjusted R-squared | 0.181012 | S.D. dependent var | 0.642485 |
| S.E. of regression | 0.581435 | Akaike info criterion | 1.807319 |
| Sum squared resid | 11.49428 | Schwarz criterion | 1.895292 |
| Log likelihood | -30.53174 | Hannan-Quinn criter. | 1.838024 |
| F-statistic | 8.735690 | Durbin-Watson stat | 2.611826 |
| Prob(F-statistic) | 0.005635 | | |

## NOR INFR ALT

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -3.809085 | 0.0275 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/26/18 Time: 01:07
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.670416 | 0.176005 | -3.809085 | 0.0006 |
| C | 1.243350 | 0.414553 | 2.999253 | 0.0051 |
| @TREND("1980") | -0.030853 | 0.013332 | -2.314178 | 0.0270 |

| | | | |
|---|---|---|---|
| R-squared | 0.315497 | Mean dependent var | -0.031152 |
| Adjusted R-squared | 0.274012 | S.D. dependent var | 0.642485 |
| S.E. of regression | 0.547429 | Akaike info criterion | 1.712486 |
| Sum squared resid | 9.889377 | Schwarz criterion | 1.844446 |
| Log likelihood | -27.82475 | Hannan-Quinn criter. | 1.758543 |
| F-statistic | 7.605079 | Durbin-Watson stat | 2.129049 |
| Prob(F-statistic) | 0.001922 | | |

## Variable 7: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR OILP AFI

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.626742 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/26/18 Time: 02:22
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.977540 | 0.173731 | -5.626742 | 0.0000 |
| C | 0.007905 | 0.046112 | 0.171436 | 0.8649 |

| | | | |
|---|---|---|---|
| R-squared | 0.489640 | Mean dependent var | 0.002456 |
| Adjusted R-squared | 0.474174 | S.D. dependent var | 0.376121 |
| S.E. of regression | 0.272739 | Akaike info criterion | 0.294845 |
| Sum squared resid | 2.454764 | Schwarz criterion | 0.383722 |
| Log likelihood | -3.159793 | Hannan-Quinn criter. | 0.325526 |
| F-statistic | 31.66023 | Durbin-Watson stat | 2.000300 |
| Prob(F-statistic) | 0.000003 | | |

## *NOR OILP AFT*

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -5.553115 | 0.0003 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/26/18 Time: 02:23
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.980850 | 0.176631 | -5.553115 | 0.0000 |
| C | -0.016259 | 0.099754 | -0.162994 | 0.8715 |
| @TREND("1980") | 0.001273 | 0.004641 | 0.274255 | 0.7857 |

| | | | |
|---|---|---|---|
| R-squared | 0.490837 | Mean dependent var | 0.002456 |
| Adjusted R-squared | 0.459014 | S.D. dependent var | 0.376121 |
| S.E. of regression | 0.276643 | Akaike info criterion | 0.349640 |
| Sum squared resid | 2.449008 | Schwarz criterion | 0.482956 |
| Log likelihood | -3.118707 | Hannan-Quinn criter. | 0.395661 |
| F-statistic | 15.42410 | Durbin-Watson stat | 1.998723 |
| Prob(F-statistic) | 0.000020 | | |

## *NOR OILP ALI*

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -1.144009 | 0.6875 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/26/18 Time: 02:05
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.076249 | 0.066650 | -1.144009 | 0.2606 |
| C | 0.272372 | 0.237466 | 1.146990 | 0.2594 |

| | | | |
|---|---|---|---|
| R-squared | 0.037066 | Mean dependent var | 0.005419 |
| Adjusted R-squared | 0.008744 | S.D. dependent var | 0.265362 |
| S.E. of regression | 0.264199 | Akaike info criterion | 0.229728 |
| Sum squared resid | 2.373246 | Schwarz criterion | 0.317701 |
| Log likelihood | -2.135099 | Hannan-Quinn criter. | 0.260433 |
| F-statistic | 1.308757 | Durbin-Watson stat | 1.878056 |
| Prob(F-statistic) | 0.260610 | | |

## NOR OILP ALT

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.078296 | 0.5400 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/26/18 Time: 02:20
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.191440 | 0.092114 | -2.078296 | 0.0455 |
| C | 0.485277 | 0.260419 | 1.863449 | 0.0713 |
| @TREND("1980") | 0.010291 | 0.005858 | 1.756751 | 0.0882 |

| | | | |
|---|---|---|---|
| R-squared | 0.119418 | Mean dependent var | 0.005419 |
| Adjusted R-squared | 0.066050 | S.D. dependent var | 0.265362 |
| S.E. of regression | 0.256449 | Akaike info criterion | 0.195881 |
| Sum squared resid | 2.170280 | Schwarz criterion | 0.327841 |
| Log likelihood | -0.525859 | Hannan-Quinn criter. | 0.241939 |
| F-statistic | 2.237617 | Durbin-Watson stat | 1.833567 |
| Prob(F-statistic) | 0.122659 | | |

## Variable 8: Norway Augmented Dickey-Fuller (ADF) Tests

## NOR UEMR AFI

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.769439 | 0.0005 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/26/18 Time: 02:39
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.796375 | 0.166974 | -4.769439 | 0.0000 |
| C | 0.021974 | 0.033675 | 0.652523 | 0.5186 |

| | | | |
|---|---|---|---|
| R-squared | 0.408046 | Mean dependent var | -0.005245 |
| Adjusted R-squared | 0.390108 | S.D. dependent var | 0.251414 |
| S.E. of regression | 0.196343 | Akaike info criterion | -0.362462 |
| Sum squared resid | 1.272169 | Schwarz criterion | -0.273585 |
| Log likelihood | 8.343088 | Hannan-Quinn criter. | -0.331782 |
| F-statistic | 22.74755 | Durbin-Watson stat | 1.920813 |
| Prob(F-statistic) | 0.000036 | | |

## *NOR UEMR AFT*

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -4.712301 | 0.0031 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/26/18 Time: 02:41
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.810271 | 0.171948 | -4.712301 | 0.0000 |
| C | 0.050863 | 0.073727 | 0.689881 | 0.4952 |
| @TREND("1980") | -0.001495 | 0.003384 | -0.441927 | 0.6615 |

| | | | |
|---|---|---|---|
| R-squared | 0.411637 | Mean dependent var | -0.005245 |
| Adjusted R-squared | 0.374864 | S.D. dependent var | 0.251414 |
| S.E. of regression | 0.198782 | Akaike info criterion | -0.311404 |
| Sum squared resid | 1.264452 | Schwarz criterion | -0.178088 |
| Log likelihood | 8.449568 | Hannan-Quinn criter. | -0.265383 |
| F-statistic | 11.19408 | Durbin-Watson stat | 1.908645 |
| Prob(F-statistic) | 0.000206 | | |

## *NOR UEMR ALI*

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.396525 | 0.1500 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/26/18 Time: 02:35
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.205697 | 0.085831 | -2.396525 | 0.022 |
| D(LOG(UEMR(-1))) | 0.241144 | 0.156913 | 1.536800 | 0.134 |
| C | 0.276720 | 0.110864 | 2.496034 | 0.017 |

| | | | |
|---|---|---|---|
| R-squared | 0.188729 | Mean dependent var | 0.02893 |
| Adjusted R-squared | 0.138025 | S.D. dependent var | 0.19774 |
| S.E. of regression | 0.183591 | Akaike info criterion | -0.47039 |
| Sum squared resid | 1.078585 | Schwarz criterion | -0.33707 |
| Log likelihood | 11.23186 | Hannan-Quinn criter. | -0.42437 |
| F-statistic | 3.722139 | Durbin-Watson stat | 1.90708 |
| Prob(F-statistic) | 0.035209 | | |

## NOR UEMR ALT

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

| | | t-Statistic | Prob.* |
|---|---|---|---|
| Augmented Dickey-Fuller test statistic | | -2.325034 | 0.4103 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/26/18 Time: 02:36
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.211947 | 0.091159 | -2.325034 | 0.0268 |
| D(LOG(UEMR(-1))) | 0.249476 | 0.163243 | 1.528242 | 0.1366 |
| C | 0.269510 | 0.116711 | 2.309208 | 0.0278 |
| @TREND("1980") | 0.000774 | 0.003319 | 0.233152 | 0.8172 |

| | | | |
|---|---|---|---|
| R-squared | 0.190149 | Mean dependent var | 0.028933 |
| Adjusted R-squared | 0.111776 | S.D. dependent var | 0.197745 |
| S.E. of regression | 0.186366 | Akaike info criterion | -0.415001 |
| Sum squared resid | 1.076697 | Schwarz criterion | -0.237247 |
| Log likelihood | 11.26252 | Hannan-Quinn criter. | -0.353641 |
| F-statistic | 2.426217 | Durbin-Watson stat | 1.913504 |
| Prob(F-statistic) | 0.084292 | | |

## Appendix A32 Norway Phillips-Perron (PP) Tests

## Variable 1: Norway Phillips-Perron (PP) Tests

## NOR AEXP PFI

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -6.827530 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.001459 |
| HAC corrected variance (Bartlett kernel) | 0.001818 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 21:42
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -1.158705 | 0.167408 | -6.921434 | 0.0000 |
| C | 0.075910 | 0.013108 | 5.791094 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.592121 | Mean dependent var | -0.002277 |
| Adjusted R-squared | 0.579761 | S.D. dependent var | 0.060682 |
| S.E. of regression | 0.039338 | Akaike info criterion | -3.577825 |
| Sum squared resid | 0.051066 | Schwarz criterion | -3.488948 |
| Log likelihood | 64.61194 | Hannan-Quinn criter. | -3.547145 |
| F-statistic | 47.90625 | Durbin-Watson stat | 1.979066 |
| Prob(F-statistic) | 0.000000 | | |

## NOR AEXP PFT

Null Hypothesis: D(LOG(AEXP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -7.901285 | 0.0000 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.001200 |
| HAC corrected variance (Bartlett kernel) | 0.001259 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP),2)
Method: Least Squares
Date: 02/25/18 Time: 21:43
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AEXP(-1))) | -1.316603 | 0.165468 | -7.956828 | 0.0000 |
| C | 0.119060 | 0.020379 | 5.842396 | 0.0000 |
| @TREND("1980") | -0.001710 | 0.000651 | -2.628193 | 0.0131 |

| | | | |
|---|---|---|---|
| R-squared | 0.664533 | Mean dependent var | -0.002277 |
| Adjusted R-squared | 0.643566 | S.D. dependent var | 0.060682 |
| S.E. of regression | 0.036228 | Akaike info criterion | -3.716131 |
| Sum squared resid | 0.042000 | Schwarz criterion | -3.582815 |
| Log likelihood | 68.03229 | Hannan-Quinn criter. | -3.670110 |
| F-statistic | 31.69472 | Durbin-Watson stat | 1.975571 |
| Prob(F-statistic) | 0.000000 | | |

## NOR AEXP PLT

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.741741 | 0.0770 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.001268 |
| HAC corrected variance (Bartlett kernel) | 0.001268 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 21:20
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.025483 | 0.009294 | -2.741741 | 0.0097 |
| C | 0.754707 | 0.250968 | 3.007179 | 0.0049 |

| | | | |
|---|---|---|---|
| R-squared | 0.181061 | Mean dependent var | 0.066820 |
| Adjusted R-squared | 0.156975 | S.D. dependent var | 0.039914 |
| S.E. of regression | 0.036648 | Akaike info criterion | -3.720960 |
| Sum squared resid | 0.045665 | Schwarz criterion | -3.632987 |
| Log likelihood | 68.97728 | Hannan-Quinn criter. | -3.690255 |
| F-statistic | 7.517144 | Durbin-Watson stat | 2.671303 |
| Prob(F-statistic) | 0.009674 | | |

## NOR AEXP PLT

Null Hypothesis: LOG(AEXP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.568035 | 0.0471 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.001012 |
| HAC corrected variance (Bartlett kernel) | 0.000583 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AEXP))
Method: Least Squares
Date: 02/25/18 Time: 21:35
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.230635 | 0.071399 | -3.230213 | 0.0028 |
| C | 6.050861 | 1.844431 | 3.280611 | 0.0024 |
| @TREND("1980") | 0.013069 | 0.004517 | 2.893527 | 0.0067 |

| | | | |
|---|---|---|---|
| R-squared | 0.346789 | Mean dependent var | 0.066820 |
| Adjusted R-squared | 0.307200 | S.D. dependent var | 0.039914 |
| S.E. of regression | 0.033223 | Akaike info criterion | -3.891513 |
| Sum squared resid | 0.036424 | Schwarz criterion | -3.759553 |
| Log likelihood | 73.04724 | Hannan-Quinn criter. | -3.845456 |
| F-statistic | 8.759823 | Durbin-Watson stat | 2.707735 |
| Prob(F-statistic) | 0.000888 | | |

## Variable 2: Norway Phillips-Perron (PP) Tests

## NOR AREV PFI

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.843910 | 0.0004 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.004160 |
| HAC corrected variance (Bartlett kernel) | 0.003233 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 22:12
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.862419 | 0.174850 | -4.932346 | 0.0000 |
| C | 0.054627 | 0.016293 | 3.352885 | 0.0020 |

| | | | |
|---|---|---|---|
| R-squared | 0.424365 | Mean dependent var | -0.003605 |
| Adjusted R-squared | 0.406922 | S.D. dependent var | 0.086252 |
| S.E. of regression | 0.066424 | Akaike info criterion | -2.530066 |
| Sum squared resid | 0.145602 | Schwarz criterion | -2.441189 |
| Log likelihood | 46.27616 | Hannan-Quinn criter. | -2.499386 |
| F-statistic | 24.32804 | Durbin-Watson stat | 1.936729 |
| Prob(F-statistic) | 0.000023 | | |

## NOR AREV PFT

Null Hypothesis: D(LOG(AREV)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 24 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -6.920608 | 0.0000 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003815 |
| HAC corrected variance (Bartlett kernel) | 0.000666 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV),2)
Method: Least Squares
Date: 02/25/18 Time: 22:13
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(AREV(-1))) | -0.950881 | 0.177805 | -5.347898 | 0.0000 |
| C | 0.097150 | 0.029589 | 3.283292 | 0.0025 |
| @TREND("1980") | -0.001924 | 0.001130 | -1.701601 | 0.0985 |

| | | | |
|---|---|---|---|
| R-squared | 0.472129 | Mean dependent var | -0.003605 |
| Adjusted R-squared | 0.439137 | S.D. dependent var | 0.086252 |
| S.E. of regression | 0.064595 | Akaike info criterion | -2.559544 |
| Sum squared resid | 0.133520 | Schwarz criterion | -2.426228 |
| Log likelihood | 47.79201 | Hannan-Quinn criter. | -2.513523 |
| F-statistic | 14.31041 | Durbin-Watson stat | 1.962654 |
| Prob(F-statistic) | 0.000036 | | |

## NOR AREV PLI

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant
Bandwidth: 14 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.819925 | 0.0655 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003652 |
| HAC corrected variance (Bartlett kernel) | 0.002061 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 22:09
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.031935 | 0.014336 | -2.227611 | 0.0326 |
| C | 0.932281 | 0.389346 | 2.394482 | 0.0223 |

| | | | |
|---|---|---|---|
| R-squared | 0.127360 | Mean dependent var | 0.065278 |
| Adjusted R-squared | 0.101695 | S.D. dependent var | 0.065611 |
| S.E. of regression | 0.062185 | Akaike info criterion | -2.663450 |
| Sum squared resid | 0.131477 | Schwarz criterion | -2.575477 |
| Log likelihood | 49.94211 | Hannan-Quinn criter. | -2.632745 |
| F-statistic | 4.962251 | Durbin-Watson stat | 1.865051 |
| Prob(F-statistic) | 0.032630 | | |

## NOR AREV PLT

Null Hypothesis: LOG(AREV) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.399773 | 0.8440 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.003513 |
| HAC corrected variance (Bartlett kernel) | 0.003512 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(AREV))
Method: Least Squares
Date: 02/25/18 Time: 22:11
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | -0.168668 | 0.120455 | -1.400260 | 0.1708 |
| C | 4.467096 | 3.116264 | 1.433478 | 0.1611 |
| @TREND("1980") | 0.009583 | 0.008383 | 1.143189 | 0.2612 |

| | | | |
|---|---|---|---|
| R-squared | 0.160603 | Mean dependent var | 0.066278 |
| Adjusted R-squared | 0.109730 | S.D. dependent var | 0.065611 |
| S.E. of regression | 0.061906 | Akaike info criterion | -2.646733 |
| Sum squared resid | 0.126469 | Schwarz criterion | -2.514773 |
| Log likelihood | 50.64120 | Hannan-Quinn criter. | -2.600676 |
| F-statistic | 3.156960 | Durbin-Watson stat | 1.701399 |
| Prob(F-statistic) | 0.055650 | | |

## Variable 3: Norway Phillips-Perron (PP) Tests

## NOR EXCR PFI

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.966922 | 0.0042 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.356341 |
| HAC corrected variance (Bartlett kernel) | 0.263510 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 22:59
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.664440 | 0.161098 | -4.124442 | 0.0002 |
| C | 0.046054 | 0.104905 | 0.439005 | 0.6635 |

| | | | |
|---|---|---|---|
| R-squared | 0.340145 | Mean dependent var | -0.013270 |
| Adjusted R-squared | 0.320150 | S.D. dependent var | 0.745596 |
| S.E. of regression | 0.614767 | Akaike info criterion | 1.920297 |
| Sum squared resid | 12.47195 | Schwarz criterion | 2.009174 |
| Log likelihood | -31.60519 | Hannan-Quinn criter. | 1.950977 |
| F-statistic | 17.01102 | Durbin-Watson stat | 1.936289 |
| Prob(F-statistic) | 0.000236 | | |

## NOR EXCR PFT

Null Hypothesis: D(EXCR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.869218 | 0.0243 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.355584 |
| HAC corrected variance (Bartlett kernel) | 0.256893 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR,2)
Method: Least Squares
Date: 02/25/18 Time: 23:00
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(EXCR(-1)) | -0.662390 | 0.163611 | -4.048577 | 0.0003 |
| C | -0.005970 | 0.225881 | -0.026430 | 0.9791 |
| @TREND("1980") | 0.002728 | 0.010450 | 0.261109 | 0.7957 |

| | | | |
|---|---|---|---|
| R-squared | 0.341548 | Mean dependent var | -0.013270 |
| Adjusted R-squared | 0.300395 | S.D. dependent var | 0.745596 |
| S.E. of regression | 0.623634 | Akaike info criterion | 1.975311 |
| Sum squared resid | 12.44543 | Schwarz criterion | 2.108627 |
| Log likelihood | -31.56795 | Hannan-Quinn criter. | 2.021332 |
| F-statistic | 8.299430 | Durbin-Watson stat | 1.944259 |
| Prob(F-statistic) | 0.001248 | | |

## NOR EXCR PLI

Null Hypothesis: EXCR has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.576843 | 0.1070 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.351435 |
| HAC corrected variance (Bartlett kernel) | 0.489474 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 22:27
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | -0.247864 | 0.107723 | -2.300932 | 0.0277 |
| C | 1.783016 | 0.740146 | 2.409005 | 0.0216 |

| | | | |
|---|---|---|---|
| R-squared | 0.134734 | Mean dependent var | 0.096133 |
| Adjusted R-squared | 0.109285 | S.D. dependent var | 0.646346 |
| S.E. of regression | 0.610006 | Akaike info criterion | 1.903257 |
| Sum squared resid | 12.65165 | Schwarz criterion | 1.991230 |
| Log likelihood | -32.25863 | Hannan-Quinn criter. | 1.933962 |
| F-statistic | 5.294289 | Durbin-Watson stat | 1.185760 |
| Prob(F-statistic) | 0.027654 | | |

## NOR EXCR PLT

Null Hypothesis: EXCR has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.583135 | 0.2897 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.349420 |
| HAC corrected variance (Bartlett kernel) | 0.485420 |

Phillips-Perron Test Equation
Dependent Variable: D(EXCR)
Method: Least Squares
Date: 02/25/18 Time: 22:55
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| EXCR(-1) | -0.253361 | 0.109755 | -2.308413 | 0.0274 |
| C | 1.900885 | 0.796373 | 2.386927 | 0.0229 |
| @TREND("1980") | -0.004349 | 0.009971 | -0.436167 | 0.6656 |

| | | | |
|---|---|---|---|
| R-squared | 0.139694 | Mean dependent var | 0.096133 |
| Adjusted R-squared | 0.087554 | S.D. dependent var | 0.646346 |
| S.E. of regression | 0.617403 | Akaike info criterion | 1.953064 |
| Sum squared resid | 12.57914 | Schwarz criterion | 2.085024 |
| Log likelihood | -32.15516 | Hannan-Quinn criter. | 1.999122 |
| F-statistic | 2.679220 | Durbin-Watson stat | 1.187633 |
| Prob(F-statistic) | 0.083517 | | |

## Variable 4: Norway Phillips-Perron (PP) Tests

## NOR EXTR PFI

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -6.637566 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.025978 |
| HAC corrected variance (Bartlett kernel) | 0.025174 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 23:16
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -1.139336 | 0.171989 | -6.624485 | 0.0000 |
| C | 0.071274 | 0.029967 | 2.378415 | 0.0233 |

| | | | |
|---|---|---|---|
| R-squared | 0.570781 | Mean dependent var | 0.001544 |
| Adjusted R-squared | 0.557774 | S.D. dependent var | 0.249610 |
| S.E. of regression | 0.165991 | Akaike info criterion | -0.698324 |
| Sum squared resid | 0.909247 | Schwarz criterion | -0.609447 |
| Log likelihood | 14.22067 | Hannan-Quinn criter. | -0.667644 |
| F-statistic | 43.88380 | Durbin-Watson stat | 2.059664 |
| Prob(F-statistic) | 0.000000 | | |

## *NOR EXTR PFT*

Null Hypothesis: D(LOG(EXTR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -6.695508 | 0.0000 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.025294 |
| HAC corrected variance (Bartlett kernel) | 0.024205 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR),2)
Method: Least Squares
Date: 02/25/18 Time: 23:17
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(EXTR(-1))) | -1.158617 | 0.173580 | -6.674834 | 0.0000 |
| C | 0.122029 | 0.062260 | 1.959975 | 0.0588 |
| @TREND("1980") | -0.002609 | 0.002804 | -0.930587 | 0.3590 |

| | | | |
|---|---|---|---|
| R-squared | 0.582090 | Mean dependent var | 0.001544 |
| Adjusted R-squared | 0.555971 | S.D. dependent var | 0.249610 |
| S.E. of regression | 0.166329 | Akaike info criterion | -0.667884 |
| Sum squared resid | 0.885289 | Schwarz criterion | -0.534568 |
| Log likelihood | 14.68797 | Hannan-Quinn criter. | -0.621863 |
| F-statistic | 22.28579 | Durbin-Watson stat | 2.085688 |
| Prob(F-statistic) | 0.000001 | | |

## *NOR EXTR PLI*

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.325795 | 0.6069 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.024605 |
| HAC corrected variance (Bartlett kernel) | 0.024605 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 23:13
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.051096 | 0.038540 | -1.325795 | 0.1937 |
| C | 1.281817 | 0.921279 | 1.391345 | 0.1732 |

| | | | |
|---|---|---|---|
| R-squared | 0.049157 | Mean dependent var | 0.060911 |
| Adjusted R-squared | 0.021191 | S.D. dependent var | 0.163146 |
| S.E. of regression | 0.161408 | Akaike info criterion | -0.755814 |
| Sum squared resid | 0.885783 | Schwarz criterion | -0.667841 |
| Log likelihood | 15.60466 | Hannan-Quinn criter. | -0.725109 |
| F-statistic | 1.757733 | Durbin-Watson stat | 2.272699 |
| Prob(F-statistic) | 0.193747 | | |

## NOR EXTR PLT

Null Hypothesis: LOG(EXTR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.793293 | 0.2088 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.020532 |
| HAC corrected variance (Bartlett kernel) | 0.019815 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(EXTR))
Method: Least Squares
Date: 02/25/18 Time: 23:14
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.411949 | 0.145482 | -2.831610 | 0.0078 |
| C | 9.441468 | 3.301309 | 2.859916 | 0.0073 |
| @TREND("1980") | 0.025013 | 0.009775 | 2.558784 | 0.0153 |

| | | | |
|---|---|---|---|
| R-squared | 0.206576 | Mean dependent var | 0.060911 |
| Adjusted R-squared | 0.158490 | S.D. dependent var | 0.163146 |
| S.E. of regression | 0.149660 | Akaike info criterion | -0.881250 |
| Sum squared resid | 0.739135 | Schwarz criterion | -0.749291 |
| Log likelihood | 18.86251 | Hannan-Quinn criter. | -0.835193 |
| F-statistic | 4.295948 | Durbin-Watson stat | 1.897064 |
| Prob(F-statistic) | 0.021970 | | |

## Variable 5: Norway Phillips-Perron (PP) Tests

## NOR GDP PFI

NOR GDP PFI
Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.014852 | 0.0432 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.000192 |
| HAC corrected variance (Bartlett kernel) | 0.000213 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 23:43
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.413549 | 0.142198 | -2.908253 | 0.0065 |
| C | 0.009919 | 0.004219 | 2.351373 | 0.0248 |

| | | | |
|---|---|---|---|
| R-squared | 0.204012 | Mean dependent var | -0.000147 |
| Adjusted R-squared | 0.179892 | S.D. dependent var | 0.015755 |
| S.E. of regression | 0.014268 | Akaike info criterion | -5.606190 |
| Sum squared resid | 0.006718 | Schwarz criterion | -5.517313 |
| Log likelihood | 100.1083 | Hannan-Quinn criter. | -5.575509 |
| F-statistic | 8.457935 | Durbin-Watson stat | 1.722910 |
| Prob(F-statistic) | 0.006455 | | |

## *NOR GDP PFT*

NOR GDP PFT
Null Hypothesis: D(LOG(GDP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.195211 | 0.1019 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.000178 |
| HAC corrected variance (Bartlett kernel) | 0.000147 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP),2)
Method: Least Squares
Date: 02/25/18 Time: 23:44
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(GDP(-1))) | -0.494275 | 0.148133 | -3.336701 | 0.0022 |
| C | 0.019362 | 0.007256 | 2.668534 | 0.0119 |
| @TREND("1980") | -0.000394 | 0.000249 | -1.582043 | 0.1235 |

| | | | |
|---|---|---|---|
| R-squared | 0.261754 | Mean dependent var | -0.000147 |
| Adjusted R-squared | 0.215614 | S.D. dependent var | 0.015755 |
| S.E. of regression | 0.013954 | Akaike info criterion | -5.624353 |
| Sum squared resid | 0.006230 | Schwarz criterion | -5.491037 |
| Log likelihood | 101.4262 | Hannan-Quinn criter. | -5.578332 |
| F-statistic | 5.672989 | Durbin-Watson stat | 1.731171 |
| Prob(F-statistic) | 0.007784 | | |

## *NOR GDP PLI*

NOR GDP PLI
Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.272112 | 0.1861 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.000247 |
| HAC corrected variance (Bartlett kernel) | 0.000247 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 23:41
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.022396 | 0.009857 | -2.272112 | 0.0295 |
| C | 0.617371 | 0.261184 | 2.363736 | 0.0239 |

| | | | |
|---|---|---|---|
| R-squared | 0.131822 | Mean dependent var | 0.023962 |
| Adjusted R-squared | 0.106288 | S.D. dependent var | 0.017111 |
| S.E. of regression | 0.016176 | Akaike info criterion | -5.356585 |
| Sum squared resid | 0.008897 | Schwarz criterion | -5.268611 |
| Log likelihood | 98.41852 | Hannan-Quinn criter. | -5.325880 |
| F-statistic | 5.162491 | Durbin-Watson stat | 0.928822 |
| Prob(F-statistic) | 0.029523 | | |

## NOR GDP PLT

NOR GDP PLT
Null Hypothesis: LOG(GDP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -0.520567 | 0.9778 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.000247 |
| HAC corrected variance (Bartlett kernel) | 0.000372 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(GDP))
Method: Least Squares
Date: 02/25/18 Time: 23:42
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.006958 | 0.059799 | -0.116354 | 0.9081 |
| C | 0.215949 | 1.555764 | 0.138806 | 0.8904 |
| @TREND("1980") | -0.000412 | 0.001575 | -0.261844 | 0.7951 |

| | | | |
|---|---|---|---|
| R-squared | 0.133622 | Mean dependent var | 0.023962 |
| Adjusted R-squared | 0.081115 | S.D. dependent var | 0.017111 |
| S.E. of regression | 0.016403 | Akaike info criterion | -5.303104 |
| Sum squared resid | 0.008878 | Schwarz criterion | -5.171145 |
| Log likelihood | 98.45588 | Hannan-Quinn criter. | -5.257047 |
| F-statistic | 2.544813 | Durbin-Watson stat | 0.944836 |
| Prob(F-statistic) | 0.093793 | | |

## Variable 6: Norway Phillips-Perron (PP) Tests

## NOR INFR PFI

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -10.96333 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.288549 |
| HAC corrected variance (Bartlett kernel) | 0.250488 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/26/18 Time: 01:31
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -1.549709 | 0.146973 | -10.54415 | 0.0000 |
| C | -0.063771 | 0.093754 | -0.680196 | 0.5011 |

| | | | |
|---|---|---|---|
| R-squared | 0.771118 | Mean dependent var | 0.007605 |
| Adjusted R-squared | 0.764182 | S.D. dependent var | 1.139196 |
| S.E. of regression | 0.553206 | Akaike info criterion | 1.709272 |
| Sum squared resid | 10.09921 | Schwarz criterion | 1.798149 |
| Log likelihood | -27.91225 | Hannan-Quinn criter. | 1.739952 |
| F-statistic | 111.1790 | Durbin-Watson stat | 2.228956 |
| Prob(F-statistic) | 0.000000 | | |

## *NOR INFR PFT*

Null Hypothesis: D(LOG(INFR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -11.92048 | 0.0000 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.273146 |
| HAC corrected variance (Bartlett kernel) | 0.193696 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR),2)
Method: Least Squares
Date: 02/26/18 Time: 01:45
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(INFR(-1))) | -1.566405 | 0.145745 | -10.74758 | 0.0000 |
| C | -0.298878 | 0.198020 | -1.509331 | 0.1410 |
| @TREND("1980") | 0.012334 | 0.009181 | 1.343328 | 0.1886 |

| | | | |
|---|---|---|---|
| R-squared | 0.783336 | Mean dependent var | 0.007605 |
| Adjusted R-squared | 0.769794 | S.D. dependent var | 1.139196 |
| S.E. of regression | 0.546583 | Akaike info criterion | 1.711556 |
| Sum squared resid | 9.560098 | Schwarz criterion | 1.844871 |
| Log likelihood | -26.95222 | Hannan-Quinn criter. | 1.757576 |
| F-statistic | 57.84704 | Durbin-Watson stat | 2.329008 |
| Prob(F-statistic) | 0.000000 | | |

## *NOR INFR PLI*

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.790281 | 0.0697 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.319286 |
| HAC corrected variance (Bartlett kernel) | 0.239106 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/26/18 Time: 01:20
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.363982 | 0.123149 | -2.955620 | 0.0056 |
| C | 0.350913 | 0.161557 | 2.172064 | 0.0369 |

| | | | |
|---|---|---|---|
| R-squared | 0.204412 | Mean dependent var | -0.031152 |
| Adjusted R-squared | 0.181012 | S.D. dependent var | 0.642485 |
| S.E. of regression | 0.581435 | Akaike info criterion | 1.807319 |
| Sum squared resid | 11.49428 | Schwarz criterion | 1.895292 |
| Log likelihood | -30.53174 | Hannan-Quinn criter. | 1.838024 |
| F-statistic | 8.735690 | Durbin-Watson stat | 2.611826 |
| Prob(F-statistic) | 0.005635 | | |

## NOR INFR PLT

Null Hypothesis: LOG(INFR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -3.911328 | 0.0218 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.274705 |
| HAC corrected variance (Bartlett kernel) | 0.299777 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(INFR))
Method: Least Squares
Date: 02/26/18 Time: 01:30
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(INFR(-1)) | -0.670416 | 0.176005 | -3.809085 | 0.0006 |
| C | 1.243350 | 0.414553 | 2.999253 | 0.0051 |
| @TREND("1980") | -0.030853 | 0.013332 | -2.314178 | 0.0270 |

| | | | |
|---|---|---|---|
| R-squared | 0.315497 | Mean dependent var | -0.031152 |
| Adjusted R-squared | 0.274012 | S.D. dependent var | 0.642485 |
| S.E. of regression | 0.547429 | Akaike info criterion | 1.712486 |
| Sum squared resid | 9.889377 | Schwarz criterion | 1.844446 |
| Log likelihood | -27.82475 | Hannan-Quinn criter. | 1.758543 |
| F-statistic | 7.605079 | Durbin-Watson stat | 2.129049 |
| Prob(F-statistic) | 0.001922 | | |

## Variable 7: Norway Phillips-Perron (PP) Tests

## NOR OILP PFI

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.626349 | 0.0000 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.070136 |
| HAC corrected variance (Bartlett kernel) | 0.069935 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/26/18 Time: 02:30
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.977540 | 0.173731 | -5.626742 | 0.0000 |
| C | 0.007905 | 0.046112 | 0.171436 | 0.8649 |

| | | | |
|---|---|---|---|
| R-squared | 0.489640 | Mean dependent var | 0.002456 |
| Adjusted R-squared | 0.474174 | S.D. dependent var | 0.376121 |
| S.E. of regression | 0.272739 | Akaike info criterion | 0.294845 |
| Sum squared resid | 2.454764 | Schwarz criterion | 0.383722 |
| Log likelihood | -3.159793 | Hannan-Quinn criter. | 0.325526 |
| F-statistic | 31.66023 | Durbin-Watson stat | 2.000300 |
| Prob(F-statistic) | 0.000003 | | |

## NOR OILP PFT

Null Hypothesis: D(LOG(OILP)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -5.552882 | 0.0003 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.069972 |
| HAC corrected variance (Bartlett kernel) | 0.069880 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP),2)
Method: Least Squares
Date: 02/26/18 Time: 02:32
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(OILP(-1))) | -0.980850 | 0.176631 | -5.553115 | 0.0000 |
| C | -0.016259 | 0.099754 | -0.162994 | 0.8715 |
| @TREND("1980") | 0.001273 | 0.004641 | 0.274255 | 0.7857 |

| | | | |
|---|---|---|---|
| R-squared | 0.490837 | Mean dependent var | 0.002456 |
| Adjusted R-squared | 0.459014 | S.D. dependent var | 0.376121 |
| S.E. of regression | 0.276643 | Akaike info criterion | 0.349640 |
| Sum squared resid | 2.449008 | Schwarz criterion | 0.482956 |
| Log likelihood | -3.118707 | Hannan-Quinn criter. | 0.395661 |
| F-statistic | 15.42410 | Durbin-Watson stat | 1.998723 |
| Prob(F-statistic) | 0.000020 | | |

## NOR OILP PLI

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant
Bandwidth: 2 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -1.179024 | 0.6728 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.065923 |
| HAC corrected variance (Bartlett kernel) | 0.069870 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/26/18 Time: 02:28
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.076249 | 0.066650 | -1.144009 | 0.2606 |
| C | 0.272372 | 0.237466 | 1.146990 | 0.2594 |

| | | | |
|---|---|---|---|
| R-squared | 0.037066 | Mean dependent var | 0.005419 |
| Adjusted R-squared | 0.008744 | S.D. dependent var | 0.265362 |
| S.E. of regression | 0.264199 | Akaike info criterion | 0.229728 |
| Sum squared resid | 2.373246 | Schwarz criterion | 0.317701 |
| Log likelihood | -2.135099 | Hannan-Quinn criter. | 0.260433 |
| F-statistic | 1.308757 | Durbin-Watson stat | 1.878056 |
| Prob(F-statistic) | 0.260610 | | |

### NOR OILP PLT

Null Hypothesis: LOG(OILP) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.120223 | 0.5176 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.060286 |
| HAC corrected variance (Bartlett kernel) | 0.064907 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(OILP))
Method: Least Squares
Date: 02/26/18 Time: 02:29
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(OILP(-1)) | -0.191440 | 0.092114 | -2.078296 | 0.0455 |
| C | 0.485277 | 0.260419 | 1.863449 | 0.0713 |
| @TREND("1980") | 0.010291 | 0.005858 | 1.756751 | 0.0882 |

| | | | |
|---|---|---|---|
| R-squared | 0.119418 | Mean dependent var | 0.005419 |
| Adjusted R-squared | 0.066050 | S.D. dependent var | 0.265362 |
| S.E. of regression | 0.256449 | Akaike info criterion | 0.195881 |
| Sum squared resid | 2.170280 | Schwarz criterion | 0.327841 |
| Log likelihood | -0.525859 | Hannan-Quinn criter. | 0.241939 |
| F-statistic | 2.237617 | Durbin-Watson stat | 1.833567 |
| Prob(F-statistic) | 0.122659 | | |

## Variable 8: Norway Phillips-Perron (PP) Tests

### NOR UEMR PFI

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.683235 | 0.0006 |
| Test critical values: | 1% level | -3.632900 | |
| | 5% level | -2.948404 | |
| | 10% level | -2.612874 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.036348 |
| HAC corrected variance (Bartlett kernel) | 0.024045 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/26/18 Time: 02:47
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.796375 | 0.166974 | -4.769439 | 0.0000 |
| C | 0.021974 | 0.033675 | 0.652523 | 0.5186 |

| | | | |
|---|---|---|---|
| R-squared | 0.408046 | Mean dependent var | -0.005245 |
| Adjusted R-squared | 0.390108 | S.D. dependent var | 0.251414 |
| S.E. of regression | 0.196343 | Akaike info criterion | -0.362462 |
| Sum squared resid | 1.272169 | Schwarz criterion | -0.273585 |
| Log likelihood | 8.343088 | Hannan-Quinn criter. | -0.331782 |
| F-statistic | 22.74755 | Durbin-Watson stat | 1.920813 |
| Prob(F-statistic) | 0.000036 | | |

## NOR UEMR PFT

Null Hypothesis: D(LOG(UEMR)) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -4.607746 | 0.0040 |
| Test critical values: | 1% level | -4.243644 | |
| | 5% level | -3.544284 | |
| | 10% level | -3.204699 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.036127 |
| HAC corrected variance (Bartlett kernel) | 0.019925 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR),2)
Method: Least Squares
Date: 02/26/18 Time: 02:48
Sample (adjusted): 1982 2016
Included observations: 35 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| D(LOG(UEMR(-1))) | -0.810271 | 0.171948 | -4.712301 | 0.0000 |
| C | 0.050863 | 0.073727 | 0.689881 | 0.4952 |
| @TREND("1980") | -0.001495 | 0.003384 | -0.441927 | 0.6615 |

| | | | |
|---|---|---|---|
| R-squared | 0.411637 | Mean dependent var | -0.005245 |
| Adjusted R-squared | 0.374864 | S.D. dependent var | 0.251414 |
| S.E. of regression | 0.198782 | Akaike info criterion | -0.311404 |
| Sum squared resid | 1.264452 | Schwarz criterion | -0.178088 |
| Log likelihood | 8.449568 | Hannan-Quinn criter. | -0.265383 |
| F-statistic | 11.19408 | Durbin-Watson stat | 1.908645 |
| Prob(F-statistic) | 0.000206 | | |

## NOR UEMR PLI

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.591116 | 0.1041 |
| Test critical values: | 1% level | -3.626784 | |
| | 5% level | -2.945842 | |
| | 10% level | -2.611531 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.032229 |
| HAC corrected variance (Bartlett kernel) | 0.038104 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/26/18 Time: 02:43
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.201160 | 0.078346 | -2.567573 | 0.0148 |
| C | 0.280474 | 0.100225 | 2.798444 | 0.0084 |

| | | | |
|---|---|---|---|
| R-squared | 0.162405 | Mean dependent var | 0.035581 |
| Adjusted R-squared | 0.137770 | S.D. dependent var | 0.198939 |
| S.E. of regression | 0.184728 | Akaike info criterion | -0.485916 |
| Sum squared resid | 1.160226 | Schwarz criterion | -0.397942 |
| Log likelihood | 10.74648 | Hannan-Quinn criter. | -0.455211 |
| F-statistic | 6.592431 | Durbin-Watson stat | 1.518780 |
| Prob(F-statistic) | 0.014810 | | |

### *NOR UEMR PLT*

Null Hypothesis: LOG(UEMR) has a unit root
Exogenous: Constant, Linear Trend
Bandwidth: 4 (Newey-West automatic) using Bartlett kernel

| | | Adj. t-Stat | Prob.* |
|---|---|---|---|
| Phillips-Perron test statistic | | -2.336444 | 0.4048 |
| Test critical values: | 1% level | -4.234972 | |
| | 5% level | -3.540328 | |
| | 10% level | -3.202445 | |

*MacKinnon (1996) one-sided p-values.

| | |
|---|---|
| Residual variance (no correction) | 0.032209 |
| HAC corrected variance (Bartlett kernel) | 0.034098 |

Phillips-Perron Test Equation
Dependent Variable: D(LOG(UEMR))
Method: Least Squares
Date: 02/26/18 Time: 02:45
Sample (adjusted): 1981 2016
Included observations: 36 after adjustments

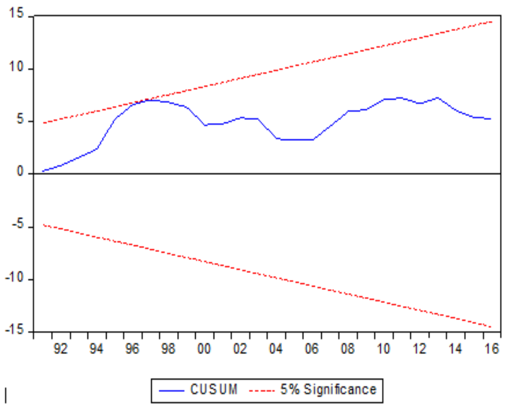
| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(UEMR(-1)) | -0.196927 | 0.084951 | -2.318120 | 0.0268 |
| C | 0.283726 | 0.104270 | 2.721066 | 0.0103 |
| @TREND("1980") | -0.000454 | 0.003214 | -0.141397 | 0.8884 |

| | | | |
|---|---|---|---|
| R-squared | 0.162913 | Mean dependent var | 0.035581 |
| Adjusted R-squared | 0.112180 | S.D. dependent var | 0.198939 |
| S.E. of regression | 0.187449 | Akaike info criterion | -0.430966 |
| Sum squared resid | 1.159524 | Schwarz criterion | -0.299006 |
| Log likelihood | 10.75738 | Hannan-Quinn criter. | -0.384908 |
| F-statistic | 3.211203 | Durbin-Watson stat | 1.525764 |
| Prob(F-statistic) | 0.053176 | | |

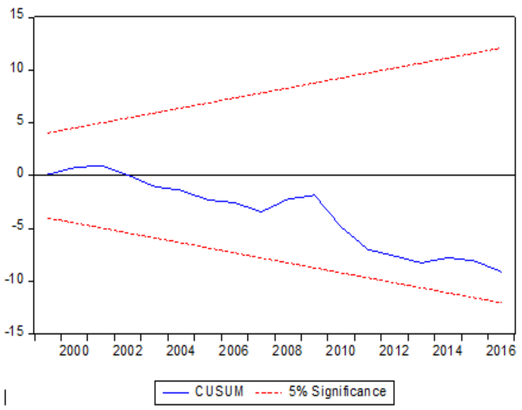
## Appendix B: CUSUM Tests

### *Appendix B1: CUSUM Tests for Nigeria*

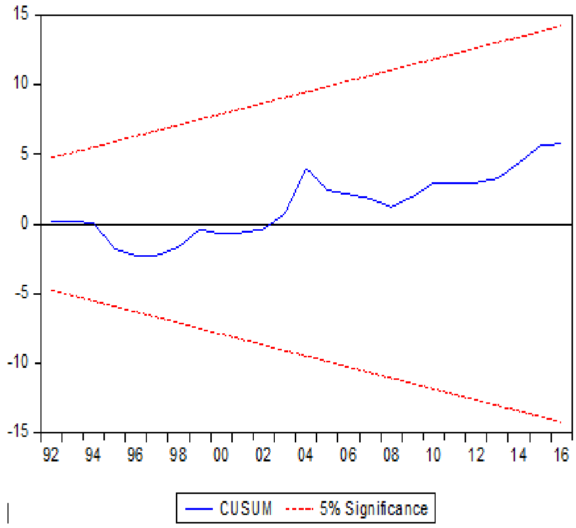
NIG CUSUM EQN 1



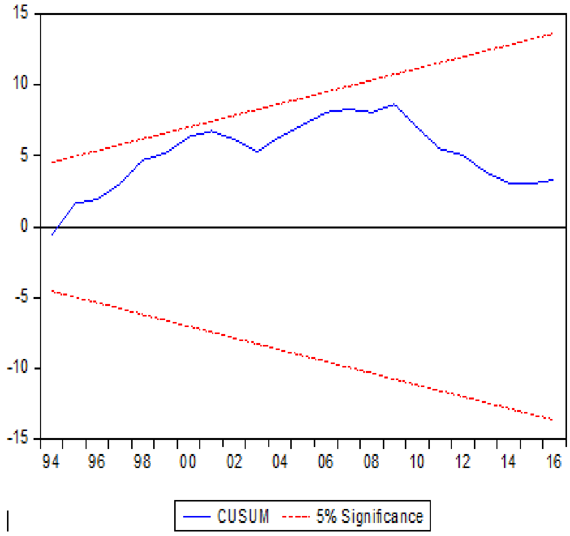

NIG CUSUM EQN 2



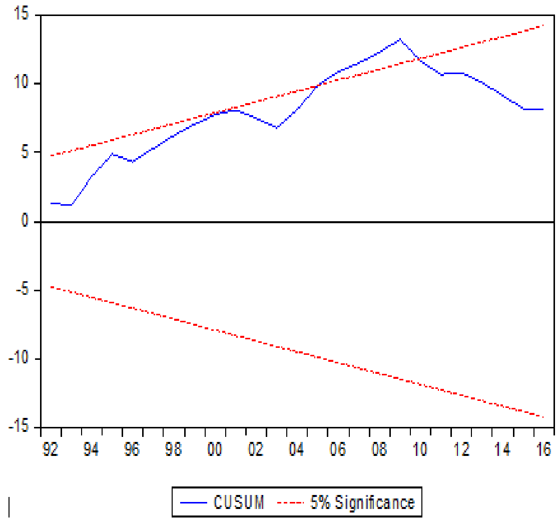
NIG CUSUM EQN 3



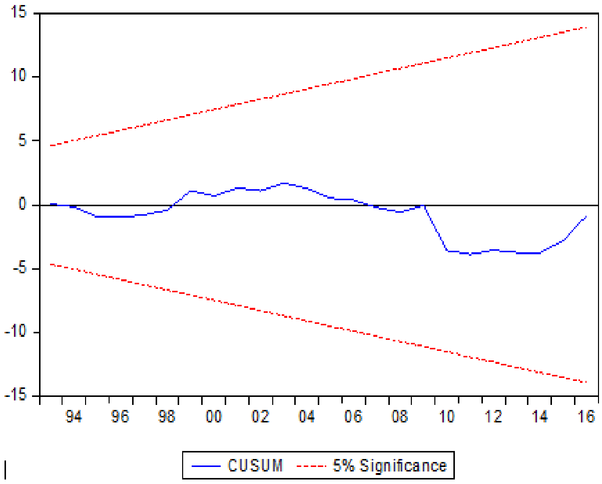

NIG CUSUM EQN 4



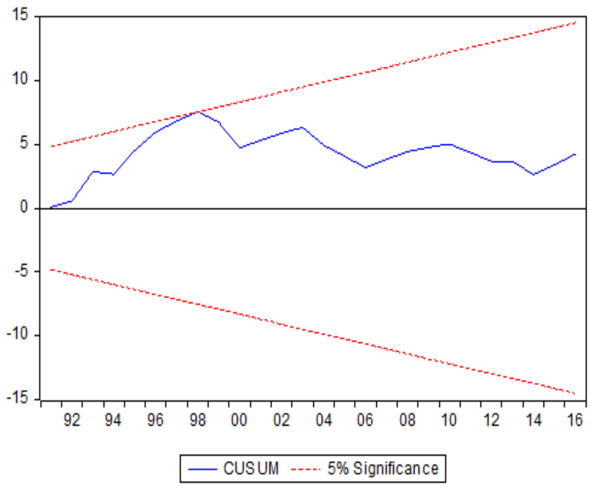

NIG CUSUM EQN 5



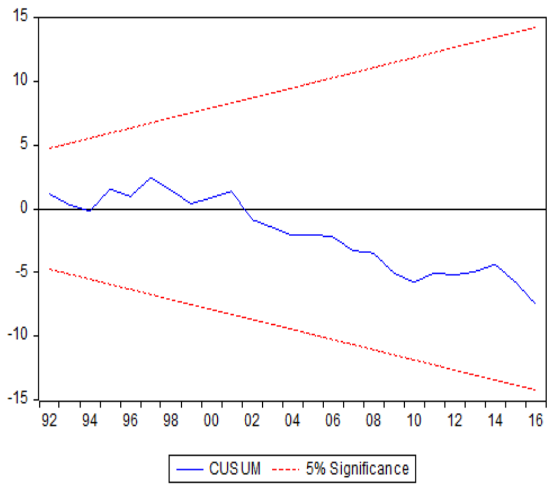

NIG CUSUM EQN 6

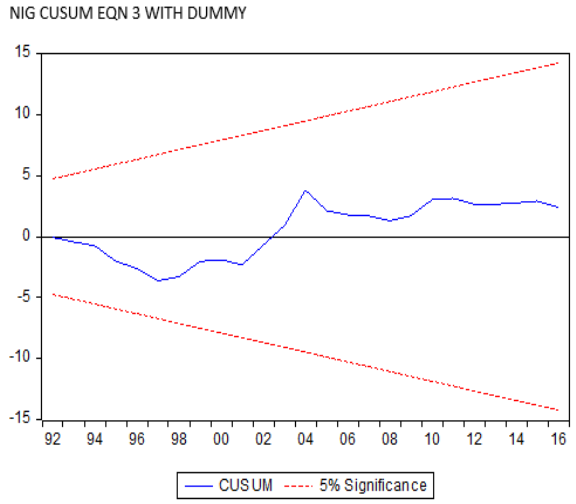


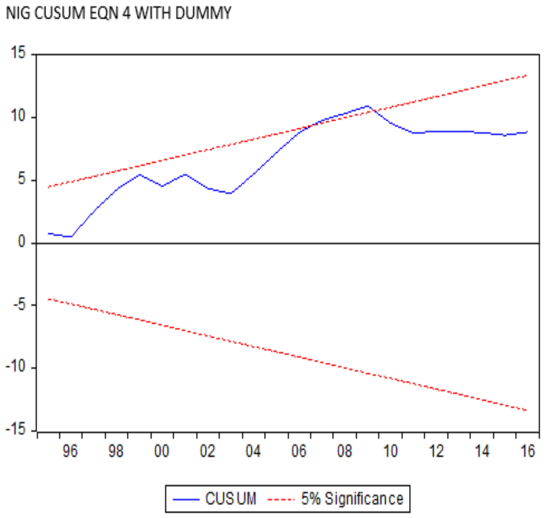

NIG CUSUM EQN 1 WITH DUMMY

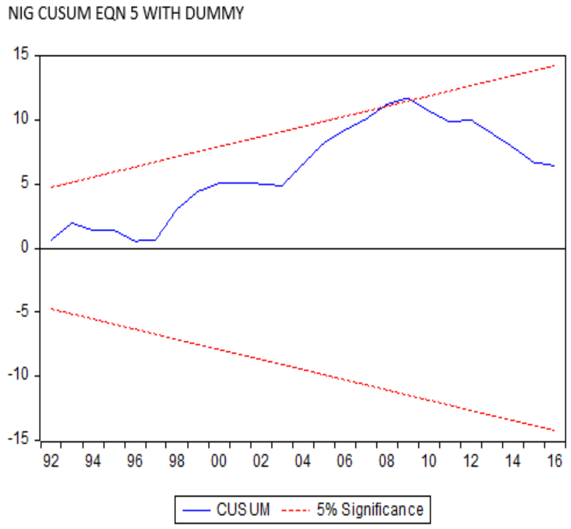


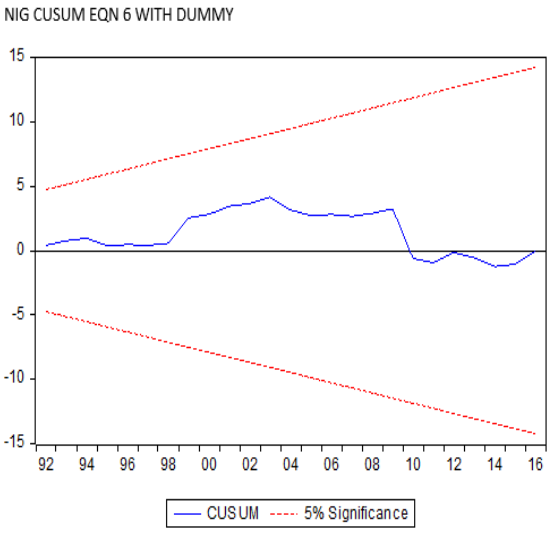

NIG CUSUM EQN 2 WITH DUMMY



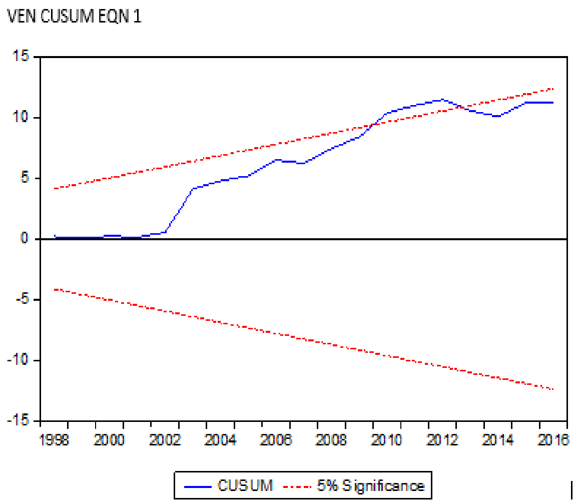


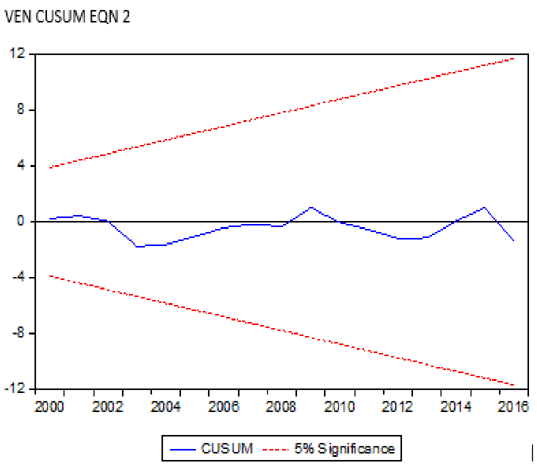



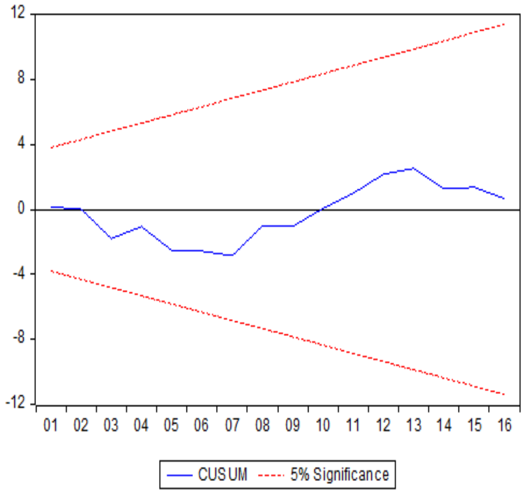




## *Appendix B2: CUSUM Tests for Venezuela*

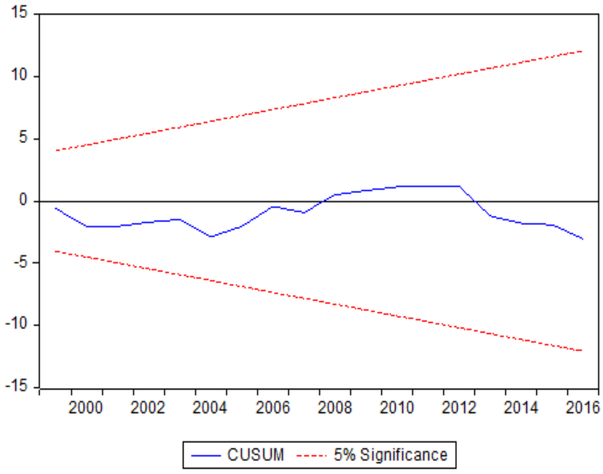


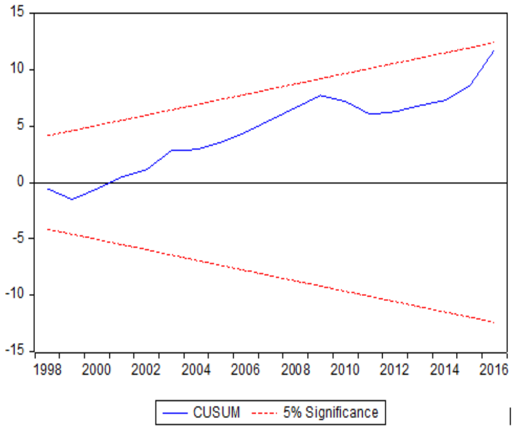
VEN CUSUM EQN 3



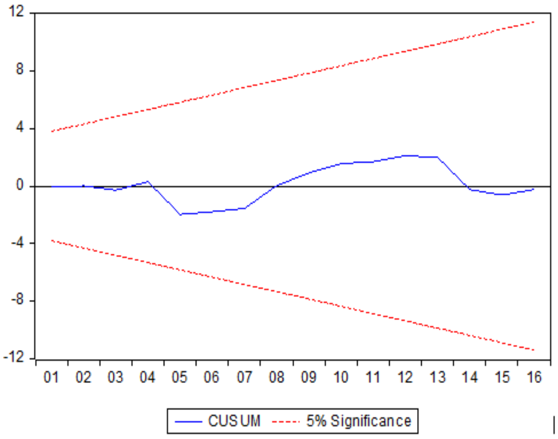

VEN CUSUM EQN 4



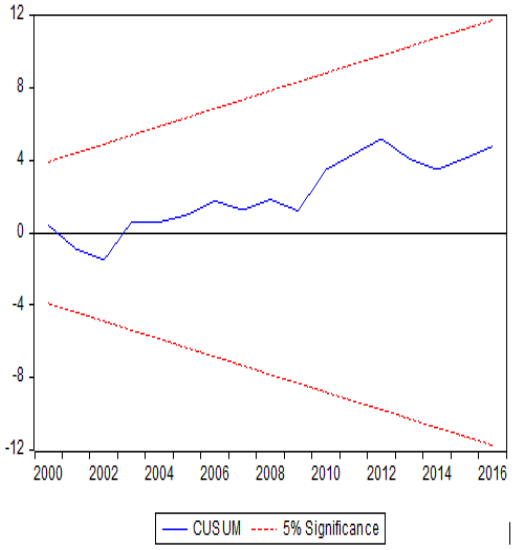

VEN CUSUM EQN 5



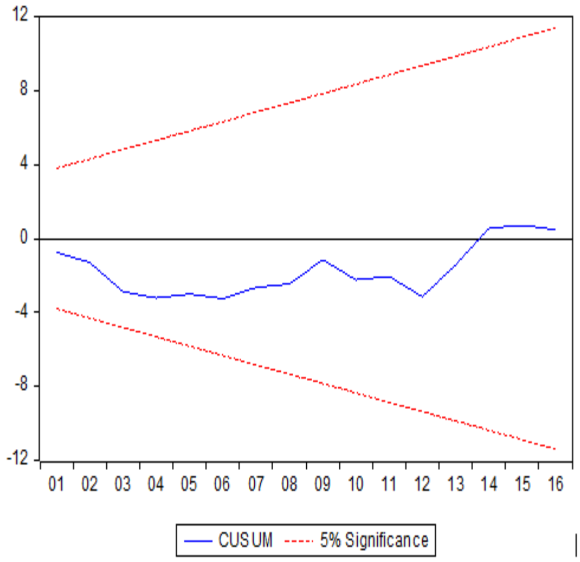

VEN CUSUM EQN 6

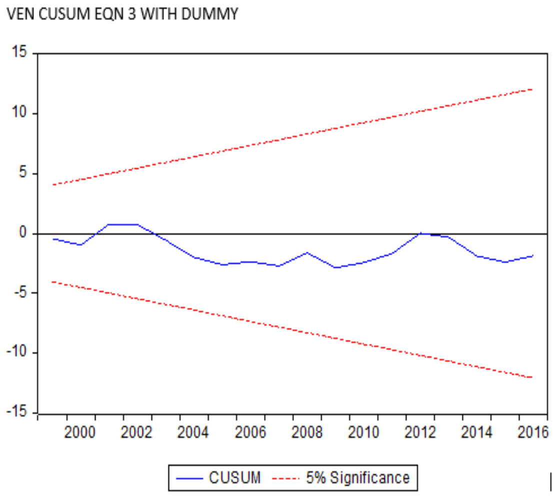


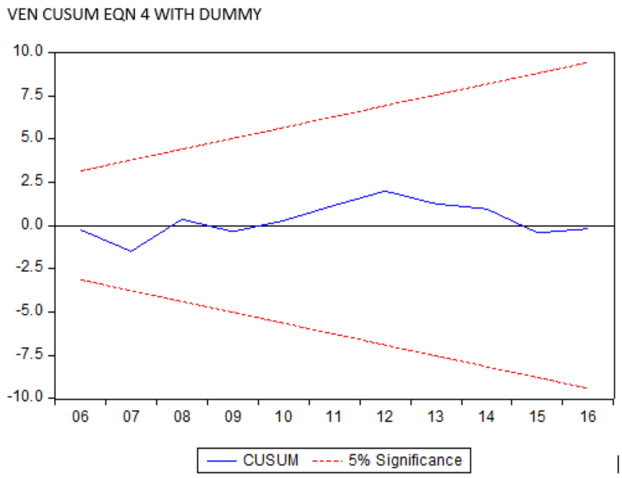

VEN CUSUM EQN 1 WITH DUMMY

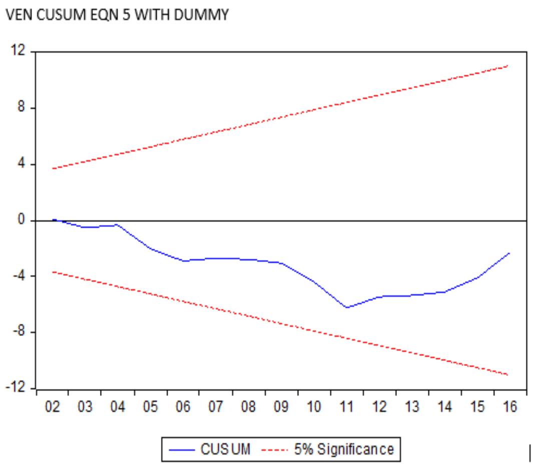


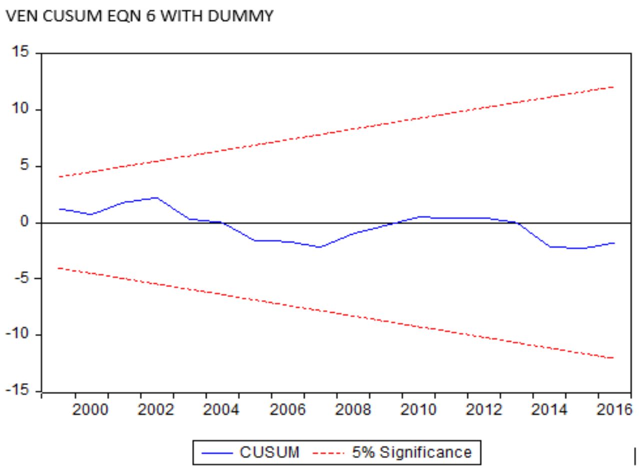

VEN CUSUM EQN 2 WITH DUMMY



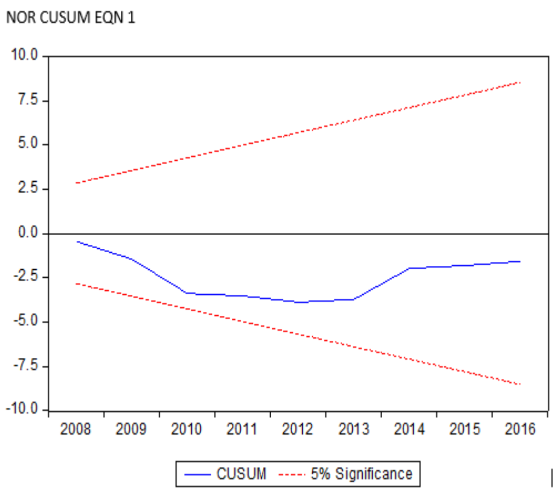


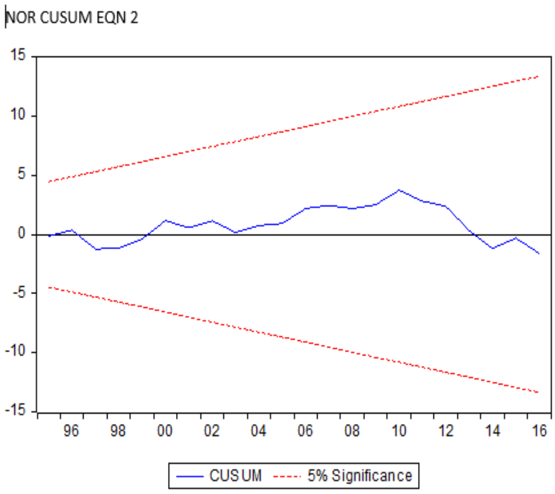



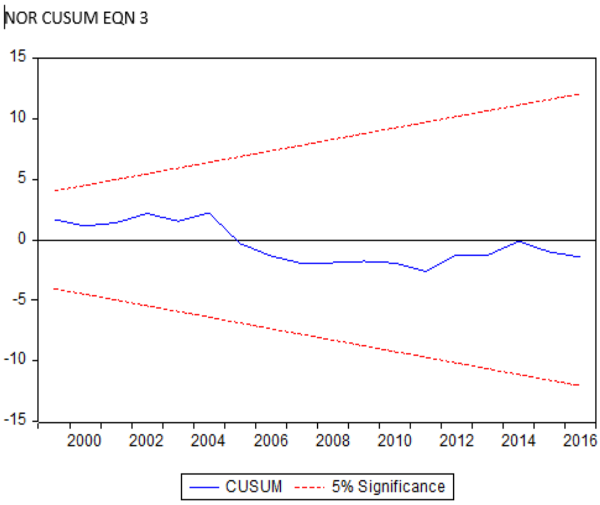



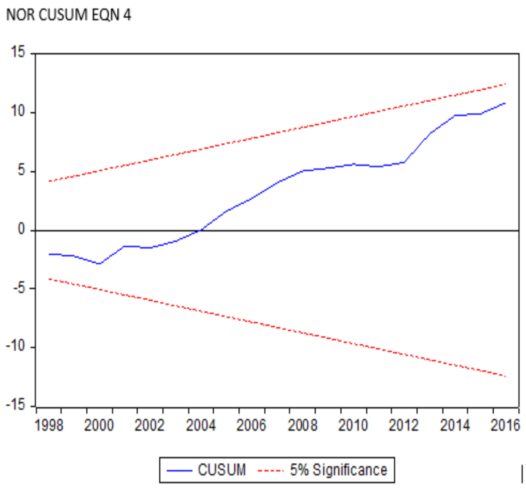



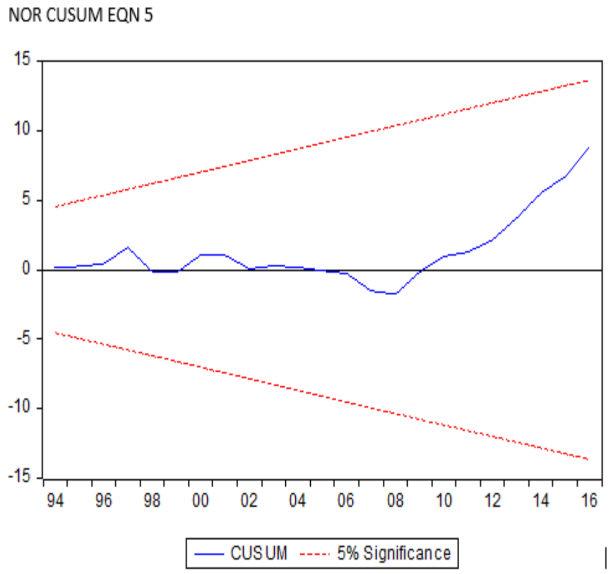

## *Appendix B3: CUSUM Tests for Norway*

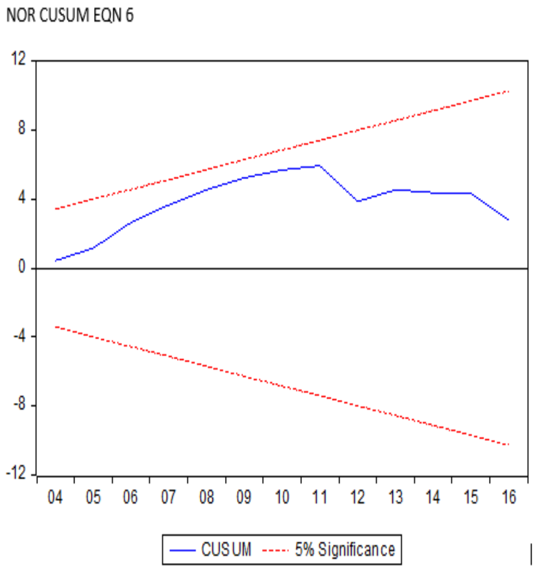




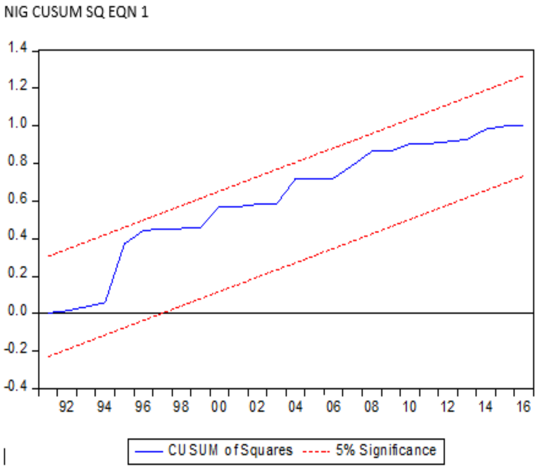



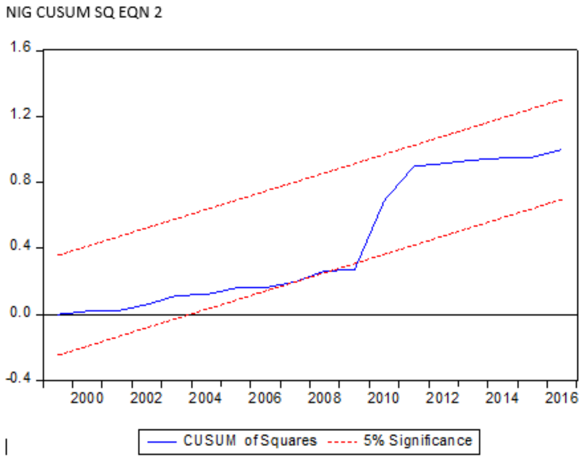



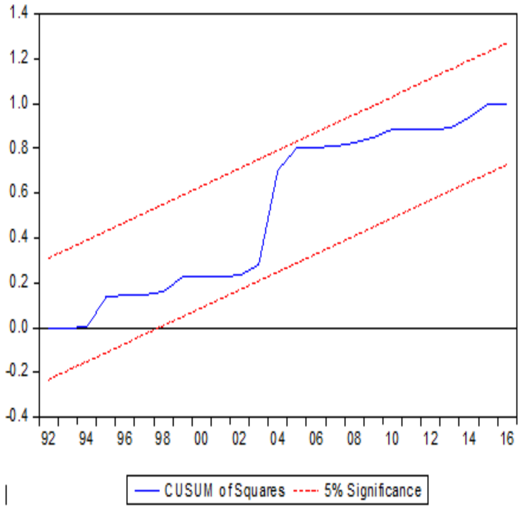

## Appendix C: CUSUM of Squares Tests

### *Appendix C1: CUSUM of Squares Tests for Nigeria*

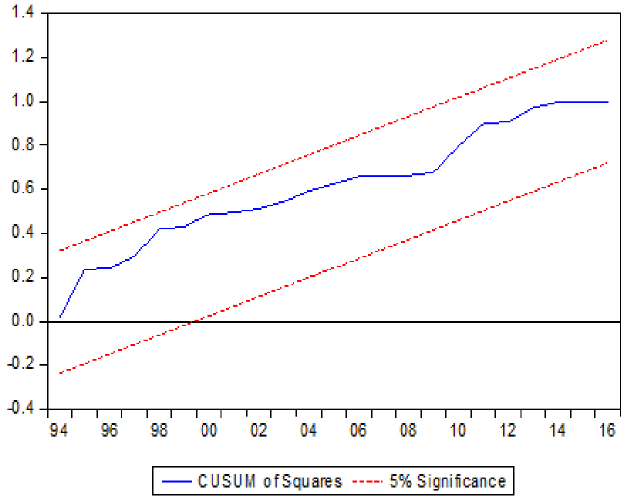


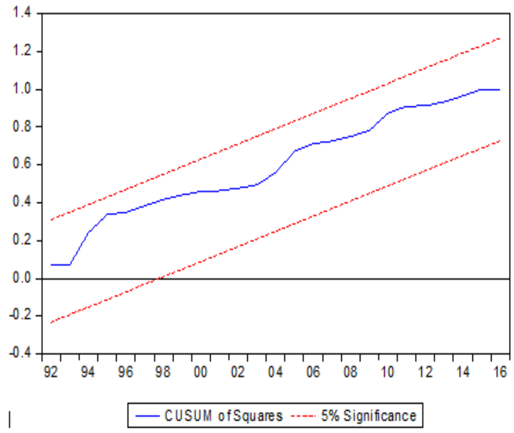
NIG CUSUM SQ EQN 3



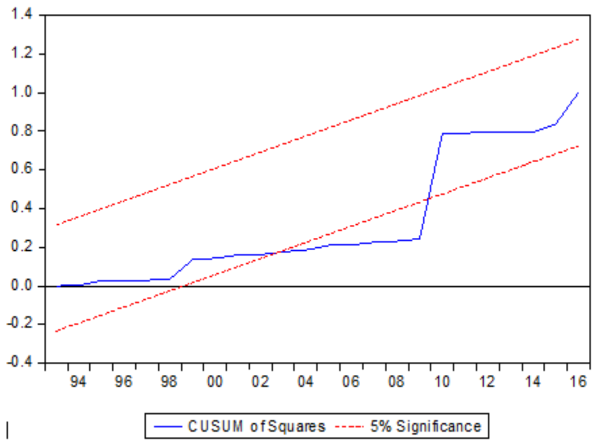

NIG CUSUM SQ EQN 4



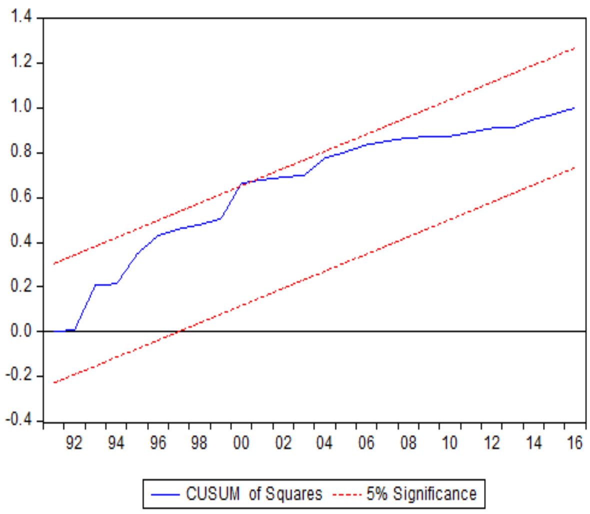

NIIG CUSUM SQ EQN 5



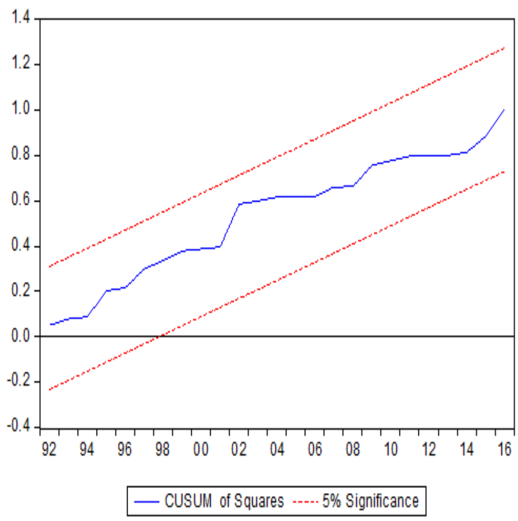

NIG CUSUM SQ EQN 6



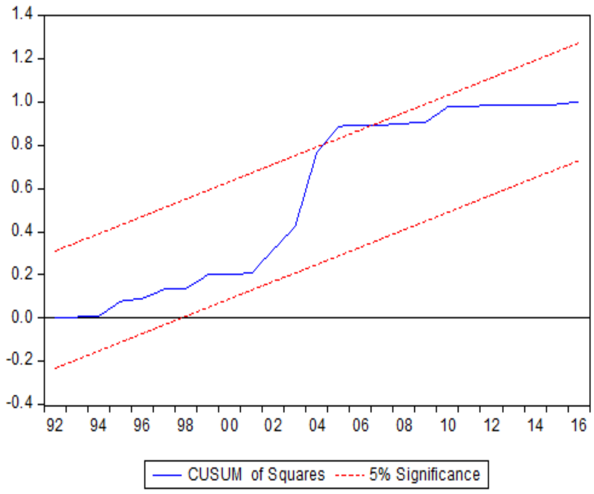

NIG CUSUM SQ EQN 1 WITH DUMMY



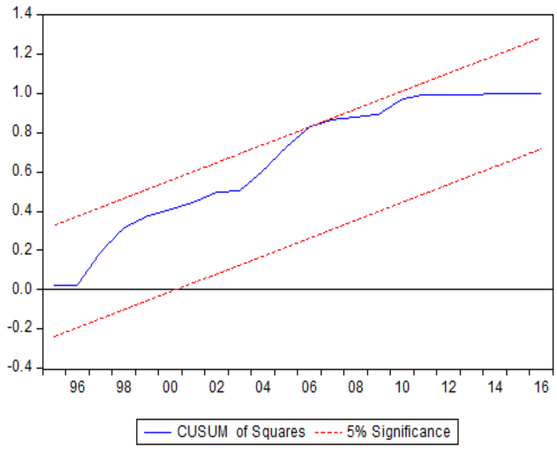

NIG CUSUM SQ EQN 2 WITH DUMMY



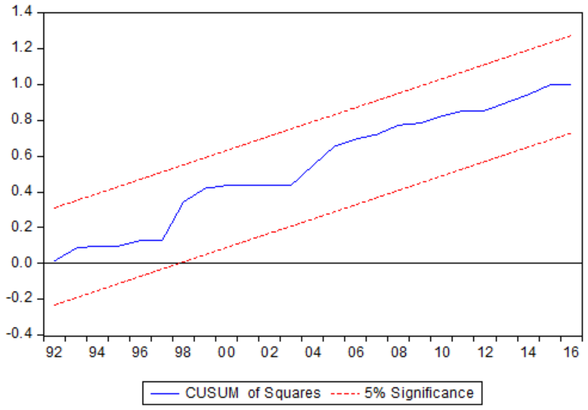
NIG CUSUM SQ EQN 3 WITH DUMMY



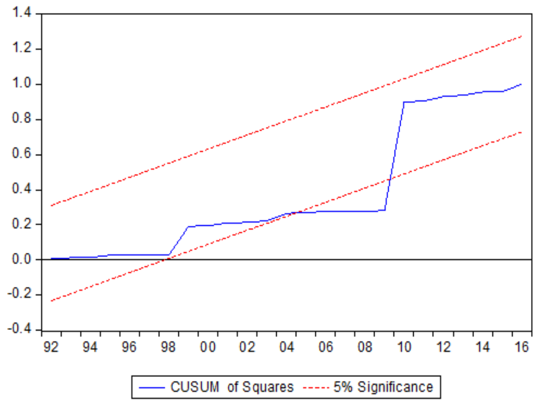

NIG CUSUM SQ EQN 4 WITH DUMMY




NIG CUSUM SQ EQN 5 WITH DUMMY

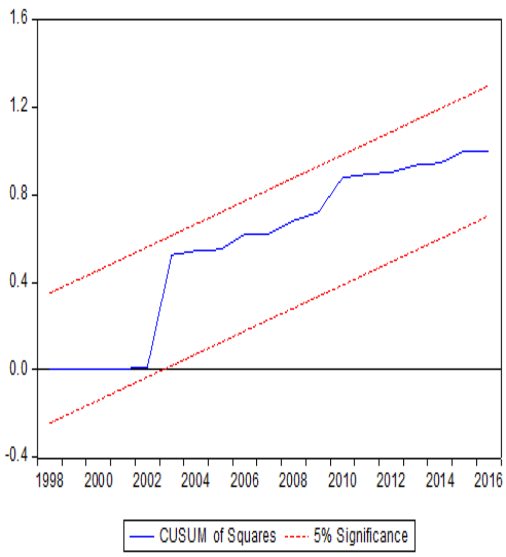



NIG CUSUM SQ EQN 6 WITH DUMMY

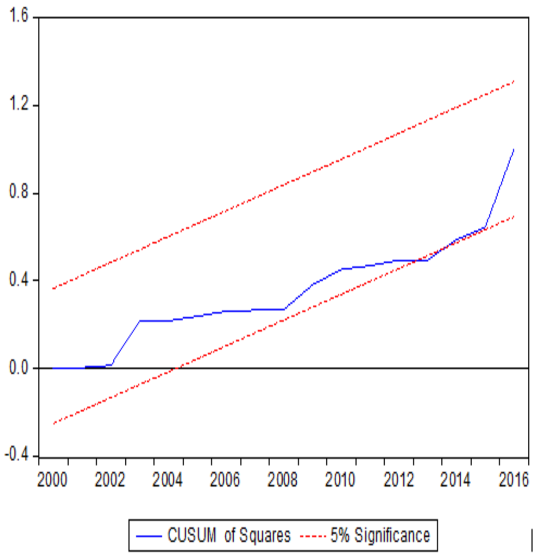



## *Appendix C2: CUSUM of Squares Tests for Venezuela*

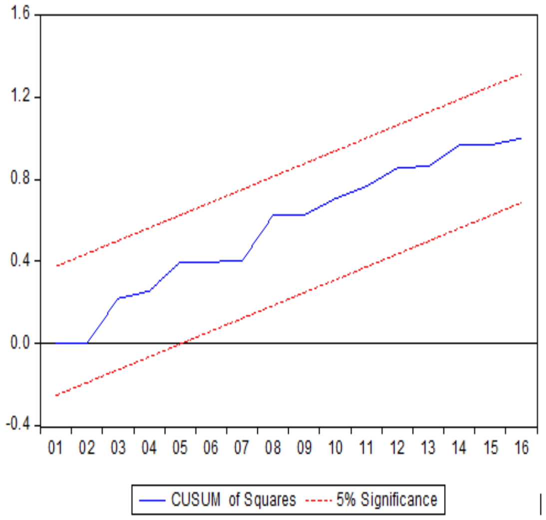
VEN CUSUM SQ EQN 1



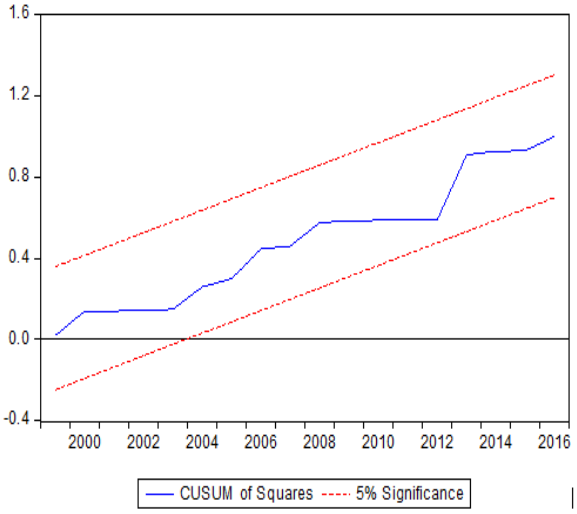

VEN CUSUM SQ EQN 2



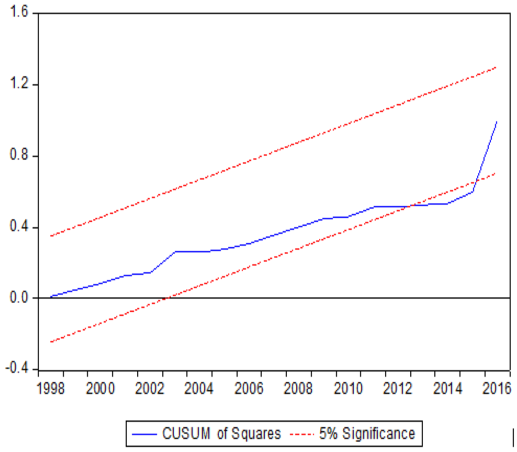
VEN CUSUM SQ EQN 3



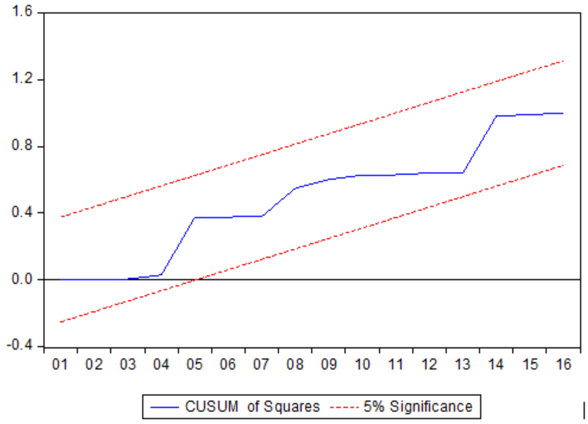

VEN CUSUM SQ EQN 4



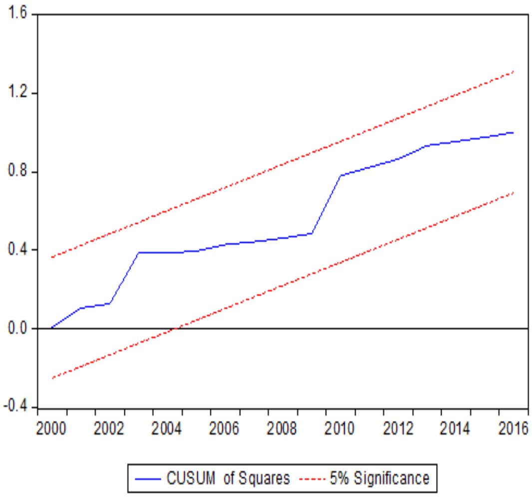

VEN CUSUM SQ EQN 5



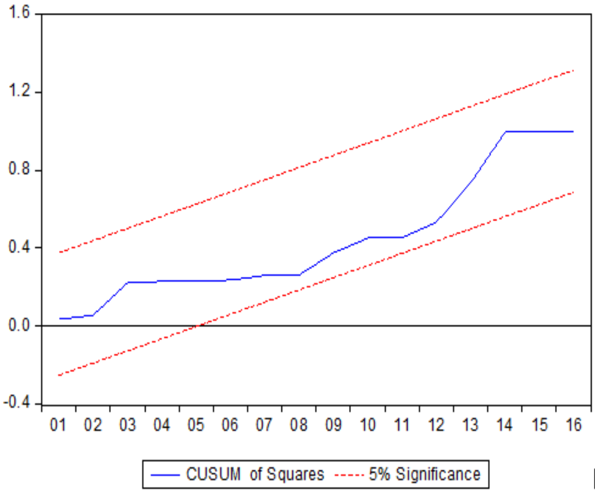

VEN CUSUM SQ EQN 6



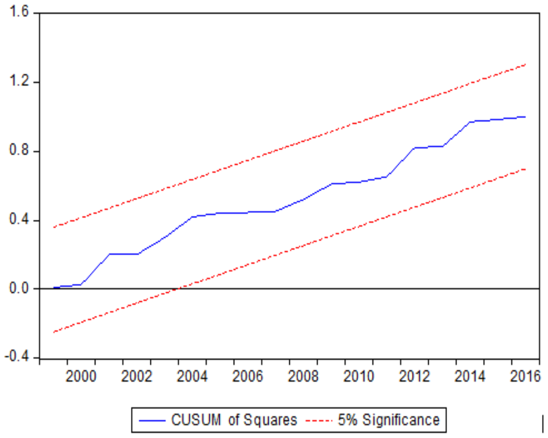

VEN CUSUM SQ EQN 1 WITH DUMMY



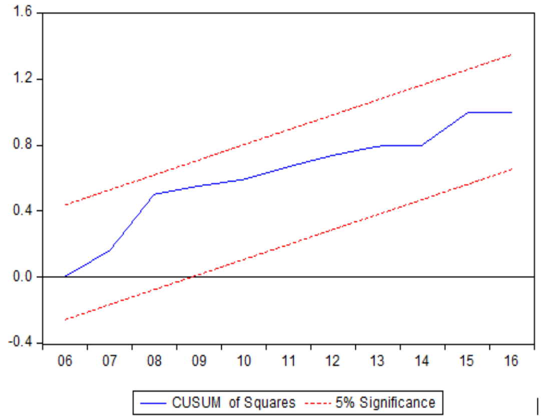

VEN CUSUM SQ EQN 2 WITH DUMMY



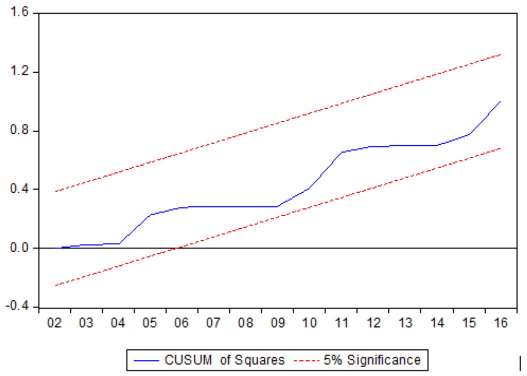
VEN CUSUM SQ EQN 3



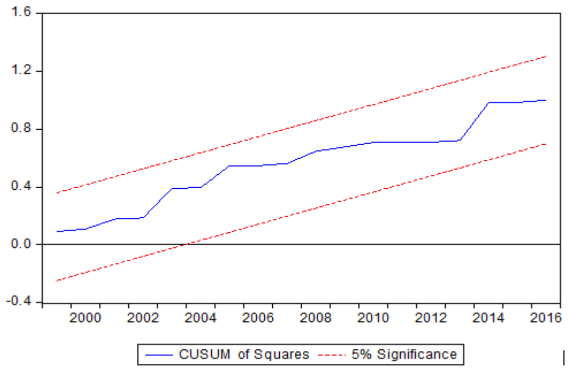

VEN CUSUM SQ EQN 4 WITH DUMMY




VEN CUSUM SQ EQN 5 WITH DUMMY

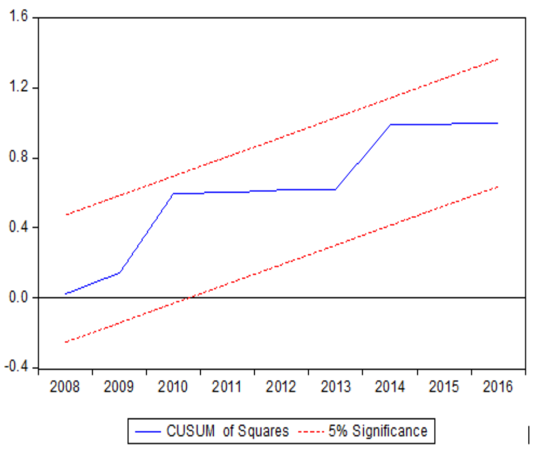



VEN CUSUM SQ EQN 6 WITH DUMMY

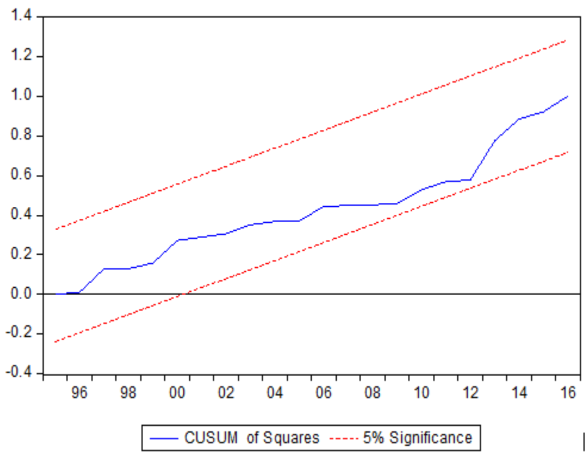



## *Appendix C3: CUSUM of Squares Tests for Norway*

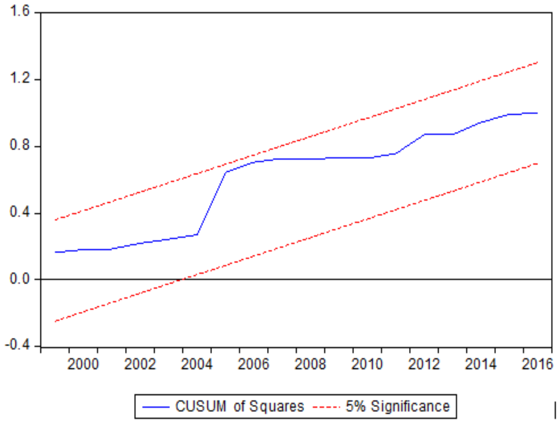
NOR CUSUM SQ EQN 1



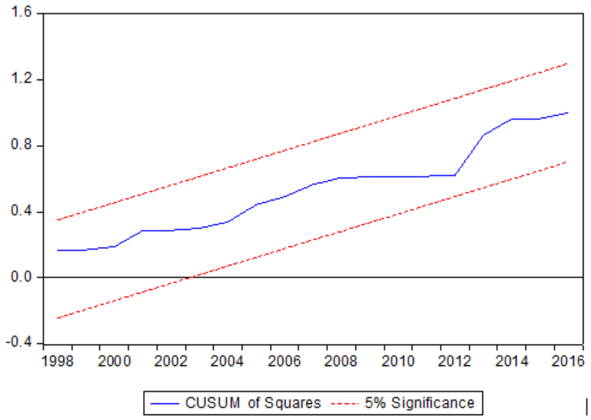

NOR CUSUM SQ EQN 2



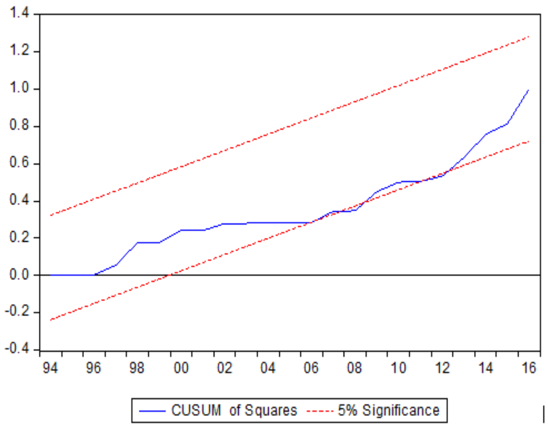
NOR CUSUM SQ EQN 3



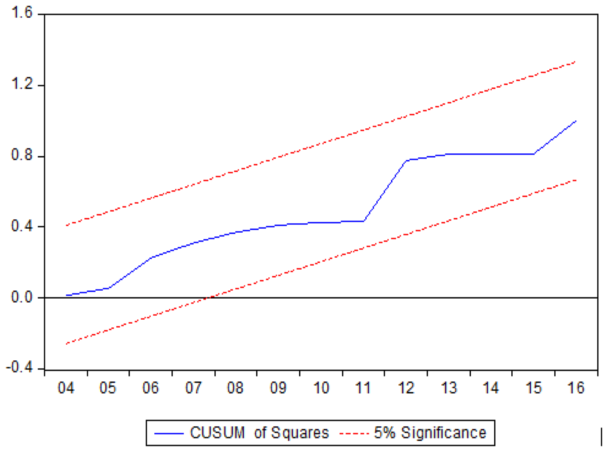

NOR CUSUM SQ EQN 4



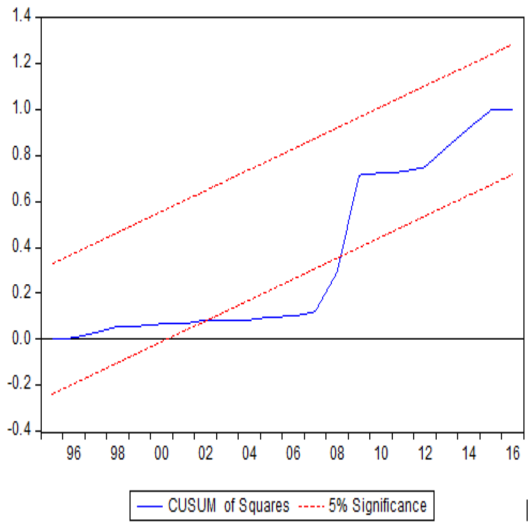

NOR CUSUM SQ EQN 5




NOR CUSUM SQ EQN 6

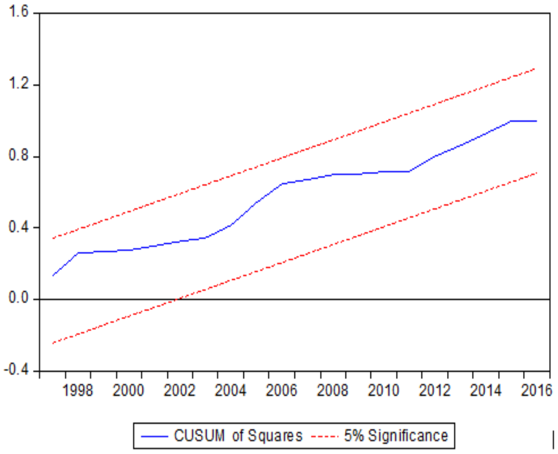



NOR CUSUM SQ EQN 1 WITH DUMMY

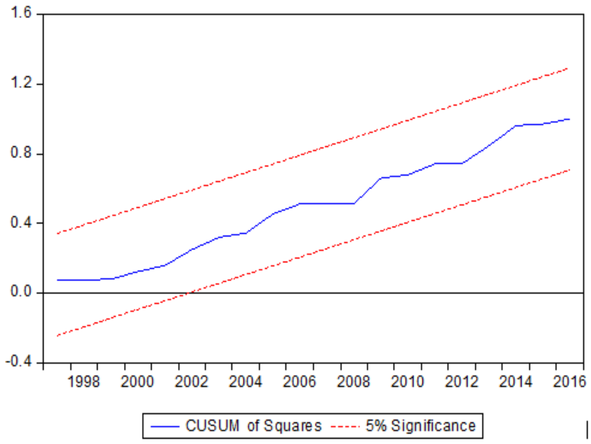



NOR CUSUM SQ EQN 2 WITH DUMMY

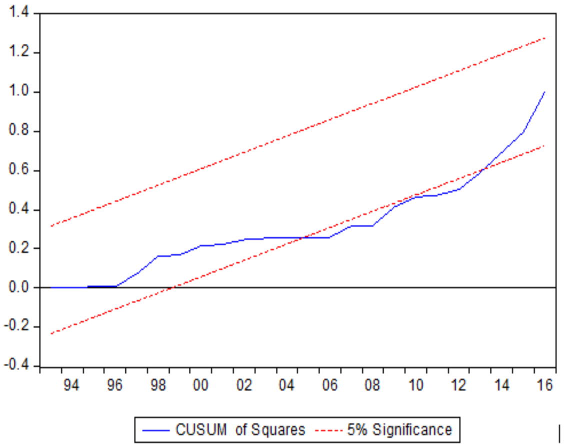
NOR CUSUM SQ EQN 3 WITH DUMMY



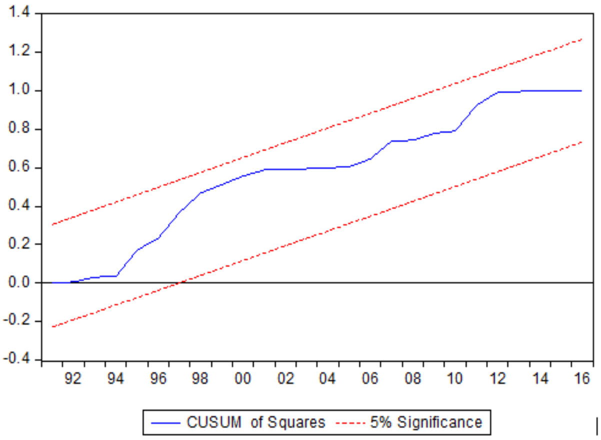

NOR CUSUM SQ EQN 4 WITH DUMMY




NOR CUSUM SQ EQN 5 WITH DUMMY




NOR CUSUM SQ EQN 6 WITH DUMMY



# Appendix D: Heteroscedasticity

## Appendix D1: Heteroscedasticity for Nigeria

### *Appendix D11: Nigeria Heteroscedasticity Model 1*

NIG HETERO EQN 1
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 1.359295 | Prob. F(1,32) | 0.2523 |
| Obs*R-squared | 1.385402 | Prob. Chi-Square(1) | 0.2392 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 15:10
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.011935 | 0.004964 | 2.404436 | 0.0222 |
| RESID^2(-1) | 0.202814 | 0.173957 | 1.165888 | 0.2523 |

| | | | |
|---|---|---|---|
| R-squared | 0.040747 | Mean dependent var | 0.015038 |
| Adjusted R-squared | 0.010770 | S.D. dependent var | 0.024561 |
| S.E. of regression | 0.024429 | Akaike info criterion | -4.529089 |
| Sum squared resid | 0.019096 | Schwarz criterion | -4.439303 |
| Log likelihood | 78.99452 | Hannan-Quinn criter. | -4.498470 |
| F-statistic | 1.359295 | Durbin-Watson stat | 1.977942 |
| Prob(F-statistic) | 0.252276 | | |

NIG HETERO EQN 1 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 2.525280 | Prob. F(1,32) | 0.1219 |
| Obs*R-squared | 2.486860 | Prob. Chi-Square(1) | 0.1148 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 20:13
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.013980 | 0.005406 | 2.585874 | 0.0145 |
| RESID^2(-1) | 0.269325 | 0.169481 | 1.589113 | 0.1219 |

| | | | |
|---|---|---|---|
| R-squared | 0.073143 | Mean dependent var | 0.019041 |
| Adjusted R-squared | 0.044179 | S.D. dependent var | 0.026058 |
| S.E. of regression | 0.025476 | Akaike info criterion | -4.445138 |
| Sum squared resid | 0.020769 | Schwarz criterion | -4.355352 |
| Log likelihood | 77.56735 | Hannan-Quinn criter. | -4.414519 |
| F-statistic | 2.525280 | Durbin-Watson stat | 2.055921 |
| Prob(F-statistic) | 0.121868 | | |

## *Appendix D12: Nigeria Heteroscedasticity Model 2*

NIG HETERO EQN 2
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.116091 | Prob. F(1,31) | 0.7356 |
| Obs*R-squared | 0.123119 | Prob. Chi-Square(1) | 0.7257 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 15:25
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.009347 | 0.002471 | 3.782972 | 0.0007 |
| RESID^2(-1) | -0.061144 | 0.179456 | -0.340721 | 0.7356 |

| | | | |
|---|---|---|---|
| R-squared | 0.003731 | Mean dependent var | 0.008797 |
| Adjusted R-squared | -0.028407 | S.D. dependent var | 0.010588 |
| S.E. of regression | 0.010737 | Akaike info criterion | -6.171558 |
| Sum squared resid | 0.003574 | Schwarz criterion | -6.080861 |
| Log likelihood | 103.8307 | Hannan-Quinn criter. | -6.141041 |
| F-statistic | 0.116091 | Durbin-Watson stat | 2.018447 |
| Prob(F-statistic) | 0.735612 | | |

NIG HETERO EQN 2 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.147567 | Prob. F(1,32) | 0.7034 |
| Obs*R-squared | 0.156070 | Prob. Chi-Square(1) | 0.6928 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/18 Time: 22:36
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.033893 | 0.009873 | 3.432869 | 0.0017 |
| RESID^2(-1) | -0.068503 | 0.178326 | -0.384144 | 0.7034 |

| | | | |
|---|---|---|---|
| R-squared | 0.004590 | Mean dependent var | 0.031872 |
| Adjusted R-squared | -0.026516 | S.D. dependent var | 0.048084 |
| S.E. of regression | 0.048718 | Akaike info criterion | -3.148523 |
| Sum squared resid | 0.075950 | Schwarz criterion | -3.058737 |
| Log likelihood | 55.52489 | Hannan-Quinn criter. | -3.117903 |
| F-statistic | 0.147567 | Durbin-Watson stat | 1.993534 |
| Prob(F-statistic) | 0.703413 | | |

## *Appendix D13: Nigeria Heteroscedasticity Model 3*

NIG HETERO EQN 3
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.052173 | Prob. F(1,32) | 0.8208 |
| Obs*R-squared | 0.055343 | Prob. Chi-Square(1) | 0.8140 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/17/18 Time: 17:47
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.002420 | 0.001182 | 2.046987 | 0.0489 |
| RESID^2(-1) | -0.040344 | 0.176626 | -0.228414 | 0.8208 |

| | | | |
|---|---|---|---|
| R-squared | 0.001628 | Mean dependent var | 0.002326 |
| Adjusted R-squared | -0.029571 | S.D. dependent var | 0.006370 |
| S.E. of regression | 0.006464 | Akaike info criterion | -7.188241 |
| Sum squared resid | 0.001337 | Schwarz criterion | -7.098455 |
| Log likelihood | 124.2001 | Hannan-Quinn criter. | -7.157621 |
| F-statistic | 0.052173 | Durbin-Watson stat | 1.999630 |
| Prob(F-statistic) | 0.820778 | | |

NIG HETERO EQN 3 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.117524 | Prob. F(1,32) | 0.7340 |
| Obs*R-squared | 0.124413 | Prob. Chi-Square(1) | 0.7243 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/18 Time: 23:47
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.002288 | 0.000978 | 2.338299 | 0.0258 |
| RESID^2(-1) | -0.060566 | 0.176670 | -0.342818 | 0.7340 |

| | | | |
|---|---|---|---|
| R-squared | 0.003659 | Mean dependent var | 0.002153 |
| Adjusted R-squared | -0.027476 | S.D. dependent var | 0.005152 |
| S.E. of regression | 0.005223 | Akaike info criterion | -7.614587 |
| Sum squared resid | 0.000873 | Schwarz criterion | -7.524801 |
| Log likelihood | 131.4480 | Hannan-Quinn criter. | -7.583968 |
| F-statistic | 0.117524 | Durbin-Watson stat | 2.000129 |
| Prob(F-statistic) | 0.733977 | | |

## *Appendix D14: Nigeria Heteroscedasticity Model 4*

NIG HETERO EQN 4
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.230287 | Prob. F(1,31) | 0.6347 |
| Obs*R-squared | 0.243337 | Prob. Chi-Square(1) | 0.6218 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/10/18 Time: 23:09
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.054512 | 0.016813 | 3.242228 | 0.0028 |
| RESID^2(-1) | -0.085855 | 0.178908 | -0.479883 | 0.6347 |

| | | | |
|---|---|---|---|
| R-squared | 0.007374 | Mean dependent var | 0.050204 |
| Adjusted R-squared | -0.024646 | S.D. dependent var | 0.080676 |
| S.E. of regression | 0.081664 | Akaike info criterion | -2.113720 |
| Sum squared resid | 0.206738 | Schwarz criterion | -2.023022 |
| Log likelihood | 36.87638 | Hannan-Quinn criter. | -2.083203 |
| F-statistic | 0.230287 | Durbin-Watson stat | 2.012118 |
| Prob(F-statistic) | 0.634680 | | |

NIG HETERO EQN 4 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.023624 | Prob. F(1,31) | 0.8788 |
| Obs*R-squared | 0.025129 | Prob. Chi-Square(1) | 0.8740 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/18 Time: 23:57
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.043101 | 0.015352 | 2.807543 | 0.0086 |
| RESID^2(-1) | 0.027703 | 0.180237 | 0.153702 | 0.8788 |

| | | | |
|---|---|---|---|
| R-squared | 0.000761 | Mean dependent var | 0.044347 |
| Adjusted R-squared | -0.031472 | S.D. dependent var | 0.073737 |
| S.E. of regression | 0.074888 | Akaike info criterion | -2.286956 |
| Sum squared resid | 0.173854 | Schwarz criterion | -2.196259 |
| Log likelihood | 39.73477 | Hannan-Quinn criter. | -2.256439 |
| F-statistic | 0.023624 | Durbin-Watson stat | 2.000372 |
| Prob(F-statistic) | 0.878841 | | |

## *Appendix D15: Nigeria Heteroscedasticity Model 5*

NIG HETERO EQN 5
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 2.615377 | Prob. F(1,32) | 0.1156 |
| Obs*R-squared | 2.568882 | Prob. Chi-Square(1) | 0.1090 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/10/18 Time: 23:21
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 52.48155 | 21.32600 | 2.460918 | 0.0194 |
| RESID^2(-1) | 0.276256 | 0.170822 | 1.617213 | 0.1156 |

| | | | |
|---|---|---|---|
| R-squared | 0.075555 | Mean dependent var | 72.84845 |
| Adjusted R-squared | 0.046666 | S.D. dependent var | 102.7792 |
| S.E. of regression | 100.3523 | Akaike info criterion | 12.11227 |
| Sum squared resid | 322259.0 | Schwarz criterion | 12.20206 |
| Log likelihood | -203.9087 | Hannan-Quinn criter. | 12.14289 |
| F-statistic | 2.615377 | Durbin-Watson stat | 1.877239 |
| Prob(F-statistic) | 0.115649 | | |

NIG HETERO EQN 5 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 3.577270 | Prob. F(1,32) | 0.0677 |
| Obs*R-squared | 3.418676 | Prob. Chi-Square(1) | 0.0645 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/18 Time: 22:47
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 50.34749 | 20.78588 | 2.422197 | 0.0213 |
| RESID^2(-1) | 0.318106 | 0.168189 | 1.891367 | 0.0677 |

| | | | |
|---|---|---|---|
| R-squared | 0.100549 | Mean dependent var | 74.07133 |
| Adjusted R-squared | 0.072441 | S.D. dependent var | 100.3493 |
| S.E. of regression | 96.64625 | Akaike info criterion | 12.03701 |
| Sum squared resid | 298895.9 | Schwarz criterion | 12.12680 |
| Log likelihood | -202.6292 | Hannan-Quinn criter. | 12.06763 |
| F-statistic | 3.577270 | Durbin-Watson stat | 1.844864 |
| Prob(F-statistic) | 0.067657 | | |

## *Appendix D16: Nigeria Heteroscedasticity Model 6*

NIG HETERO EQN 6
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.011061 | Prob. F(1,32) | 0.9169 |
| Obs*R-squared | 0.011748 | Prob. Chi-Square(1) | 0.9137 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/23/18 Time: 19:54
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 6.358032 | 2.196024 | 2.895247 | 0.0068 |
| RESID^2(-1) | -0.018868 | 0.179403 | -0.105171 | 0.9169 |

| | | | |
|---|---|---|---|
| R-squared | 0.000346 | Mean dependent var | 6.250358 |
| Adjusted R-squared | -0.030894 | S.D. dependent var | 11.15718 |
| S.E. of regression | 11.32822 | Akaike info criterion | 7.749493 |
| Sum squared resid | 4106.511 | Schwarz criterion | 7.839278 |
| Log likelihood | -129.7414 | Hannan-Quinn criter. | 7.780112 |
| F-statistic | 0.011061 | Durbin-Watson stat | 1.973315 |
| Prob(F-statistic) | 0.916896 | | |

NIG HETERO EQN 6 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.211923 | Prob. F(1,32) | 0.6484 |
| Obs*R-squared | 0.223686 | Prob. Chi-Square(1) | 0.6362 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/25/18 Time: 15:25
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 6.828232 | 2.940412 | 2.322203 | 0.0267 |
| RESID^2(-1) | 0.080905 | 0.175746 | 0.460350 | 0.6484 |

| | | | |
|---|---|---|---|
| R-squared | 0.006579 | Mean dependent var | 7.414537 |
| Adjusted R-squared | -0.024465 | S.D. dependent var | 15.26798 |
| S.E. of regression | 15.45362 | Akaike info criterion | 8.370586 |
| Sum squared resid | 7642.058 | Schwarz criterion | 8.460372 |
| Log likelihood | -140.3000 | Hannan-Quinn criter. | 8.401205 |
| F-statistic | 0.211923 | Durbin-Watson stat | 1.992035 |
| Prob(F-statistic) | 0.648378 | | |

## Appendix D2: Heteroscedasticity for Venezuela

### *Appendix D21: Venezuela Heteroscedasticity Model 1*

VEN HETERO EQN 1
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.409982 | Prob. F(1,25) | 0.5278 |
| Obs*R-squared | 0.435637 | Prob. Chi-Square(1) | 0.5092 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 15:53
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.005479 | 0.002714 | 2.018610 | 0.0544 |
| RESID^2(-1) | 0.127273 | 0.198772 | 0.640298 | 0.5278 |

| | | | |
|---|---|---|---|
| R-squared | 0.016135 | Mean dependent var | 0.006286 |
| Adjusted R-squared | -0.023220 | S.D. dependent var | 0.012350 |
| S.E. of regression | 0.012493 | Akaike info criterion | -5.856113 |
| Sum squared resid | 0.003902 | Schwarz criterion | -5.760125 |
| Log likelihood | 81.05753 | Hannan-Quinn criter. | -5.827571 |
| F-statistic | 0.409982 | Durbin-Watson stat | 1.987208 |
| Prob(F-statistic) | 0.527804 | | |

VEN HETERO EQN 1 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.913503 | Prob. F(1,25) | 0.3483 |
| Obs*R-squared | 0.951805 | Prob. Chi-Square(1) | 0.3293 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/18 Time: 23:24
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.004077 | 0.001571 | 2.595829 | 0.0156 |
| RESID^2(-1) | 0.187237 | 0.195901 | 0.955774 | 0.3483 |

| | | | |
|---|---|---|---|
| R-squared | 0.035252 | Mean dependent var | 0.005011 |
| Adjusted R-squared | -0.003338 | S.D. dependent var | 0.006380 |
| S.E. of regression | 0.006390 | Akaike info criterion | -7.196889 |
| Sum squared resid | 0.001021 | Schwarz criterion | -7.100901 |
| Log likelihood | 99.15800 | Hannan-Quinn criter. | -7.168347 |
| F-statistic | 0.913503 | Durbin-Watson stat | 1.982477 |
| Prob(F-statistic) | 0.348338 | | |

## *Appendix D22: Venezuela Heteroscedasticity Model 2*

VEN HETERO EQN 2
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.356944 | Prob. F(1,25) | 0.5556 |
| Obs*R-squared | 0.380073 | Prob. Chi-Square(1) | 0.5376 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 16:17
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.004827 | 0.001325 | 3.642298 | 0.0012 |
| RESID^2(-1) | -0.117799 | 0.197170 | -0.597448 | 0.5556 |

| | | | |
|---|---|---|---|
| R-squared | 0.014077 | Mean dependent var | 0.004343 |
| Adjusted R-squared | -0.025360 | S.D. dependent var | 0.005379 |
| S.E. of regression | 0.005447 | Akaike info criterion | -7.516224 |
| Sum squared resid | 0.000742 | Schwarz criterion | -7.420237 |
| Log likelihood | 103.4690 | Hannan-Quinn criter. | -7.487682 |
| F-statistic | 0.356944 | Durbin-Watson stat | 2.010243 |
| Prob(F-statistic) | 0.555582 | | |

VEN HETERO EQN 2 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.144765 | Prob. F(1,25) | 0.7068 |
| Obs*R-squared | 0.155446 | Prob. Chi-Square(1) | 0.6934 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 20:53
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.005155 | 0.001740 | 2.962548 | 0.0066 |
| RESID^2(-1) | -0.076145 | 0.200130 | -0.380480 | 0.7068 |

| | | | |
|---|---|---|---|
| R-squared | 0.005757 | Mean dependent var | 0.004787 |
| Adjusted R-squared | -0.034012 | S.D. dependent var | 0.007392 |
| S.E. of regression | 0.007517 | Akaike info criterion | -6.872212 |
| Sum squared resid | 0.001412 | Schwarz criterion | -6.776224 |
| Log likelihood | 94.77487 | Hannan-Quinn criter. | -6.843670 |
| F-statistic | 0.144765 | Durbin-Watson stat | 1.983124 |
| Prob(F-statistic) | 0.706803 | | |

## *Appendix D23: Venezuela Heteroscedasticity Model 3*

VEN HETERO EQN 3
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.713172 | Prob. F(1,25) | 0.4064 |
| Obs*R-squared | 0.748863 | Prob. Chi-Square(1) | 0.3868 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/23/18 Time: 23:41
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.000282 | 8.36E-05 | 3.374461 | 0.0024 |
| RESID^2(-1) | -0.146258 | 0.173190 | -0.844495 | 0.4064 |

| | | | |
|---|---|---|---|
| R-squared | 0.027736 | Mean dependent var | 0.000240 |
| Adjusted R-squared | -0.011155 | S.D. dependent var | 0.000348 |
| S.E. of regression | 0.000350 | Akaike info criterion | -13.00453 |
| Sum squared resid | 3.07E-06 | Schwarz criterion | -12.90854 |
| Log likelihood | 177.5611 | Hannan-Quinn criter. | -12.97599 |
| F-statistic | 0.713172 | Durbin-Watson stat | 1.915276 |
| Prob(F-statistic) | 0.406402 | | |

VEN HETERO EQN 3 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.570822 | Prob. F(1,25) | 0.4570 |
| Obs*R-squared | 0.602726 | Prob. Chi-Square(1) | 0.4375 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/25/18 Time: 23:06
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.000488 | 0.000134 | 3.631301 | 0.0013 |
| RESID^2(-1) | -0.129751 | 0.171736 | -0.755528 | 0.4570 |

| | | | |
|---|---|---|---|
| R-squared | 0.022323 | Mean dependent var | 0.000423 |
| Adjusted R-squared | -0.016784 | S.D. dependent var | 0.000534 |
| S.E. of regression | 0.000538 | Akaike info criterion | -12.14495 |
| Sum squared resid | 7.25E-06 | Schwarz criterion | -12.04896 |
| Log likelihood | 165.9568 | Hannan-Quinn criter. | -12.11641 |
| F-statistic | 0.570822 | Durbin-Watson stat | 1.846977 |
| Prob(F-statistic) | 0.456992 | | |

## *Appendix D24: Venezuela Heteroscedasticity Model 4*

VEN HETERO EQN 4
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.048696 | Prob. F(1,25) | 0.8271 |
| Obs*R-squared | 0.052489 | Prob. Chi-Square(1) | 0.8188 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 16:47
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.009725 | 0.003145 | 3.092033 | 0.0048 |
| RESID^2(-1) | 0.044285 | 0.200683 | 0.220671 | 0.8271 |

| | | | |
|---|---|---|---|
| R-squared | 0.001944 | Mean dependent var | 0.010182 |
| Adjusted R-squared | -0.037978 | S.D. dependent var | 0.012067 |
| S.E. of regression | 0.012294 | Akaike info criterion | -5.888202 |
| Sum squared resid | 0.003779 | Schwarz criterion | -5.792214 |
| Log likelihood | 81.49073 | Hannan-Quinn criter. | -5.859660 |
| F-statistic | 0.048696 | Durbin-Watson stat | 1.954265 |
| Prob(F-statistic) | 0.827141 | | |

VEN HETERO EQN 4 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.012623 | Prob. F(1,24) | 0.9115 |
| Obs*R-squared | 0.013667 | Prob. Chi-Square(1) | 0.9069 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/25/18 Time: 23:14
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.010171 | 0.003488 | 2.915578 | 0.0076 |
| RESID^2(-1) | -0.022946 | 0.204234 | -0.112351 | 0.9115 |

| | | | |
|---|---|---|---|
| R-squared | 0.000526 | Mean dependent var | 0.009942 |
| Adjusted R-squared | -0.041119 | S.D. dependent var | 0.014163 |
| S.E. of regression | 0.014451 | Akaike info criterion | -5.562276 |
| Sum squared resid | 0.005012 | Schwarz criterion | -5.465499 |
| Log likelihood | 74.30958 | Hannan-Quinn criter. | -5.534408 |
| F-statistic | 0.012623 | Durbin-Watson stat | 1.720451 |
| Prob(F-statistic) | 0.911480 | | |

## *Appendix D25: Venezuela Heteroscedasticity Model 5*

VEN HETERO EQN 5
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.002130 | Prob. F(1,25) | 0.9636 |
| Obs*R-squared | 0.002300 | Prob. Chi-Square(1) | 0.9617 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/18 Time: 02:00
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 196.2677 | 60.49378 | 3.244429 | 0.0033 |
| RESID^2(-1) | 0.011184 | 0.242322 | 0.046153 | 0.9636 |

| | | | |
|---|---|---|---|
| R-squared | 0.000085 | Mean dependent var | 198.3075 |
| Adjusted R-squared | -0.039911 | S.D. dependent var | 210.4816 |
| S.E. of regression | 214.6408 | Akaike info criterion | 13.64700 |
| Sum squared resid | 1151767. | Schwarz criterion | 13.74298 |
| Log likelihood | -182.2344 | Hannan-Quinn criter. | 13.67554 |
| F-statistic | 0.002130 | Durbin-Watson stat | 1.652005 |
| Prob(F-statistic) | 0.963555 | | |

VEN HETERO EQN 5 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 1.384706 | Prob. F(1,24) | 0.2508 |
| Obs*R-squared | 1.418270 | Prob. Chi-Square(1) | 0.2337 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 21:25
Sample (adjusted): 1991 2016
Included observations: 26 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 57.50405 | 21.33659 | 2.695091 | 0.0126 |
| RESID^2(-1) | 0.211291 | 0.179557 | 1.176736 | 0.2508 |

| | | | |
|---|---|---|---|
| R-squared | 0.054549 | Mean dependent var | 74.41834 |
| Adjusted R-squared | 0.015155 | S.D. dependent var | 81.01935 |
| S.E. of regression | 80.40308 | Akaike info criterion | 11.68579 |
| Sum squared resid | 155151.7 | Schwarz criterion | 11.78256 |
| Log likelihood | -149.9152 | Hannan-Quinn criter. | 11.71365 |
| F-statistic | 1.384706 | Durbin-Watson stat | 1.505859 |
| Prob(F-statistic) | 0.250841 | | |

## *Appendix D26: Venezuela Heteroscedasticity Model 6*

VEN HETERO EQN 6
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.629323 | Prob. F(1,25) | 0.4351 |
| Obs*R-squared | 0.662980 | Prob. Chi-Square(1) | 0.4155 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 17:00
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.394195 | 0.101289 | 3.891789 | 0.0007 |
| RESID^2(-1) | -0.159065 | 0.200511 | -0.793299 | 0.4351 |

| | | | |
|---|---|---|---|
| R-squared | 0.024555 | Mean dependent var | 0.338365 |
| Adjusted R-squared | -0.014463 | S.D. dependent var | 0.375810 |
| S.E. of regression | 0.378518 | Akaike info criterion | 0.966081 |
| Sum squared resid | 3.581897 | Schwarz criterion | 1.062069 |
| Log likelihood | -11.04209 | Hannan-Quinn criter. | 0.994623 |
| F-statistic | 0.629323 | Durbin-Watson stat | 1.950976 |
| Prob(F-statistic) | 0.435069 | | |

VEN HETERO EQN 6 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 1.185190 | Prob. F(1,25) | 0.2867 |
| Obs*R-squared | 1.222070 | Prob. Chi-Square(1) | 0.2690 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/18 Time: 23:42
Sample (adjusted): 1990 2016
Included observations: 27 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.425729 | 0.119958 | 3.548994 | 0.0016 |
| RESID^2(-1) | -0.214327 | 0.196871 | -1.088664 | 0.2867 |

| | | | |
|---|---|---|---|
| R-squared | 0.045262 | Mean dependent var | 0.349028 |
| Adjusted R-squared | 0.007072 | S.D. dependent var | 0.506277 |
| S.E. of regression | 0.504484 | Akaike info criterion | 1.540624 |
| Sum squared resid | 6.362593 | Schwarz criterion | 1.636612 |
| Log likelihood | -18.79843 | Hannan-Quinn criter. | 1.569167 |
| F-statistic | 1.185190 | Durbin-Watson stat | 1.923723 |
| Prob(F-statistic) | 0.286686 | | |

## Appendix D3: Heteroscedasticity for Norway

### *Appendix D31: Norway Heteroscedasticity Model 1*

NOR HETERO EQN 1
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.229376 | Prob. F(1,31) | 0.6353 |
| Obs*R-squared | 0.242381 | Prob. Chi-Square(1) | 0.6225 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/18 Time: 19:24
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.000111 | 3.68E-05 | 3.006149 | 0.0052 |
| RESID^2(-1) | 0.085665 | 0.178866 | 0.478933 | 0.6353 |

| | | | |
|---|---|---|---|
| R-squared | 0.007345 | Mean dependent var | 0.000121 |
| Adjusted R-squared | -0.024676 | S.D. dependent var | 0.000169 |
| S.E. of regression | 0.000171 | Akaike info criterion | -14.45133 |
| Sum squared resid | 9.06E-07 | Schwarz criterion | -14.36064 |
| Log likelihood | 240.4470 | Hannan-Quinn criter. | -14.42082 |
| F-statistic | 0.229376 | Durbin-Watson stat | 1.970733 |
| Prob(F-statistic) | 0.635348 | | |

NOR HETERO EQN 1 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.111085 | Prob. F(1,31) | 0.7412 |
| Obs*R-squared | 0.117830 | Prob. Chi-Square(1) | 0.7314 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 21:46
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.000387 | 0.000205 | 1.886221 | 0.0687 |
| RESID^2(-1) | 0.059476 | 0.178449 | 0.333295 | 0.7412 |

| | | | |
|---|---|---|---|
| R-squared | 0.003571 | Mean dependent var | 0.000414 |
| Adjusted R-squared | -0.028572 | S.D. dependent var | 0.001071 |
| S.E. of regression | 0.001086 | Akaike info criterion | -10.75358 |
| Sum squared resid | 3.66E-05 | Schwarz criterion | -10.66288 |
| Log likelihood | 179.4341 | Hannan-Quinn criter. | -10.72306 |
| F-statistic | 0.111085 | Durbin-Watson stat | 1.969984 |
| Prob(F-statistic) | 0.741156 | | |

## *Appendix D31: Norway Heteroscedasticity Model 2*

NOR HETERO EQN 2
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 1.327878 | Prob. F(1,31) | 0.2580 |
| Obs*R-squared | 1.355486 | Prob. Chi-Square(1) | 0.2443 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/11/18 Time: 01:12
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.000296 | 7.40E-05 | 3.993814 | 0.0004 |
| RESID^2(-1) | -0.201367 | 0.174747 | -1.152336 | 0.2580 |

| | | | |
|---|---|---|---|
| R-squared | 0.041075 | Mean dependent var | 0.000247 |
| Adjusted R-squared | 0.010142 | S.D. dependent var | 0.000352 |
| S.E. of regression | 0.000351 | Akaike info criterion | -13.01557 |
| Sum squared resid | 3.81E-06 | Schwarz criterion | -12.92487 |
| Log likelihood | 216.7569 | Hannan-Quinn criter. | -12.98506 |
| F-statistic | 1.327878 | Durbin-Watson stat | 2.039407 |
| Prob(F-statistic) | 0.257992 | | |

NOR HETERO EQN 2 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.453884 | Prob. F(1,31) | 0.5055 |
| Obs*R-squared | 0.476195 | Prob. Chi-Square(1) | 0.4902 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/26/18 Time: 01:39
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.000715 | 0.000185 | 3.862985 | 0.0005 |
| RESID^2(-1) | -0.120822 | 0.179339 | -0.673709 | 0.5055 |

| | | | |
|---|---|---|---|
| R-squared | 0.014430 | Mean dependent var | 0.000637 |
| Adjusted R-squared | -0.017362 | S.D. dependent var | 0.000823 |
| S.E. of regression | 0.000831 | Akaike info criterion | -11.29016 |
| Sum squared resid | 2.14E-05 | Schwarz criterion | -11.19947 |
| Log likelihood | 188.2877 | Hannan-Quinn criter. | -11.25965 |
| F-statistic | 0.453884 | Durbin-Watson stat | 2.031080 |
| Prob(F-statistic) | 0.505489 | | |

## *Appendix D31: Norway Heteroscedasticity Model 3*

NOR HETERO EQN 3
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.385655 | Prob. F(1,31) | 0.5391 |
| Obs*R-squared | 0.405491 | Prob. Chi-Square(1) | 0.5243 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/18 Time: 19:51
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.73E-05 | 4.92E-06 | 3.510289 | 0.0014 |
| RESID^2(-1) | -0.111169 | 0.179013 | -0.621011 | 0.5391 |

| | | | |
|---|---|---|---|
| R-squared | 0.012288 | Mean dependent var | 1.55E-05 |
| Adjusted R-squared | -0.019574 | S.D. dependent var | 2.30E-05 |
| S.E. of regression | 2.32E-05 | Akaike info criterion | -18.44186 |
| Sum squared resid | 1.68E-08 | Schwarz criterion | -18.35116 |
| Log likelihood | 306.2906 | Hannan-Quinn criter. | -18.41134 |
| F-statistic | 0.385655 | Durbin-Watson stat | 1.984223 |
| Prob(F-statistic) | 0.539132 | | |

NOR HETERO EQN 3 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.955170 | Prob. F(1,31) | 0.3360 |
| Obs*R-squared | 0.986400 | Prob. Chi-Square(1) | 0.3206 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/26/18 Time: 02:14
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 2.25E-05 | 5.60E-06 | 4.017642 | 0.0003 |
| RESID^2(-1) | -0.172890 | 0.176901 | -0.977328 | 0.3360 |

| | | | |
|---|---|---|---|
| R-squared | 0.029891 | Mean dependent var | 1.90E-05 |
| Adjusted R-squared | -0.001403 | S.D. dependent var | 2.48E-05 |
| S.E. of regression | 2.48E-05 | Akaike info criterion | -18.31429 |
| Sum squared resid | 1.90E-08 | Schwarz criterion | -18.22360 |
| Log likelihood | 304.1858 | Hannan-Quinn criter. | -18.28378 |
| F-statistic | 0.955170 | Durbin-Watson stat | 2.020663 |
| Prob(F-statistic) | 0.335973 | | |

## *Appendix D31: Norway Heteroscedasticity Model 4*

NOR HETERO EQN 4
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.204344 | Prob. F(1,31) | 0.6544 |
| Obs*R-squared | 0.216103 | Prob. Chi-Square(1) | 0.6420 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/24/18 Time: 20:08
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.007340 | 0.002338 | 3.139035 | 0.0037 |
| RESID^2(-1) | 0.068518 | 0.151573 | 0.452044 | 0.6544 |

| | | | |
|---|---|---|---|
| R-squared | 0.006549 | Mean dependent var | 0.007975 |
| Adjusted R-squared | -0.025498 | S.D. dependent var | 0.010605 |
| S.E. of regression | 0.010739 | Akaike info criterion | -6.171192 |
| Sum squared resid | 0.003575 | Schwarz criterion | -6.080494 |
| Log likelihood | 103.8247 | Hannan-Quinn criter. | -6.140675 |
| F-statistic | 0.204344 | Durbin-Watson stat | 1.944285 |
| Prob(F-statistic) | 0.654384 | | |

NOR HETERO EQN 4 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 1.625796 | Prob. F(1,31) | 0.2118 |
| Obs*R-squared | 1.644443 | Prob. Chi-Square(1) | 0.1997 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/26/18 Time: 02:28
Sample (adjusted): 1984 2016
Included observations: 33 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.006519 | 0.002546 | 2.560958 | 0.0155 |
| RESID^2(-1) | 0.222843 | 0.174769 | 1.275067 | 0.2118 |

| | | | |
|---|---|---|---|
| R-squared | 0.049832 | Mean dependent var | 0.008376 |
| Adjusted R-squared | 0.019181 | S.D. dependent var | 0.012112 |
| S.E. of regression | 0.011995 | Akaike info criterion | -5.949889 |
| Sum squared resid | 0.004461 | Schwarz criterion | -5.859192 |
| Log likelihood | 100.1732 | Hannan-Quinn criter. | -5.919372 |
| F-statistic | 1.625796 | Durbin-Watson stat | 1.869956 |
| Prob(F-statistic) | 0.211759 | | |

## *Appendix D31: Norway Heteroscedasticity Model 5*

NOR HETERO EQN 5
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 2.251758 | Prob. F(1,32) | 0.1433 |
| Obs*R-squared | 2.235207 | Prob. Chi-Square(1) | 0.1349 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 18:35
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.560154 | 0.118969 | 4.708389 | 0.0000 |
| RESID^2(-1) | -0.276485 | 0.184251 | -1.500586 | 0.1433 |

| | | | |
|---|---|---|---|
| R-squared | 0.065741 | Mean dependent var | 0.446620 |
| Adjusted R-squared | 0.036546 | S.D. dependent var | 0.545407 |
| S.E. of regression | 0.535349 | Akaike info criterion | 1.645225 |
| Sum squared resid | 9.171139 | Schwarz criterion | 1.735011 |
| Log likelihood | -25.96883 | Hannan-Quinn criter. | 1.675845 |
| F-statistic | 2.251758 | Durbin-Watson stat | 1.801697 |
| Prob(F-statistic) | 0.143266 | | |

NOR HETERO EQN 5 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.468876 | Prob. F(1,32) | 0.4 |
| Obs*R-squared | 0.490986 | Prob. Chi-Square(1) | 0.4 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 22:16
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Pr |
|---|---|---|---|---|
| C | 0.538530 | 0.135146 | 3.984803 | 0.0 |
| RESID^2(-1) | -0.132554 | 0.193582 | -0.684745 | 0.4 |

| | | | |
|---|---|---|---|
| R-squared | 0.014441 | Mean dependent var | 0.480 |
| Adjusted R-squared | -0.016358 | S.D. dependent var | 0.606 |
| S.E. of regression | 0.611420 | Akaike info criterion | 1.910 |
| Sum squared resid | 11.96272 | Schwarz criterion | 2.000 |
| Log likelihood | -30.48629 | Hannan-Quinn criter. | 1.941 |
| F-statistic | 0.468876 | Durbin-Watson stat | 1.815 |
| Prob(F-statistic) | 0.498435 | | |

## *Appendix D31: Norway Heteroscedasticity Model 6*

NOR HETERO EQN 6
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.027403 | Prob. F(1,30) | 0.8696 |
| Obs*R-squared | 0.029203 | Prob. Chi-Square(1) | 0.8643 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 07/24/18 Time: 18:46
Sample (adjusted): 1985 2016
Included observations: 32 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.062787 | 0.024592 | 2.553170 | 0.0160 |
| RESID^2(-1) | -0.029847 | 0.180303 | -0.165537 | 0.8696 |

| | | | |
|---|---|---|---|
| R-squared | 0.000913 | Mean dependent var | 0.060882 |
| Adjusted R-squared | -0.032390 | S.D. dependent var | 0.120995 |
| S.E. of regression | 0.122939 | Akaike info criterion | -1.293799 |
| Sum squared resid | 0.453418 | Schwarz criterion | -1.202191 |
| Log likelihood | 22.70079 | Hannan-Quinn criter. | -1.263434 |
| F-statistic | 0.027403 | Durbin-Watson stat | 2.021719 |
| Prob(F-statistic) | 0.869632 | | |

NOR HETERO EQN 6 WITH DUMMY
Heteroskedasticity Test: ARCH

| | | | |
|---|---|---|---|
| F-statistic | 0.008791 | Prob. F(1,32) | 0.9259 |
| Obs*R-squared | 0.009338 | Prob. Chi-Square(1) | 0.9230 |

Test Equation:
Dependent Variable: RESID^2
Method: Least Squares
Date: 06/26/18 Time: 03:00
Sample (adjusted): 1983 2016
Included observations: 34 after adjustments

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 0.213860 | 0.062643 | 3.413951 | 0.0018 |
| RESID^2(-1) | -0.016628 | 0.177346 | -0.093762 | 0.9259 |

| | | | |
|---|---|---|---|
| R-squared | 0.000275 | Mean dependent var | 0.210338 |
| Adjusted R-squared | -0.030967 | S.D. dependent var | 0.287911 |
| S.E. of regression | 0.292335 | Akaike info criterion | 0.435188 |
| Sum squared resid | 2.734709 | Schwarz criterion | 0.524974 |
| Log likelihood | -5.398204 | Hannan-Quinn criter. | 0.465808 |
| F-statistic | 0.008791 | Durbin-Watson stat | 1.993250 |
| Prob(F-statistic) | 0.925883 | | |

# Appendix E: Serial Correlation

## Appendix E1: Serial Correlation for Nigeria

### *Appendix E11: Nigeria Serial Correlation Model 1*

NIG SERIAL CORRE EQN 1
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 2.003244 | Prob. F(2,24) | 0.1568 |
| Obs*R-squared | 5.006950 | Prob. Chi-Square(2) | 0.0818 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 15:10
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | 0.050676 | 0.095660 | 0.529752 | 0.6012 |
| LOG(AREV) | 0.029979 | 0.111025 | 0.270020 | 0.7895 |
| LOG(OILP) | 0.006215 | 0.123479 | 0.050329 | 0.9603 |
| LOG(GDP) | -0.023114 | 0.230590 | -0.100239 | 0.9210 |
| LOG(EXTR) | -0.044624 | 0.095689 | -0.466346 | 0.6452 |
| INFR | -0.000126 | 0.002431 | -0.051897 | 0.9590 |
| UEMR | 0.000130 | 0.007820 | 0.016687 | 0.9868 |
| LOG(EXCR) | 0.018927 | 0.042208 | 0.448420 | 0.6579 |
| C | -0.361370 | 4.858373 | -0.074381 | 0.9413 |
| RESID(-1) | -0.349673 | 0.213903 | -1.634727 | 0.1152 |
| RESID(-2) | -0.323376 | 0.212958 | -1.518496 | 0.1420 |

| | | | |
|---|---|---|---|
| R-squared | 0.143056 | Mean dependent var | -1.25E-14 |
| Adjusted R-squared | -0.214004 | S.D. dependent var | 0.123730 |
| S.E. of regression | 0.136328 | Akaike info criterion | -0.896235 |
| Sum squared resid | 0.446045 | Schwarz criterion | -0.407411 |
| Log likelihood | 26.68411 | Hannan-Quinn criter. | -0.727493 |
| F-statistic | 0.400649 | Durbin-Watson stat | 2.087087 |
| Prob(F-statistic) | 0.933185 | | |

NIG SERIAL CORRE EQN 1 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.548193 | Prob. F(2,24) | 0.2331 |
| Obs*R-squared | 3.999555 | Prob. Chi-Square(2) | 0.1354 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 20:17
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | 0.079075 | 0.109082 | 0.724910 | 0.4755 |
| LOG(AREV) | 0.000980 | 0.106951 | 0.009166 | 0.9928 |
| LOG(GDP) | -0.111439 | 0.209899 | -0.530920 | 0.6004 |
| LOG(EXTR) | -0.000220 | 0.105195 | -0.002094 | 0.9983 |
| INFR | -0.000216 | 0.002759 | -0.078433 | 0.9381 |
| UEMR | -0.000730 | 0.008132 | -0.089764 | 0.9292 |
| LOG(EXCR) | 0.012328 | 0.038544 | 0.319838 | 0.7519 |
| OILD | -0.038818 | 0.068233 | -0.568901 | 0.5747 |
| C | 1.020373 | 3.106010 | 0.328516 | 0.7454 |
| RESID(-1) | -0.329420 | 0.240039 | -1.372363 | 0.1826 |
| RESID(-2) | -0.315566 | 0.218828 | -1.442076 | 0.1622 |

| | | | |
|---|---|---|---|
| R-squared | 0.114273 | Mean dependent var | -6.37E-15 |
| Adjusted R-squared | -0.254780 | S.D. dependent var | 0.138380 |
| S.E. of regression | 0.155009 | Akaike info criterion | -0.639393 |
| Sum squared resid | 0.576665 | Schwarz criterion | -0.150570 |
| Log likelihood | 22.18938 | Hannan-Quinn criter. | -0.470651 |
| F-statistic | 0.309639 | Durbin-Watson stat | 2.068347 |
| Prob(F-statistic) | 0.971162 | | |

## *Appendix E12: Nigeria Serial Correlation Model 2*

NIG SERIAL CORRE EQN 2

Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.883289 | Prob. F(2,16) | 0.4326 |
| Obs*R-squared | 3.380709 | Prob. Chi-Square(2) | 0.1845 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 15:26
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | 0.043186 | 0.235109 | 0.183686 | 0.8566 |
| LOG(AEXP) | -0.021142 | 0.228146 | -0.092670 | 0.9273 |
| LOG(AEXP(-1)) | 0.072242 | 0.250779 | 0.288072 | 0.7770 |
| LOG(AEXP(-2)) | -0.059406 | 0.164385 | -0.361385 | 0.7225 |
| LOG(OILP) | -0.022073 | 0.161620 | -0.136572 | 0.8931 |
| LOG(OILP(-1)) | -0.093049 | 0.231651 | -0.401678 | 0.6932 |
| LOG(OILP(-2)) | 0.110351 | 0.169160 | 0.652350 | 0.5234 |
| LOG(GDP) | -0.129126 | 0.566278 | -0.228025 | 0.8225 |
| LOG(EXTR) | 0.064505 | 0.112435 | 0.573706 | 0.5741 |
| INFR | 0.001695 | 0.002935 | 0.577666 | 0.5715 |
| UEMR | -0.000434 | 0.008257 | -0.052552 | 0.9587 |
| LOG(EXCR) | -0.014448 | 0.196362 | -0.073579 | 0.9423 |
| LOG(EXCR(-1)) | 0.110384 | 0.205353 | 0.537532 | 0.5983 |
| LOG(EXCR(-2)) | -0.104159 | 0.183530 | -0.567532 | 0.5782 |
| C | 1.062253 | 15.52086 | 0.068440 | 0.9463 |
| @TREND | -0.000429 | 0.043696 | -0.009814 | 0.9923 |
| RESID(-1) | -0.208594 | 0.396144 | -0.526562 | 0.6057 |
| RESID(-2) | -0.410995 | 0.360686 | -1.139479 | 0.2713 |

| | | | |
|---|---|---|---|
| R-squared | 0.099433 | Mean dependent var | -3.78E-16 |
| Adjusted R-squared | -0.857420 | S.D. dependent var | 0.095680 |
| S.E. of regression | 0.130400 | Akaike info criterion | -0.931371 |
| Sum squared resid | 0.272066 | Schwarz criterion | -0.123297 |
| Log likelihood | 33.83330 | Hannan-Quinn criter. | -0.655795 |
| F-statistic | 0.103916 | Durbin-Watson stat | 2.003400 |
| Prob(F-statistic) | 0.999986 | | |

NIG SERIAL CORRE EQN 2 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.915962 | Prob. F(2,23) | 0.1700 |
| Obs*R-squared | 4.998424 | Prob. Chi-Square(2) | 0.0821 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/11/18 Time: 22:37
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | 0.201087 | 0.233115 | 0.862608 | 0.3973 |
| LOG(AEXP) | -0.125264 | 0.214598 | -0.583712 | 0.5651 |
| LOG(GDP) | -0.033090 | 0.243248 | -0.136035 | 0.8930 |
| LOG(EXTR) | -0.064249 | 0.139496 | -0.460581 | 0.6494 |
| INFR | -0.000374 | 0.003486 | -0.107201 | 0.9156 |
| UEMR | -0.001081 | 0.011381 | -0.094987 | 0.9251 |
| LOG(EXCR) | -0.048001 | 0.161579 | -0.297072 | 0.7691 |
| LOG(EXCR(-1)) | 0.069638 | 0.169180 | 0.411624 | 0.6844 |
| OILD | 0.030071 | 0.091859 | 0.327357 | 0.7464 |
| C | 0.409550 | 3.901299 | 0.104978 | 0.9173 |
| RESID(-1) | -0.406926 | 0.273211 | -1.489423 | 0.1500 |
| RESID(-2) | -0.383798 | 0.227151 | -1.689616 | 0.1046 |

| | | | |
|---|---|---|---|
| R-squared | 0.142812 | Mean dependent var | -3.27E-16 |
| Adjusted R-squared | -0.267147 | S.D. dependent var | 0.178580 |
| S.E. of regression | 0.201023 | Akaike info criterion | -0.104932 |
| Sum squared resid | 0.929438 | Schwarz criterion | 0.428330 |
| Log likelihood | 13.83631 | Hannan-Quinn criter. | 0.079150 |
| F-statistic | 0.348357 | Durbin-Watson stat | 2.128062 |
| Prob(F-statistic) | 0.963656 | | |

## *Appendix E13: Nigeria Serial Correlation Model 3*

NIG SERIAL CORRE EQN 3
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.688550 | Prob. F(2,23) | 0.2069 |
| Obs*R-squared | 4.481103 | Prob. Chi-Square(2) | 0.1064 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/17/18 Time: 17:48
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | 0.093816 | 0.104216 | 0.900206 | 0.3773 |
| LOG(AEXP) | -0.092391 | 0.080162 | -1.152559 | 0.2609 |
| LOG(OILP) | -0.051505 | 0.066793 | -0.771111 | 0.4485 |
| LOG(AREV) | 0.061917 | 0.074257 | 0.833831 | 0.4130 |
| LOG(EXTR) | 0.021859 | 0.040652 | 0.537711 | 0.5959 |
| INFR | -2.69E-05 | 0.000947 | -0.028372 | 0.9776 |
| UEMR | -0.001463 | 0.003318 | -0.440899 | 0.6634 |
| LOG(EXCR) | 0.004992 | 0.045913 | 0.108725 | 0.9144 |
| LOG(EXCR(-1)) | -0.028419 | 0.051778 | -0.548854 | 0.5884 |
| C | -1.982837 | 2.458315 | -0.806584 | 0.4282 |
| RESID(-1) | -0.208578 | 0.255683 | -0.815768 | 0.4230 |
| RESID(-2) | -0.466881 | 0.254521 | -1.834352 | 0.0796 |

| | | | |
|---|---|---|---|
| R-squared | 0.128032 | Mean dependent var | -3.20E-15 |
| Adjusted R-squared | -0.288997 | S.D. dependent var | 0.048232 |
| S.E. of regression | 0.054759 | Akaike info criterion | -2.705883 |
| Sum squared resid | 0.068967 | Schwarz criterion | -2.172621 |
| Log likelihood | 59.35296 | Hannan-Quinn criter. | -2.521801 |
| F-statistic | 0.307009 | Durbin-Watson stat | 2.199414 |
| Prob(F-statistic) | 0.977012 | | |

NIG SERIAL CORRE EQN 3 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.933363 | Prob. F(2,23) | 0.4076 |
| Obs*R-squared | 2.627424 | Prob. Chi-Square(2) | 0.2688 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/24/18 Time: 23:48
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | 0.087494 | 0.145583 | 0.600989 | 0.5537 |
| LOG(AEXP) | -0.035303 | 0.058252 | -0.606034 | 0.5504 |
| LOG(AREV) | 0.028797 | 0.048848 | 0.589529 | 0.5613 |
| LOG(EXTR) | -0.003615 | 0.035020 | -0.103222 | 0.9187 |
| INFR | -5.22E-05 | 0.000884 | -0.059115 | 0.9534 |
| UEMR | -0.000835 | 0.003132 | -0.266740 | 0.7920 |
| LOG(EXCR) | 0.010889 | 0.043668 | 0.249359 | 0.8053 |
| OILD | 0.002672 | 0.024459 | 0.109247 | 0.9140 |
| C | -1.981654 | 3.681425 | -0.538284 | 0.5956 |
| @TREND | -0.005447 | 0.012883 | -0.422829 | 0.6763 |
| RESID(-1) | -0.154064 | 0.261288 | -0.589634 | 0.5612 |
| RESID(-2) | -0.343783 | 0.252863 | -1.359562 | 0.1871 |

| | | | |
|---|---|---|---|
| R-squared | 0.075069 | Mean dependent var | 3.72E-16 |
| Adjusted R-squared | -0.367289 | S.D. dependent var | 0.047352 |
| S.E. of regression | 0.055369 | Akaike info criterion | -2.683724 |
| Sum squared resid | 0.070512 | Schwarz criterion | -2.150462 |
| Log likelihood | 58.96517 | Hannan-Quinn criter. | -2.499642 |
| F-statistic | 0.169702 | Durbin-Watson stat | 2.071442 |
| Prob(F-statistic) | 0.997986 | | |

## *Appendix E14: Nigeria Serial Correlation Model 4*

NIG SERIAL CORRE EQN 4
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.554440 | Prob. F(2,21) | 0.2347 |
| Obs*R-squared | 4.384356 | Prob. Chi-Square(2) | 0.1117 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/10/18 Time: 23:10
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.001941 | 0.191794 | -0.010123 | 0.9920 |
| LOG(EXTR(-2)) | -0.108626 | 0.162507 | -0.668439 | 0.5111 |
| LOG(AEXP) | -0.129114 | 0.386626 | -0.333951 | 0.7417 |
| LOG(AEXP(-1)) | 0.084074 | 0.240920 | 0.348971 | 0.7306 |
| LOG(OILP) | -0.070984 | 0.343819 | -0.206458 | 0.8384 |
| LOG(AREV) | 0.061614 | 0.332366 | 0.185379 | 0.8547 |
| LOG(GDP) | 0.359189 | 0.584508 | 0.614516 | 0.5455 |
| INFR | 0.001059 | 0.004108 | 0.257737 | 0.7991 |
| UEMR | 0.006726 | 0.015559 | 0.432306 | 0.6699 |
| LOG(EXCR) | -0.015033 | 0.093499 | -0.160787 | 0.8738 |
| C | -7.024308 | 13.02878 | -0.539138 | 0.5955 |
| RESID(-1) | -0.021601 | 0.291519 | -0.074097 | 0.9416 |
| RESID(-2) | 0.435921 | 0.263732 | 1.652894 | 0.1132 |

| | | | |
|---|---|---|---|
| R-squared | 0.128952 | Mean dependent var | 2.58E-16 |
| Adjusted R-squared | -0.368790 | S.D. dependent var | 0.224221 |
| S.E. of regression | 0.262328 | Akaike info criterion | 0.444425 |
| Sum squared resid | 1.445134 | Schwarz criterion | 1.028033 |
| Log likelihood | 5.444778 | Hannan-Quinn criter. | 0.643452 |
| F-statistic | 0.259073 | Durbin-Watson stat | 1.907059 |
| Prob(F-statistic) | 0.990255 | | |

NIG SERIAL CORRE EQN 4 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.130077 | Prob. F(2,20) | 0.3428 |
| Obs*R-squared | 3.452142 | Prob. Chi-Square(2) | 0.1780 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/24/18 Time: 23:58
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | 0.066814 | 0.201094 | 0.332253 | 0.7432 |
| LOG(EXTR(-2)) | -0.107257 | 0.144552 | -0.741995 | 0.4667 |
| LOG(AEXP) | -0.048863 | 0.306672 | -0.159334 | 0.8750 |
| LOG(AREV) | 0.046976 | 0.296377 | 0.158500 | 0.8757 |
| LOG(GDP) | 0.086382 | 0.725022 | 0.119144 | 0.9063 |
| INFR | 0.000913 | 0.004034 | 0.226381 | 0.8232 |
| UEMR | 0.004188 | 0.015606 | 0.268367 | 0.7912 |
| LOG(EXCR) | -0.003345 | 0.292814 | -0.011425 | 0.9910 |
| LOG(EXCR(-1)) | -0.028125 | 0.236127 | -0.119109 | 0.9064 |
| OILD | 0.003326 | 0.131553 | 0.025285 | 0.9801 |
| C | -1.346026 | 18.51163 | -0.072712 | 0.9428 |
| @TREND | 0.004550 | 0.065418 | 0.069552 | 0.9452 |
| RESID(-1) | -0.150206 | 0.290667 | -0.516765 | 0.6110 |
| RESID(-2) | 0.329425 | 0.270146 | 1.219435 | 0.2369 |

| | | | |
|---|---|---|---|
| R-squared | 0.101534 | Mean dependent var | 8.84E-15 |
| Adjusted R-squared | -0.482470 | S.D. dependent var | 0.212231 |
| S.E. of regression | 0.258405 | Akaike info criterion | 0.424325 |
| Sum squared resid | 1.335464 | Schwarz criterion | 1.052826 |
| Log likelihood | 6.786477 | Hannan-Quinn criter. | 0.638662 |
| F-statistic | 0.173858 | Durbin-Watson stat | 1.890545 |
| Prob(F-statistic) | 0.998828 | | |

## *Appendix E15: Nigeria Serial Correlation Model 5*

NIG SERIAL CORRE EQN 5
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.156825 | Prob. F(2,23) | 0.3321 |
| Obs*R-squared | 3.198976 | Prob. Chi-Square(2) | 0.2020 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/10/18 Time: 23:22
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| INFR(-1) | 0.020381 | 0.166135 | 0.122675 | 0.9034 |
| LOG(AEXP) | 5.666195 | 14.92953 | 0.379529 | 0.7078 |
| LOG(AEXP(-1)) | -0.549264 | 8.431367 | -0.065145 | 0.9486 |
| LOG(OILP) | 4.410377 | 12.15927 | 0.362717 | 0.7201 |
| LOG(AREV) | -5.992564 | 12.33916 | -0.485654 | 0.6318 |
| LOG(GDP) | -10.56660 | 20.43234 | -0.517151 | 0.6100 |
| LOG(EXTR) | 3.290293 | 5.614272 | 0.586059 | 0.5635 |
| UEMR | -0.313946 | 0.621552 | -0.505101 | 0.6183 |
| LOG(EXCR) | 0.722784 | 3.502851 | 0.206342 | 0.8383 |
| C | 207.2487 | 455.2965 | 0.455195 | 0.6532 |
| RESID(-1) | 0.057241 | 0.276364 | 0.207122 | 0.8377 |
| RESID(-2) | -0.370739 | 0.265819 | -1.394706 | 0.1764 |

| | | | |
|---|---|---|---|
| R-squared | 0.091399 | Mean dependent var | -3.25E-14 |
| Adjusted R-squared | -0.343149 | S.D. dependent var | 8.586322 |
| S.E. of regression | 9.951058 | Akaike info criterion | 7.699095 |
| Sum squared resid | 2277.542 | Schwarz criterion | 8.232357 |
| Log likelihood | -122.7342 | Hannan-Quinn criter. | 7.883177 |
| F-statistic | 0.210332 | Durbin-Watson stat | 2.014423 |
| Prob(F-statistic) | 0.994897 | | |

NIG SERIAL CORRE EQN 5 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.183357 | Prob. F(2,23) | 0.3242 |
| Obs*R-squared | 3.265499 | Prob. Chi-Square(2) | 0.1954 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/11/18 Time: 22:48
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| INFR(-1) | -0.056992 | 0.167315 | -0.340625 | 0.7365 |
| LOG(AEXP) | 1.148710 | 13.05623 | 0.087982 | 0.9307 |
| LOG(AEXP(-1)) | -0.427023 | 8.664287 | -0.049285 | 0.9611 |
| LOG(AREV) | -1.895379 | 8.512311 | -0.222663 | 0.8258 |
| LOG(GDP) | -3.803545 | 11.95406 | -0.318180 | 0.7532 |
| LOG(EXTR) | 2.489334 | 5.736388 | 0.433955 | 0.6684 |
| UEMR | -0.307984 | 0.602060 | -0.511550 | 0.6138 |
| LOG(EXCR) | 0.115325 | 2.368169 | 0.048698 | 0.9616 |
| OILD | 1.056123 | 4.802950 | 0.219890 | 0.8279 |
| C | 73.23302 | 201.7032 | 0.363073 | 0.7199 |
| RESID(-1) | 0.283629 | 0.254660 | 1.113753 | 0.2769 |
| RESID(-2) | -0.262117 | 0.248140 | -1.056326 | 0.3018 |

| | | | |
|---|---|---|---|
| R-squared | 0.093300 | Mean dependent var | 1.01E-13 |
| Adjusted R-squared | -0.340339 | S.D. dependent var | 8.643549 |
| S.E. of regression | 10.00690 | Akaike info criterion | 7.710287 |
| Sum squared resid | 2303.174 | Schwarz criterion | 8.243549 |
| Log likelihood | -122.9300 | Hannan-Quinn criter. | 7.894369 |
| F-statistic | 0.215156 | Durbin-Watson stat | 2.059174 |
| Prob(F-statistic) | 0.994386 | | |

## *Appendix E16: Nigeria Serial Correlation Model 6*

NIG SERIAL CORRE EQN 6
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.413561 | Prob. F(2,22) | 0.2645 |
| Obs*R-squared | 3.985530 | Prob. Chi-Square(2) | 0.1363 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/23/18 Time: 19:54
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| UEMR(-1) | 0.103676 | 0.275196 | 0.376736 | 0.7100 |
| LOG(AEXP) | -1.081203 | 3.685973 | -0.293329 | 0.7720 |
| LOG(OILP) | -1.432016 | 4.043778 | -0.354128 | 0.7266 |
| LOG(AREV) | 2.416688 | 4.122942 | 0.586156 | 0.5637 |
| LOG(AREV(-1)) | -0.226887 | 2.499783 | -0.090763 | 0.9285 |
| LOG(GDP) | 1.012769 | 5.097552 | 0.198677 | 0.8443 |
| LOG(EXTR) | -0.248638 | 2.082116 | -0.119416 | 0.9060 |
| INFR | -0.020863 | 0.056332 | -0.370363 | 0.7147 |
| LOG(EXCR) | 0.811399 | 2.493128 | 0.325454 | 0.7479 |
| LOG(EXCR(-1)) | -1.218592 | 3.048615 | -0.399720 | 0.6932 |
| C | -41.79670 | 138.0291 | -0.302811 | 0.7649 |
| RESID(-1) | -0.009396 | 0.374555 | -0.025085 | 0.9802 |
| RESID(-2) | -0.444784 | 0.287430 | -1.547450 | 0.1360 |

| | | | |
|---|---|---|---|
| R-squared | 0.113872 | Mean dependent var | -1.94E-14 |
| Adjusted R-squared | -0.369470 | S.D. dependent var | 2.500085 |
| S.E. of regression | 2.925709 | Akaike info criterion | 5.263502 |
| Sum squared resid | 188.3150 | Schwarz criterion | 5.841203 |
| Log likelihood | -79.11129 | Hannan-Quinn criter. | 5.462924 |
| F-statistic | 0.235593 | Durbin-Watson stat | 2.006740 |
| Prob(F-statistic) | 0.993676 | | |

NIG SERIAL CORRE EQN 6 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.986065 | Prob. F(2,23) | 0.3883 |
| Obs*R-squared | 2.764063 | Prob. Chi-Square(2) | 0.2511 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/25/18 Time: 15:25
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| UEMR(-1) | -0.033776 | 0.260319 | -0.129748 | 0.8979 |
| LOG(AEXP) | -0.531623 | 2.917751 | -0.182203 | 0.8570 |
| LOG(AREV) | 0.957412 | 3.024776 | 0.316523 | 0.7545 |
| LOG(GDP) | 0.146351 | 3.952887 | 0.037024 | 0.9708 |
| LOG(EXTR) | -0.428945 | 2.114252 | -0.202883 | 0.8410 |
| INFR | -0.018396 | 0.057031 | -0.322568 | 0.7499 |
| LOG(EXCR) | 0.312292 | 2.777935 | 0.112419 | 0.9115 |
| LOG(EXCR(-1)) | -0.237882 | 2.892299 | -0.082247 | 0.9352 |
| OILD | 0.100580 | 1.486183 | 0.067677 | 0.9466 |
| C | -4.120796 | 61.14520 | -0.067394 | 0.9469 |
| RESID(-1) | 0.185496 | 0.316556 | 0.585981 | 0.5636 |
| RESID(-2) | -0.267844 | 0.248843 | -1.076358 | 0.2929 |

| | | | |
|---|---|---|---|
| R-squared | 0.078973 | Mean dependent var | -1.65E-14 |
| Adjusted R-squared | -0.361518 | S.D. dependent var | 2.728543 |
| S.E. of regression | 3.183776 | Akaike info criterion | 5.419873 |
| Sum squared resid | 233.1379 | Schwarz criterion | 5.953136 |
| Log likelihood | -82.84779 | Hannan-Quinn criter. | 5.603955 |
| F-statistic | 0.179285 | Durbin-Watson stat | 1.941548 |
| Prob(F-statistic) | 0.997433 | | |

## Appendix E2: Serial Correlation for Venezuela

### *Appendix E21: Venezuela Serial Correlation Model 1*

VEN SERIAL CORRE EQN 1
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.758247 | Prob. F(2,17) | 0.2023 |
| Obs*R-squared | 4.799155 | Prob. Chi-Square(2) | 0.0908 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 15:54
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | -0.037456 | 0.109785 | -0.341174 | 0.7372 |
| LOG(AREV) | -0.163454 | 0.165404 | -0.988211 | 0.3369 |
| LOG(OILP) | 0.113627 | 0.095403 | 1.191027 | 0.2500 |
| LOG(GDP) | 0.247459 | 0.645949 | 0.383093 | 0.7064 |
| LOG(EXTR) | -0.053094 | 0.095851 | -0.553921 | 0.5868 |
| INFR | 0.001036 | 0.001175 | 0.881360 | 0.3904 |
| UEMR | -0.000826 | 0.022951 | -0.035982 | 0.9717 |
| LOG(EXCR) | 0.238939 | 0.186293 | 1.282593 | 0.2168 |
| C | -0.827198 | 16.07281 | -0.051466 | 0.9596 |
| RESID(-1) | -0.489233 | 0.298066 | -1.641360 | 0.1191 |
| RESID(-2) | -0.517848 | 0.344772 | -1.501999 | 0.1514 |

| | | | |
|---|---|---|---|
| R-squared | 0.171398 | Mean dependent var | 1.14E-15 |
| Adjusted R-squared | -0.316014 | S.D. dependent var | 0.079607 |
| S.E. of regression | 0.091323 | Akaike info criterion | -1.662098 |
| Sum squared resid | 0.141779 | Schwarz criterion | -1.138732 |
| Log likelihood | 34.26938 | Hannan-Quinn criter. | -1.502100 |
| F-statistic | 0.351649 | Durbin-Watson stat | 2.008086 |
| Prob(F-statistic) | 0.951731 | | |

VEN SERIAL CORRE EQN 1 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.596031 | Prob. F(2,15) | 0.5635 |
| Obs*R-squared | 2.061366 | Prob. Chi-Square(2) | 0.3568 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/11/18 Time: 23:25
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | 0.055840 | 0.133895 | 0.417045 | 0.6826 |
| LOG(AREV) | -0.142319 | 0.193064 | -0.737158 | 0.4724 |
| LOG(GDP) | 0.174867 | 0.684874 | 0.255327 | 0.8019 |
| LOG(GDP(-1)) | -0.238593 | 0.732496 | -0.325726 | 0.7491 |
| LOG(EXTR) | -0.077566 | 0.121055 | -0.640751 | 0.5314 |
| INFR | 0.000127 | 0.001029 | 0.123545 | 0.9033 |
| UEMR | -0.015203 | 0.028996 | -0.524307 | 0.6077 |
| UEMR(-1) | 0.002218 | 0.028452 | 0.077947 | 0.9389 |
| LOG(EXCR) | 0.139522 | 0.194452 | 0.717513 | 0.4841 |
| OILD | -0.046234 | 0.065635 | -0.704412 | 0.4920 |
| C | 5.801116 | 22.79977 | 0.254438 | 0.8026 |
| RESID(-1) | -0.485067 | 0.444383 | -1.091551 | 0.2923 |
| RESID(-2) | -0.099838 | 0.333974 | -0.298941 | 0.7691 |

| | | | |
|---|---|---|---|
| R-squared | 0.073620 | Mean dependent var | 6.85E-15 |
| Adjusted R-squared | -0.667484 | S.D. dependent var | 0.070794 |
| S.E. of regression | 0.091418 | Akaike info criterion | -1.642340 |
| Sum squared resid | 0.125358 | Schwarz criterion | -1.023816 |
| Log likelihood | 35.99276 | Hannan-Quinn criter. | -1.453251 |
| F-statistic | 0.099339 | Durbin-Watson stat | 1.826936 |
| Prob(F-statistic) | 0.999867 | | |

## *Appendix E22: Venezuela Serial Correlation Model 2*

VEN SERIAL CORRE EQN 2 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.813786 | Prob. F(2,14) | 0.4631 |
| Obs*R-squared | 2.916130 | Prob. Chi-Square(2) | 0.2327 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 20:57
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | 0.215124 | 0.413966 | 0.519666 | 0.6114 |
| LOG(AEXP) | -0.058689 | 0.295819 | -0.198394 | 0.8456 |
| LOG(AEXP(-1)) | -0.184087 | 0.453736 | -0.405715 | 0.6911 |
| LOG(GDP) | -0.041719 | 0.835848 | -0.049912 | 0.9609 |
| LOG(EXTR) | -0.140163 | 0.217015 | -0.645868 | 0.5288 |
| LOG(EXTR(-1)) | 0.103059 | 0.186189 | 0.553521 | 0.5886 |
| INFR | 0.000551 | 0.001774 | 0.310531 | 0.7607 |
| UEMR | 0.000467 | 0.030262 | 0.015431 | 0.9879 |
| LOG(EXCR) | -0.057039 | 0.189404 | -0.301150 | 0.7677 |
| OILD | -0.044135 | 0.081343 | -0.542576 | 0.5960 |
| C | 2.343728 | 19.39417 | 0.120847 | 0.9055 |
| @TREND | 0.023348 | 0.070407 | 0.331621 | 0.7451 |
| RESID(-1) | -0.223464 | 0.465051 | -0.480514 | 0.6383 |
| RESID(-2) | -0.477333 | 0.378780 | -1.260184 | 0.2282 |

| | | | |
|---|---|---|---|
| R-squared | 0.104148 | Mean dependent var | -1.83E-16 |
| Adjusted R-squared | -0.727716 | S.D. dependent var | 0.069543 |
| S.E. of regression | 0.091409 | Akaike info criterion | -1.640086 |
| Sum squared resid | 0.116979 | Schwarz criterion | -0.973984 |
| Log likelihood | 36.96121 | Hannan-Quinn criter. | -1.436452 |
| F-statistic | 0.125198 | Durbin-Watson stat | 2.316542 |
| Prob(F-statistic) | 0.999703 | | |

VEN SERIAL CORRE EQN 2
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 2.002163 | Prob. F(2,15) | 0.1695 |
| Obs*R-squared | 5.899770 | Prob. Chi-Square(2) | 0.0523 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 16:20
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | 0.263741 | 0.216492 | 1.218251 | 0.2419 |
| LOG(AEXP) | 0.055679 | 0.178729 | 0.311527 | 0.7597 |
| LOG(AEXP(-1)) | -0.207168 | 0.218201 | -0.949435 | 0.3574 |
| LOG(OILP) | 0.020327 | 0.104893 | 0.193787 | 0.8489 |
| LOG(OILP(-1)) | -0.004276 | 0.098734 | -0.043312 | 0.9660 |
| LOG(GDP) | 0.240428 | 0.602310 | 0.399176 | 0.6954 |
| LOG(EXTR) | -0.043690 | 0.112371 | -0.388805 | 0.7029 |
| INFR | 0.000588 | 0.000942 | 0.624647 | 0.5416 |
| UEMR | 0.019180 | 0.027195 | 0.705274 | 0.4914 |
| LOG(EXCR) | -0.184248 | 0.158042 | -1.165817 | 0.2619 |
| C | -8.337307 | 16.69181 | -0.499485 | 0.6247 |
| RESID(-1) | -0.816720 | 0.516286 | -1.581914 | 0.1345 |
| RESID(-2) | -0.579386 | 0.355276 | -1.630804 | 0.1237 |

| | | | |
|---|---|---|---|
| R-squared | 0.210706 | Mean dependent var | -2.63E-15 |
| Adjusted R-squared | -0.420729 | S.D. dependent var | 0.065969 |
| S.E. of regression | 0.078632 | Akaike info criterion | -1.943665 |
| Sum squared resid | 0.092744 | Schwarz criterion | -1.325142 |
| Log likelihood | 40.21132 | Hannan-Quinn criter. | -1.754577 |
| F-statistic | 0.333694 | Durbin-Watson stat | 2.057224 |
| Prob(F-statistic) | 0.968973 | | |

## Appendix E23: Venezuela Serial Correlation Model 3

VEN SERIAL CORRE EQN 3
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.861298 | Prob. F(2,14) | 0.4438 |
| Obs*R-squared | 3.067731 | Prob. Chi-Square(2) | 0.2157 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/23/18 Time: 23:42
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | 0.001931 | 0.086641 | 0.022290 | 0.9825 |
| LOG(AEXP) | 0.012135 | 0.070977 | 0.170965 | 0.8667 |
| LOG(AEXP(-1)) | 0.000769 | 0.036434 | 0.021115 | 0.9835 |
| LOG(OILP) | -0.013044 | 0.031018 | -0.420526 | 0.6805 |
| LOG(AREV) | -0.020323 | 0.063475 | -0.320173 | 0.7536 |
| LOG(EXTR) | 0.000770 | 0.036641 | 0.021005 | 0.9835 |
| LOG(EXTR(-1)) | -0.030606 | 0.044460 | -0.688407 | 0.5024 |
| INFR | -0.000190 | 0.000308 | -0.617614 | 0.5467 |
| UEMR | -0.004062 | 0.005516 | -0.736407 | 0.4736 |
| LOG(EXCR) | 0.024316 | 0.042363 | 0.573999 | 0.5751 |
| C | 0.945560 | 2.682324 | 0.352515 | 0.7297 |
| @TREND | -0.000843 | 0.012130 | -0.069475 | 0.9456 |
| RESID(-1) | -0.088614 | 0.319443 | -0.277402 | 0.7855 |
| RESID(-2) | -0.540462 | 0.414132 | -1.305046 | 0.2129 |

| | | | |
|---|---|---|---|
| R-squared | 0.109562 | Mean dependent var | 9.24E-15 |
| Adjusted R-squared | -0.717274 | S.D. dependent var | 0.016934 |
| S.E. of regression | 0.022191 | Akaike info criterion | -4.471451 |
| Sum squared resid | 0.006894 | Schwarz criterion | -3.805348 |
| Log likelihood | 76.60031 | Hannan-Quinn criter. | -4.267817 |
| F-statistic | 0.132507 | Durbin-Watson stat | 2.101852 |
| Prob(F-statistic) | 0.999599 | | |

VEN SERIAL CORRE EQN 3 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 2.058238 | Prob. F(2,16) | 0.1602 |
| Obs*R-squared | 5.729699 | Prob. Chi-Square(2) | 0.0570 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/25/18 Time: 23:07
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | -0.024944 | 0.106526 | -0.234159 | 0.8178 |
| LOG(AEXP) | 0.023748 | 0.059811 | 0.397052 | 0.6966 |
| LOG(AREV) | -0.018359 | 0.059791 | -0.307055 | 0.7628 |
| LOG(EXTR) | 0.003699 | 0.038608 | 0.095814 | 0.9249 |
| LOG(EXTR(-1)) | -0.020606 | 0.041615 | -0.495161 | 0.6272 |
| INFR | -0.000135 | 0.000246 | -0.549170 | 0.5905 |
| UEMR | -0.000730 | 0.004888 | -0.149319 | 0.8832 |
| LOG(EXCR) | -0.002967 | 0.043511 | -0.068190 | 0.9465 |
| OILD | -4.09E-05 | 0.018516 | -0.002212 | 0.9983 |
| C | 0.938290 | 2.693442 | 0.348361 | 0.7321 |
| RESID(-1) | 0.298569 | 0.381086 | 0.783467 | 0.4448 |
| RESID(-2) | -0.460346 | 0.291306 | -1.580284 | 0.1336 |

| | | | |
|---|---|---|---|
| R-squared | 0.204632 | Mean dependent var | 1.27E-15 |
| Adjusted R-squared | -0.342183 | S.D. dependent var | 0.022359 |
| S.E. of regression | 0.025904 | Akaike info criterion | -4.171334 |
| Sum squared resid | 0.010736 | Schwarz criterion | -3.600389 |
| Log likelihood | 70.39867 | Hannan-Quinn criter. | -3.996790 |
| F-statistic | 0.374225 | Durbin-Watson stat | 1.944878 |
| Prob(F-statistic) | 0.948224 | | |

## *Appendix E24: Venezuela Serial Correlation Model 4*

VEN SERIAL CORRE EQN 4
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 2.115746 | Prob. F(2,16) | 0.1530 |
| Obs*R-squared | 5.856305 | Prob. Chi-Square(2) | 0.0535 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 16:49
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | 0.120996 | 0.190372 | 0.635578 | 0.5340 |
| LOG(AEXP) | 0.078433 | 0.181617 | 0.431858 | 0.6716 |
| LOG(OILP) | 0.061977 | 0.145472 | 0.426038 | 0.6758 |
| LOG(AREV) | -0.258756 | 0.299406 | -0.864232 | 0.4002 |
| LOG(GDP) | 0.728269 | 0.916112 | 0.794956 | 0.4383 |
| INFR | 0.001907 | 0.002375 | 0.803029 | 0.4337 |
| UEMR | 0.030163 | 0.034555 | 0.872901 | 0.3956 |
| LOG(EXCR) | 0.078398 | 0.183967 | 0.426154 | 0.6757 |
| LOG(EXCR(-1)) | 0.054808 | 0.208857 | 0.262419 | 0.7963 |
| C | -18.35597 | 22.24042 | -0.825343 | 0.4213 |
| RESID(-1) | -0.601652 | 0.308512 | -1.950172 | 0.0689 |
| RESID(-2) | -0.304560 | 0.267935 | -1.136696 | 0.2724 |

| | | | |
|---|---|---|---|
| R-squared | 0.209154 | Mean dependent var | -9.65E-15 |
| Adjusted R-squared | -0.334553 | S.D. dependent var | 0.102347 |
| S.E. of regression | 0.118234 | Akaike info criterion | -1.134779 |
| Sum squared resid | 0.223668 | Schwarz criterion | -0.563834 |
| Log likelihood | 27.88690 | Hannan-Quinn criter. | -0.960235 |
| F-statistic | 0.384681 | Durbin-Watson stat | 2.072001 |
| Prob(F-statistic) | 0.943401 | | |

VEN SERIAL CORRE EQN 4 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.775951 | Prob. F(2,9) | 0.4888 |
| Obs*R-squared | 3.970976 | Prob. Chi-Square(2) | 0.1373 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/25/18 Time: 23:15
Sample: 1990 2016
Included observations: 27
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | 0.444647 | 0.553411 | 0.803466 | 0.4424 |
| LOG(EXTR(-2)) | -0.264398 | 0.585951 | -0.451230 | 0.6625 |
| LOG(AEXP) | 0.064079 | 0.432285 | 0.148234 | 0.8854 |
| LOG(AEXP(-1)) | 0.376971 | 0.525503 | 0.717353 | 0.4914 |
| LOG(AREV) | 0.058623 | 0.431064 | 0.135997 | 0.8948 |
| LOG(AREV(-1)) | -0.505449 | 0.614235 | -0.822892 | 0.4318 |
| LOG(GDP) | -0.729596 | 1.638278 | -0.445343 | 0.6666 |
| LOG(GDP(-1)) | 1.110848 | 2.508610 | 0.442814 | 0.6684 |
| INFR | -0.000780 | 0.002411 | -0.323690 | 0.7536 |
| INFR(-1) | 0.001462 | 0.002828 | 0.517005 | 0.6176 |
| UEMR | -0.015338 | 0.058782 | -0.260932 | 0.8000 |
| UEMR(-1) | 0.048033 | 0.077090 | 0.623073 | 0.5487 |
| LOG(EXCR) | -0.094621 | 0.354541 | -0.266883 | 0.7956 |
| LOG(EXCR(-1)) | 0.012456 | 0.347054 | 0.035889 | 0.9722 |
| OILD | 0.013802 | 0.163843 | 0.084239 | 0.9347 |
| C | -14.67859 | 58.78659 | -0.249693 | 0.8084 |
| RESID(-1) | -0.691082 | 0.559305 | -1.235608 | 0.2479 |
| RESID(-2) | -0.074258 | 0.596276 | -0.124537 | 0.9036 |

| | | | |
|---|---|---|---|
| R-squared | 0.147073 | Mean dependent var | -2.11E-14 |
| Adjusted R-squared | -1.464011 | S.D. dependent var | 0.099829 |
| S.E. of regression | 0.156703 | Akaike info criterion | -0.634206 |
| Sum squared resid | 0.221003 | Schwarz criterion | 0.229686 |
| Log likelihood | 26.56178 | Hannan-Quinn criter. | -0.377325 |
| F-statistic | 0.091288 | Durbin-Watson stat | 2.243524 |
| Prob(F-statistic) | 0.999982 | | |

## *Appendix E25: Venezuela Serial Correlation Model 5*

VEN SERIAL CORRE EQN 5
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.929806 | Prob. F(2,17) | 0.1757 |
| Obs*R-squared | 5.180784 | Prob. Chi-Square(2) | 0.0750 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/24/18 Time: 02:08
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| INFR(-1) | 0.001732 | 0.188769 | 0.009175 | 0.9928 |
| LOG(AEXP) | 23.14016 | 36.72252 | 0.630135 | 0.5370 |
| LOG(OILP) | -1.788603 | 14.77406 | -0.121064 | 0.9051 |
| LOG(AREV) | -25.23723 | 34.42420 | -0.733125 | 0.4735 |
| LOG(AREV(-1)) | 3.217750 | 19.04153 | 0.168986 | 0.8678 |
| LOG(GDP) | -57.26557 | 113.7284 | -0.503529 | 0.6211 |
| LOG(EXTR) | 18.00669 | 22.27472 | 0.808391 | 0.4300 |
| UEMR | -1.047238 | 3.877389 | -0.270088 | 0.7903 |
| C | 1078.428 | 2859.907 | 0.377085 | 0.7108 |
| RESID(-1) | 0.000646 | 0.295042 | 0.002190 | 0.9983 |
| RESID(-2) | -0.598213 | 0.305030 | -1.961165 | 0.0665 |

| | | | |
|---|---|---|---|
| R-squared | 0.185028 | Mean dependent var | 1.56E-12 |
| Adjusted R-squared | -0.294367 | S.D. dependent var | 14.60170 |
| S.E. of regression | 16.61239 | Akaike info criterion | 8.744898 |
| Sum squared resid | 4691.515 | Schwarz criterion | 9.268264 |
| Log likelihood | -111.4286 | Hannan-Quinn criter. | 8.904896 |
| F-statistic | 0.385961 | Durbin-Watson stat | 1.912257 |
| Prob(F-statistic) | 0.935706 | | |

VEN SERIAL CORRE EQN 5 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.538781 | Prob. F(2,13) | 0.2513 |
| Obs*R-squared | 5.168331 | Prob. Chi-Square(2) | 0.0755 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 21:25
Sample: 1990 2016
Included observations: 27
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| INFR(-1) | 0.146215 | 0.226977 | 0.644185 | 0.5307 |
| LOG(AEXP) | 4.183321 | 26.34573 | 0.158786 | 0.8763 |
| LOG(AREV) | -8.756672 | 32.47442 | -0.269648 | 0.7917 |
| LOG(GDP) | -42.83103 | 95.94389 | -0.446418 | 0.6626 |
| LOG(EXTR) | 17.00592 | 24.80072 | 0.685703 | 0.5049 |
| LOG(EXTR(-1)) | -6.008310 | 27.85595 | -0.215692 | 0.8326 |
| UEMR | -1.096234 | 3.498085 | -0.313381 | 0.7590 |
| LOG(EXCR) | 6.205025 | 21.06943 | 0.294504 | 0.7730 |
| LOG(EXCR(-1)) | -2.741109 | 19.17612 | -0.142944 | 0.8885 |
| LOG(EXCR(-2)) | 6.236719 | 20.54102 | 0.303623 | 0.7662 |
| OILD | 2.945963 | 7.318529 | 0.402535 | 0.6938 |
| C | 993.0882 | 2377.142 | 0.417766 | 0.6829 |
| RESID(-1) | 0.104021 | 0.320193 | 0.324869 | 0.7504 |
| RESID(-2) | -0.623702 | 0.368275 | -1.693574 | 0.1142 |

| | | | |
|---|---|---|---|
| R-squared | 0.191420 | Mean dependent var | -9.43E-13 |
| Adjusted R-squared | -0.617161 | S.D. dependent var | 9.218779 |
| S.E. of regression | 11.72330 | Akaike info criterion | 8.067184 |
| Sum squared resid | 1786.666 | Schwarz criterion | 8.739099 |
| Log likelihood | -94.90698 | Hannan-Quinn criter. | 8.266979 |
| F-statistic | 0.236735 | Durbin-Watson stat | 1.822633 |
| Prob(F-statistic) | 0.992878 | | |

## *Appendix E26: Venezuela Serial Correlation Model 6*

VEN SERIAL CORRE EQN 6
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.101180 | Prob. F(2,14) | 0.3596 |
| Obs*R-squared | 3.805992 | Prob. Chi-Square(2) | 0.1491 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 17:01
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| UEMR(-1) | 0.080764 | 0.183716 | 0.439613 | 0.6669 |
| LOG(AEXP) | 0.177760 | 2.507899 | 0.070880 | 0.9445 |
| LOG(AEXP(-1)) | -0.269867 | 1.513058 | -0.178359 | 0.8610 |
| LOG(OILP) | -0.300353 | 1.218332 | -0.246528 | 0.8089 |
| LOG(AREV) | -0.450127 | 2.143958 | -0.209951 | 0.8367 |
| LOG(GDP) | 2.472155 | 5.332484 | 0.463605 | 0.6501 |
| LOG(EXTR) | -0.122233 | 0.963508 | -0.126863 | 0.9009 |
| INFR | -0.001950 | 0.012929 | -0.150785 | 0.8823 |
| LOG(EXCR) | 0.746726 | 1.302404 | 0.573344 | 0.5755 |
| LOG(EXCR(-1)) | -0.665682 | 1.970761 | -0.337779 | 0.7405 |
| C | -51.14853 | 124.6087 | -0.410473 | 0.6877 |
| @TREND | 0.129366 | 0.505015 | 0.256162 | 0.8016 |
| RESID(-1) | -0.248914 | 0.347693 | -0.715902 | 0.4858 |
| RESID(-2) | -0.414119 | 0.289632 | -1.429809 | 0.1747 |

| | | | |
|---|---|---|---|
| R-squared | 0.135928 | Mean dependent var | -1.64E-13 |
| Adjusted R-squared | -0.666424 | S.D. dependent var | 0.592919 |
| S.E. of regression | 0.765400 | Akaike info criterion | 2.610016 |
| Sum squared resid | 8.201720 | Schwarz criterion | 3.276119 |
| Log likelihood | -22.54023 | Hannan-Quinn criter. | 2.813651 |
| F-statistic | 0.169412 | Durbin-Watson stat | 2.128759 |
| Prob(F-statistic) | 0.998601 | | |

VEN SERIAL CORRE EQN 6 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.556706 | Prob. F(2,16) | 0.5838 |
| Obs*R-squared | 1.821701 | Prob. Chi-Square(2) | 0.4022 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/11/18 Time: 23:42
Sample: 1989 2016
Included observations: 28
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| UEMR(-1) | 0.015209 | 0.137353 | 0.110727 | 0.9132 |
| LOG(AEXP) | 0.317088 | 1.566533 | 0.202414 | 0.8421 |
| LOG(AREV) | -0.300986 | 1.890056 | -0.159247 | 0.8755 |
| LOG(AREV(-1)) | -0.277448 | 0.901011 | -0.307930 | 0.7621 |
| LOG(GDP) | 0.638849 | 4.293748 | 0.148786 | 0.8836 |
| LOG(EXTR) | -0.141833 | 0.841844 | -0.168479 | 0.8683 |
| INFR | -0.002061 | 0.008439 | -0.244216 | 0.8102 |
| LOG(EXCR) | 0.331751 | 1.020790 | 0.324994 | 0.7494 |
| OILD | 0.045053 | 0.433154 | 0.104011 | 0.9185 |
| C | -7.377106 | 95.19491 | -0.077495 | 0.9392 |
| RESID(-1) | -0.098683 | 0.290468 | -0.339739 | 0.7385 |
| RESID(-2) | -0.302443 | 0.290484 | -1.041168 | 0.3133 |

| | | | |
|---|---|---|---|
| R-squared | 0.065061 | Mean dependent var | -9.34E-14 |
| Adjusted R-squared | -0.577710 | S.D. dependent var | 0.599126 |
| S.E. of regression | 0.752543 | Akaike info criterion | 2.566811 |
| Sum squared resid | 9.061142 | Schwarz criterion | 3.137755 |
| Log likelihood | -23.93535 | Hannan-Quinn criter. | 2.741354 |
| F-statistic | 0.101219 | Durbin-Watson stat | 1.921144 |
| Prob(F-statistic) | 0.999764 | | |

## Appendix E3: Serial Correlation for Norway

### *Appendix E31: Norway Serial Correlation Model 1*

NOR SERIAL CORRE EQN 1
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.605685 | Prob. F(2,7) | 0.5720 |
| Obs*R-squared | 5.015799 | Prob. Chi-Square(2) | 0.0814 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/24/18 Time: 19:26
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | 0.302424 | 0.551851 | 0.548018 | 0.6007 |
| LOG(AEXP(-2)) | 0.015308 | 0.337487 | 0.045358 | 0.9651 |
| LOG(AREV) | 0.155055 | 0.341923 | 0.453480 | 0.6639 |
| LOG(AREV(-1)) | -0.173845 | 0.303538 | -0.572727 | 0.5847 |
| LOG(AREV(-2)) | -0.073665 | 0.224880 | -0.327529 | 0.7528 |
| LOG(OILP) | -0.027947 | 0.087050 | -0.321046 | 0.7575 |
| LOG(OILP(-1)) | 0.038928 | 0.064787 | 0.600856 | 0.5669 |
| LOG(OILP(-2)) | 0.047693 | 0.079533 | 0.599659 | 0.5676 |
| LOG(GDP) | 0.242049 | 1.232582 | 0.196376 | 0.8499 |
| LOG(GDP(-1)) | 0.088810 | 1.250355 | 0.071028 | 0.9454 |
| LOG(GDP(-2)) | 0.253780 | 0.774939 | 0.327484 | 0.7529 |
| LOG(EXTR) | 0.016642 | 0.045699 | 0.364163 | 0.7265 |
| LOG(EXTR(-1)) | -0.002165 | 0.058956 | -0.036728 | 0.9717 |
| LOG(EXTR(-2)) | -0.017383 | 0.067586 | -0.257204 | 0.8044 |
| INFR | 0.005766 | 0.011589 | 0.497559 | 0.6340 |
| INFR(-1) | 0.001553 | 0.010598 | 0.146550 | 0.8876 |
| INFR(-2) | 0.002879 | 0.009228 | 0.311993 | 0.7641 |
| UEMR | 0.010503 | 0.016367 | 0.641721 | 0.5415 |
| UEMR(-1) | 0.006105 | 0.015167 | 0.402500 | 0.6993 |
| UEMR(-2) | -0.003525 | 0.015158 | -0.232543 | 0.8228 |
| LOG(EXCR) | -0.024157 | 0.147650 | -0.163609 | 0.8747 |
| LOG(EXCR(-1)) | 0.066004 | 0.131351 | 0.502501 | 0.6307 |
| LOG(EXCR(-2)) | -0.025094 | 0.100738 | -0.249096 | 0.8104 |
| C | -21.33461 | 32.62378 | -0.653959 | 0.5340 |
| @TREND | -0.028274 | 0.044169 | -0.640126 | 0.5425 |
| RESID(-1) | -0.588834 | 0.671652 | -0.876695 | 0.4097 |
| RESID(-2) | -0.689852 | 0.732206 | -0.942156 | 0.3775 |

| | | | |
|---|---|---|---|
| R-squared | 0.147524 | Mean dependent var | 2.70E-15 |
| Adjusted R-squared | -3.018818 | S.D. dependent var | 0.010997 |
| S.E. of regression | 0.022045 | Akaike info criterion | -4.783643 |
| Sum squared resid | 0.003402 | Schwarz criterion | -3.571533 |
| Log likelihood | 108.3219 | Hannan-Quinn criter. | -4.370279 |
| F-statistic | 0.046591 | Durbin-Watson stat | 2.204356 |
| Prob(F-statistic) | 1.000000 | | |

NOR SERIAL CORRE EQN 1 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.922608 | Prob. F(2,20) | 0.4137 |
| Obs*R-squared | 2.871904 | Prob. Chi-Square(2) | 0.2379 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 21:47
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP(-1)) | 0.056649 | 0.122362 | 0.462958 | 0.6484 |
| LOG(AREV) | -0.089311 | 0.129596 | -0.689147 | 0.4986 |
| LOG(AREV(-1)) | 0.054930 | 0.140061 | 0.392188 | 0.6991 |
| LOG(AREV(-2)) | -0.043224 | 0.109767 | -0.393777 | 0.6979 |
| LOG(GDP) | 0.068370 | 0.208789 | 0.327460 | 0.7467 |
| LOG(EXTR) | 0.010080 | 0.035650 | 0.282756 | 0.7803 |
| INFR | 0.004380 | 0.006324 | 0.692653 | 0.4965 |
| UEMR | 0.003732 | 0.010479 | 0.356126 | 0.7255 |
| UEMR(-1) | -0.001640 | 0.010308 | -0.159064 | 0.8752 |
| LOG(EXCR) | -2.33E-05 | 0.052245 | -0.000447 | 0.9996 |
| OILD | -0.003496 | 0.015381 | -0.227274 | 0.8225 |
| C | -1.495610 | 3.548421 | -0.421486 | 0.6779 |
| RESID(-1) | -0.277666 | 0.290171 | -0.956903 | 0.3500 |
| RESID(-2) | -0.350024 | 0.278768 | -1.255610 | 0.2237 |

| | | | |
|---|---|---|---|
| R-squared | 0.084468 | Mean dependent var | 5.64E-15 |
| Adjusted R-squared | -0.510628 | S.D. dependent var | 0.021178 |
| S.E. of regression | 0.026030 | Akaike info criterion | -4.166238 |
| Sum squared resid | 0.013551 | Schwarz criterion | -3.537737 |
| Log likelihood | 84.82604 | Hannan-Quinn criter. | -3.951901 |
| F-statistic | 0.141940 | Durbin-Watson stat | 1.988957 |
| Prob(F-statistic) | 0.999591 | | |

## *Appendix E32: Norway Serial Correlation Model 2*

NOR SERIAL CORRE EQN 2
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.176184 | Prob. F(2,20) | 0.8398 |
| Obs*R-squared | 0.588654 | Prob. Chi-Square(2) | 0.7450 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/11/18 Time: 01:13
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | 0.032920 | 0.142822 | 0.230499 | 0.8200 |
| LOG(AREV(-2)) | -0.019837 | 0.123639 | -0.160441 | 0.8741 |
| LOG(AEXP) | 0.005188 | 0.082555 | 0.062838 | 0.9505 |
| LOG(OILP) | 0.002433 | 0.017577 | 0.138392 | 0.8913 |
| LOG(OILP(-1)) | -0.007906 | 0.036204 | -0.218375 | 0.8293 |
| LOG(OILP(-2)) | 0.002667 | 0.024635 | 0.108280 | 0.9149 |
| LOG(GDP) | -0.035079 | 0.173331 | -0.202381 | 0.8417 |
| LOG(EXTR) | -0.003578 | 0.026954 | -0.132735 | 0.8957 |
| INFR | -0.000417 | 0.004482 | -0.093116 | 0.9267 |
| UEMR | -0.000851 | 0.006693 | -0.127203 | 0.9000 |
| LOG(EXCR) | -0.006437 | 0.039447 | -0.163191 | 0.8720 |
| C | 0.545887 | 2.744435 | 0.198907 | 0.8443 |
| RESID(-1) | -0.125656 | 0.306846 | -0.409508 | 0.6865 |
| RESID(-2) | -0.123246 | 0.267222 | -0.461212 | 0.6496 |

| | | | |
|---|---|---|---|
| R-squared | 0.017313 | Mean dependent var | -3.29E-15 |
| Adjusted R-squared | -0.621433 | S.D. dependent var | 0.015742 |
| S.E. of regression | 0.020045 | Akaike info criterion | -4.688734 |
| Sum squared resid | 0.008036 | Schwarz criterion | -4.060233 |
| Log likelihood | 93.70849 | Hannan-Quinn criter. | -4.474397 |
| F-statistic | 0.027105 | Durbin-Watson stat | 2.017354 |
| Prob(F-statistic) | 1.000000 | | |

NOR SERIAL CORRE EQN 2 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.364373 | Prob. F(2,18) | 0.6996 |
| Obs*R-squared | 1.322961 | Prob. Chi-Square(2) | 0.5161 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/26/18 Time: 02:00
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV(-1)) | 0.036408 | 0.154622 | 0.235463 | 0.8165 |
| LOG(AREV(-2)) | -0.006860 | 0.147381 | -0.046544 | 0.9634 |
| LOG(AEXP) | -0.011997 | 0.150104 | -0.079922 | 0.9372 |
| LOG(GDP) | -0.021179 | 0.280157 | -0.075598 | 0.9406 |
| LOG(EXTR) | 0.010472 | 0.051834 | 0.202036 | 0.8422 |
| LOG(EXTR(-1)) | -0.015146 | 0.062858 | -0.240953 | 0.8123 |
| LOG(EXTR(-2)) | -0.005638 | 0.058023 | -0.097175 | 0.9237 |
| INFR | 0.000450 | 0.008923 | 0.050459 | 0.9603 |
| UEMR | 0.000427 | 0.011321 | 0.037756 | 0.9703 |
| LOG(EXCR) | -0.028942 | 0.112389 | -0.257515 | 0.7997 |
| LOG(EXCR(-1)) | 0.024294 | 0.119963 | 0.202517 | 0.8418 |
| LOG(EXCR(-2)) | -0.007521 | 0.088437 | -0.085042 | 0.9332 |
| OILD | -0.000350 | 0.018357 | -0.019067 | 0.9850 |
| C | 0.349834 | 4.788270 | 0.073061 | 0.9426 |
| RESID(-1) | -0.148138 | 0.285151 | -0.519507 | 0.6097 |
| RESID(-2) | -0.201762 | 0.284793 | -0.708450 | 0.4877 |

| | | | |
|---|---|---|---|
| R-squared | 0.038911 | Mean dependent var | -5.64E-15 |
| Adjusted R-squared | -0.761997 | S.D. dependent var | 0.025402 |
| S.E. of regression | 0.033719 | Akaike info criterion | -3.636349 |
| Sum squared resid | 0.020465 | Schwarz criterion | -2.918061 |
| Log likelihood | 77.81793 | Hannan-Quinn criter. | -3.391392 |
| F-statistic | 0.048583 | Durbin-Watson stat | 2.051249 |
| Prob(F-statistic) | 1.000000 | | |

## *Appendix E33: Norway Serial Correlation Model 3*

NOR SERIAL CORRE EQN 3
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.433368 | Prob. F(2,16) | 0.2675 |
| Obs*R-squared | 5.166183 | Prob. Chi-Square(2) | 0.0755 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/24/18 Time: 19:52
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | 0.070991 | 0.125602 | 0.565203 | 0.5798 |
| LOG(GDP(-2)) | -0.019071 | 0.098015 | -0.194571 | 0.8482 |
| LOG(AEXP) | 0.009367 | 0.043499 | 0.215331 | 0.8322 |
| LOG(AEXP(-1)) | 0.003012 | 0.040999 | 0.073453 | 0.9424 |
| LOG(OILP) | 0.005119 | 0.011959 | 0.428079 | 0.6743 |
| LOG(OILP(-1)) | 1.21E-05 | 0.005853 | 0.002062 | 0.9984 |
| LOG(AREV) | -0.034183 | 0.047387 | -0.721361 | 0.4811 |
| LOG(EXTR) | -0.000965 | 0.008271 | -0.116689 | 0.9086 |
| LOG(EXTR(-1)) | 0.004610 | 0.010932 | 0.421714 | 0.6788 |
| INFR | 1.37E-05 | 0.001314 | 0.010449 | 0.9918 |
| UEMR | 0.000160 | 0.002094 | 0.076429 | 0.9400 |
| UEMR(-1) | 0.000305 | 0.002300 | 0.132533 | 0.8962 |
| UEMR(-2) | -0.000497 | 0.001978 | -0.251317 | 0.8048 |
| LOG(EXCR) | 0.008265 | 0.019595 | 0.421801 | 0.6788 |
| C | -0.896415 | 1.922213 | -0.466345 | 0.6473 |
| @TREND | -0.000280 | 0.002637 | -0.106201 | 0.9167 |
| RESID(-1) | -0.461313 | 0.293552 | -1.571486 | 0.1356 |
| RESID(-2) | -0.307485 | 0.276081 | -1.113749 | 0.2818 |

| | | | |
|---|---|---|---|
| R-squared | 0.151947 | Mean dependent var | 7.38E-15 |
| Adjusted R-squared | -0.749110 | S.D. dependent var | 0.003965 |
| S.E. of regression | 0.005244 | Akaike info criterion | -7.358367 |
| Sum squared resid | 0.000440 | Schwarz criterion | -6.550294 |
| Log likelihood | 143.0922 | Hannan-Quinn criter. | -7.082791 |
| F-statistic | 0.168631 | Durbin-Watson stat | 2.178512 |
| Prob(F-statistic) | 0.999654 | | |

NOR SERIAL CORRE EQN 3 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.563845 | Prob. F(2,18) | 0.5787 |
| Obs*R-squared | 2.004501 | Prob. Chi-Square(2) | 0.3671 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/26/18 Time: 02:15
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(GDP(-1)) | 0.014434 | 0.052377 | 0.275588 | 0.7860 |
| LOG(AEXP) | 0.004029 | 0.042098 | 0.095708 | 0.9248 |
| LOG(AEXP(-1)) | -0.003451 | 0.043391 | -0.079533 | 0.9375 |
| LOG(AREV) | -0.008564 | 0.023892 | -0.358443 | 0.7242 |
| LOG(EXTR) | 0.000306 | 0.009174 | 0.033351 | 0.9738 |
| LOG(EXTR(-1)) | 0.001374 | 0.009974 | 0.137756 | 0.8920 |
| INFR | -9.32E-06 | 0.001453 | -0.006412 | 0.9950 |
| UEMR | -9.67E-05 | 0.002401 | -0.040258 | 0.9683 |
| UEMR(-1) | 0.000204 | 0.002582 | 0.079138 | 0.9378 |
| UEMR(-2) | -0.000325 | 0.001939 | -0.167553 | 0.8688 |
| LOG(EXCR) | 0.002297 | 0.013486 | 0.170365 | 0.8666 |
| OILD | 0.000620 | 0.003675 | 0.168612 | 0.8680 |
| C | -0.210661 | 1.021108 | -0.206306 | 0.8389 |
| @TREND | 7.59E-05 | 0.001919 | 0.039543 | 0.9689 |
| RESID(-1) | -0.234208 | 0.269573 | -0.868813 | 0.3964 |
| RESID(-2) | -0.220339 | 0.277560 | -0.793842 | 0.4376 |

| | | | |
|---|---|---|---|
| R-squared | 0.058956 | Mean dependent var | -3.85E-15 |
| Adjusted R-squared | -0.725248 | S.D. dependent var | 0.004492 |
| S.E. of regression | 0.005900 | Akaike info criterion | -7.122462 |
| Sum squared resid | 0.000627 | Schwarz criterion | -6.404175 |
| Log likelihood | 137.0819 | Hannan-Quinn criter. | -6.877506 |
| F-statistic | 0.075179 | Durbin-Watson stat | 1.988185 |
| Prob(F-statistic) | 0.999996 | | |

## *Appendix E34: Norway Serial Correlation Model 4*

NOR SERIAL CORRE EQN 4
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.257831 | Prob. F(2,17) | 0.3094 |
| Obs*R-squared | 4.382764 | Prob. Chi-Square(2) | 0.1118 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/24/18 Time: 20:24
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | -0.095018 | 0.313976 | -0.302629 | 0.7658 |
| LOG(AEXP) | -0.366656 | 1.241959 | -0.295224 | 0.7714 |
| LOG(OILP) | -0.088962 | 0.230708 | -0.385604 | 0.7046 |
| LOG(AREV) | -0.010176 | 1.171338 | -0.008688 | 0.9932 |
| LOG(AREV(-1)) | 0.344827 | 0.654371 | 0.526960 | 0.6050 |
| LOG(AREV(-2)) | -0.241184 | 0.633508 | -0.380711 | 0.7081 |
| LOG(GDP) | 0.341723 | 1.908592 | 0.179045 | 0.8600 |
| INFR | 0.022294 | 0.034041 | 0.654922 | 0.5213 |
| UEMR | 0.040697 | 0.053299 | 0.763570 | 0.4556 |
| UEMR(-1) | -0.026036 | 0.052092 | -0.499799 | 0.6236 |
| LOG(EXCR) | -0.345442 | 0.503311 | -0.686339 | 0.5018 |
| LOG(EXCR(-1)) | 0.035108 | 0.436801 | 0.080376 | 0.9369 |
| LOG(EXCR(-2)) | -0.028193 | 0.364743 | -0.077295 | 0.9393 |
| C | 1.048900 | 47.40468 | 0.022127 | 0.9826 |
| @TREND | 0.020521 | 0.059214 | 0.346566 | 0.7332 |
| RESID(-1) | 0.205143 | 0.380554 | 0.539064 | 0.5968 |
| RESID(-2) | -0.479074 | 0.338262 | -1.416282 | 0.1748 |

| | | | |
|---|---|---|---|
| R-squared | 0.128905 | Mean dependent var | 3.32E-15 |
| Adjusted R-squared | -0.690949 | S.D. dependent var | 0.096886 |
| S.E. of regression | 0.125987 | Akaike info criterion | -0.998422 |
| Sum squared resid | 0.269837 | Schwarz criterion | -0.235242 |
| Log likelihood | 33.97318 | Hannan-Quinn criter. | -0.738156 |
| F-statistic | 0.157229 | Durbin-Watson stat | 1.941560 |
| Prob(F-statistic) | 0.999718 | | |

NOR SERIAL CORRE EQN 4 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.921812 | Prob. F(2,18) | 0.4158 |
| Obs*R-squared | 3.158861 | Prob. Chi-Square(2) | 0.2061 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/26/18 Time: 02:28
Sample: 1983 2016
Included observations: 34
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(EXTR(-1)) | 0.259044 | 0.289338 | 0.895298 | 0.3824 |
| LOG(AEXP) | -0.210277 | 0.931529 | -0.225733 | 0.8240 |
| LOG(AEXP(-1)) | 0.026464 | 0.835844 | 0.031661 | 0.9751 |
| LOG(AREV) | -0.164152 | 0.632770 | -0.259418 | 0.7983 |
| LOG(AREV(-1)) | 0.141841 | 0.763815 | 0.185701 | 0.8548 |
| LOG(AREV(-2)) | 0.064611 | 0.570508 | 0.113251 | 0.9111 |
| LOG(GDP) | 0.347110 | 2.734221 | 0.126950 | 0.9004 |
| LOG(GDP(-1)) | -0.499017 | 3.607951 | -0.138310 | 0.8915 |
| LOG(GDP(-2)) | -0.107162 | 2.078604 | -0.051555 | 0.9595 |
| INFR | 0.013061 | 0.037648 | 0.346934 | 0.7327 |
| UEMR | 0.024645 | 0.044508 | 0.553708 | 0.5866 |
| LOG(EXCR) | 0.099930 | 0.313769 | 0.318483 | 0.7538 |
| OILD | -0.033227 | 0.076615 | -0.433690 | 0.6697 |
| C | 4.190754 | 20.46787 | 0.204748 | 0.8401 |
| RESID(-1) | -0.412848 | 0.366836 | -1.125428 | 0.2752 |
| RESID(-2) | -0.363670 | 0.331565 | -1.096826 | 0.2872 |

| | | | |
|---|---|---|---|
| R-squared | 0.092908 | Mean dependent var | 4.87E-14 |
| Adjusted R-squared | -0.663003 | S.D. dependent var | 0.091861 |
| S.E. of regression | 0.118461 | Akaike info criterion | -1.123275 |
| Sum squared resid | 0.252595 | Schwarz criterion | -0.404988 |
| Log likelihood | 35.09568 | Hannan-Quinn criter. | -0.878319 |
| F-statistic | 0.122908 | Durbin-Watson stat | 1.974026 |
| Prob(F-statistic) | 0.999915 | | |

## *Appendix E35: Norway Serial Correlation Model 5*

NOR SERIAL CORRE EQN 5
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 1.737435 | Prob. F(2,21) | 0.2003 |
| Obs*R-squared | 4.969198 | Prob. Chi-Square(2) | 0.0834 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 18:35
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| INFR(-1) | 0.099787 | 0.188929 | 0.528171 | 0.6029 |
| LOG(AEXP) | 2.068181 | 4.709808 | 0.439122 | 0.6651 |
| LOG(AEXP(-1)) | -1.618909 | 4.534655 | -0.357008 | 0.7246 |
| LOG(OILP) | -0.302918 | 1.032306 | -0.293438 | 0.7721 |
| LOG(AREV) | -0.228655 | 4.727021 | -0.048372 | 0.9619 |
| LOG(GDP) | 7.832896 | 15.10778 | 0.518468 | 0.6096 |
| LOG(GDP(-1)) | -6.320176 | 15.95443 | -0.396139 | 0.6960 |
| LOG(EXTR) | -0.061183 | 1.112382 | -0.055002 | 0.9567 |
| LOG(EXTR(-1)) | -0.093891 | 1.359034 | -0.069086 | 0.9456 |
| UEMR | -0.023670 | 0.240176 | -0.098553 | 0.9224 |
| LOG(EXCR) | -0.297677 | 2.058623 | -0.144600 | 0.8864 |
| C | -41.29014 | 110.4803 | -0.373733 | 0.7123 |
| RESID(-1) | -0.292241 | 0.269064 | -1.086137 | 0.2897 |
| RESID(-2) | -0.391370 | 0.232852 | -1.680765 | 0.1076 |

| | | | |
|---|---|---|---|
| R-squared | 0.141977 | Mean dependent var | 3.81E-14 |
| Adjusted R-squared | -0.389180 | S.D. dependent var | 0.676573 |
| S.E. of regression | 0.797432 | Akaike info criterion | 2.674334 |
| Sum squared resid | 13.35385 | Schwarz criterion | 3.296473 |
| Log likelihood | -32.80084 | Hannan-Quinn criter. | 2.889096 |
| F-statistic | 0.267298 | Durbin-Watson stat | 2.065321 |
| Prob(F-statistic) | 0.991119 | | |

NOR SERIAL CORRE EQN 5 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 2.826492 | Prob. F(2,22) | 0.0808 |
| Obs*R-squared | 7.154904 | Prob. Chi-Square(2) | 0.0279 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 22:17
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| INFR(-1) | 0.101937 | 0.146423 | 0.696178 | 0.4936 |
| LOG(AEXP) | 2.036150 | 4.529184 | 0.449562 | 0.6574 |
| LOG(AEXP(-1)) | -2.288872 | 4.821482 | -0.474724 | 0.6397 |
| LOG(AREV) | -0.836170 | 2.693493 | -0.310441 | 0.7591 |
| LOG(GDP) | 9.857660 | 13.62750 | 0.723365 | 0.4771 |
| LOG(GDP(-1)) | -5.677827 | 12.04932 | -0.471216 | 0.6421 |
| LOG(EXTR) | -0.132613 | 1.045481 | -0.126844 | 0.9002 |
| UEMR | 0.012970 | 0.251004 | 0.051673 | 0.9593 |
| LOG(EXCR) | -0.340566 | 1.353728 | -0.251576 | 0.8037 |
| OILD | 0.190090 | 0.392479 | 0.484331 | 0.6329 |
| C | -78.28009 | 100.4616 | -0.779204 | 0.4442 |
| RESID(-1) | -0.403966 | 0.248089 | -1.628309 | 0.1177 |
| RESID(-2) | -0.479984 | 0.223724 | -2.145434 | 0.0432 |

| | | | |
|---|---|---|---|
| R-squared | 0.204426 | Mean dependent var | 1.89E-13 |
| Adjusted R-squared | -0.229524 | S.D. dependent var | 0.705249 |
| S.E. of regression | 0.782007 | Akaike info criterion | 2.624647 |
| Sum squared resid | 13.45378 | Schwarz criterion | 3.202347 |
| Log likelihood | -32.93131 | Hannan-Quinn criter. | 2.824069 |
| F-statistic | 0.471082 | Durbin-Watson stat | 1.995824 |
| Prob(F-statistic) | 0.910803 | | |

## *Appendix E36: Norway Serial Correlation Model 6*

NOR SERIAL CORRE EQN 6
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.711053 | Prob. F(2,11) | 0.5124 |
| Obs*R-squared | 3.777904 | Prob. Chi-Square(2) | 0.1512 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 07/24/18 Time: 18:48
Sample: 1984 2016
Included observations: 33
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| UEMR(-1) | 0.050733 | 0.246849 | 0.205523 | 0.8409 |
| UEMR(-2) | -0.013983 | 0.232791 | -0.060065 | 0.9532 |
| UEMR(-3) | -0.109569 | 0.227568 | -0.481477 | 0.6396 |
| LOG(AEXP) | 0.290307 | 4.584136 | 0.063329 | 0.9506 |
| LOG(AEXP(-1)) | 0.158022 | 3.642547 | 0.043382 | 0.9662 |
| LOG(AEXP(-2)) | -0.653585 | 4.423645 | -0.147748 | 0.8852 |
| LOG(OILP) | 0.056314 | 1.111865 | 0.050648 | 0.9605 |
| LOG(OILP(-1)) | -0.019282 | 0.700087 | -0.027542 | 0.9785 |
| LOG(OILP(-2)) | 0.059546 | 0.814240 | 0.073131 | 0.9430 |
| LOG(AREV) | -1.478798 | 5.078919 | -0.291164 | 0.7763 |
| LOG(GDP) | 3.525476 | 7.118127 | 0.495281 | 0.6301 |
| LOG(EXTR) | -0.180959 | 0.923635 | -0.195920 | 0.8482 |
| LOG(EXTR(-1)) | 0.212474 | 0.996126 | 0.213300 | 0.8350 |
| LOG(EXTR(-2)) | 0.144903 | 0.993461 | 0.145857 | 0.8867 |
| INFR | -0.009399 | 0.134503 | -0.069876 | 0.9455 |
| INFR(-1) | -0.042350 | 0.152051 | -0.278528 | 0.7858 |
| LOG(EXCR) | 0.274295 | 1.871162 | 0.146591 | 0.8861 |
| LOG(EXCR(-1)) | -0.402185 | 2.044389 | -0.196726 | 0.8476 |
| LOG(EXCR(-2)) | 0.006230 | 1.966502 | 0.003168 | 0.9975 |
| C | -51.63417 | 117.5008 | -0.439437 | 0.6689 |
| RESID(-1) | -0.245513 | 0.434128 | -0.565532 | 0.5831 |
| RESID(-2) | -0.454850 | 0.422120 | -1.077535 | 0.3043 |

| | | | |
|---|---|---|---|
| R-squared | 0.114482 | Mean dependent var | 6.55E-14 |
| Adjusted R-squared | -1.576053 | S.D. dependent var | 0.257177 |
| S.E. of regression | 0.412771 | Akaike info criterion | 1.302875 |
| Sum squared resid | 1.874181 | Schwarz criterion | 2.300546 |
| Log likelihood | 0.502569 | Hannan-Quinn criter. | 1.638561 |
| F-statistic | 0.067719 | Durbin-Watson stat | 2.078324 |
| Prob(F-statistic) | 1.000000 | | |

NOR SERIAL CORRE EQN 6 WITH DUMMY
Breusch-Godfrey Serial Correlation LM Test:

| | | | |
|---|---|---|---|
| F-statistic | 0.749780 | Prob. F(2,24) | 0.4832 |
| Obs*R-squared | 2.058255 | Prob. Chi-Square(2) | 0.3573 |

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/26/18 Time: 03:01
Sample: 1982 2016
Included observations: 35
Presample missing value lagged residuals set to zero.

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| UEMR(-1) | 0.074757 | 0.154609 | 0.483524 | 0.6331 |
| LOG(AEXP) | -0.476564 | 1.324886 | -0.359702 | 0.7222 |
| LOG(AREV) | 0.441794 | 1.907765 | 0.231576 | 0.8188 |
| LOG(GDP) | -0.367568 | 3.480972 | -0.105593 | 0.9168 |
| LOG(EXTR) | 0.137831 | 0.699968 | 0.196911 | 0.8456 |
| INFR | 0.008909 | 0.090969 | 0.097940 | 0.9228 |
| LOG(EXCR) | -0.032922 | 0.913956 | -0.036021 | 0.9716 |
| OILD | 0.000558 | 0.221547 | 0.002518 | 0.9980 |
| C | 7.076761 | 56.88329 | 0.124408 | 0.9020 |
| RESID(-1) | -0.274382 | 0.236132 | -1.161985 | 0.2567 |
| RESID(-2) | -0.160477 | 0.219723 | -0.730362 | 0.4722 |

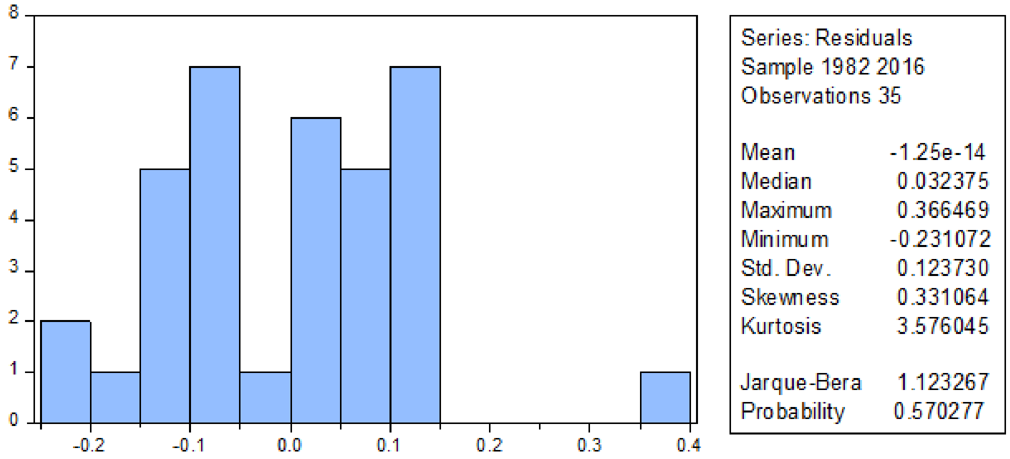
| | | | |
|---|---|---|---|
| R-squared | 0.058807 | Mean dependent var | -6.66E-14 |
| Adjusted R-squared | -0.333356 | S.D. dependent var | 0.460196 |
| S.E. of regression | 0.531393 | Akaike info criterion | 1.824649 |
| Sum squared resid | 6.777095 | Schwarz criterion | 2.313473 |
| Log likelihood | -20.93136 | Hannan-Quinn criter. | 1.993391 |
| F-statistic | 0.149956 | Durbin-Watson stat | 2.043299 |
| Prob(F-statistic) | 0.998225 | | |

# Appendix F: Normality

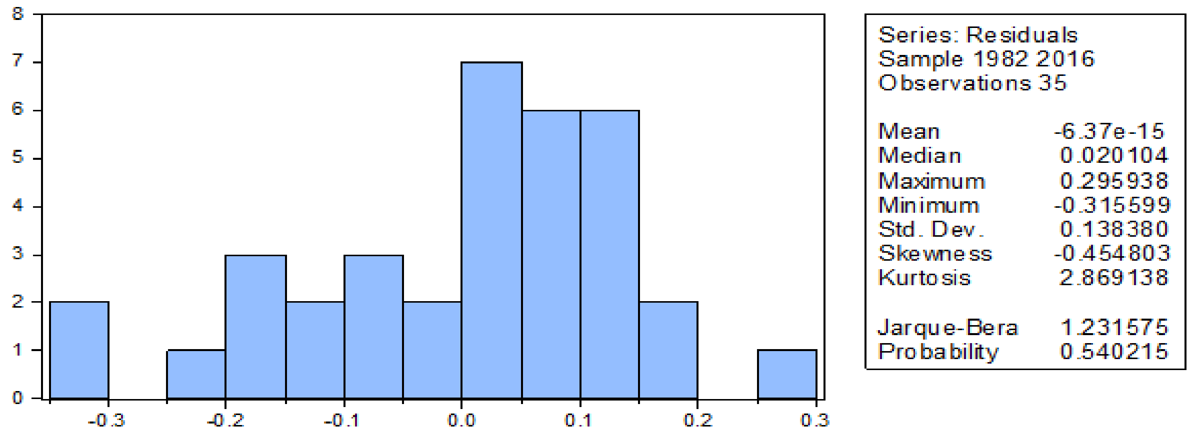
## *Appendix F1: Normality for Nigeria*

### *Appendix F11: Nigeria Normality Model 1*

NIG NORMALITY EQN 1

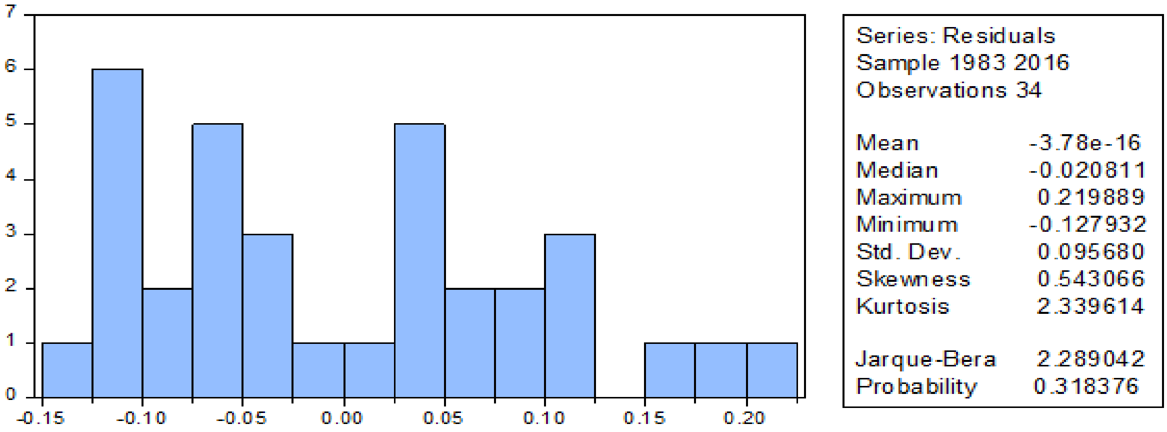



NIG NORMALITY EQN 1 WITH DUMMY

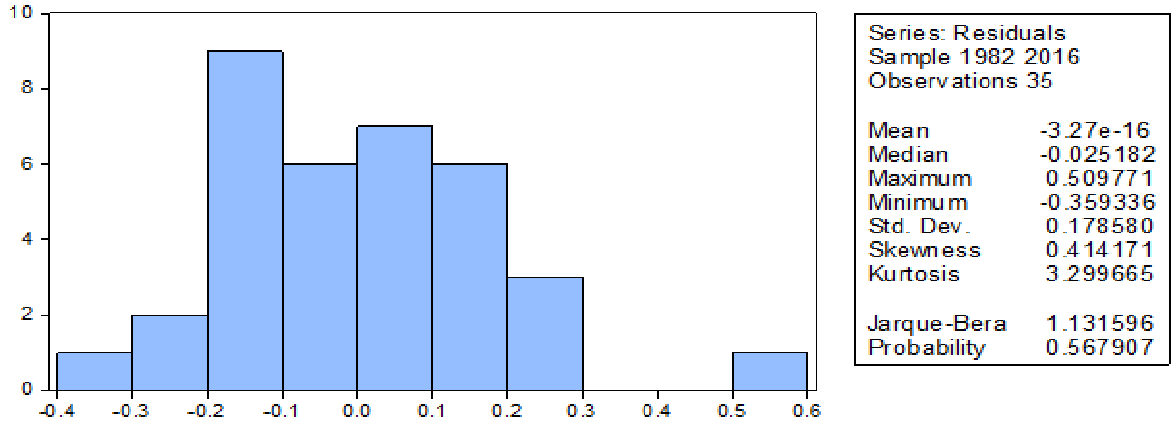



### *Appendix F12: Nigeria Normality Model 2*

NIG NORMALITY EQN 2

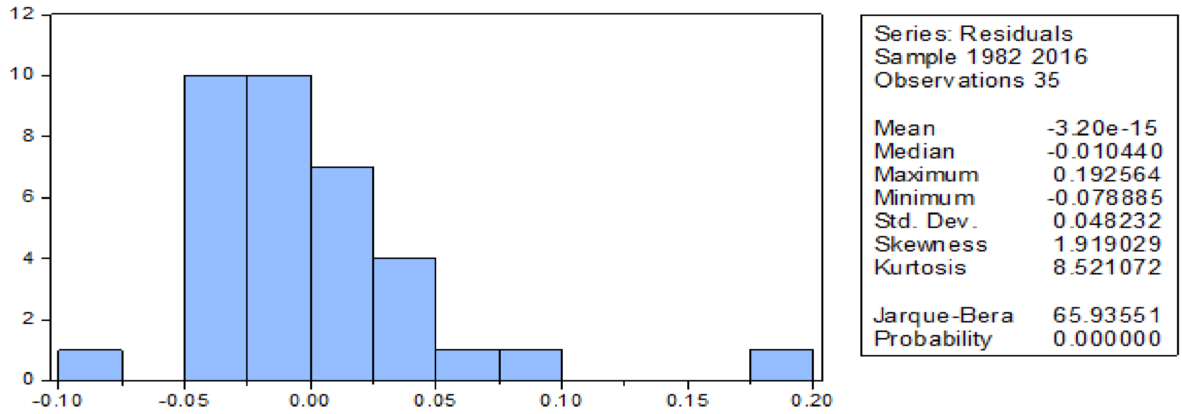


NIG NORMALITY EQN 2 WITH DUMMY

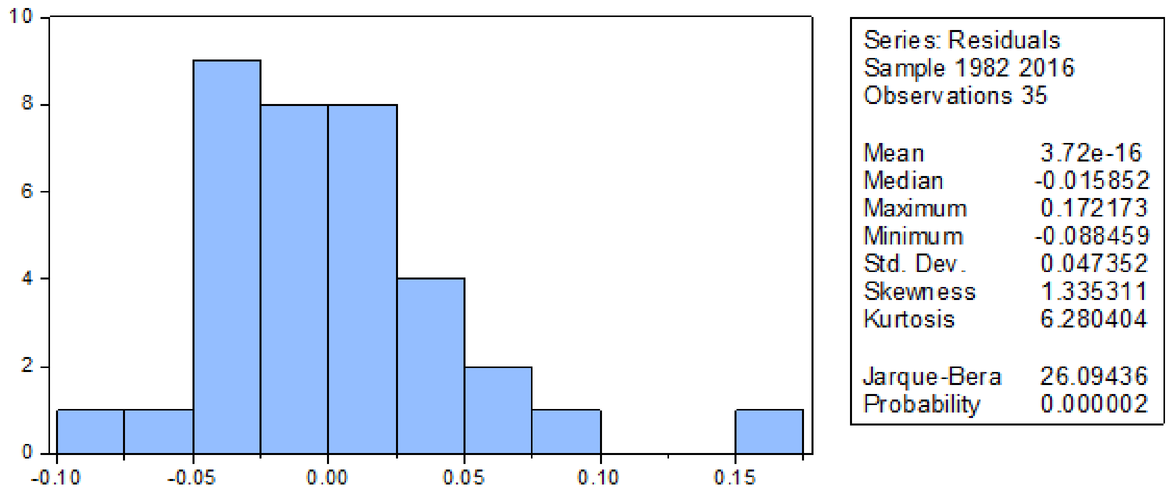



***Appendix F13: Nigeria Normality Model 3***

NIG NORMALITY EQN 3

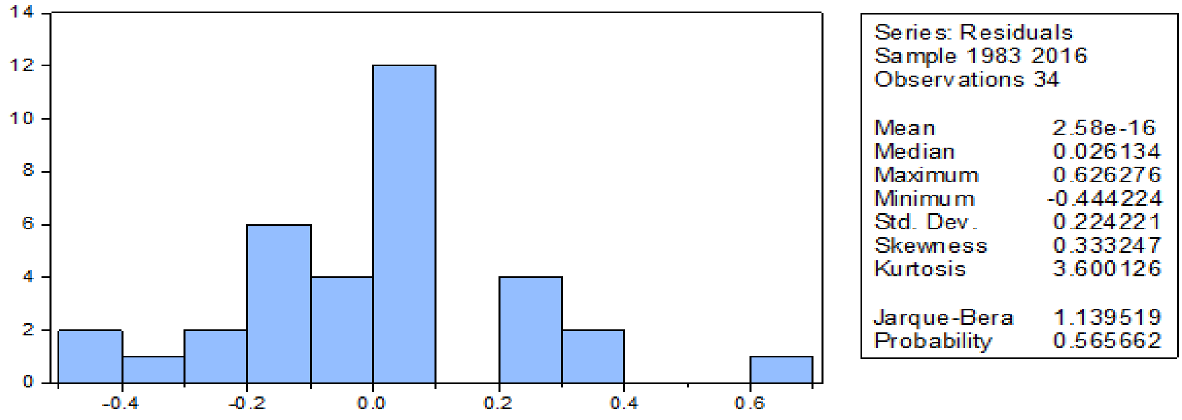



NIG NORMALITY EQN 3 WITH DUMMY

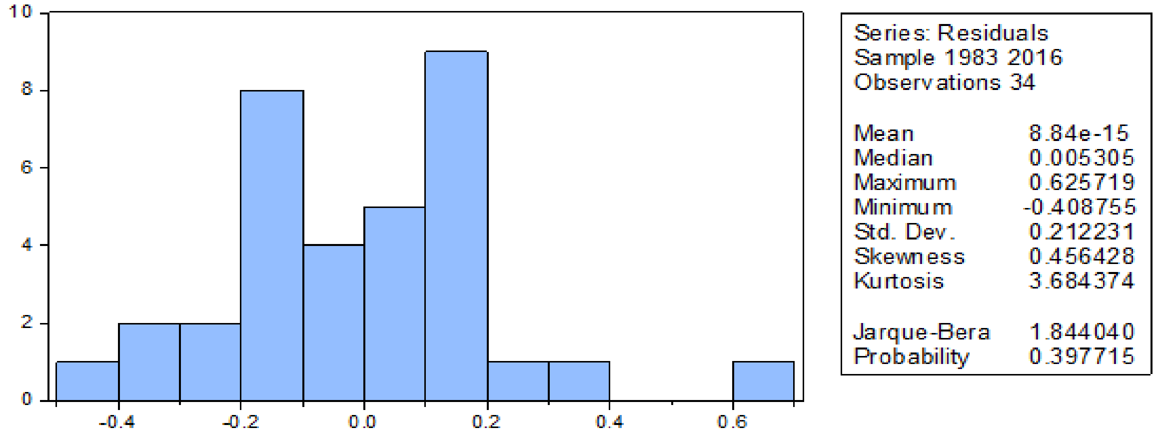



***Appendix F14: Nigeria Normality Model 4***

NIG NORMALITY EQN 4

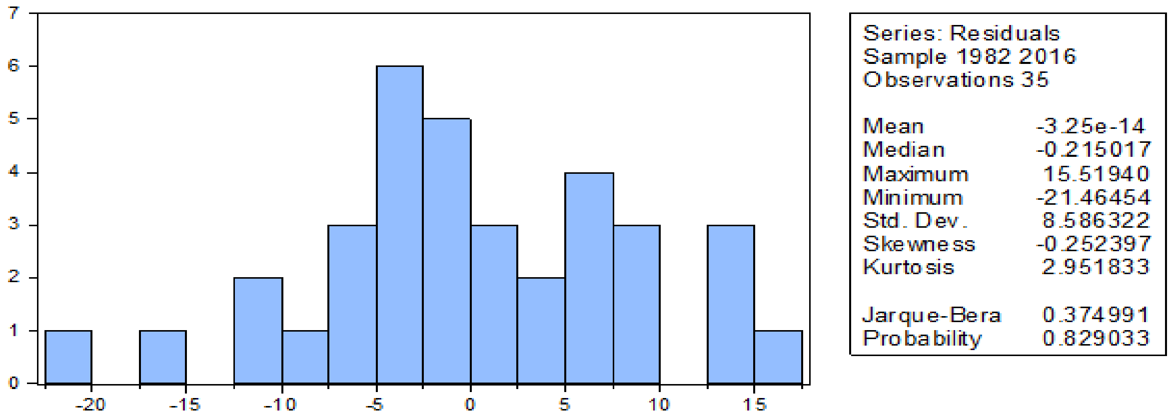



NIG NORMALITY EQN 4 WITH DUMMY

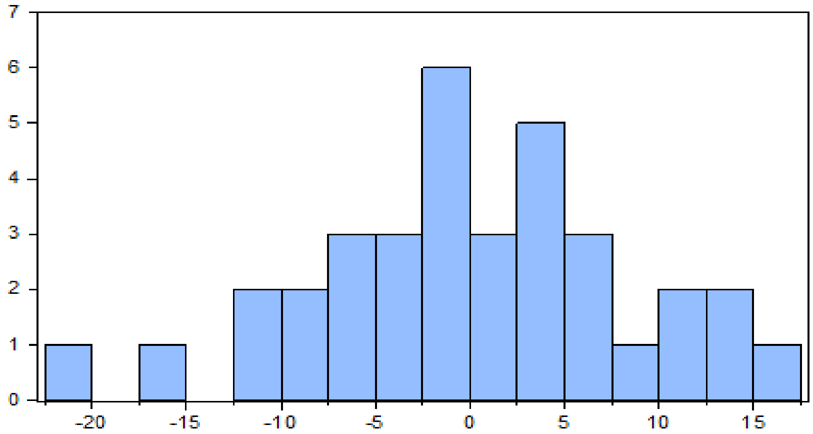



## *Appendix F15: Nigeria Normality Model 5*

NIG NORMALITY EQN 5



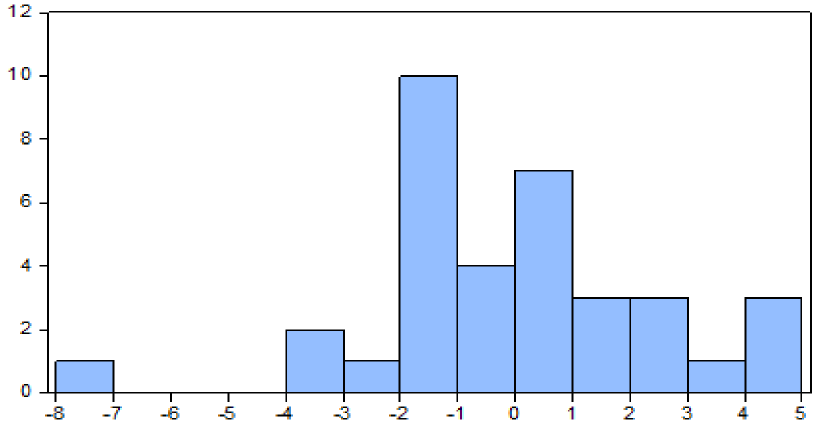
NIG NORMALITY EQN 5 WITH DUMMY




| | |
|---|---|
| Series: Residuals | |
| Sample 1982 2016 | |
| Observations 35 | |
| Mean | 1.01e-13 |
| Median | -0.345710 |
| Maximum | 16.54535 |
| Minimum | -20.89476 |
| Std. Dev. | 8.643549 |
| Skewness | -0.171817 |
| Kurtosis | 2.816965 |
| Jarque-Bera | 0.221062 |
| Probability | 0.895358 |

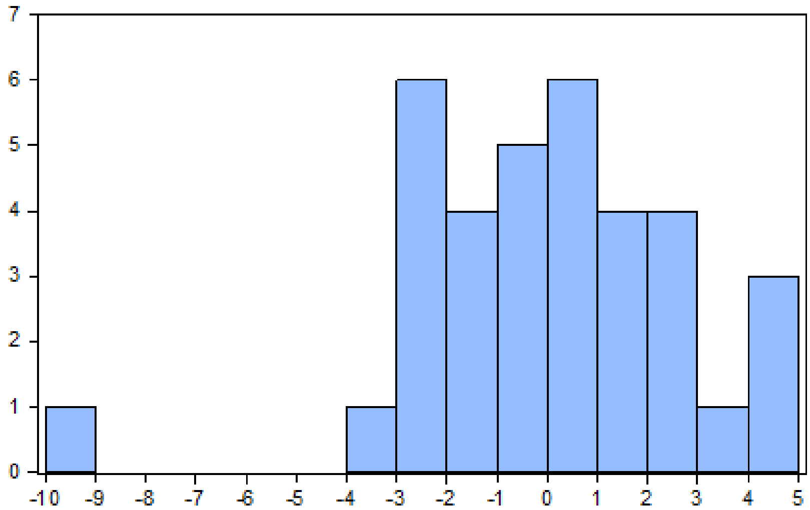
## *Appendix F16: Nigeria Normality Model 6*

NIG NORMALITY EQN 6




| | |
|---|---|
| Series: Residuals | |
| Sample 1982 2016 | |
| Observations 35 | |
| Mean | -1.94e-14 |
| Median | -0.090322 |
| Maximum | 4.699170 |
| Minimum | -7.768043 |
| Std. Dev. | 2.500085 |
| Skewness | -0.447699 |
| Kurtosis | 4.212957 |
| Jarque-Bera | 3.314795 |
| Probability | 0.190634 |

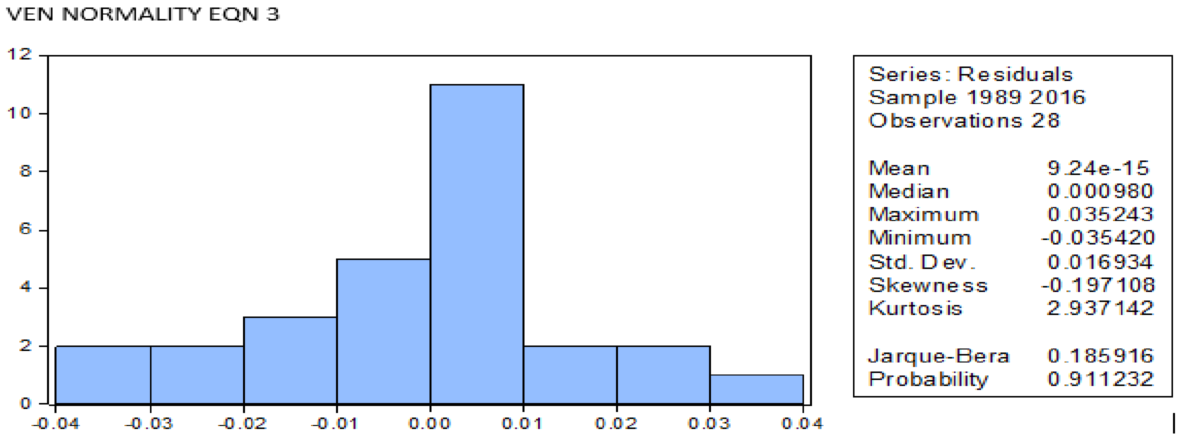
NIG NORMALITY EQN 6 WITH DUMMY

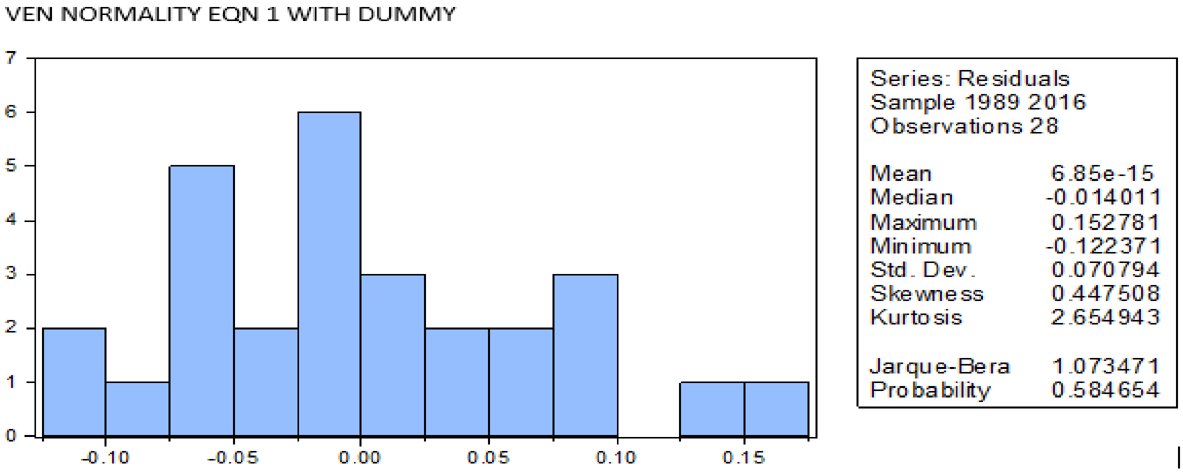



| | |
|---|---|
| Series: Residuals | |
| Sample 1982 2016 | |
| Observations 35 | |
| Mean | -1.65e-14 |
| Median | 0.312570 |
| Maximum | 4.848024 |
| Minimum | -9.337365 |
| Std. Dev. | 2.728543 |
| Skewness | -0.838111 |
| Kurtosis | 5.223678 |
| Jarque-Bera | 11.30859 |
| Probability | 0.003502 |

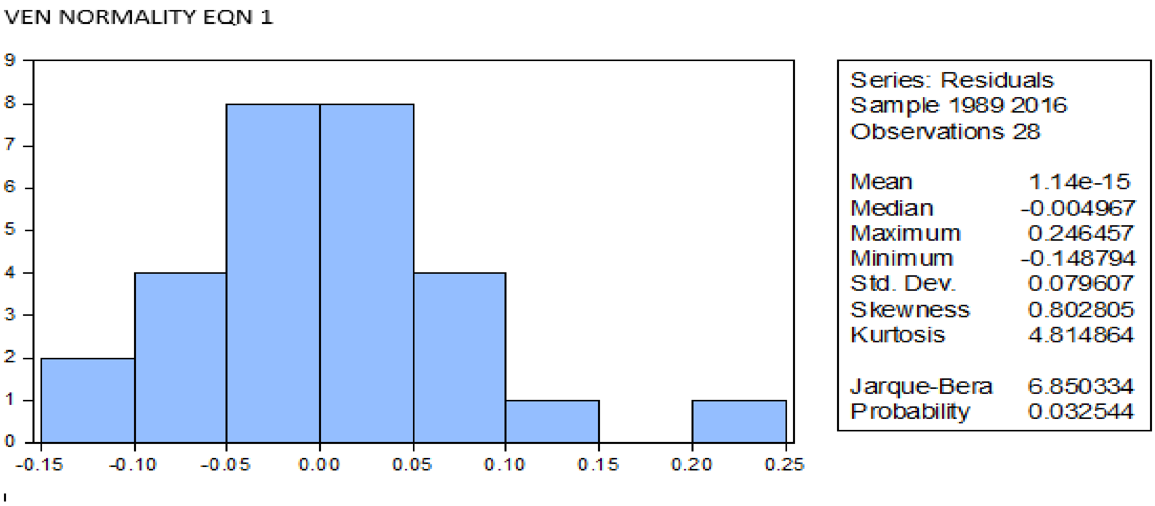
## Appendix F2: Normality for Venezuela

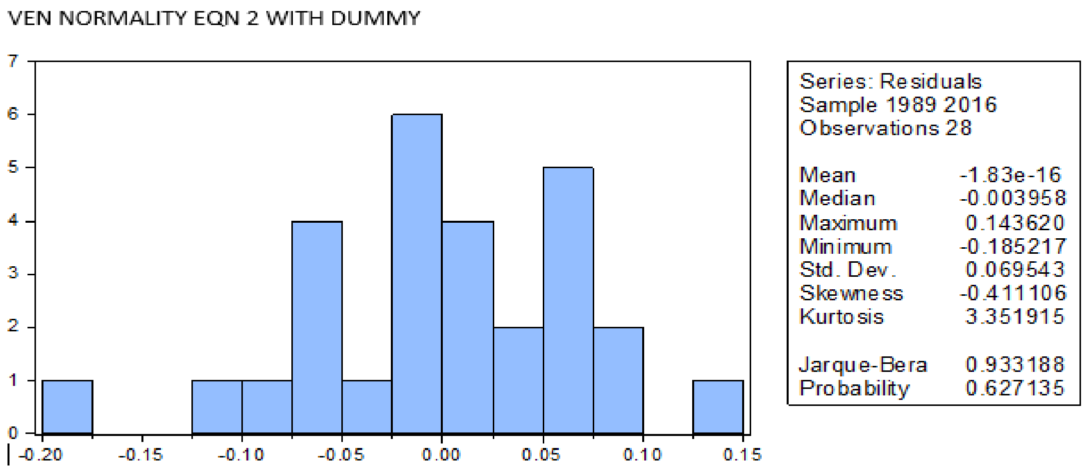
### *Appendix F21: Venezuela Normality Model 1*



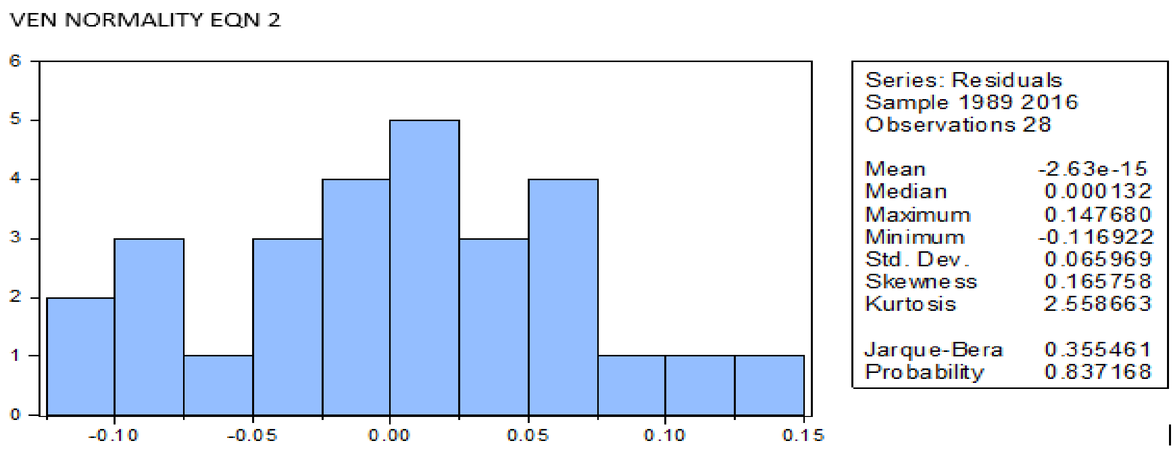



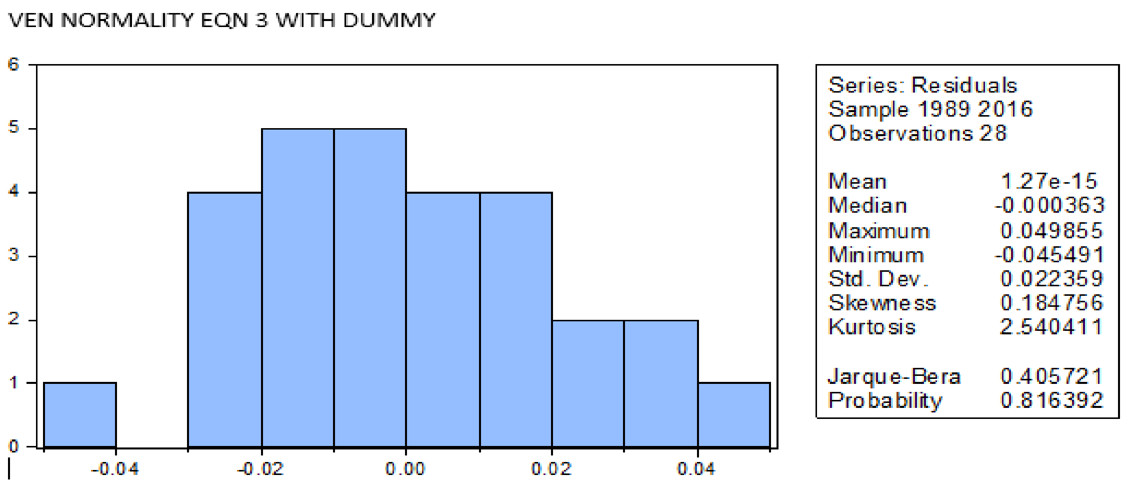

### *Appendix F22: Venezuela Normality Model 2*





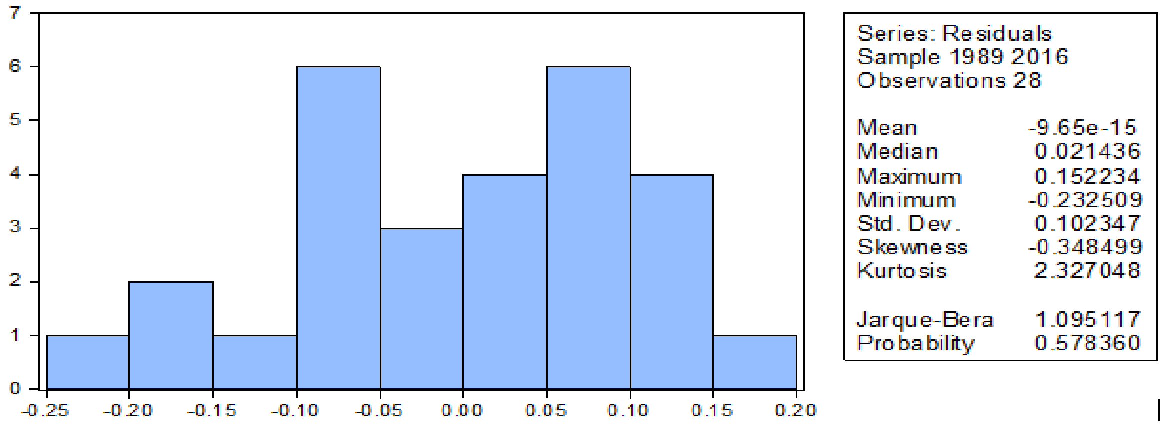

***Appendix F23: Venezuela Normality Model 3***



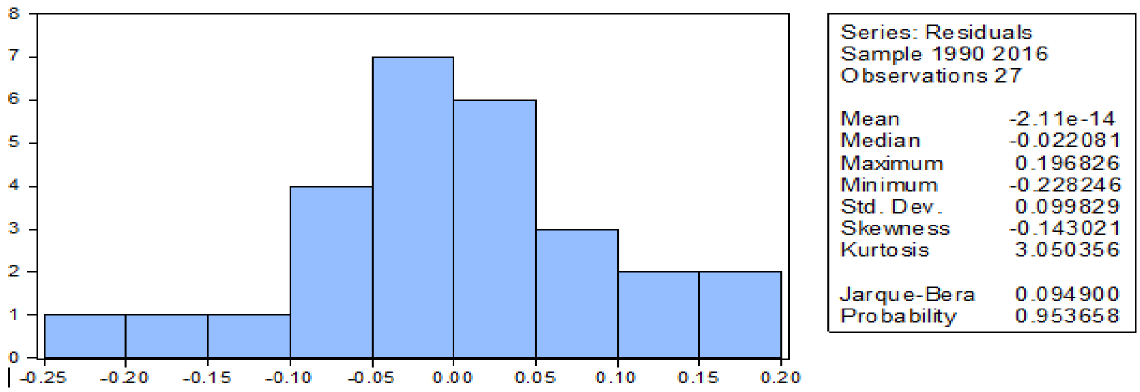




***Appendix F24: Venezuela Normality Model 4***

VEN NORMALITY EQN 4

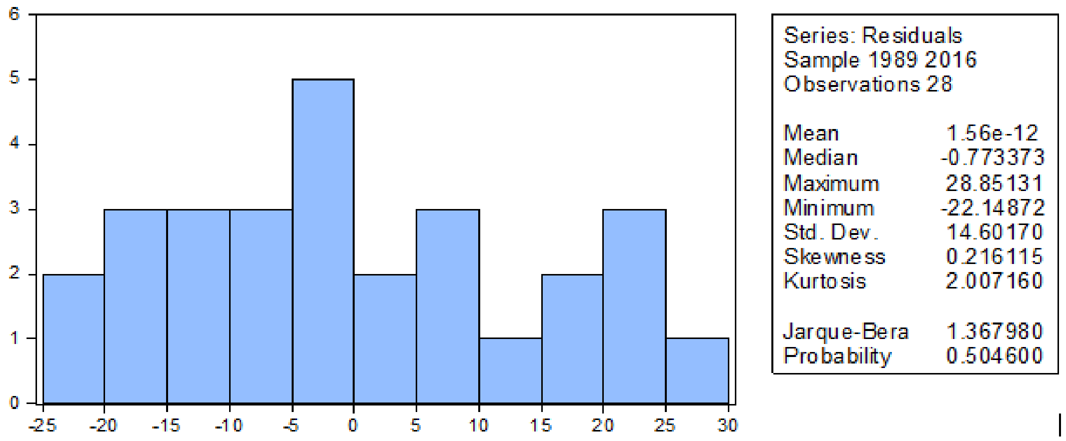



VEN NORMALITY EQN 4 WITH DUMMY

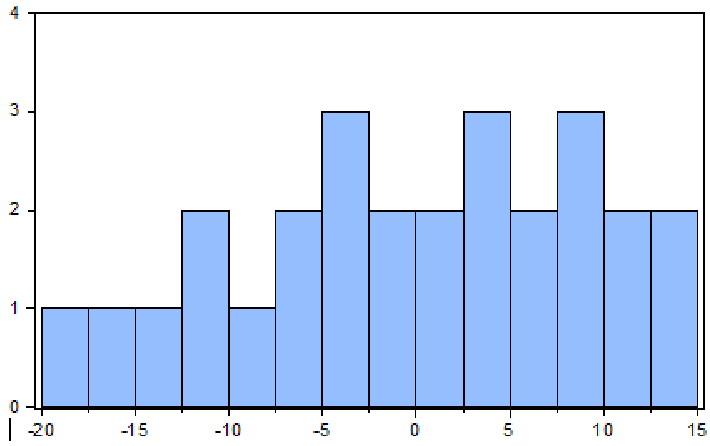



## *Appendix F25: Venezuela Normality Model 5*

VEN NORMALITY EQN 5



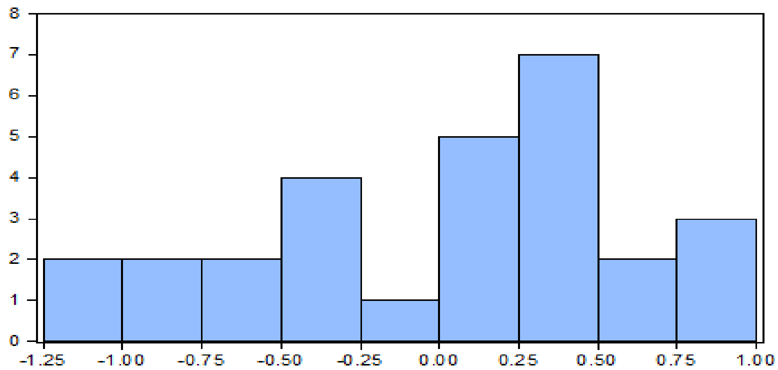
VEN NORMALITY EQN 5 WITH DUMMY



| | |
|---|---|
| Series: Residuals | |
| Sample 1990 2016 | |
| Observations 27 | |
| Mean | -9.43e-13 |
| Median | 0.596742 |
| Maximum | 14.14556 |
| Minimum | -18.27972 |
| Std. Dev. | 9.218779 |
| Skewness | -0.283864 |
| Kurtosis | 2.121215 |
| Jarque-Bera | 1.231400 |
| Probability | 0.540263 |

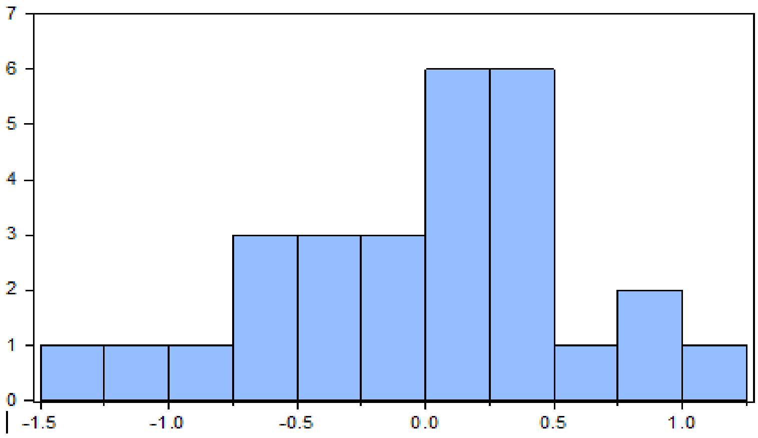
## *Appendix F26: Venezuela Normality Model 6*

VEN NORMALITY EQN 6



| | |
|---|---|
| Series: Residuals | |
| Sample 1989 2016 | |
| Observations 28 | |
| Mean | -1.64e-13 |
| Median | 0.129763 |
| Maximum | 0.873641 |
| Minimum | -1.209385 |
| Std. Dev. | 0.592919 |
| Skewness | -0.466965 |
| Kurtosis | 2.141284 |
| Jarque-Bera | 1.877890 |
| Probability | 0.391040 |

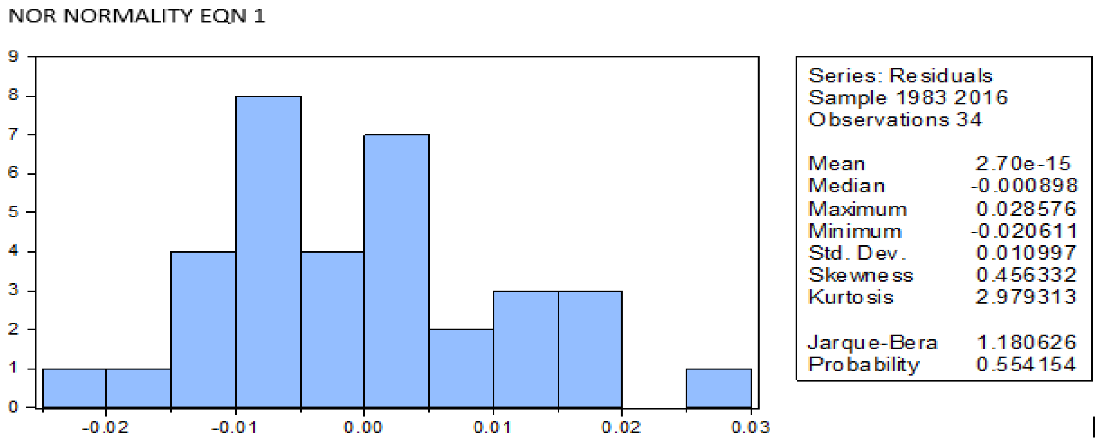
VEN NORMALITY EQN 6 WITH DUMMY

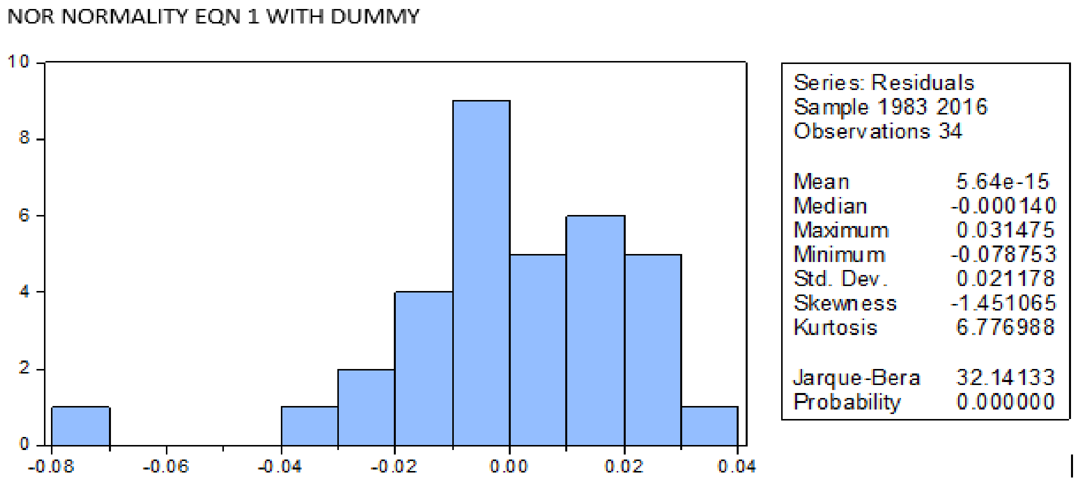


| | |
|---|---|
| Series: Residuals | |
| Sample 1989 2016 | |
| Observations 28 | |
| Mean | -9.34e-14 |
| Median | 0.117569 |
| Maximum | 1.074406 |
| Minimum | -1.480375 |
| Std. Dev. | 0.599126 |
| Skewness | -0.541267 |
| Kurtosis | 2.988483 |
| Jarque-Bera | 1.367350 |
| Probability | 0.504759 |

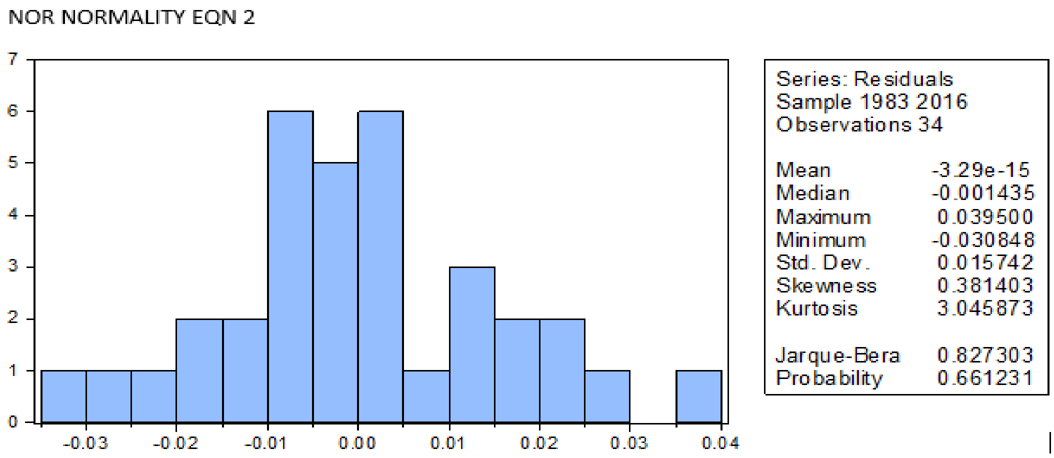
## Appendix F3: Normality for Norway

### *Appendix F31: Norway Normality Model 1*

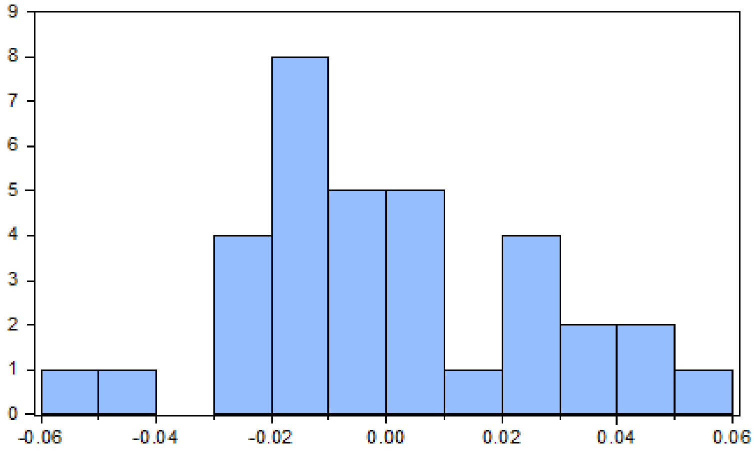



### *Appendix F32: Norway Normality Model 2*



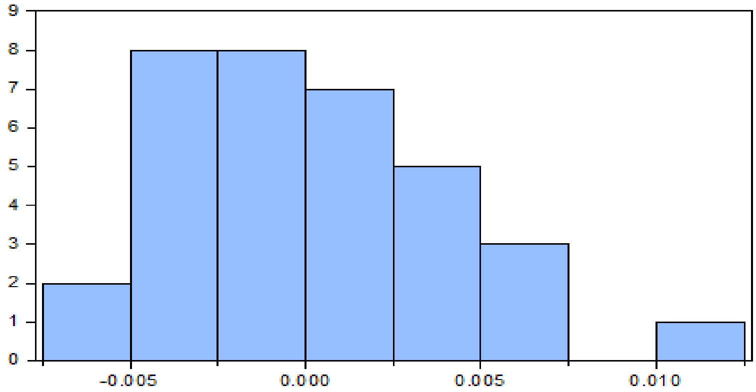
NOR NORMALITY EQN 2 WITH DUMMY




| | |
|---|---|
| Series: Residuals | |
| Sample 1983 2016 | |
| Observations 34 | |
| Mean | -5.64e-15 |
| Median | -0.006113 |
| Maximum | 0.055939 |
| Minimum | -0.054555 |
| Std. Dev. | 0.025402 |
| Skewness | 0.321465 |
| Kurtosis | 2.637426 |
| Jarque-Bera | 0.771825 |
| Probability | 0.679830 |

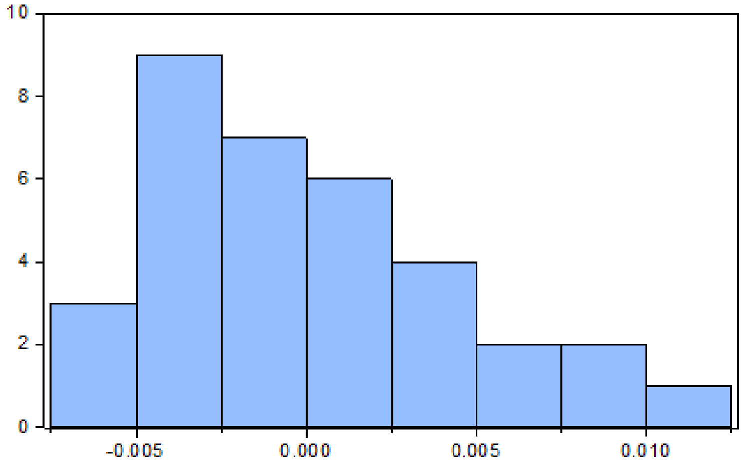
## *Appendix F33: Norway Normality Model 3*

NOR NORMALITY EQN 3




| | |
|---|---|
| Series: Residuals | |
| Sample 1983 2016 | |
| Observations 34 | |
| Mean | 7.38e-15 |
| Median | -0.001060 |
| Maximum | 0.010871 |
| Minimum | -0.006732 |
| Std. Dev. | 0.003965 |
| Skewness | 0.731419 |
| Kurtosis | 3.154098 |
| Jarque-Bera | 3.065157 |
| Probability | 0.215978 |

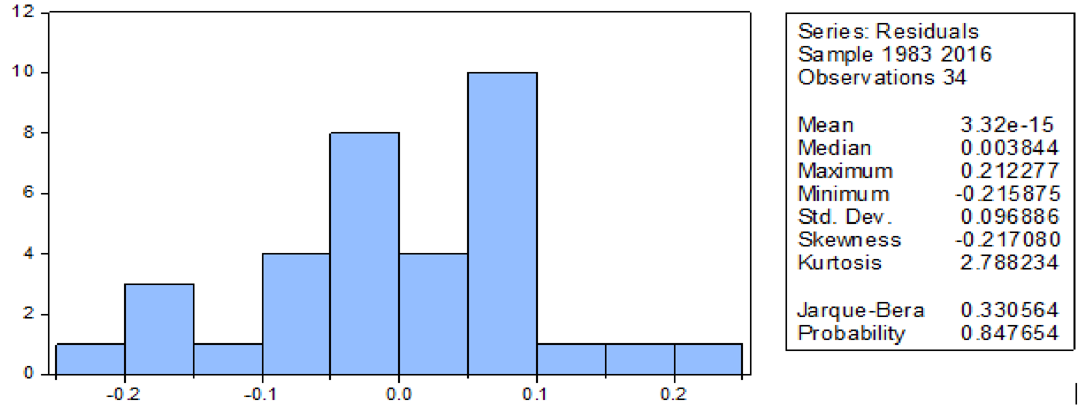
NOR NORMALITY EQN 3 WITH DUMMY



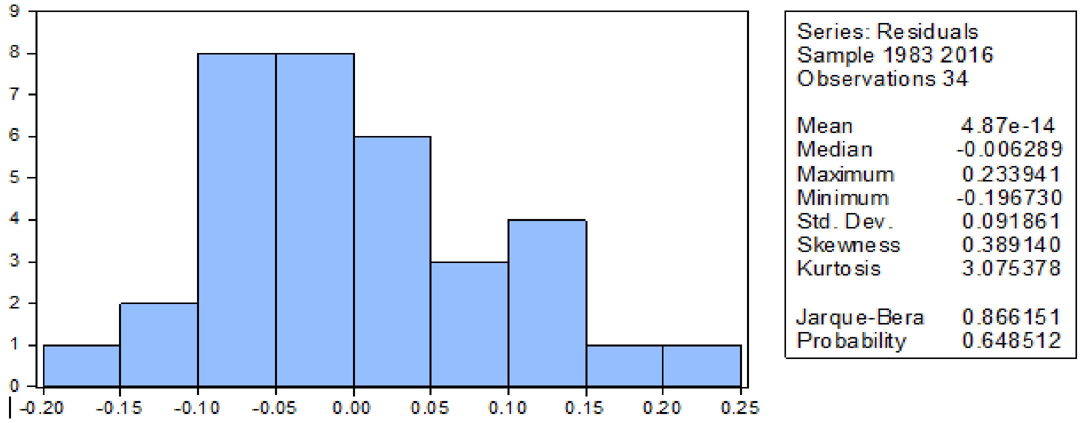

| | |
|---|---|
| Series: Residuals | |
| Sample 1983 2016 | |
| Observations 34 | |
| Mean | -3.85e-15 |
| Median | -0.001044 |
| Maximum | 0.011056 |
| Minimum | -0.006227 |
| Std. Dev. | 0.004492 |
| Skewness | 0.649994 |
| Kurtosis | 2.533811 |
| Jarque-Bera | 2.702007 |
| Probability | 0.258980 |

## *Appendix F34: Norway Normality Model 4*

NOR NORMALITY 4

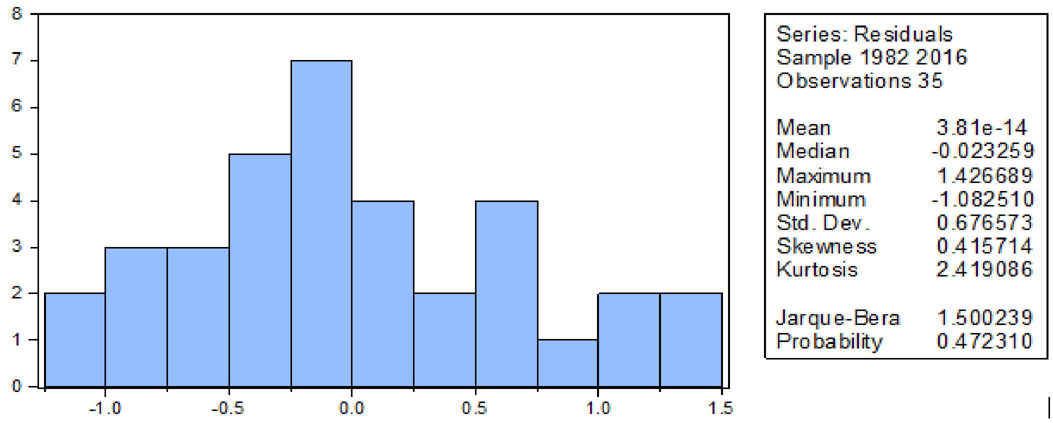



NOR NORMALITY EQN 4 WITH DUMMY

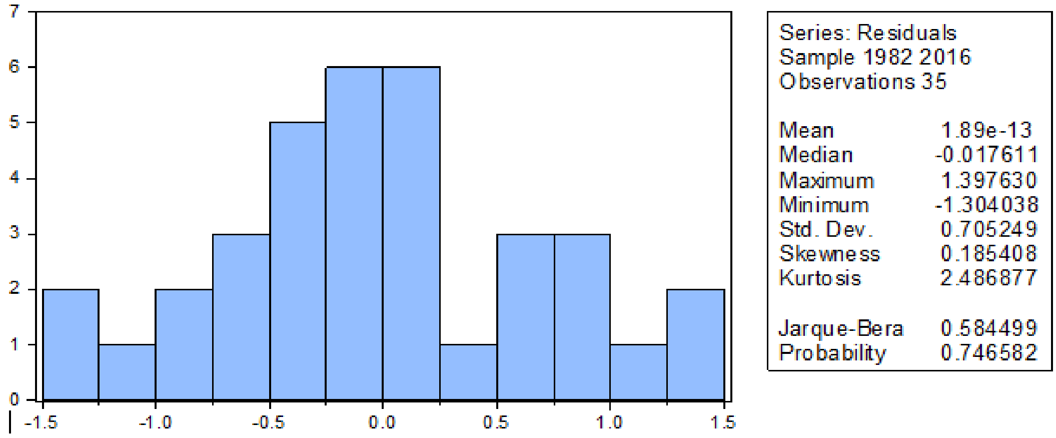



## *Appendix F35: Norway Normality Model 5*

NOR NORMALITY EQN 5

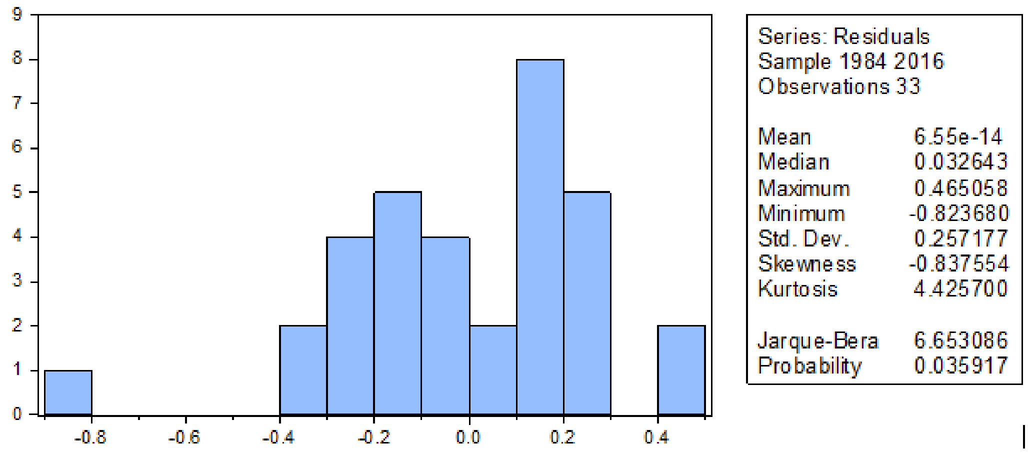


NOR NORMALITY EQN 5 WITH DUMMY

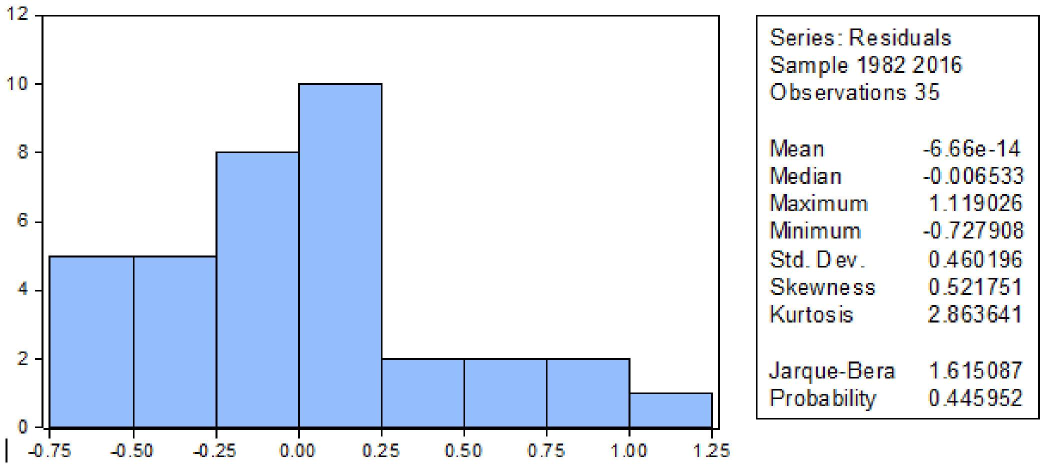



## *Appendix F36: Norway Normality Model 6*

NOR NORMALITY EQN 6




NOR NORMALITY EQN 6 WITH DUMMY



# Appendix G: ARDL Long Run Form and Bound Tests

## *Appendix G1: ARDL Long Run Form and Bound Tests for Nigeria*

### *Appendix G11: Nigeria ARDL Long Run Form and Bound Tests Model 1*

NIG LONGRUN EQN 1
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 15:12
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -13.08423 | 4.887584 | -2.677035 | 0.0127 |
| LOG(AEXP(-1))* | -0.518884 | 0.091426 | -5.675440 | 0.0000 |
| LOG(AREV)** | 0.552746 | 0.107183 | 5.157031 | 0.0000 |
| LOG(OILP)** | -0.400817 | 0.125550 | -3.192485 | 0.0037 |
| LOG(GDP)** | 0.406776 | 0.231819 | 1.754715 | 0.0911 |
| LOG(EXTR)** | 0.146136 | 0.094407 | 1.547929 | 0.1337 |
| INFR** | 0.004533 | 0.002508 | 1.807036 | 0.0823 |
| UEMR** | -0.003470 | 0.007981 | -0.434793 | 0.6673 |
| LOG(EXCR)** | -0.150041 | 0.042476 | -3.532328 | 0.0016 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV) | 1.065259 | 0.216447 | 4.921569 | 0.0000 |
| LOG(OILP) | -0.772459 | 0.230304 | -3.354090 | 0.0025 |
| LOG(GDP) | 0.783944 | 0.367719 | 2.131909 | 0.0426 |
| LOG(EXTR) | 0.281635 | 0.200291 | 1.406127 | 0.1715 |
| INFR | 0.008735 | 0.005668 | 1.541101 | 0.1354 |
| UEMR | -0.006687 | 0.015689 | -0.426232 | 0.6734 |
| LOG(EXCR) | -0.289160 | 0.078386 | -3.688925 | 0.0010 |

EC = LOG(AEXP) - (1.0653*LOG(AREV) -0.7725*LOG(OILP) + 0.7839
*LOG(GDP) + 0.2816*LOG(EXTR) + 0.0087*INFR -0.0067*UEMR
-0.2892*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 13.42495 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -5.675440 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG LONGRUN EQN 1 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 20:18
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.753149 | 3.104610 | 0.564692 | 0.5771 |
| LOG(AEXP(-1))* | -0.443634 | 0.096934 | -4.576660 | 0.0001 |
| LOG(AREV)** | 0.406849 | 0.103318 | 3.937816 | 0.0005 |
| LOG(GDP)** | -0.163705 | 0.203238 | -0.805482 | 0.4278 |
| LOG(EXTR)** | 0.145542 | 0.105718 | 1.376691 | 0.1803 |
| INFR** | 0.004511 | 0.002807 | 1.607326 | 0.1201 |
| UEMR** | -0.012288 | 0.008242 | -1.490954 | 0.1480 |
| LOG(EXCR)** | -0.053983 | 0.038693 | -1.395162 | 0.1748 |
| OILD | 0.112629 | 0.065749 | 1.713009 | 0.0986 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV) | 0.917081 | 0.259467 | 3.534475 | 0.0016 |
| LOG(GDP) | -0.369009 | 0.506401 | -0.728688 | 0.4727 |
| LOG(EXTR) | 0.328067 | 0.266678 | 1.230198 | 0.2296 |
| INFR | 0.010169 | 0.007595 | 1.338983 | 0.1922 |
| UEMR | -0.027698 | 0.020167 | -1.373426 | 0.1813 |
| LOG(EXCR) | -0.121684 | 0.086915 | -1.400036 | 0.1733 |

EC = LOG(AEXP) - (0.9171*LOG(AREV) -0.3690*LOG(GDP) + 0.3281
*LOG(EXTR) + 0.0102*INFR -0.0277*UEMR -0.1217*LOG(EXCR) )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 11.33578 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |

| t-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| t-statistic | -4.576660 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## Appendix G12: Nigeria ARDL Long Run Form and Bound Tests Model 2

NIG LONGRUN EQN 2
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 2, 2, 0, 0, 0, 0, 2)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 07/24/18 Time: 15:28
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.024057 | 13.81263 | 0.074139 | 0.9417 |
| @TREND | -0.017628 | 0.041323 | -0.426605 | 0.6747 |
| LOG(AREV(-1))* | -0.698965 | 0.203659 | -3.432032 | 0.0030 |
| LOG(AEXP(-1)) | 0.470245 | 0.197949 | 2.375584 | 0.0288 |
| LOG(OILP(-1)) | 0.103589 | 0.189514 | 0.546600 | 0.5914 |
| LOG(GDP)** | 0.162490 | 0.509526 | 0.318904 | 0.7535 |
| LOG(EXTR)** | 0.011156 | 0.100502 | 0.110999 | 0.9128 |
| INFR** | -0.000709 | 0.002626 | -0.270116 | 0.7901 |
| UEMR** | -0.018935 | 0.008147 | -2.324309 | 0.0320 |
| LOG(EXCR(-1)) | 0.136102 | 0.141934 | 0.958906 | 0.3503 |
| DLOG(AEXP) | 0.217613 | 0.201860 | 1.078040 | 0.2953 |
| DLOG(AEXP(-1)) | -0.464157 | 0.155191 | -2.990883 | 0.0078 |
| DLOG(OILP) | 0.803957 | 0.136398 | 5.894188 | 0.0000 |
| DLOG(OILP(-1)) | 0.359127 | 0.146420 | 2.452719 | 0.0246 |
| DLOG(EXCR) | -0.406018 | 0.166501 | -2.438532 | 0.0253 |
| DLOG(EXCR(-1)) | -0.522973 | 0.154979 | -3.374478 | 0.0034 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.672773 | 0.186541 | 3.606572 | 0.0020 |
| LOG(OILP) | 0.148203 | 0.252208 | 0.587620 | 0.5641 |
| LOG(GDP) | 0.232472 | 0.739753 | 0.314257 | 0.7569 |
| LOG(EXTR) | 0.015960 | 0.143629 | 0.111121 | 0.9128 |
| INFR | -0.001015 | 0.003693 | -0.274773 | 0.7866 |
| UEMR | -0.027091 | 0.014964 | -1.810390 | 0.0870 |
| LOG(EXCR) | 0.194719 | 0.195269 | 0.997183 | 0.3319 |

EC = LOG(AREV) - (0.6728*LOG(AEXP) + 0.1482*LOG(OILP) + 0.2325 *LOG(GDP) + 0.0160*LOG(EXTR) -0.0010*INFR -0.0271*UEMR + 0.1947*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 3.959010 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | | | |
| | | 10% | 2.729 | 3.985 |
| | | 5% | 3.251 | 4.64 |
| | | 1% | 4.459 | 6.206 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.843 | 4.16 |
| | | 5% | 3.394 | 4.939 |
| | | 1% | 4.779 | 6.821 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -3.432032 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

NIG LONGRUN EQN 2 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 1)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 22:39
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 2.746581 | 4.007361 | 0.685384 | 0.4994 |
| LOG(AREV(-1))* | -0.691174 | 0.196680 | -3.514210 | 0.0017 |
| LOG(AEXP)** | 0.391263 | 0.200264 | 1.953734 | 0.0620 |
| LOG(GDP)** | 0.073465 | 0.248738 | 0.295352 | 0.7702 |
| LOG(EXTR)** | 0.127840 | 0.140448 | 0.910229 | 0.3714 |
| INFR** | 0.001113 | 0.003585 | 0.310563 | 0.7587 |
| UEMR** | -0.005012 | 0.011653 | -0.430130 | 0.6708 |
| LOG(EXCR(-1)) | 0.003928 | 0.054440 | 0.072148 | 0.9431 |
| DLOG(EXCR) | -0.570619 | 0.160091 | -3.564338 | 0.0015 |
| OILD | -0.292442 | 0.093759 | -3.119065 | 0.0045 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.566085 | 0.203827 | 2.777281 | 0.0102 |
| LOG(GDP) | 0.106291 | 0.357623 | 0.297215 | 0.7688 |
| LOG(EXTR) | 0.184960 | 0.197036 | 0.938713 | 0.3569 |
| INFR | 0.001611 | 0.005254 | 0.306604 | 0.7617 |
| UEMR | -0.007252 | 0.017506 | -0.414255 | 0.6822 |
| LOG(EXCR) | 0.005683 | 0.078775 | 0.072138 | 0.9431 |

EC = LOG(AREV) - (0.5661*LOG(AEXP) + 0.1063*LOG(GDP) + 0.1850 *LOG(EXTR) + 0.0016*INFR -0.0073*UEMR + 0.0057*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 3.992583 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -3.514210 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

# Appendix G13: Nigeria ARDL Long Run Form and Bound Tests Model 3

NIG LONGRUN EQN 3
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 1)
Case 3: Unrestricted Constant and No Trend
Date: 07/17/18 Time: 17:50
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 4.135072 | 2.177094 | 1.899354 | 0.0691 |
| LOG(GDP(-1))* | -0.182283 | 0.089228 | -2.042885 | 0.0517 |
| LOG(AEXP)** | 0.023234 | 0.059562 | 0.390086 | 0.6998 |
| LOG(OILP)** | 0.069221 | 0.059711 | 1.159262 | 0.2573 |
| LOG(AREV)** | -0.031964 | 0.066919 | -0.477654 | 0.6370 |
| LOG(EXTR)** | 0.022907 | 0.037780 | 0.606319 | 0.5498 |
| INFR** | 0.000245 | 0.000972 | 0.251840 | 0.8032 |
| UEMR** | 0.000551 | 0.003191 | 0.172573 | 0.8644 |
| LOG(EXCR(-1)) | 0.026178 | 0.021356 | 1.225817 | 0.2317 |
| DLOG(EXCR) | -0.044000 | 0.046871 | -0.938746 | 0.3568 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.127464 | 0.285204 | 0.446922 | 0.6588 |
| LOG(OILP) | 0.379743 | 0.226697 | 1.675115 | 0.1064 |
| LOG(AREV) | -0.175355 | 0.323713 | -0.541699 | 0.5928 |
| LOG(EXTR) | 0.125667 | 0.208704 | 0.602132 | 0.5525 |
| INFR | 0.001342 | 0.005333 | 0.251671 | 0.8034 |
| UEMR | 0.003021 | 0.017982 | 0.167998 | 0.8679 |
| LOG(EXCR) | 0.143614 | 0.095803 | 1.499058 | 0.1464 |

EC = LOG(GDP) - (0.1275*LOG(AEXP) + 0.3797*LOG(OILP) -0.1754 *LOG(AREV) + 0.1257*LOG(EXTR) + 0.0013*INFR + 0.0030*UEMR + 0.1436*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 1.790724 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -2.042885 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG LONGRUN EQN 3 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/24/18 Time: 23:50
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 7.564487 | 3.100623 | 2.439667 | 0.0221 |
| @TREND | 0.022248 | 0.011416 | 1.948859 | 0.0626 |
| LOG(GDP(-1))* | -0.328942 | 0.117722 | -2.794233 | 0.0098 |
| LOG(AEXP)** | -0.077538 | 0.051703 | -1.499669 | 0.1462 |
| LOG(AREV)** | 0.059523 | 0.043948 | 1.354409 | 0.1877 |
| LOG(EXTR)** | 0.053095 | 0.034660 | 1.531896 | 0.1381 |
| INFR** | 0.001133 | 0.000880 | 1.287197 | 0.2098 |
| UEMR** | 0.001667 | 0.002920 | 0.570980 | 0.5731 |
| LOG(EXCR)** | -0.072166 | 0.041344 | -1.745510 | 0.0932 |
| OILD | 0.000443 | 0.024306 | 0.018222 | 0.9856 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -0.235719 | 0.163223 | -1.444155 | 0.1611 |
| LOG(AREV) | 0.180954 | 0.147855 | 1.223861 | 0.2324 |
| LOG(EXTR) | 0.161411 | 0.104611 | 1.542962 | 0.1354 |
| INFR | 0.003444 | 0.002668 | 1.290951 | 0.2085 |
| UEMR | 0.005069 | 0.008809 | 0.575490 | 0.5701 |
| LOG(EXCR) | -0.219389 | 0.080371 | -2.729694 | 0.0114 |

EC = LOG(GDP) - (-0.2357*LOG(AEXP) + 0.1810*LOG(AREV) + 0.1614
*LOG(EXTR) + 0.0034*INFR + 0.0051*UEMR -0.2194*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 2.044185 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | | | |
| | | 10% | 2.879 | 4.114 |
| | | 5% | 3.426 | 4.79 |
| | | 1% | 4.704 | 6.537 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -2.794233 | 10% | -3.13 | -4.37 |
| | | 5% | -3.41 | -4.69 |
| | | 2.5% | -3.65 | -4.96 |
| | | 1% | -3.96 | -5.31 |

## *Appendix G14: Nigeria ARDL Long Run Form and Bound Tests Model 4*

NIG LONGRUN EQN 4
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(2, 1, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/10/18 Time: 23:12
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.529090 | 10.69461 | 0.142978 | 0.8876 |
| LOG(EXTR(-1))* | -0.975195 | 0.145968 | -6.680873 | 0.0000 |
| LOG(AEXP(-1)) | 0.280942 | 0.293654 | 0.956714 | 0.3487 |
| LOG(OILP)** | 0.519258 | 0.316602 | 1.640099 | 0.1146 |
| LOG(AREV)** | -0.023786 | 0.313781 | -0.075804 | 0.9402 |
| LOG(GDP)** | 0.461065 | 0.464663 | 0.992256 | 0.3314 |
| INFR** | -0.014704 | 0.004093 | -3.592265 | 0.0015 |
| UEMR** | 0.020700 | 0.015279 | 1.354791 | 0.1886 |
| LOG(EXCR)** | 0.290154 | 0.094094 | 3.083674 | 0.0052 |
| DLOG(EXTR(-1)) | 0.278299 | 0.143674 | 1.937012 | 0.0651 |
| DLOG(AEXP) | 0.710423 | 0.366418 | 1.938832 | 0.0649 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.288089 | 0.289637 | 0.994653 | 0.3303 |
| LOG(OILP) | 0.532466 | 0.306657 | 1.736360 | 0.0959 |
| LOG(AREV) | -0.024391 | 0.321109 | -0.075958 | 0.9401 |
| LOG(GDP) | 0.472792 | 0.468833 | 1.008445 | 0.3237 |
| INFR | -0.015078 | 0.004456 | -3.383588 | 0.0026 |
| UEMR | 0.021226 | 0.015293 | 1.388006 | 0.1784 |
| LOG(EXCR) | 0.297535 | 0.085832 | 3.466461 | 0.0021 |

EC = LOG(EXTR) - (0.2881*LOG(AEXP) + 0.5325*LOG(OILP) -0.0244 *LOG(AREV) + 0.4728*LOG(GDP) -0.0151*INFR + 0.0212*UEMR + 0.2975*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.068365 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.384 | 3.728 |
| | | 5% | 2.875 | 4.445 |
| | | 1% | 4.104 | 6.151 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -6.680873 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG LONGRUN EQN 4 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(2, 0, 0, 0, 0, 0, 1)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/25/18 Time: 14:09
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -45.28653 | 18.59159 | -2.435861 | 0.0234 |
| @TREND | -0.117113 | 0.064714 | -1.809688 | 0.0840 |
| LOG(EXTR(-1))* | -0.893779 | 0.138318 | -6.461754 | 0.0000 |
| LOG(AEXP)** | 0.557962 | 0.295429 | 1.888650 | 0.0722 |
| LOG(AREV)** | -0.072970 | 0.266999 | -0.273296 | 0.7872 |
| LOG(GDP)** | 2.114328 | 0.726662 | 2.909642 | 0.0081 |
| INFR** | -0.013612 | 0.003975 | -3.424803 | 0.0024 |
| UEMR** | 0.021578 | 0.014741 | 1.463827 | 0.1574 |
| LOG(EXCR(-1)) | 0.534795 | 0.216485 | 2.470355 | 0.0217 |
| DLOG(EXTR(-1)) | 0.266148 | 0.125600 | 2.119009 | 0.0456 |
| DLOG(EXCR) | 0.049376 | 0.293534 | 0.168211 | 0.8680 |
| OILD | -0.226168 | 0.129701 | -1.743762 | 0.0952 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.624274 | 0.335491 | 1.860778 | 0.0762 |
| LOG(AREV) | -0.081642 | 0.301099 | -0.271146 | 0.7888 |
| LOG(GDP) | 2.365606 | 0.738634 | 3.202676 | 0.0041 |
| INFR | -0.015230 | 0.004355 | -3.497412 | 0.0020 |
| UEMR | 0.024143 | 0.015940 | 1.514647 | 0.1441 |
| LOG(EXCR) | 0.598353 | 0.234895 | 2.547323 | 0.0184 |

EC = LOG(EXTR) - (0.6243*LOG(AEXP) -0.0816*LOG(AREV) + 2.3656
*LOG(GDP) -0.0152*INFR + 0.0241*UEMR + 0.5984*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 6.650869 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | 10% | 2.879 | 4.114 |
| | | 5% | 3.426 | 4.79 |
| | | 1% | 4.704 | 6.537 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.977 | 4.26 |
| | | 5% | 3.576 | 5.065 |
| | | 1% | 5.046 | 6.93 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -6.461754 | 10% | -3.13 | -4.37 |
| | | 5% | -3.41 | -4.69 |
| | | 2.5% | -3.65 | -4.96 |
| | | 1% | -3.96 | -5.31 |

## *Appendix G15: Nigeria ARDL Long Run Form and Bound Tests Model 5*

NIG LONGRUN EQN 5
ARDL Long Run Form and Bounds Test
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/10/18 Time: 23:24
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.061197 | 396.8636 | -0.000154 | 0.9999 |
| INFR(-1)* | -0.765124 | 0.131432 | -5.821443 | 0.0000 |
| LOG(AEXP(-1)) | -3.088542 | 9.740436 | -0.317085 | 0.7538 |
| LOG(OILP)** | 7.341624 | 10.38572 | 0.706896 | 0.4862 |
| LOG(AREV)** | -1.277674 | 10.80817 | -0.118214 | 0.9068 |
| LOG(GDP)** | 23.68330 | 17.11607 | 1.383688 | 0.1787 |
| LOG(EXTR)** | -24.11204 | 5.102696 | -4.725352 | 0.0001 |
| UEMR** | 0.004011 | 0.589903 | 0.006799 | 0.9946 |
| LOG(EXCR)** | 7.309475 | 3.373066 | 2.167012 | 0.0400 |
| DLOG(AEXP) | 17.33082 | 13.70255 | 1.264788 | 0.2176 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -4.036656 | 12.82683 | -0.314704 | 0.7556 |
| LOG(OILP) | 9.595340 | 13.53092 | 0.709142 | 0.4848 |
| LOG(AREV) | -1.669891 | 14.10679 | -0.118375 | 0.9067 |
| LOG(GDP) | 30.95355 | 23.68809 | 1.306714 | 0.2032 |
| LOG(EXTR) | -31.51390 | 7.774522 | -4.053483 | 0.0004 |
| UEMR | 0.005242 | 0.771255 | 0.006797 | 0.9946 |
| LOG(EXCR) | 9.553322 | 4.262835 | 2.241072 | 0.0341 |

EC = INFR - (-4.0367*LOG(AEXP) + 9.5953*LOG(OILP) -1.6699*LOG(AREV) + 30.9536*LOG(GDP) -31.5139*LOG(EXTR) + 0.0052*UEMR + 9.5533 *LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.262153 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -5.821443 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG LONGRUN EQN 5 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 22:50
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -225.9369 | 197.0690 | -1.146486 | 0.2624 |
| INFR(-1)* | -0.735254 | 0.142439 | -5.161894 | 0.0000 |
| LOG(AEXP(-1)) | -8.710042 | 8.436722 | -1.032396 | 0.3118 |
| LOG(AREV)** | 5.476701 | 8.423760 | 0.650149 | 0.5215 |
| LOG(GDP)** | 31.56984 | 11.68144 | 2.702563 | 0.0122 |
| LOG(EXTR)** | -23.22396 | 5.222427 | -4.446968 | 0.0002 |
| UEMR** | 0.145400 | 0.571572 | 0.254386 | 0.8013 |
| LOG(EXCR)** | 5.595175 | 2.305730 | 2.426639 | 0.0228 |
| DLOG(AEXP) | 10.13798 | 13.05014 | 0.776848 | 0.4445 |
| OILD | 1.925039 | 4.765695 | 0.403937 | 0.6897 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -11.84630 | 12.17890 | -0.972691 | 0.3400 |
| LOG(AREV) | 7.448719 | 11.79045 | 0.631759 | 0.5333 |
| LOG(GDP) | 42.93732 | 17.88608 | 2.400600 | 0.0241 |
| LOG(EXTR) | -31.58631 | 8.181970 | -3.860478 | 0.0007 |
| UEMR | 0.197755 | 0.789549 | 0.250466 | 0.8043 |
| LOG(EXCR) | 7.609853 | 3.081494 | 2.469533 | 0.0207 |

EC = INFR - (-11.8463*LOG(AEXP) + 7.4487*LOG(AREV) + 42.9373
*LOG(GDP) -31.5863*LOG(EXTR) + 0.1978*UEMR + 7.6099*LOG(EXCR)
)

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.293987 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | | | |
| | | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |

| t-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| t-statistic | -5.161894 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix G16: Nigeria ARDL Long Run Form and Bound Tests Model 6*

NIG LONGRUN EQN 6
ARDL Long Run Form and Bounds Test
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 0, 1, 0, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 07/09/18 Time: 20:04
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 144.9117 | 121.9023 | 1.188753 | 0.2462 |
| UEMR(-1)* | -0.508429 | 0.163484 | -3.109965 | 0.0048 |
| LOG(AEXP)** | -1.729107 | 3.517197 | -0.491615 | 0.6275 |
| LOG(OILP)** | 2.732240 | 3.201436 | 0.853442 | 0.4019 |
| LOG(AREV(-1)) | 2.278539 | 4.237523 | 0.537705 | 0.5957 |
| LOG(GDP)** | -7.506887 | 5.006912 | -1.499305 | 0.1468 |
| LOG(EXTR)** | 1.183928 | 2.004037 | 0.590772 | 0.5602 |
| INFR** | 0.003795 | 0.053394 | 0.071068 | 0.9439 |
| LOG(EXCR(-1)) | 1.000314 | 1.149870 | 0.869937 | 0.3930 |
| DLOG(AREV) | -2.953709 | 3.463982 | -0.852692 | 0.4023 |
| DLOG(EXCR) | 5.003179 | 2.482420 | 2.015444 | 0.0552 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -3.400885 | 6.951889 | -0.489203 | 0.6291 |
| LOG(OILP) | 5.373891 | 6.074578 | 0.884653 | 0.3851 |
| LOG(AREV) | 4.481531 | 8.778813 | 0.510494 | 0.6144 |
| LOG(GDP) | -14.76488 | 10.60961 | -1.391651 | 0.1768 |
| LOG(EXTR) | 2.328602 | 3.931947 | 0.592226 | 0.5592 |
| INFR | 0.007463 | 0.105662 | 0.070634 | 0.9443 |
| LOG(EXCR) | 1.967462 | 2.224976 | 0.884262 | 0.3853 |
| C | 285.0188 | 234.7773 | 1.213997 | 0.2366 |

EC = UEMR - (-3.4009*LOG(AEXP) + 5.3739*LOG(OILP) + 4.4815*LOG(AREV)
-14.7649*LOG(GDP) + 2.3286*LOG(EXTR) + 0.0075*INFR + 1.9675
*LOG(EXCR) + 285.0188 )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 1.922379 | 10% | 1.92 | 2.89 |
| k | 7 | 5% | 2.17 | 3.21 |
| | | 2.5% | 2.43 | 3.51 |
| | | 1% | 2.73 | 3.9 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | | | |
| | | 10% | 2.196 | 3.37 |
| | | 5% | 2.597 | 3.907 |
| | | 1% | 3.599 | 5.23 |

NIG LONGRUN EQN 6 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 06/25/18 Time: 15:27
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 40.54579 | 60.90439 | 0.665728 | 0.5117 |
| UEMR(-1)* | -0.501863 | 0.168006 | -2.987167 | 0.0062 |
| LOG(AEXP)** | -0.455294 | 2.844999 | -0.160033 | 0.8741 |
| LOG(AREV)** | 0.353965 | 2.919149 | 0.121256 | 0.9045 |
| LOG(GDP)** | -3.575770 | 3.833928 | -0.932665 | 0.3599 |
| LOG(EXTR)** | 2.471334 | 2.089443 | 1.182772 | 0.2480 |
| INFR** | -0.004795 | 0.055310 | -0.086685 | 0.9316 |
| LOG(EXCR(-1)) | 0.298487 | 0.830238 | 0.359520 | 0.7222 |
| DLOG(EXCR) | 7.193714 | 2.767130 | 2.599702 | 0.0154 |
| OILD | 1.051192 | 1.482524 | 0.709056 | 0.4849 |

 * p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -0.907208 | 5.584946 | -0.162438 | 0.8723 |
| LOG(AREV) | 0.705302 | 5.833346 | 0.120909 | 0.9047 |
| LOG(GDP) | -7.124989 | 8.376100 | -0.850633 | 0.4030 |
| LOG(EXTR) | 4.924319 | 4.245274 | 1.159953 | 0.2570 |
| INFR | -0.009553 | 0.109588 | -0.087175 | 0.9312 |
| LOG(EXCR) | 0.594758 | 1.665780 | 0.357045 | 0.7241 |
| C | 80.79052 | 123.6688 | 0.653281 | 0.5195 |

EC = UEMR - (-0.9072*LOG(AEXP) + 0.7053*LOG(AREV) -7.1250*LOG(GDP)
+ 4.9243*LOG(EXTR) -0.0096*INFR + 0.5948*LOG(EXCR) + 80.7905 )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 1.964493 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | | | |
| | | 10% | 2.254 | 3.388 |
| | | 5% | 2.685 | 3.96 |
| | | 1% | 3.713 | 5.326 |

## Appendix G2: ARDL Long Run Form and Bound Tests for Venezuela

### *Appendix G21: Venezuela ARDL Long Run Form and Bound Tests Model 1*

VEN LONGRUN EQN 1
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 15:55
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 27.78534 | 16.65263 | 1.668526 | 0.1116 |
| LOG(AEXP(-1))* | -0.621061 | 0.098204 | -6.324222 | 0.0000 |
| LOG(AREV)** | 0.669421 | 0.141428 | 4.733291 | 0.0001 |
| LOG(OILP)** | 0.023564 | 0.076506 | 0.308004 | 0.7614 |
| LOG(GDP)** | -0.829213 | 0.656508 | -1.263067 | 0.2218 |
| LOG(EXTR)** | -0.262367 | 0.095157 | -2.757195 | 0.0125 |
| INFR** | 0.000215 | 0.001075 | 0.199653 | 0.8439 |
| UEMR** | -0.063076 | 0.023392 | -2.696511 | 0.0143 |
| LOG(EXCR)** | 0.088409 | 0.137843 | 0.641377 | 0.5289 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV) | 1.077867 | 0.178395 | 6.042018 | 0.0000 |
| LOG(OILP) | 0.037942 | 0.124025 | 0.305921 | 0.7630 |
| LOG(GDP) | -1.335156 | 1.147533 | -1.163501 | 0.2590 |
| LOG(EXTR) | -0.422450 | 0.136642 | -3.091651 | 0.0060 |
| INFR | 0.000346 | 0.001752 | 0.197358 | 0.8456 |
| UEMR | -0.101561 | 0.041313 | -2.458318 | 0.0237 |
| LOG(EXCR) | 0.142352 | 0.222342 | 0.640239 | 0.5297 |

EC = LOG(AEXP) - (1.0779*LOG(AREV) + 0.0379*LOG(OILP) -1.3352
*LOG(GDP) -0.4224*LOG(EXTR) + 0.0003*INFR -0.1016*UEMR +
0.1424*LOG(EXCR) )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 18.64531 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.384 | 3.728 |
| | | 5% | 2.875 | 4.445 |
| | | 1% | 4.104 | 6.151 |

| t-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| t-statistic | -6.324222 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

VEN LONGRUN EQN 1 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 1, 0, 0, 1, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 23:27
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 55.97680 | 21.56626 | 2.595572 | 0.0189 |
| LOG(AEXP(-1))* | -0.602053 | 0.105664 | -5.697816 | 0.0000 |
| LOG(AREV)** | 0.734591 | 0.136461 | 5.383139 | 0.0000 |
| LOG(GDP(-1)) | -2.005687 | 0.847901 | -2.365472 | 0.0302 |
| LOG(EXTR)** | -0.203950 | 0.094728 | -2.153015 | 0.0460 |
| INFR** | -0.000822 | 0.000984 | -0.835162 | 0.4152 |
| UEMR(-1) | -0.099150 | 0.028080 | -3.530916 | 0.0026 |
| LOG(EXCR)** | 0.099759 | 0.131961 | 0.755979 | 0.4600 |
| DLOG(GDP) | -0.871544 | 0.637895 | -1.366282 | 0.1897 |
| D(UEMR) | -0.041736 | 0.023899 | -1.746303 | 0.0988 |
| OILD | 0.065804 | 0.048790 | 1.348729 | 0.1951 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV) | 1.220144 | 0.171781 | 7.102907 | 0.0000 |
| LOG(GDP) | -3.331414 | 1.741949 | -1.912463 | 0.0728 |
| LOG(EXTR) | -0.338758 | 0.147050 | -2.303685 | 0.0341 |
| INFR | -0.001366 | 0.001583 | -0.862861 | 0.4002 |
| UEMR | -0.164686 | 0.060070 | -2.741565 | 0.0139 |
| LOG(EXCR) | 0.165699 | 0.223692 | 0.740746 | 0.4690 |

EC = LOG(AEXP) - (1.2201*LOG(AREV) -3.3314*LOG(GDP) -0.3388 *LOG(EXTR) -0.0014*INFR -0.1647*UEMR + 0.1657*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 23.48837 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | | | |
| | | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.457 | 3.797 |
| | | 5% | 2.97 | 4.499 |
| | | 1% | 4.27 | 6.211 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -5.697816 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix G22: Venezuela ARDL Long Run Form and Bound Tests Model 2*

VEN LONGRUN EQN 2
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 1, 1, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 16:23
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 5.704204 | 16.99836 | 0.335574 | 0.7413 |
| LOG(AREV(-1))* | -0.446292 | 0.168850 | -2.643128 | 0.0171 |
| LOG(AEXP(-1)) | 0.146296 | 0.203754 | 0.718005 | 0.4825 |
| LOG(OILP(-1)) | 0.151508 | 0.093769 | 1.615758 | 0.1246 |
| LOG(GDP)** | 0.011886 | 0.623554 | 0.019062 | 0.9850 |
| LOG(EXTR)** | 0.026050 | 0.116089 | 0.224393 | 0.8251 |
| INFR** | 0.003437 | 0.000945 | 3.635498 | 0.0020 |
| UEMR** | 0.004615 | 0.026584 | 0.173612 | 0.8642 |
| LOG(EXCR)** | 0.358537 | 0.125699 | 2.852355 | 0.0110 |
| DLOG(AEXP) | 0.526350 | 0.159920 | 3.291327 | 0.0043 |
| DLOG(OILP) | 0.405358 | 0.110381 | 3.672358 | 0.0019 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.327804 | 0.348279 | 0.941209 | 0.3598 |
| LOG(OILP) | 0.339482 | 0.291766 | 1.163541 | 0.2607 |
| LOG(GDP) | 0.026633 | 1.394284 | 0.019102 | 0.9850 |
| LOG(EXTR) | 0.058369 | 0.244937 | 0.238302 | 0.8145 |
| INFR | 0.007700 | 0.004258 | 1.808368 | 0.0883 |
| UEMR | 0.010341 | 0.057820 | 0.178852 | 0.8602 |
| LOG(EXCR) | 0.803369 | 0.487168 | 1.649061 | 0.1175 |

EC = LOG(AREV) - (0.3278*LOG(AEXP) + 0.3395*LOG(OILP) + 0.0266 *LOG(GDP) + 0.0584*LOG(EXTR) + 0.0077*INFR + 0.0103*UEMR + 0.8034*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.369309 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.384 | 3.728 |
| | | 5% | 2.875 | 4.445 |
| | | 1% | 4.104 | 6.151 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -2.643128 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

VEN LONGRUN EQN 2 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 1, 0, 1, 0, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 07/24/18 Time: 20:59
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -16.38028 | 18.97416 | -0.863294 | 0.4007 |
| @TREND | 0.063747 | 0.067182 | 0.948877 | 0.3568 |
| LOG(AREV(-1))* | -0.260103 | 0.346020 | -0.751700 | 0.4631 |
| LOG(AEXP(-1)) | -0.279950 | 0.613826 | -0.456073 | 0.6545 |
| LOG(GDP)** | 1.222928 | 0.821057 | 1.489456 | 0.1558 |
| LOG(EXTR(-1)) | -0.165441 | 0.193348 | -0.855660 | 0.4048 |
| INFR** | 0.003208 | 0.001648 | 1.946489 | 0.0694 |
| UEMR** | 0.011451 | 0.029714 | 0.385385 | 0.7050 |
| LOG(EXCR)** | 0.383247 | 0.163940 | 2.337732 | 0.0327 |
| DLOG(AEXP) | 0.500500 | 0.274781 | 1.821448 | 0.0873 |
| DLOG(EXTR) | 0.089390 | 0.184958 | 0.483299 | 0.6354 |
| OILD | -0.167100 | 0.072311 | -2.310842 | 0.0345 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -1.076301 | 3.759843 | -0.286262 | 0.7784 |
| LOG(GDP) | 4.701700 | 7.857159 | 0.598397 | 0.5580 |
| LOG(EXTR) | -0.636057 | 1.499469 | -0.424188 | 0.6771 |
| INFR | 0.012333 | 0.021641 | 0.569900 | 0.5767 |
| UEMR | 0.044027 | 0.108926 | 0.404189 | 0.6914 |
| LOG(EXCR) | 1.473442 | 2.415801 | 0.609919 | 0.5505 |

EC = LOG(AREV) - (-1.0763*LOG(AEXP) + 4.7017*LOG(GDP) -0.6361
*LOG(EXTR) + 0.0123*INFR + 0.0440*UEMR + 1.4734*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 5.929742 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | 10% | 2.879 | 4.114 |
| | | 5% | 3.426 | 4.79 |
| | | 1% | 4.704 | 6.537 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.977 | 4.26 |
| | | 5% | 3.576 | 5.065 |
| | | 1% | 5.046 | 6.93 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -0.751700 | 10% | -3.13 | -4.37 |
| | | 5% | -3.41 | -4.69 |
| | | 2.5% | -3.65 | -4.96 |
| | | 1% | -3.96 | -5.31 |

## *Appendix G23: Venezuela ARDL Long Run Form and Bound Tests Model 3*

VEN LONGRUN EQN 3
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 1, 0, 0, 1, 0, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/23/18 Time: 23:44
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 18.56214 | 2.561083 | 7.247769 | 0.0000 |
| @TREND | -0.038475 | 0.011937 | -3.223079 | 0.0053 |
| LOG(GDP(-1))* | -0.832893 | 0.084590 | -9.846189 | 0.0000 |
| LOG(AEXP(-1)) | 0.139898 | 0.076525 | 1.828138 | 0.0862 |
| LOG(OILP)** | 0.077769 | 0.029061 | 2.676096 | 0.0166 |
| LOG(AREV)** | -0.005914 | 0.060524 | -0.097715 | 0.9234 |
| LOG(EXTR(-1)) | 0.032580 | 0.030027 | 1.085012 | 0.2940 |
| INFR** | -0.000262 | 0.000269 | -0.972134 | 0.3455 |
| UEMR** | -0.021325 | 0.004459 | -4.782662 | 0.0002 |
| LOG(EXCR)** | 0.032170 | 0.034203 | 0.940549 | 0.3609 |
| DLOG(AEXP) | 0.047815 | 0.069647 | 0.686535 | 0.5022 |
| DLOG(EXTR) | -0.067691 | 0.034454 | -1.964699 | 0.0671 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.167966 | 0.092274 | 1.820293 | 0.0875 |
| LOG(OILP) | 0.093373 | 0.035522 | 2.628616 | 0.0182 |
| LOG(AREV) | -0.007101 | 0.072560 | -0.097858 | 0.9233 |
| LOG(EXTR) | 0.039116 | 0.036371 | 1.075482 | 0.2981 |
| INFR | -0.000315 | 0.000331 | -0.948977 | 0.3567 |
| UEMR | -0.025603 | 0.004810 | -5.323357 | 0.0001 |
| LOG(EXCR) | 0.038624 | 0.040261 | 0.959347 | 0.3517 |

EC = LOG(GDP) - (0.1680*LOG(AEXP) + 0.0934*LOG(OILP) -0.0071
*LOG(AREV) + 0.0391*LOG(EXTR) -0.0003*INFR -0.0256*UEMR +
0.0386*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 24.69285 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | | | |
| | | 10% | 2.729 | 3.985 |
| | | 5% | 3.251 | 4.64 |
| | | 1% | 4.459 | 6.206 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.843 | 4.16 |
| | | 5% | 3.394 | 4.939 |
| | | 1% | 4.779 | 6.821 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -9.846189 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

*VEN LONGRUN EQN 3 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 0, 0, 1, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 06/25/18 Time: 23:08
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 19.38728 | 2.673829 | 7.250756 | 0.0000 |
| LOG(GDP(-1))* | -0.806258 | 0.091824 | -8.780424 | 0.0000 |
| LOG(AEXP)** | -0.065329 | 0.053481 | -1.221541 | 0.2376 |
| LOG(AREV)** | 0.114884 | 0.060579 | 1.896441 | 0.0741 |
| LOG(EXTR(-1)) | 0.044357 | 0.036839 | 1.204056 | 0.2442 |
| INFR** | -0.000382 | 0.000248 | -1.543904 | 0.1400 |
| UEMR** | -0.024308 | 0.005027 | -4.835278 | 0.0001 |
| LOG(EXCR)** | 0.005122 | 0.039988 | 0.128092 | 0.8995 |
| DLOG(EXTR) | -0.073847 | 0.040358 | -1.829814 | 0.0839 |
| OILD | -0.003600 | 0.014187 | -0.253779 | 0.8025 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -0.081028 | 0.069392 | -1.167673 | 0.2582 |
| LOG(AREV) | 0.142491 | 0.080655 | 1.766669 | 0.0942 |
| LOG(EXTR) | 0.055016 | 0.045989 | 1.196281 | 0.2471 |
| INFR | -0.000474 | 0.000308 | -1.540629 | 0.1408 |
| UEMR | -0.030149 | 0.005667 | -5.319805 | 0.0000 |
| LOG(EXCR) | 0.006353 | 0.049443 | 0.128493 | 0.8992 |
| C | 24.04600 | 1.374139 | 17.49896 | 0.0000 |

EC = LOG(GDP) - (-0.0810*LOG(AEXP) + 0.1425*LOG(AREV) + 0.0550 *LOG(EXTR) -0.0005*INFR -0.0301*UEMR + 0.0064*LOG(EXCR) + 24.0460 )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 16.16362 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | 10% | 2.254 | 3.388 |
| | | 5% | 2.685 | 3.96 |
| | | 1% | 3.713 | 5.326 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.334 | 3.515 |
| | | 5% | 2.794 | 4.148 |
| | | 1% | 3.976 | 5.691 |

## *Appendix G24: Venezuela ARDL Long Run Form and Bound Tests Model 4*

VEN LONGRUN EQN 4
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 1)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 16:50
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 57.83503 | 21.58550 | 2.679346 | 0.0153 |
| LOG(EXTR(-1))* | -0.172963 | 0.171159 | -1.010536 | 0.3256 |
| LOG(AEXP)** | -0.755323 | 0.179119 | -4.216868 | 0.0005 |
| LOG(OILP)** | 0.482103 | 0.150705 | 3.198981 | 0.0050 |
| LOG(AREV)** | 0.390769 | 0.284467 | 1.373689 | 0.1864 |
| LOG(GDP)** | -1.733157 | 0.887523 | -1.952803 | 0.0666 |
| INFR** | 0.003348 | 0.002285 | 1.465573 | 0.1600 |
| UEMR** | -0.050971 | 0.032311 | -1.577516 | 0.1321 |
| LOG(EXCR(-1)) | 0.565906 | 0.257191 | 2.200332 | 0.0411 |
| DLOG(EXCR) | 0.112816 | 0.185919 | 0.606803 | 0.5516 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -4.366968 | 4.140853 | -1.054606 | 0.3056 |
| LOG(OILP) | 2.787321 | 3.029901 | 0.919938 | 0.3698 |
| LOG(AREV) | 2.259266 | 2.460729 | 0.918129 | 0.3707 |
| LOG(GDP) | -10.02041 | 12.84606 | -0.780037 | 0.4455 |
| INFR | 0.019358 | 0.026705 | 0.724864 | 0.4779 |
| UEMR | -0.294692 | 0.326997 | -0.901208 | 0.3794 |
| LOG(EXCR) | 3.271838 | 3.603913 | 0.907857 | 0.3759 |

EC = LOG(EXTR) - (-4.3670*LOG(AEXP) + 2.7873*LOG(OILP) + 2.2593 *LOG(AREV) -10.0204*LOG(GDP) + 0.0194*INFR -0.2947*UEMR + 3.2718*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 9.052437 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.384 | 3.728 |
| | | 5% | 2.875 | 4.445 |
| | | 1% | 4.104 | 6.151 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -1.010536 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

VEN LONGRUN EQN 4 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(2, 1, 1, 1, 1, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 06/25/18 Time: 23:17
Sample: 1988 2016
Included observations: 27

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 30.17691 | 52.80488 | 0.571480 | 0.5792 |
| LOG(EXTR(-1))* | -0.597935 | 0.316841 | -1.887175 | 0.0858 |
| LOG(AEXP(-1)) | -0.884219 | 0.373532 | -2.367184 | 0.0373 |
| LOG(AREV(-1)) | 0.904502 | 0.463418 | 1.951805 | 0.0769 |
| LOG(GDP(-1)) | -0.571063 | 2.193432 | -0.260351 | 0.7994 |
| INFR(-1) | -0.001016 | 0.002230 | -0.455728 | 0.6575 |
| UEMR(-1) | -0.098995 | 0.069167 | -1.431252 | 0.1801 |
| LOG(EXCR(-1)) | 0.139634 | 0.292860 | 0.476794 | 0.6428 |
| DLOG(EXTR(-1)) | 0.574611 | 0.411744 | 1.395554 | 0.1904 |
| DLOG(AEXP) | -0.434268 | 0.418174 | -1.038486 | 0.3213 |
| DLOG(AREV) | 0.464362 | 0.417712 | 1.111681 | 0.2900 |
| DLOG(GDP) | -3.643642 | 1.491313 | -2.443245 | 0.0326 |
| D(INFR) | -0.001562 | 0.002252 | -0.693610 | 0.5023 |
| D(UEMR) | -0.141369 | 0.046145 | -3.063569 | 0.0108 |
| DLOG(EXCR) | 0.243281 | 0.333563 | 0.729341 | 0.4810 |
| OILD | -0.375259 | 0.154945 | -2.421889 | 0.0339 |

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -1.478788 | 0.818658 | -1.806357 | 0.0983 |
| LOG(AREV) | 1.512709 | 1.027854 | 1.471715 | 0.1691 |
| LOG(GDP) | -0.955059 | 3.890841 | -0.245463 | 0.8106 |
| INFR | -0.001700 | 0.003605 | -0.471498 | 0.6465 |
| UEMR | -0.165562 | 0.138985 | -1.191221 | 0.2586 |
| LOG(EXCR) | 0.233527 | 0.480442 | 0.486066 | 0.6365 |
| C | 50.46854 | 98.49113 | 0.512417 | 0.6185 |

EC = LOG(EXTR) - (-1.4788*LOG(AEXP) + 1.5127*LOG(AREV) -0.9551
*LOG(GDP) -0.0017*INFR -0.1656*UEMR + 0.2335*LOG(EXCR) +
50.4685 )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 1.529238 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 27 | 10% | 2.254 | 3.388 |
| | | 5% | 2.685 | 3.96 |
| | | 1% | 3.713 | 5.326 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.334 | 3.515 |
| | | 5% | 2.794 | 4.148 |
| | | 1% | 3.976 | 5.691 |

***Appendix G25: Venezuela ARDL Long Run Form and Bound Tests Model 5***

VEN LONGRUN EQN 5
ARDL Long Run Form and Bounds Test
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 0, 0, 1, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 06/24/18 Time: 02:10
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 4960.102 | 2935.940 | 1.689442 | 0.1075 |
| INFR(-1)* | -0.514545 | 0.184365 | -2.790909 | 0.0117 |
| LOG(AEXP)** | 18.44800 | 36.44427 | 0.506198 | 0.6185 |
| LOG(OILP)** | -29.27101 | 14.56979 | -2.009020 | 0.0590 |
| LOG(AREV(-1)) | 5.666557 | 41.05398 | 0.138027 | 0.8917 |
| LOG(GDP)** | -179.6649 | 114.7207 | -1.566107 | 0.1338 |
| LOG(EXTR)** | -24.36748 | 20.79199 | -1.171965 | 0.2557 |
| UEMR** | -9.701705 | 4.019803 | -2.413478 | 0.0261 |
| DLOG(AREV) | 53.38300 | 33.31320 | 1.602458 | 0.1255 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 35.85306 | 73.75614 | 0.486103 | 0.6325 |
| LOG(OILP) | -56.88721 | 26.62532 | -2.136583 | 0.0459 |
| LOG(AREV) | 11.01276 | 79.19668 | 0.139056 | 0.8909 |
| LOG(GDP) | -349.1726 | 252.7304 | -1.381601 | 0.1831 |
| LOG(EXTR) | -47.35737 | 41.57149 | -1.139179 | 0.2688 |
| UEMR | -18.85493 | 8.918926 | -2.114036 | 0.0480 |
| C | 9639.788 | 6524.755 | 1.477418 | 0.1559 |

EC = INFR - (35.8531*LOG(AEXP) -56.8872*LOG(OILP) + 11.0128
*LOG(AREV) -349.1726*LOG(GDP) -47.3574*LOG(EXTR) -18.8549
*UEMR + 9639.7883 )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.086587 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | 10% | 2.254 | 3.388 |
| | | 5% | 2.685 | 3.96 |
| | | 1% | 3.713 | 5.326 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.334 | 3.515 |
| | | 5% | 2.794 | 4.148 |
| | | 1% | 3.976 | 5.691 |

VEN LONGRUN EQN 5 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 0, 0, 0, 1, 0, 2)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 21:26
Sample: 1988 2016
Included observations: 27

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 4935.032 | 2371.588 | 2.080898 | 0.0550 |
| INFR(-1)* | 0.278212 | 0.209101 | 1.330518 | 0.2032 |
| LOG(AEXP)** | 39.52269 | 25.33635 | 1.559920 | 0.1396 |
| LOG(AREV)** | -21.01837 | 32.85773 | -0.639678 | 0.5320 |
| LOG(GDP)** | -169.0857 | 95.67685 | -1.767258 | 0.0975 |
| LOG(EXTR(-1)) | -35.34201 | 17.17007 | -2.058349 | 0.0574 |
| UEMR** | -6.464125 | 3.449437 | -1.873965 | 0.0805 |
| LOG(EXCR(-1)) | -2.016199 | 22.84305 | -0.088263 | 0.9308 |
| DLOG(EXTR) | 19.26308 | 23.63250 | 0.815110 | 0.4278 |
| DLOG(EXCR) | 19.17220 | 19.17575 | 0.999815 | 0.3333 |
| DLOG(EXCR(-1)) | -89.01105 | 20.72293 | -4.295292 | 0.0006 |
| OILD | -2.146135 | 7.311950 | -0.293511 | 0.7732 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -142.0594 | 109.1976 | -1.300939 | 0.2129 |
| LOG(AREV) | 75.54791 | 91.82408 | 0.822746 | 0.4235 |
| LOG(GDP) | 607.7575 | 612.1932 | 0.992755 | 0.3366 |
| LOG(EXTR) | 127.0325 | 116.6293 | 1.089199 | 0.2933 |
| UEMR | 23.23449 | 21.50202 | 1.080573 | 0.2970 |
| LOG(EXCR) | 7.246977 | 85.57448 | 0.084686 | 0.9336 |

EC = INFR - (-142.0594*LOG(AEXP) + 75.5479*LOG(AREV) + 607.7575 *LOG(GDP) + 127.0325*LOG(EXTR) + 23.2345*UEMR + 7.2470 *LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 13.81525 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 27 | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.457 | 3.797 |
| | | 5% | 2.97 | 4.499 |
| | | 1% | 4.27 | 6.211 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | 1.330518 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix G26: Venezuela ARDL Long Run Form and Bound Tests Model 6*

VEN LONGRUN EQN 6
ARDL Long Run Form and Bounds Test
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0, 1)
Case 4: Unrestricted Constant and Restricted Trend
Date: 07/24/18 Time: 17:02
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 541.5582 | 106.6612 | 5.077368 | 0.0001 |
| @TREND | -0.811540 | 0.497574 | -1.630994 | 0.1224 |
| UEMR(-1)* | -0.895204 | 0.150352 | -5.954065 | 0.0000 |
| LOG(AEXP(-1)) | 2.990375 | 3.225768 | 0.927027 | 0.3677 |
| LOG(OILP)** | -0.268228 | 1.204624 | -0.222665 | 0.8266 |
| LOG(AREV)** | 1.617971 | 2.134909 | 0.757864 | 0.4595 |
| LOG(GDP)** | -23.13836 | 4.583934 | -5.047709 | 0.0001 |
| LOG(EXTR)** | -0.734730 | 0.962356 | -0.763470 | 0.4563 |
| INFR** | -0.028013 | 0.012915 | -2.168981 | 0.0455 |
| LOG(EXCR(-1)) | -0.252572 | 1.851027 | -0.136450 | 0.8932 |
| DLOG(AEXP) | -0.891118 | 2.486661 | -0.358359 | 0.7248 |
| DLOG(EXCR) | 2.418656 | 1.139413 | 2.122721 | 0.0497 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 4: Unrestricted Constant and Restricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 3.340441 | 3.745525 | 0.891849 | 0.3857 |
| LOG(OILP) | -0.299627 | 1.359034 | -0.220471 | 0.8283 |
| LOG(AREV) | 1.807377 | 2.344738 | 0.770823 | 0.4520 |
| LOG(GDP) | -25.84703 | 4.502461 | -5.740645 | 0.0000 |
| LOG(EXTR) | -0.820740 | 1.049078 | -0.782344 | 0.4454 |
| INFR | -0.031292 | 0.015356 | -2.037728 | 0.0585 |
| LOG(EXCR) | -0.282139 | 2.086429 | -0.135226 | 0.8941 |
| @TREND | -0.906543 | 0.560292 | -1.617982 | 0.1252 |

EC = UEMR - (3.3404*LOG(AEXP) -0.2996*LOG(OILP) + 1.8074*LOG(AREV)
-25.8470*LOG(GDP) -0.8207*LOG(EXTR) -0.0313*INFR -0.2821
*LOG(EXCR) -0.9065*@TREND )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.534461 | 10% | 2.22 | 3.17 |
| k | 7 | 5% | 2.5 | 3.5 |
| | | 2.5% | 2.76 | 3.81 |
| | | 1% | 3.07 | 4.23 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 28 | | | |
| | | 10% | 2.578 | 3.71 |
| | | 5% | 3.057 | 4.319 |
| | | 1% | 4.489 | 5.064 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.681 | 3.887 |
| | | 5% | 3.194 | 4.604 |
| | | 1% | 4.49 | 6.328 |

VEN LONGRUN EQN 6 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 1, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 23:44
Sample: 1988 2016
Included observations: 28

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 562.1969 | 87.30753 | 6.439272 | 0.0000 |
| UEMR(-1)* | -0.996159 | 0.125741 | -7.922278 | 0.0000 |
| LOG(AEXP)** | -3.649564 | 1.495785 | -2.439898 | 0.0253 |
| LOG(AREV(-1)) | 3.534202 | 1.825348 | 1.936180 | 0.0687 |
| LOG(GDP)** | -18.66104 | 3.870806 | -4.820969 | 0.0001 |
| LOG(EXTR)** | -2.225019 | 0.789450 | -2.818443 | 0.0114 |
| INFR** | -0.003085 | 0.007939 | -0.388588 | 0.7021 |
| LOG(EXCR)** | 2.609506 | 0.938180 | 2.781457 | 0.0123 |
| DLOG(AREV) | 1.089577 | 1.771354 | 0.615109 | 0.5462 |
| OILD | -0.779468 | 0.412048 | -1.891691 | 0.0747 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -3.663636 | 1.318919 | -2.777757 | 0.0124 |
| LOG(AREV) | 3.547829 | 1.623866 | 2.184804 | 0.0424 |
| LOG(GDP) | -18.73299 | 2.932682 | -6.387665 | 0.0000 |
| LOG(EXTR) | -2.233598 | 0.814182 | -2.743364 | 0.0134 |
| INFR | -0.003097 | 0.007867 | -0.393680 | 0.6984 |
| LOG(EXCR) | 2.619568 | 0.997026 | 2.627382 | 0.0171 |

EC = UEMR - (-3.6636*LOG(AEXP) + 3.5478*LOG(AREV) -18.7330
*LOG(GDP) -2.2336*LOG(EXTR) -0.0031*INFR + 2.6196*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 15.66722 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| Actual Sample Size | 28 | | Finite Sample: n=35 | |
| | | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.457 | 3.797 |
| | | 5% | 2.97 | 4.499 |
| | | 1% | 4.27 | 6.211 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -7.922278 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## Appendix G3: ARDL Long Run Form and Bound Tests for Norway

### *Appendix G31: Norway ARDL Long Run Form and Bound Tests Model 1*

NOR LONGRUN EQN 1
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(2, 2, 2, 2, 2, 2, 2, 2)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 05/24/18 Time: 19:36
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 31.46822 | 24.95490 | 1.261004 | 0.2390 |
| @TREND | 0.030259 | 0.033920 | 0.892056 | 0.3956 |
| LOG(AEXP(-1))* | -0.914884 | 0.546190 | -1.674993 | 0.1283 |
| LOG(AREV(-1)) | 1.132147 | 0.342805 | 3.302598 | 0.0092 |
| LOG(OILP(-1)) | -0.176529 | 0.075070 | -2.351532 | 0.0432 |
| LOG(GDP(-1)) | -1.293463 | 0.650009 | -1.989916 | 0.0778 |
| LOG(EXTR(-1)) | -0.118494 | 0.085000 | -1.394046 | 0.1968 |
| INFR(-1) | 0.010470 | 0.019195 | 0.545433 | 0.5987 |
| UEMR(-1) | 0.011913 | 0.012964 | 0.918954 | 0.3821 |
| LOG(EXCR(-1)) | -0.194611 | 0.173359 | -1.122591 | 0.2907 |
| DLOG(AEXP(-1)) | 0.029304 | 0.311142 | 0.094181 | 0.9270 |
| DLOG(AREV) | 0.760201 | 0.297585 | 2.554572 | 0.0310 |
| DLOG(AREV(-1)) | -0.463222 | 0.204868 | -2.261073 | 0.0501 |
| DLOG(OILP) | -0.113248 | 0.077690 | -1.457692 | 0.1789 |
| DLOG(OILP(-1)) | -0.007139 | 0.062578 | -0.114087 | 0.9117 |
| DLOG(GDP) | -0.478066 | 1.152968 | -0.414639 | 0.6881 |
| DLOG(GDP(-1)) | 1.275123 | 0.684263 | 1.863498 | 0.0953 |
| DLOG(EXTR) | -0.088704 | 0.040861 | -2.170903 | 0.0580 |
| DLOG(EXTR(-1)) | 0.060200 | 0.062692 | 0.960256 | 0.3620 |
| D(INFR) | 0.003228 | 0.009315 | 0.346497 | 0.7369 |
| D(INFR(-1)) | -0.002796 | 0.008386 | -0.333416 | 0.7465 |
| D(UEMR) | 0.003988 | 0.012695 | 0.313963 | 0.7607 |
| D(UEMR(-1)) | 0.000458 | 0.014047 | 0.032632 | 0.9747 |
| DLOG(EXCR) | -0.108539 | 0.132992 | -0.816130 | 0.4355 |
| DLOG(EXCR(-1)) | -0.048578 | 0.093061 | -0.521865 | 0.6144 |

* p-value incompatible with t-Bounds distribution.

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV) | 1.237504 | 0.606006 | 2.042058 | 0.0715 |
| LOG(OILP) | -0.192957 | 0.080134 | -2.407921 | 0.0394 |
| LOG(GDP) | -1.413831 | 0.462751 | -3.055277 | 0.0137 |
| LOG(EXTR) | -0.129521 | 0.134571 | -0.962474 | 0.3610 |
| INFR | 0.011444 | 0.026287 | 0.435340 | 0.6736 |
| UEMR | 0.013022 | 0.014825 | 0.878339 | 0.4026 |
| LOG(EXCR) | -0.212722 | 0.217544 | -0.977832 | 0.3537 |

EC = LOG(AEXP) - (1.2375*LOG(AREV) -0.1930*LOG(OILP) -1.4138
*LOG(GDP) -0.1295*LOG(EXTR) + 0.0114*INFR + 0.0130*UEMR
-0.2127*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 3.285580 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | 10% | 2.729 | 3.985 |
| | | 5% | 3.251 | 4.64 |
| | | 1% | 4.459 | 6.206 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.843 | 4.16 |
| | | 5% | 3.394 | 4.939 |
| | | 1% | 4.779 | 6.821 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -1.674993 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

NOR LONGRUN EQN 1 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 2, 0, 0, 0, 1, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 21:48
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.269747 | 3.355215 | -0.080396 | 0.9366 |
| LOG(AEXP(-1))* | -0.349189 | 0.105904 | -3.297212 | 0.0033 |
| LOG(AREV(-1)) | 0.379047 | 0.124887 | 3.035124 | 0.0061 |
| LOG(GDP)** | 0.037778 | 0.201886 | 0.187126 | 0.8533 |
| LOG(EXTR)** | -0.067612 | 0.034693 | -1.948862 | 0.0642 |
| INFR** | 0.017740 | 0.005380 | 3.297121 | 0.0033 |
| UEMR(-1) | 0.022592 | 0.008696 | 2.598024 | 0.0164 |
| LOG(EXCR)** | -0.025564 | 0.052049 | -0.491158 | 0.6282 |
| DLOG(AREV) | 0.289266 | 0.107947 | 2.679715 | 0.0137 |
| DLOG(AREV(-1)) | -0.317645 | 0.098172 | -3.235600 | 0.0038 |
| D(UEMR) | 0.003157 | 0.010032 | 0.314657 | 0.7560 |
| OILD | -0.002891 | 0.014617 | -0.197819 | 0.8450 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AREV) | 1.085507 | 0.229427 | 4.731378 | 0.0001 |
| LOG(GDP) | 0.108188 | 0.578504 | 0.187014 | 0.8534 |
| LOG(EXTR) | -0.193625 | 0.109712 | -1.764845 | 0.0915 |
| INFR | 0.050802 | 0.021403 | 2.373603 | 0.0268 |
| UEMR | 0.064698 | 0.019718 | 3.281117 | 0.0034 |
| LOG(EXCR) | -0.073211 | 0.151427 | -0.483473 | 0.6335 |

EC = LOG(AEXP) - (1.0855*LOG(AREV) + 0.1082*LOG(GDP) -0.1936
*LOG(EXTR) + 0.0508*INFR + 0.0647*UEMR -0.0732*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 5.463493 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | | | |
| | | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.457 | 3.797 |
| | | 5% | 2.97 | 4.499 |
| | | 1% | 4.27 | 6.211 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -3.297212 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix G32: Norway ARDL Long Run Form and Bound Tests Model 2*

NOR LONGRUN EQN 2
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(2, 0, 2, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 01:15
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -13.23029 | 2.480801 | -5.333073 | 0.0000 |
| LOG(AREV(-1))* | -0.763043 | 0.077276 | -9.874283 | 0.0000 |
| LOG(AEXP)** | 0.405737 | 0.078682 | 5.156657 | 0.0000 |
| LOG(OILP(-1)) | 0.079197 | 0.013446 | 5.889849 | 0.0000 |
| LOG(GDP)** | 0.813557 | 0.155486 | 5.232348 | 0.0000 |
| LOG(EXTR)** | 0.042641 | 0.025262 | 1.687939 | 0.1056 |
| INFR** | 0.009378 | 0.004209 | 2.228082 | 0.0364 |
| UEMR** | -0.006210 | 0.006245 | -0.994288 | 0.3309 |
| LOG(EXCR)** | 0.072444 | 0.036152 | 2.003855 | 0.0576 |
| DLOG(AREV(-1)) | 0.161913 | 0.098404 | 1.645389 | 0.1141 |
| DLOG(OILP) | 0.170056 | 0.016207 | 10.49299 | 0.0000 |
| DLOG(OILP(-1)) | 0.072393 | 0.021190 | 3.416344 | 0.0025 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.531735 | 0.073499 | 7.234575 | 0.0000 |
| LOG(OILP) | 0.103791 | 0.016674 | 6.224773 | 0.0000 |
| LOG(GDP) | 1.066201 | 0.194161 | 5.491327 | 0.0000 |
| LOG(EXTR) | 0.055883 | 0.033085 | 1.689059 | 0.1053 |
| INFR | 0.012291 | 0.005781 | 2.126050 | 0.0450 |
| UEMR | -0.008138 | 0.007978 | -1.020016 | 0.3188 |
| LOG(EXCR) | 0.094941 | 0.049444 | 1.920184 | 0.0679 |

EC = LOG(AREV) - (0.5317*LOG(AEXP) + 0.1038*LOG(OILP) + 1.0662 *LOG(GDP) + 0.0559*LOG(EXTR) + 0.0123*INFR -0.0081*UEMR + 0.0949*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 20.85628 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.384 | 3.728 |
| | | 5% | 2.875 | 4.445 |
| | | 1% | 4.104 | 6.151 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -9.874283 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NOR LONGRUN EQN 2 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(2, 0, 0, 2, 0, 0, 2)
Case 3: Unrestricted Constant and No Trend
Date: 06/26/18 Time: 02:02
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -15.67865 | 4.474867 | -3.503713 | 0.0022 |
| LOG(AREV(-1))* | -0.471731 | 0.131296 | -3.592878 | 0.0018 |
| LOG(AEXP)** | 0.319855 | 0.144607 | 2.211889 | 0.0388 |
| LOG(GDP)** | 0.903284 | 0.262316 | 3.443496 | 0.0026 |
| LOG(EXTR(-1)) | -0.146758 | 0.080352 | -1.826436 | 0.0828 |
| INFR** | 0.021464 | 0.008335 | 2.575046 | 0.0181 |
| UEMR** | -0.002261 | 0.010913 | -0.207134 | 0.8380 |
| LOG(EXCR(-1)) | -0.319762 | 0.093666 | -3.413842 | 0.0028 |
| DLOG(AREV(-1)) | 0.413044 | 0.136645 | 3.022749 | 0.0067 |
| DLOG(EXTR) | 0.058419 | 0.048110 | 1.214270 | 0.2388 |
| DLOG(EXTR(-1)) | 0.204334 | 0.055447 | 3.685244 | 0.0015 |
| DLOG(EXCR) | 0.001458 | 0.103025 | 0.014147 | 0.9889 |
| DLOG(EXCR(-1)) | 0.185798 | 0.084945 | 2.187279 | 0.0408 |
| OILD | -0.095232 | 0.017735 | -5.369820 | 0.0000 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 0.678045 | 0.185324 | 3.658708 | 0.0016 |
| LOG(GDP) | 1.914830 | 0.778160 | 2.460714 | 0.0231 |
| LOG(EXTR) | -0.311106 | 0.215948 | -1.440652 | 0.1652 |
| INFR | 0.045501 | 0.024678 | 1.843810 | 0.0801 |
| UEMR | -0.004792 | 0.022365 | -0.214263 | 0.8325 |
| LOG(EXCR) | -0.677849 | 0.284332 | -2.384010 | 0.0271 |

EC = LOG(AREV) - (0.6780*LOG(AEXP) + 1.9148*LOG(GDP) -0.3111
*LOG(EXTR) + 0.0455*INFR -0.0048*UEMR -0.6778*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 7.281435 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | | | |
| | | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.457 | 3.797 |
| | | 5% | 2.97 | 4.499 |
| | | 1% | 4.27 | 6.211 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -3.592878 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix G33: Norway ARDL Long Run Form and Bound Tests Model 3*

NOR LONGRUN EQN 3
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(2, 1, 1, 0, 1, 0, 2, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 05/24/18 Time: 19:54
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 10.32747 | 1.842938 | 5.603805 | 0.0000 |
| @TREND | 0.012247 | 0.002629 | 4.658230 | 0.0002 |
| LOG(GDP(-1))* | -0.289201 | 0.072836 | -3.970603 | 0.0009 |
| LOG(AEXP(-1)) | -0.189284 | 0.047869 | -3.953809 | 0.0009 |
| LOG(OILP(-1)) | -0.009663 | 0.010722 | -0.901195 | 0.3794 |
| LOG(AREV)** | 0.066845 | 0.043502 | 1.536598 | 0.1418 |
| LOG(EXTR(-1)) | 0.017174 | 0.010563 | 1.625835 | 0.1214 |
| INFR** | -0.005969 | 0.001345 | -4.438058 | 0.0003 |
| UEMR(-1) | 0.004536 | 0.002275 | 1.994156 | 0.0615 |
| LOG(EXCR)** | 0.033549 | 0.019346 | 1.734174 | 0.1000 |
| DLOG(GDP(-1)) | 0.166910 | 0.095162 | 1.753957 | 0.0964 |
| DLOG(AEXP) | -0.055795 | 0.044093 | -1.265393 | 0.2219 |
| DLOG(OILP) | 0.003492 | 0.011649 | 0.299770 | 0.7678 |
| DLOG(EXTR) | -0.002268 | 0.008401 | -0.269984 | 0.7902 |
| D(UEMR) | -0.001238 | 0.002112 | -0.586135 | 0.5651 |
| D(UEMR(-1)) | -0.006469 | 0.001999 | -3.236041 | 0.0046 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -0.654437 | 0.180369 | -3.628321 | 0.0019 |
| LOG(OILP) | -0.033413 | 0.030706 | -1.088091 | 0.2909 |
| LOG(AREV) | 0.231138 | 0.110290 | 2.095724 | 0.0505 |
| LOG(EXTR) | 0.059388 | 0.041306 | 1.437706 | 0.1677 |
| INFR | -0.020641 | 0.006224 | -3.316505 | 0.0038 |
| UEMR | 0.015684 | 0.010071 | 1.557360 | 0.1365 |
| LOG(EXCR) | 0.116004 | 0.083242 | 1.393583 | 0.1804 |

EC = LOG(GDP) - (-0.6544*LOG(AEXP) -0.0334*LOG(OILP) + 0.2311
*LOG(AREV) + 0.0594*LOG(EXTR) -0.0206*INFR + 0.0157*UEMR +
0.1160*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 19.10423 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | 10% | 2.729 | 3.985 |
| | | 5% | 3.251 | 4.64 |
| | | 1% | 4.459 | 6.206 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.843 | 4.16 |
| | | 5% | 3.394 | 4.939 |
| | | 1% | 4.779 | 6.821 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -3.970603 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

NOR LONGRUN EQN 3 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 1, 0, 1, 0, 2, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/26/18 Time: 02:18
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 8.689180 | 0.950945 | 9.137411 | 0.0000 |
| @TREND | 0.010033 | 0.001847 | 5.430979 | 0.0000 |
| LOG(GDP(-1))* | -0.235783 | 0.048998 | -4.812078 | 0.0001 |
| LOG(AEXP(-1)) | -0.169559 | 0.033392 | -5.077777 | 0.0001 |
| LOG(AREV)** | 0.053412 | 0.021482 | 2.486297 | 0.0219 |
| LOG(EXTR(-1)) | 0.018160 | 0.010023 | 1.811900 | 0.0850 |
| INFR** | -0.005166 | 0.001420 | -3.638120 | 0.0016 |
| UEMR(-1) | 0.007581 | 0.001969 | 3.849572 | 0.0010 |
| LOG(EXCR)** | 0.047914 | 0.012764 | 3.753909 | 0.0012 |
| DLOG(AEXP) | -0.026638 | 0.041002 | -0.649678 | 0.5233 |
| DLOG(EXTR) | 0.003027 | 0.008787 | 0.344525 | 0.7340 |
| D(UEMR) | -0.001108 | 0.002293 | -0.483166 | 0.6342 |
| D(UEMR(-1)) | -0.008517 | 0.001870 | -4.554515 | 0.0002 |
| OILD | -0.002883 | 0.003269 | -0.881943 | 0.3883 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -0.719129 | 0.252285 | -2.850467 | 0.0099 |
| LOG(AREV) | 0.226529 | 0.084094 | 2.693760 | 0.0140 |
| LOG(EXTR) | 0.077022 | 0.041334 | 1.863406 | 0.0772 |
| INFR | -0.021910 | 0.007116 | -3.079065 | 0.0059 |
| UEMR | 0.032154 | 0.011618 | 2.767518 | 0.0119 |
| LOG(EXCR) | 0.203210 | 0.040596 | 5.005723 | 0.0001 |

EC = LOG(GDP) - (-0.7191*LOG(AEXP) + 0.2265*LOG(AREV) + 0.0770
*LOG(EXTR) -0.0219*INFR + 0.0322*UEMR + 0.2032*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 20.63370 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | 10% | 2.879 | 4.114 |
| | | 5% | 3.426 | 4.79 |
| | | 1% | 4.704 | 6.537 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.977 | 4.26 |
| | | 5% | 3.576 | 5.065 |
| | | 1% | 5.046 | 6.93 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -4.812078 | 10% | -3.13 | -4.37 |
| | | 5% | -3.41 | -4.69 |
| | | 2.5% | -3.65 | -4.96 |
| | | 1% | -3.96 | -5.31 |

## *Appendix G34: Norway ARDL Long Run Form and Bound Tests Model 4*

NOR LONGRUN EQN 4
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(1, 0, 0, 2, 0, 0, 1, 2)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/24/18 Time: 22:09
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 73.63693 | 47.92351 | 1.536551 | 0.1409 |
| @TREND | 0.106549 | 0.057871 | 1.841142 | 0.0813 |
| LOG(EXTR(-1))* | -0.547487 | 0.211943 | -2.583181 | 0.0182 |
| LOG(AEXP)** | -2.644646 | 1.236626 | -2.138598 | 0.0457 |
| LOG(OILP)** | -0.099891 | 0.224361 | -0.445224 | 0.6612 |
| LOG(AREV(-1)) | 1.943372 | 1.268794 | 1.531669 | 0.1421 |
| LOG(GDP)** | -1.666800 | 1.871121 | -0.890803 | 0.3842 |
| INFR** | -0.003930 | 0.031343 | -0.125386 | 0.9015 |
| UEMR(-1) | 0.077381 | 0.047876 | 1.616289 | 0.1225 |
| LOG(EXCR(-1)) | 0.386680 | 0.430378 | 0.898466 | 0.3802 |
| DLOG(AREV) | 1.698759 | 1.180639 | 1.438847 | 0.1665 |
| DLOG(AREV(-1)) | -1.473053 | 0.613922 | -2.399415 | 0.0268 |
| D(UEMR) | 0.008504 | 0.047217 | 0.180101 | 0.8590 |
| DLOG(EXCR) | 0.010285 | 0.448148 | 0.022950 | 0.9819 |
| DLOG(EXCR(-1)) | -0.807606 | 0.356269 | -2.266845 | 0.0353 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -4.830522 | 2.655368 | -1.819153 | 0.0847 |
| LOG(OILP) | -0.182454 | 0.395162 | -0.461719 | 0.6495 |
| LOG(AREV) | 3.549624 | 2.363443 | 1.501887 | 0.1496 |
| LOG(GDP) | -3.044457 | 3.589782 | -0.848090 | 0.4069 |
| INFR | -0.007178 | 0.058273 | -0.123184 | 0.9033 |
| UEMR | 0.141339 | 0.096592 | 1.463266 | 0.1597 |
| LOG(EXCR) | 0.706281 | 0.954181 | 0.740197 | 0.4682 |

EC = LOG(EXTR) - (-4.8305*LOG(AEXP) -0.1825*LOG(OILP) + 3.5496
*LOG(AREV) -3.0445*LOG(GDP) -0.0072*INFR + 0.1413*UEMR +
0.7063*LOG(EXCR) )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 3.651481 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | 10% | 2.729 | 3.985 |
| | | 5% | 3.251 | 4.64 |
| | | 1% | 4.459 | 6.206 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.843 | 4.16 |
| | | 5% | 3.394 | 4.939 |
| | | 1% | 4.779 | 6.821 |

| t-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| t-statistic | -2.583181 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

NOR LONGRUN EQN 4 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(1, 1, 2, 2, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 06/26/18 Time: 02:30
Sample: 1981 2016
Included observations: 34

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 31.19402 | 18.97859 | 1.643643 | 0.1159 |
| LOG(EXTR(-1))* | -0.449880 | 0.188098 | -2.391729 | 0.0267 |
| LOG(AEXP(-1)) | -0.782319 | 0.556350 | -1.406164 | 0.1750 |
| LOG(AREV(-1)) | 1.769351 | 0.575364 | 3.075185 | 0.0060 |
| LOG(GDP(-1)) | -1.799961 | 1.116558 | -1.612063 | 0.1226 |
| INFR** | 0.001593 | 0.031979 | 0.049811 | 0.9608 |
| UEMR** | 0.004990 | 0.038306 | 0.130257 | 0.8977 |
| LOG(EXCR)** | 0.271889 | 0.282128 | 0.963708 | 0.3467 |
| DLOG(AEXP) | -2.813832 | 0.907867 | -3.099388 | 0.0057 |
| DLOG(AREV) | 1.283783 | 0.613124 | 2.093839 | 0.0492 |
| DLOG(AREV(-1)) | -1.905412 | 0.553925 | -3.439839 | 0.0026 |
| DLOG(GDP) | 0.177507 | 2.705172 | 0.065618 | 0.9483 |
| DLOG(GDP(-1)) | 5.682599 | 2.042767 | 2.781815 | 0.0115 |
| OILD | -0.139970 | 0.071711 | -1.951864 | 0.0651 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -1.738948 | 1.483191 | -1.172437 | 0.2548 |
| LOG(AREV) | 3.932936 | 2.130997 | 1.845585 | 0.0798 |
| LOG(GDP) | -4.000975 | 3.569148 | -1.120989 | 0.2756 |
| INFR | 0.003541 | 0.070586 | 0.050162 | 0.9605 |
| UEMR | 0.011091 | 0.084750 | 0.130865 | 0.8972 |
| LOG(EXCR) | 0.604359 | 0.803767 | 0.751908 | 0.4609 |

EC = LOG(EXTR) - (-1.7389*LOG(AEXP) + 3.9329*LOG(AREV) -4.0010
*LOG(GDP) + 0.0035*INFR + 0.0111*UEMR + 0.6044*LOG(EXCR) )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 3.703676 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 34 | | | |
| | | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |
| | | | Finite Sample: n=30 | |
| | | 10% | 2.457 | 3.797 |
| | | 5% | 2.97 | 4.499 |
| | | 1% | 4.27 | 6.211 |

| t-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| t-statistic | -2.391729 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix G35: Norway ARDL Long Run Form and Bound Tests Model 5*

NOR LONGRUN EQN 5
ARDL Long Run Form and Bounds Test
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 0, 1, 1, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 18:38
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 69.88954 | 111.6346 | 0.626056 | 0.5374 |
| INFR(-1)* | -0.845437 | 0.168068 | -5.030317 | 0.0000 |
| LOG(AEXP(-1)) | 2.451319 | 2.457155 | 0.997625 | 0.3288 |
| LOG(OILP)** | 1.883031 | 0.965001 | 1.951326 | 0.0633 |
| LOG(AREV)** | -8.622311 | 4.701252 | -1.834046 | 0.0796 |
| LOG(GDP(-1)) | 0.609186 | 7.337315 | 0.083026 | 0.9345 |
| LOG(EXTR(-1)) | 2.861993 | 1.422102 | 2.012509 | 0.0560 |
| UEMR** | -0.304923 | 0.246950 | -1.234757 | 0.2294 |
| LOG(EXCR)** | 5.948520 | 1.989206 | 2.990399 | 0.0065 |
| DLOG(AEXP) | 16.89410 | 4.701178 | 3.593589 | 0.0015 |
| DLOG(GDP) | -41.95411 | 13.95067 | -3.007319 | 0.0063 |
| DLOG(EXTR) | 0.074557 | 1.140118 | 0.065394 | 0.9484 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 2.899469 | 2.792300 | 1.038380 | 0.3099 |
| LOG(OILP) | 2.227287 | 0.981193 | 2.269979 | 0.0329 |
| LOG(AREV) | -10.19864 | 5.160639 | -1.976236 | 0.0602 |
| LOG(GDP) | 0.720558 | 8.679320 | 0.083020 | 0.9346 |
| LOG(EXTR) | 3.385222 | 1.779947 | 1.901867 | 0.0698 |
| UEMR | -0.360669 | 0.267754 | -1.347017 | 0.1911 |
| LOG(EXCR) | 7.036027 | 2.095995 | 3.356891 | 0.0027 |

EC = INFR - (2.8995*LOG(AEXP) + 2.2273*LOG(OILP) -10.1986*LOG(AREV)
+ 0.7206*LOG(GDP) + 3.3852*LOG(EXTR) -0.3607*UEMR + 7.0360
*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 8.273949 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -5.030317 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NOR LONGRUN EQN 5 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 1, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 22:18
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 120.8704 | 99.93045 | 1.209545 | 0.2382 |
| INFR(-1)* | -0.674313 | 0.145254 | -4.642295 | 0.0001 |
| LOG(AEXP(-1)) | -0.943393 | 2.821804 | -0.334323 | 0.7410 |
| LOG(AREV)** | 0.105987 | 2.866466 | 0.036975 | 0.9708 |
| LOG(GDP(-1)) | -5.185775 | 5.778922 | -0.897360 | 0.3784 |
| LOG(EXTR)** | 1.565096 | 1.116221 | 1.402138 | 0.1737 |
| UEMR** | -0.240280 | 0.267201 | -0.899247 | 0.3775 |
| LOG(EXCR)** | 2.125287 | 1.428195 | 1.488093 | 0.1497 |
| DLOG(AEXP) | 18.33382 | 4.764834 | 3.847734 | 0.0008 |
| DLOG(GDP) | -36.68662 | 13.75584 | -2.666984 | 0.0135 |
| OILD | 0.700916 | 0.401307 | 1.746583 | 0.0935 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | -1.399044 | 4.245457 | -0.329539 | 0.7446 |
| LOG(AREV) | 0.157177 | 4.247242 | 0.037007 | 0.9708 |
| LOG(GDP) | -7.690459 | 7.832697 | -0.981841 | 0.3360 |
| LOG(EXTR) | 2.321024 | 1.792434 | 1.294901 | 0.2077 |
| UEMR | -0.356333 | 0.356272 | -1.000171 | 0.3272 |
| LOG(EXCR) | 3.151782 | 2.082264 | 1.513632 | 0.1432 |

EC = INFR - (-1.3990*LOG(AEXP) + 0.1572*LOG(AREV) -7.6905*LOG(GDP) + 2.3210*LOG(EXTR) -0.3563*UEMR + 3.1518*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | | Asymptotic: n=1000 | |
| F-statistic | 8.670407 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | 10% | 2.387 | 3.671 |
| | | 5% | 2.864 | 4.324 |
| | | 1% | 4.016 | 5.797 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -4.642295 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix G36: Norway ARDL Long Run Form and Bound Tests Model 6*

NOR LONGRUN EQN 6
ARDL Long Run Form and Bounds Test
Dependent Variable: D(UEMR)
Selected Model: ARDL(3, 2, 2, 0, 0, 2, 1, 2)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 18:49
Sample: 1981 2016
Included observations: 33

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 374.7447 | 106.7618 | 3.510102 | 0.0038 |
| UEMR(-1)* | -0.558567 | 0.206423 | -2.696722 | 0.0183 |
| LOG(AEXP(-1)) | 11.23454 | 2.860924 | 3.926890 | 0.0017 |
| LOG(OILP(-1)) | 1.884725 | 0.859930 | 2.191718 | 0.0472 |
| LOG(AREV)** | -10.01510 | 4.787123 | -2.092092 | 0.0566 |
| LOG(GDP)** | -20.82018 | 6.328911 | -3.289695 | 0.0059 |
| LOG(EXTR(-1)) | 5.124633 | 1.476715 | 3.470294 | 0.0041 |
| INFR(-1) | -0.444393 | 0.201415 | -2.206351 | 0.0460 |
| LOG(EXCR(-1)) | 11.73044 | 2.944335 | 3.984070 | 0.0016 |
| D(UEMR(-1)) | -0.455278 | 0.245506 | -1.854452 | 0.0865 |
| D(UEMR(-2)) | -0.362936 | 0.194079 | -1.870038 | 0.0842 |
| DLOG(AEXP) | -1.070178 | 4.377342 | -0.244481 | 0.8107 |
| DLOG(AEXP(-1)) | -12.83101 | 4.285005 | -2.994398 | 0.0103 |
| DLOG(OILP) | 3.039303 | 1.063422 | 2.858040 | 0.0134 |
| DLOG(OILP(-1)) | 1.618076 | 0.793292 | 2.039698 | 0.0622 |
| DLOG(EXTR) | -0.093329 | 0.889924 | -0.104873 | 0.9181 |
| DLOG(EXTR(-1)) | -3.839721 | 0.945908 | -4.059297 | 0.0014 |
| D(INFR) | -0.247157 | 0.125461 | -1.969983 | 0.0705 |
| DLOG(EXCR) | 6.198546 | 1.666517 | 3.719462 | 0.0026 |
| DLOG(EXCR(-1)) | -3.708360 | 1.810705 | -2.048020 | 0.0613 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 20.18180 | 9.269408 | 2.177248 | 0.0485 |
| LOG(OILP) | 3.385734 | 2.317108 | 1.461189 | 0.1677 |
| LOG(AREV) | -17.99120 | 10.45771 | -1.720377 | 0.1091 |
| LOG(GDP) | -37.40153 | 19.33584 | -1.934311 | 0.0751 |
| LOG(EXTR) | 9.205928 | 4.187419 | 2.198473 | 0.0466 |
| INFR | -0.798311 | 0.292625 | -2.728099 | 0.0172 |
| LOG(EXCR) | 21.07264 | 10.83849 | 1.944241 | 0.0738 |

EC = UEMR - (20.1818*LOG(AEXP) + 3.3857*LOG(OILP) -17.9912
*LOG(AREV) -37.4015*LOG(GDP) + 9.2059*LOG(EXTR) -0.7983*INFR +
21.0726*LOG(EXCR) )

F-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| | | Asymptotic: n=1000 | | |
| F-statistic | 7.595065 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |
| | | Finite Sample: n=35 | | |
| Actual Sample Size | 33 | | | |
| | | 10% | 2.3 | 3.606 |
| | | 5% | 2.753 | 4.209 |
| | | 1% | 3.841 | 5.686 |
| | | Finite Sample: n=30 | | |
| | | 10% | 2.384 | 3.728 |
| | | 5% | 2.875 | 4.445 |
| | | 1% | 4.104 | 6.151 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -2.696722 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NOR LONGRUN EQN 6 WITH DUMMY
ARDL Long Run Form and Bounds Test
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 06/26/18 Time: 03:03
Sample: 1981 2016
Included observations: 35

Conditional Error Correction Regression

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 141.1530 | 55.57600 | 2.539819 | 0.0174 |
| UEMR(-1)* | -0.389477 | 0.140433 | -2.773406 | 0.0101 |
| LOG(AEXP)** | 4.855507 | 1.252541 | 3.876525 | 0.0006 |
| LOG(AREV)** | -1.274652 | 1.851183 | -0.688561 | 0.4972 |
| LOG(GDP)** | -8.758428 | 3.397146 | -2.578173 | 0.0159 |
| LOG(EXTR)** | -0.273360 | 0.683386 | -0.400008 | 0.6924 |
| INFR** | -0.172783 | 0.089641 | -1.927504 | 0.0649 |
| LOG(EXCR)** | 1.705529 | 0.893805 | 1.908168 | 0.0675 |
| OILD | -0.399072 | 0.219383 | -1.819064 | 0.0804 |

* p-value incompatible with t-Bounds distribution.
** Variable interpreted as Z = Z(-1) + D(Z).

Levels Equation
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| LOG(AEXP) | 12.46673 | 4.209385 | 2.961652 | 0.0065 |
| LOG(AREV) | -3.272726 | 4.182172 | -0.782542 | 0.4410 |
| LOG(GDP) | -22.48766 | 13.28370 | -1.692876 | 0.1024 |
| LOG(EXTR) | -0.701863 | 1.817926 | -0.386079 | 0.7026 |
| INFR | -0.443629 | 0.162121 | -2.736402 | 0.0110 |
| LOG(EXCR) | 4.379024 | 2.983815 | 1.467592 | 0.1542 |
| C | 362.4167 | 210.0031 | 1.725768 | 0.0963 |

EC = UEMR - (12.4667*LOG(AEXP) -3.2727*LOG(AREV) -22.4877 *LOG(GDP) -0.7019*LOG(EXTR) -0.4436*INFR + 4.3790*LOG(EXCR) + 362.4167 )

| F-Bounds Test | | Null Hypothesis: No levels relationship | | |
|---|---|---|---|---|
| Test Statistic | Value | Signif. | I(0) | I(1) |
| | | | Asymptotic: n=1000 | |
| F-statistic | 4.019726 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |
| | | | Finite Sample: n=35 | |
| Actual Sample Size | 35 | | | |
| | | 10% | 2.254 | 3.388 |
| | | 5% | 2.685 | 3.96 |
| | | 1% | 3.713 | 5.326 |

# Appendix H: Error Correction Form (Short Run Tests)

## Appendix H1: Error Correction Form (Short Run Tests) for Nigeria

### *Appendix H11: Nigeria Error Correction Form (Short Run Tests) Model 1*

NIG SHORTRUN EQN 1
ARDL Error Correction Regression
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 15:13
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -13.08423 | 1.121106 | -11.67082 | 0.0000 |
| CointEq(-1)* | -0.518884 | 0.044443 | -11.67540 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.805097 | Mean dependent var | 0.002779 |
| Adjusted R-squared | 0.799191 | S.D. dependent var | 0.280262 |
| S.E. of regression | 0.125590 | Akaike info criterion | -1.256138 |
| Sum squared resid | 0.520506 | Schwarz criterion | -1.167261 |
| Log likelihood | 23.98242 | Hannan-Quinn criter. | -1.225458 |
| F-statistic | 136.3149 | Durbin-Watson stat | 2.430712 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 13.42495 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -11.67540 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG SHORTRUN EQN 1 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 20:19
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.753149 | 0.177353 | 9.885097 | 0.0000 |
| OILD | 0.112629 | 0.051340 | 2.193799 | 0.0374 |
| CointEq(-1)* | -0.443634 | 0.044891 | -9.882416 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.756210 | Mean dependent var | 0.002779 |
| Adjusted R-squared | 0.740973 | S.D. dependent var | 0.280262 |
| S.E. of regression | 0.142639 | Akaike info criterion | -0.975190 |
| Sum squared resid | 0.651064 | Schwarz criterion | -0.841874 |
| Log likelihood | 20.06582 | Hannan-Quinn criter. | -0.929169 |
| F-statistic | 49.63017 | Durbin-Watson stat | 2.298602 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 11.33578 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -9.882416 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix H12: Nigeria Error Correction Form (Short Run Tests) Model 2*

NIG SHORTRUN EQN 2
ARDL Error Correction Regression
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 2, 2, 0, 0, 0, 0, 2)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 07/24/18 Time: 15:28
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.024057 | 0.130693 | 7.835614 | 0.0000 |
| @TREND | -0.017628 | 0.002659 | -6.629235 | 0.0000 |
| DLOG(AEXP) | 0.217613 | 0.107823 | 2.018235 | 0.0587 |
| DLOG(AEXR(-1)) | -0.464157 | 0.105518 | -4.398854 | 0.0003 |
| DLOG(OILP) | 0.803957 | 0.077366 | 10.39158 | 0.0000 |
| DLOG(OILP(-1)) | 0.359127 | 0.100452 | 3.575115 | 0.0022 |
| DLOG(EXCR) | -0.406018 | 0.106782 | -3.802321 | 0.0013 |
| DLOG(EXCR(-1)) | -0.522973 | 0.122514 | -4.268687 | 0.0005 |
| CointEq(-1)* | -0.698965 | 0.105386 | -6.632421 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.937959 | Mean dependent var | 0.008166 |
| Adjusted R-squared | 0.918106 | S.D. dependent var | 0.384134 |
| S.E. of regression | 0.109928 | Akaike info criterion | -1.356052 |
| Sum squared resid | 0.302105 | Schwarz criterion | -0.952015 |
| Log likelihood | 32.05289 | Hannan-Quinn criter. | -1.218264 |
| F-statistic | 47.24484 | Durbin-Watson stat | 2.140805 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 3.959010 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -6.632421 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

NIG SHORTRUN EQN 2 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 1)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 22:40
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 2.746581 | 0.415831 | 6.605048 | 0.0000 |
| DLOG(EXCR) | -0.570619 | 0.107699 | -5.298262 | 0.0000 |
| OILD | -0.292442 | 0.065348 | -4.475112 | 0.0001 |
| CointEq(-1)* | -0.691174 | 0.117409 | -5.886902 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.779970 | Mean dependent var | 0.001156 |
| Adjusted R-squared | 0.758677 | S.D. dependent var | 0.380708 |
| S.E. of regression | 0.187021 | Akaike info criterion | -0.407976 |
| Sum squared resid | 1.084288 | Schwarz criterion | -0.230222 |
| Log likelihood | 11.13959 | Hannan-Quinn criter. | -0.346616 |
| F-statistic | 36.63000 | Durbin-Watson stat | 2.209971 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 3.992583 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -5.886902 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix H13: Nigeria Error Correction Form (Short Run Tests) Model 3*

NIG SHORTRUN EQN 3
ARDL Error Correction Regression
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 1)
Case 3: Unrestricted Constant and No Trend
Date: 07/17/18 Time: 17:50
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 4.135072 | 0.953520 | 4.336640 | 0.0002 |
| DLOG(EXCR) | -0.044000 | 0.030068 | -1.463358 | 0.1558 |
| CointEq(-1)* | -0.182283 | 0.042568 | -4.282174 | 0.0002 |

| | | | |
|---|---|---|---|
| R-squared | 0.466213 | Mean dependent var | 0.037071 |
| Adjusted R-squared | 0.432851 | S.D. dependent var | 0.066016 |
| S.E. of regression | 0.049716 | Akaike info criterion | -3.083167 |
| Sum squared resid | 0.079093 | Schwarz criterion | -2.949851 |
| Log likelihood | 56.95542 | Hannan-Quinn criter. | -3.037147 |
| F-statistic | 13.97449 | Durbin-Watson stat | 2.035121 |
| Prob(F-statistic) | 0.000043 | | |

* 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 | 1.790724 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -4.282174 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG SHORTRUN EQN 3 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/24/18 Time: 23:50
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 7.564487 | 1.791241 | 4.223042 | 0.0003 |
| @TREND | 0.022248 | 0.004900 | 4.539917 | 0.0001 |
| OILD | 0.000443 | 0.019038 | 0.023264 | 0.9816 |
| CointEq(-1)* | -0.328942 | 0.078091 | -4.212307 | 0.0003 |

| | | | |
|---|---|---|---|
| R-squared | 0.485502 | Mean dependent var | 0.037071 |
| Adjusted R-squared | 0.435712 | S.D. dependent var | 0.066016 |
| S.E. of regression | 0.049590 | Akaike info criterion | -3.062830 |
| Sum squared resid | 0.076235 | Schwarz criterion | -2.885076 |
| Log likelihood | 57.59953 | Hannan-Quinn criter. | -3.001470 |
| F-statistic | 9.750981 | Durbin-Watson stat | 1.997923 |
| Prob(F-statistic) | 0.000110 | | |

* 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 | 2.044185 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -4.212307 | 10% | -3.13 | -4.37 |
| | | 5% | -3.41 | -4.69 |
| | | 2.5% | -3.65 | -4.96 |
| | | 1% | -3.96 | -5.31 |

### *Appendix H14: Nigeria Error Correction Form (Short Run Tests) Model 4*

NIG SHORTRUN EQN 4
ARDL Error Correction Regression
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(2, 1, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/10/18 Time: 23:12
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 1.529090 | 0.174026 | 8.786574 | 0.0000 |
| DLOG(EXTR(-1)) | 0.278299 | 0.092840 | 2.997625 | 0.0064 |
| DLOG(AEXP) | 0.710423 | 0.148095 | 4.797088 | 0.0001 |
| CointEq(-1)* | -0.975195 | 0.113551 | -8.588181 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.750034 | Mean dependent var | 0.080780 |
| Adjusted R-squared | 0.725037 | S.D. dependent var | 0.448472 |
| S.E. of regression | 0.235165 | Akaike info criterion | 0.053071 |
| Sum squared resid | 1.659075 | Schwarz criterion | 0.232643 |
| Log likelihood | 3.097796 | Hannan-Quinn criter. | 0.114310 |
| F-statistic | 30.00544 | Durbin-Watson stat | 2.180315 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 7.068365 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -8.588181 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG SHORTRUN EQN 4 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(2, 0, 0, 0, 0, 0, 1)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/25/18 Time: 14:11
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -45.28653 | 5.953402 | -7.606833 | 0.0000 |
| @TREND | -0.117113 | 0.014715 | -7.958871 | 0.0000 |
| DLOG(EXTR(-1)) | 0.266148 | 0.091246 | 2.916829 | 0.0080 |
| DLOG(EXCR) | 0.049376 | 0.157208 | 0.314078 | 0.7564 |
| OILD | -0.226168 | 0.084348 | -2.681356 | 0.0136 |
| CointEq(-1)* | -0.893779 | 0.116111 | -7.697610 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.776053 | Mean dependent var | 0.080780 |
| Adjusted R-squared | 0.736062 | S.D. dependent var | 0.448472 |
| S.E. of regression | 0.230402 | Akaike info criterion | 0.060803 |
| Sum squared resid | 1.486382 | Schwarz criterion | 0.330160 |
| Log likelihood | 4.966356 | Hannan-Quinn criter. | 0.152661 |
| F-statistic | 19.40591 | Durbin-Watson stat | 2.265535 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 6.650869 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -7.697610 | 10% | -3.13 | -4.37 |
| | | 5% | -3.41 | -4.69 |
| | | 2.5% | -3.65 | -4.96 |
| | | 1% | -3.96 | -5.31 |

## *Appendix H15: Nigeria Error Correction Form (Short Run Tests) Model 5*

NIG SHORTRUNEQN 5
ARDL Error Correction Regression
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/10/18 Time: 23:25
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.061197 | 1.496114 | -0.040904 | 0.9677 |
| DLOG(AEXP) | 17.33082 | 6.166657 | 2.810407 | 0.0095 |
| CointEq(-1)* | -0.765124 | 0.088726 | -8.623482 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.705343 | Mean dependent var | -0.146171 |
| Adjusted R-squared | 0.686927 | S.D. dependent var | 15.81789 |
| S.E. of regression | 8.850578 | Akaike info criterion | 7.280659 |
| Sum squared resid | 2506.647 | Schwarz criterion | 7.413975 |
| Log likelihood | -124.4115 | Hannan-Quinn criter. | 7.326680 |
| F-statistic | 38.30037 | Durbin-Watson stat | 1.807859 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 7.262153 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -8.623482 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NIG SHORTRUN EQN 5 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 22:51
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -225.9369 | 27.92571 | -8.090640 | 0.0000 |
| DLOG(AEXP) | 10.13798 | 5.949486 | 1.704009 | 0.1008 |
| OILD | 1.925039 | 3.184684 | 0.604468 | 0.5510 |
| CointEq(-1)* | -0.735254 | 0.092405 | -7.956872 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.701402 | Mean dependent var | -0.146171 |
| Adjusted R-squared | 0.672505 | S.D. dependent var | 15.81789 |
| S.E. of regression | 9.052128 | Akaike info criterion | 7.351087 |
| Sum squared resid | 2540.172 | Schwarz criterion | 7.528841 |
| Log likelihood | -124.6440 | Hannan-Quinn criter. | 7.412448 |
| F-statistic | 24.27282 | Durbin-Watson stat | 1.643391 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 7.293987 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -7.956872 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix H16: Nigeria Error Correction Form (Short Run Tests) Model 6*

NIG SHORTRUN EQN 6
ARDL Error Correction Regression
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 0, 1, 0, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 06/23/18 Time: 20:01
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(AREV) | -2.953709 | 1.302972 | -2.266901 | 0.0327 |
| DLOG(EXCR) | 5.003179 | 1.443523 | 3.465952 | 0.0020 |
| CointEq(-1)* | -0.508429 | 0.105857 | -4.802973 | 0.0001 |

| | | | |
|---|---|---|---|
| R-squared | 0.603132 | Mean dependent var | 0.265714 |
| Adjusted R-squared | 0.578328 | S.D. dependent var | 3.968549 |
| S.E. of regression | 2.577029 | Akaike info criterion | 4.812968 |
| Sum squared resid | 212.5145 | Schwarz criterion | 4.946283 |
| Log likelihood | -81.22694 | Hannan-Quinn criter. | 4.858988 |
| Durbin-Watson stat | 1.758308 | | |

* 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 | 1.922379 | 10% | 1.92 | 2.89 |
| k | 7 | 5% | 2.17 | 3.21 |
| | | 2.5% | 2.43 | 3.51 |
| | | 1% | 2.73 | 3.9 |

NIG SHORTRUN EQN 6 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 1)
Case 2: Restricted Constant and No Trend
Date: 06/25/18 Time: 15:32
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(EXCR) | 7.193714 | 1.507454 | 4.772095 | 0.0001 |
| OILD | 1.051192 | 0.788450 | 1.333238 | 0.1945 |
| CointEq(-1)* | -0.501863 | 0.111895 | -4.485132 | 0.0001 |

| | | | |
|---|---|---|---|
| R-squared | 0.527286 | Mean dependent var | 0.265714 |
| Adjusted R-squared | 0.497742 | S.D. dependent var | 3.968549 |
| S.E. of regression | 2.812518 | Akaike info criterion | 4.987854 |
| Sum squared resid | 253.1283 | Schwarz criterion | 5.121169 |
| Log likelihood | -84.28744 | Hannan-Quinn criter. | 5.033874 |
| Durbin-Watson stat | 1.732716 | | |

* 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 | 1.964493 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |

## Appendix H2: Error Correction Form (Short Run Tests) for Venezuela

### *Appendix H21: Venezuela Error Correction Form (Short Run Tests)*

### *Model 1*

VEN SHORTRUN EQN 1
ARDL Error Correction Regression
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 15:56
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 27.78534 | 1.919233 | 14.47731 | 0.0000 |
| CointEq(-1)* | -0.621061 | 0.043470 | -14.28695 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.887014 | Mean dependent var | 0.368218 |
| Adjusted R-squared | 0.882668 | S.D. dependent var | 0.236831 |
| S.E. of regression | 0.081123 | Akaike info criterion | -2.116940 |
| Sum squared resid | 0.171106 | Schwarz criterion | -2.021782 |
| Log likelihood | 31.63716 | Hannan-Quinn criter. | -2.087849 |
| F-statistic | 204.1170 | Durbin-Watson stat | 2.394699 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 18.64531 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -14.28695 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

VEN SHORTRUN EQN 1 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 0, 1, 0, 0, 1, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 23:29
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 55.97680 | 3.732539 | 14.99698 | 0.0000 |
| DLOG(GDP) | -0.871544 | 0.422130 | -2.064633 | 0.0546 |
| D(UEMR) | -0.041736 | 0.016188 | -2.578125 | 0.0195 |
| OILD | 0.065804 | 0.030233 | 2.176590 | 0.0439 |
| CointEq(-1)* | -0.602053 | 0.040366 | -14.91471 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.910645 | Mean dependent var | 0.368218 |
| Adjusted R-squared | 0.895105 | S.D. dependent var | 0.236831 |
| S.E. of regression | 0.076704 | Akaike info criterion | -2.137297 |
| Sum squared resid | 0.135320 | Schwarz criterion | -1.899404 |
| Log likelihood | 34.92216 | Hannan-Quinn criter. | -2.064571 |
| F-statistic | 58.59987 | Durbin-Watson stat | 2.296845 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 23.46837 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -14.91471 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix H22: Venezuela Error Correction Form (Short Run Tests)*

## *Model 2*

VEN SHORTRUN EQN 2
ARDL Error Correction Regression
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 1, 1, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 16:24
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 5.704204 | 0.631299 | 9.035658 | 0.0000 |
| DLOG(AEXP) | 0.526350 | 0.081701 | 6.442367 | 0.0000 |
| DLOG(OILP) | 0.405358 | 0.051101 | 7.932505 | 0.0000 |
| CointEq(-1)* | -0.446292 | 0.048919 | -9.123039 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.952405 | Mean dependent var | 0.353305 |
| Adjusted R-squared | 0.946456 | S.D. dependent var | 0.302388 |
| S.E. of regression | 0.069971 | Akaike info criterion | -2.349906 |
| Sum squared resid | 0.117503 | Schwarz criterion | -2.159591 |
| Log likelihood | 36.89869 | Hannan-Quinn criter. | -2.291725 |
| F-statistic | 160.0866 | Durbin-Watson stat | 2.189857 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 7.369309 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -9.123039 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

VEN SHORTRUN EQN 2 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(1, 1, 0, 1, 0, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 07/24/18 Time: 20:58
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -16.38028 | 2.181343 | -7.509264 | 0.0000 |
| @TREND | 0.063747 | 0.009361 | 6.809915 | 0.0000 |
| DLOG(AEXP) | 0.500500 | 0.106802 | 4.686259 | 0.0002 |
| DLOG(EXTR) | 0.089390 | 0.085949 | 1.040029 | 0.3138 |
| OILD | -0.167100 | 0.037406 | -4.467242 | 0.0004 |
| CointEq(-1)* | -0.260103 | 0.034429 | -7.554718 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.947109 | Mean dependent var | 0.353305 |
| Adjusted R-squared | 0.935088 | S.D. dependent var | 0.302388 |
| S.E. of regression | 0.077042 | Akaike info criterion | -2.101535 |
| Sum squared resid | 0.130579 | Schwarz criterion | -1.816063 |
| Log likelihood | 35.42149 | Hannan-Quinn criter. | -2.014264 |
| F-statistic | 78.79014 | Durbin-Watson stat | 2.045215 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 5.929742 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |

## *Appendix H23: Venezuela Error Correction Form (Short Run Tests)*

## *Model 3*

VEN SHORTRUN EQN 3
ARDL Error Correction Regression
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 1, 0, 0, 1, 0, 0, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/23/18 Time: 23:46
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 18.56214 | 1.101003 | 16.85931 | 0.0000 |
| @TREND | -0.038475 | 0.002354 | -16.34224 | 0.0000 |
| DLOG(AEXP) | 0.047815 | 0.015238 | 3.137979 | 0.0064 |
| DLOG(EXTR) | -0.067691 | 0.017322 | -3.907933 | 0.0013 |
| CointEq(-1)* | -0.832893 | 0.049426 | -16.85134 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.925919 | Mean dependent var | 0.020504 |
| Adjusted R-squared | 0.913035 | S.D. dependent var | 0.062215 |
| S.E. of regression | 0.018347 | Akaike info criterion | -4.998268 |
| Sum squared resid | 0.007742 | Schwarz criterion | -4.760373 |
| Log likelihood | 74.97573 | Hannan-Quinn criter. | -4.925540 |
| F-statistic | 71.86767 | Durbin-Watson stat | 1.773872 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 24.69285 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -16.85134 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

VEN SHORTRUN EQN 3 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 0, 0, 1, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 06/25/18 Time: 23:08
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(EXTR) | -0.073847 | 0.022681 | -3.255928 | 0.0044 |
| OILD | -0.003600 | 0.007546 | -0.477098 | 0.6390 |
| CointEq(-1)* | -0.806258 | 0.060163 | -13.40133 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.870841 | Mean dependent var | 0.020504 |
| Adjusted R-squared | 0.860508 | S.D. dependent var | 0.062215 |
| S.E. of regression | 0.023236 | Akaike info criterion | -4.585240 |
| Sum squared resid | 0.013498 | Schwarz criterion | -4.442504 |
| Log likelihood | 67.19336 | Hannan-Quinn criter. | -4.541604 |
| Durbin-Watson stat | 1.497706 | | |

* 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 | 16.16362 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |

## *Appendix H24: Venezuela Error Correction Form (Short Run Tests)*

## *Model 4*

*VEN SHORTRUN EQN 4
ARDL Error Correction Regression
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0, 1)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 16:51
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 57.83503 | 5.770336 | 10.02282 | 0.0000 |
| DLOG(EXCR) | 0.112816 | 0.086967 | 1.297232 | 0.2109 |
| CointEq(-1)* | -0.172963 | 0.017246 | -10.02909 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.808639 | Mean dependent var | 0.009437 |
| Adjusted R-squared | 0.793330 | S.D. dependent var | 0.233963 |
| S.E. of regression | 0.106362 | Akaike info criterion | -1.542984 |
| Sum squared resid | 0.282821 | Schwarz criterion | -1.400248 |
| Log likelihood | 24.60178 | Hannan-Quinn criter. | -1.499348 |
| F-statistic | 52.82156 | Durbin-Watson stat | 2.526437 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 9.052437 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -10.02909 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

VEN SHORTRUN EQN 4 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(2, 1, 1, 1, 1, 1, 1)
Case 2: Restricted Constant and No Trend
Date: 06/25/18 Time: 23:17
Sample: 1988 2016
Included observations: 27

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(EXTR(-1)) | 0.574611 | 0.188021 | 3.056102 | 0.0109 |
| DLOG(AEXP) | -0.434268 | 0.246757 | -1.759902 | 0.1062 |
| DLOG(AREV) | 0.464362 | 0.235094 | 1.975217 | 0.0739 |
| DLOG(GDP) | -3.643642 | 0.879505 | -4.142834 | 0.0016 |
| D(INFR) | -0.001562 | 0.001129 | -1.383254 | 0.1940 |
| D(UEMR) | -0.141369 | 0.029268 | -4.830158 | 0.0005 |
| DLOG(EXCR) | 0.243281 | 0.185088 | 1.314404 | 0.2155 |
| OILD | -0.375259 | 0.073732 | -5.089518 | 0.0003 |
| CointEq(-1)* | -0.597935 | 0.133639 | -4.474272 | 0.0009 |

| | | | |
|---|---|---|---|
| R-squared | 0.823420 | Mean dependent var | 0.005701 |
| Adjusted R-squared | 0.744941 | S.D. dependent var | 0.237567 |
| S.E. of regression | 0.119979 | Akaike info criterion | -1.141791 |
| Sum squared resid | 0.259111 | Schwarz criterion | -0.709845 |
| Log likelihood | 24.41417 | Hannan-Quinn criter. | -1.013351 |
| Durbin-Watson stat | 2.428053 | | |

* 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 | 1.529238 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |

## *Appendix H25: Venezuela Error Correction Form (Short Run Tests)*

## *Model 5*

VEN SHORTRUN EQN 5
ARDL Error Correction Regression
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 0, 0, 1, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 06/24/18 Time: 02:19
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| DLOG(AREV) | 53.38300 | 6.265296 | 8.520428 | 0.0000 |
| CointEq(-1)* | -0.514545 | 0.058418 | -8.807921 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.813792 | Mean dependent var | 8.052850 |
| Adjusted R-squared | 0.806631 | S.D. dependent var | 33.83799 |
| S.E. of regression | 14.87985 | Akaike info criterion | 8.306642 |
| Sum squared resid | 5756.658 | Schwarz criterion | 8.401799 |
| Log likelihood | -114.2930 | Hannan-Quinn criter. | 8.335733 |
| Durbin-Watson stat | 1.747763 | | |

* 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 | 7.086587 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |

VEN SHORTRUN EQN 5 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 0, 0, 0, 1, 0, 2)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 21:27
Sample: 1988 2016
Included observations: 27

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 4935.032 | 423.8005 | 11.64471 | 0.0000 |
| DLOG(EXTR) | 19.26308 | 12.74674 | 1.511217 | 0.1515 |
| DLOG(EXCR) | 19.17220 | 10.54176 | 1.818690 | 0.0890 |
| DLOG(EXCR(-1)) | -89.01105 | 10.29460 | -8.646380 | 0.0000 |
| OILD | -2.146135 | 5.042977 | -0.425569 | 0.6765 |
| CointEq(-1)* | 0.278212 | 0.023910 | 11.63570 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.922821 | Mean dependent var | 6.314268 |
| Adjusted R-squared | 0.904446 | S.D. dependent var | 33.18371 |
| S.E. of regression | 10.25771 | Akaike info criterion | 7.687066 |
| Sum squared resid | 2209.633 | Schwarz criterion | 7.975030 |
| Log likelihood | -97.77540 | Hannan-Quinn criter. | 7.772693 |
| F-statistic | 50.21922 | Durbin-Watson stat | 1.639298 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 13.81525 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | 11.63570 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix H26: Venezuela Error Correction Form (Short Run Tests)*

## *Model 6*

VEN SHORTRUN EQN 6
ARDL Error Correction Regression
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 1, 0, 0, 0, 0, 0, 1)
Case 4: Unrestricted Constant and Restricted Trend
Date: 07/24/18 Time: 17:03
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 4: Unrestricted Constant and Restricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 540.7467 | 53.65300 | 10.07859 | 0.0000 |
| DLOG(AEXP) | -0.891118 | 0.565982 | -1.574463 | 0.1349 |
| DLOG(EXCR) | 2.418656 | 0.589198 | 4.104997 | 0.0008 |
| CointEq(-1)* | -0.895204 | 0.088762 | -10.08540 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.868278 | Mean dependent var | -0.003571 |
| Adjusted R-squared | 0.851813 | S.D. dependent var | 1.633681 |
| S.E. of regression | 0.628886 | Akaike info criterion | 2.041830 |
| Sum squared resid | 9.491944 | Schwarz criterion | 2.232145 |
| Log likelihood | -24.58562 | Hannan-Quinn criter. | 2.100011 |
| F-statistic | 52.73416 | Durbin-Watson stat | 2.105893 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 7.534461 | 10% | 2.22 | 3.17 |
| k | 7 | 5% | 2.5 | 3.5 |
| | | 2.5% | 2.76 | 3.81 |
| | | 1% | 3.07 | 4.23 |

VEN SHORTRUN EQN 6 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 1, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 23:44
Sample: 1988 2016
Included observations: 28

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 562.1969 | 46.51984 | 12.08510 | 0.0000 |
| DLOG(AREV) | 1.089577 | 0.413505 | 2.634975 | 0.0168 |
| OILD | -0.779468 | 0.253870 | -3.070343 | 0.0066 |
| CointEq(-1)* | -0.996159 | 0.082379 | -12.09245 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.865506 | Mean dependent var | -0.003571 |
| Adjusted R-squared | 0.848695 | S.D. dependent var | 1.633681 |
| S.E. of regression | 0.635469 | Akaike info criterion | 2.062656 |
| Sum squared resid | 9.691691 | Schwarz criterion | 2.252971 |
| Log likelihood | -24.87718 | Hannan-Quinn criter. | 2.120837 |
| F-statistic | 51.48242 | Durbin-Watson stat | 2.039247 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 15.66722 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -12.09245 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## Appendix H3: Error Correction Form (Short Run Tests) for Norway

### *Appendix H31: Norway Error Correction Form (Short Run Tests) Model 1*

NOR SHORTRUN EQN 1
ARDL Error Correction Regression
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(2, 2, 2, 2, 2, 2, 2, 2)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/24/18 Time: 19:37
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 31.46822 | 4.592186 | 6.852559 | 0.0001 |
| @TREND | 0.030259 | 0.004499 | 6.726293 | 0.0001 |
| DLOG(AEXP(-1)) | 0.029304 | 0.123329 | 0.237606 | 0.8175 |
| DLOG(AREV) | 0.760201 | 0.108604 | 6.999776 | 0.0001 |
| DLOG(AREV(-1)) | -0.463222 | 0.137731 | -3.363227 | 0.0083 |
| DLOG(OILP) | -0.113248 | 0.024600 | -4.603557 | 0.0013 |
| DLOG(OILP(-1)) | -0.007139 | 0.026431 | -0.270117 | 0.7932 |
| DLOG(GDP) | -0.478066 | 0.390721 | -1.223547 | 0.2522 |
| DLOG(GDP(-1)) | 1.275123 | 0.432388 | 2.949021 | 0.0162 |
| DLOG(EXTR) | -0.088704 | 0.022120 | -4.010050 | 0.0031 |
| DLOG(EXTR(-1)) | 0.060200 | 0.025754 | 2.337536 | 0.0442 |
| D(INFR) | 0.003228 | 0.004371 | 0.738393 | 0.4791 |
| D(INFR(-1)) | -0.002796 | 0.003435 | -0.814068 | 0.4366 |
| D(UEMR) | 0.003986 | 0.006281 | 0.634555 | 0.5415 |
| D(UEMR(-1)) | 0.000458 | 0.005114 | 0.089627 | 0.9305 |
| DLOG(EXCR) | -0.108539 | 0.044466 | -2.440922 | 0.0373 |
| DLOG(EXCR(-1)) | -0.048878 | 0.050976 | -0.958845 | 0.3627 |
| CointEq(-1)* | -0.914864 | 0.133834 | -6.835807 | 0.0001 |

| | | | |
|---|---|---|---|
| R-squared | 0.919942 | Mean dependent var | 0.063720 |
| Adjusted R-squared | 0.834881 | S.D. dependent var | 0.038866 |
| S.E. of regression | 0.015793 | Akaike info criterion | -5.153445 |
| Sum squared resid | 0.003991 | Schwarz criterion | -4.345372 |
| Log likelihood | 105.6086 | Hannan-Quinn criter. | -4.877869 |
| F-statistic | 10.81507 | Durbin-Watson stat | 2.221048 |
| Prob(F-statistic) | 0.000009 | | |

* 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 | 3.285580 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -6.835807 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

NOR SHORTRUN EQN 1 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(AEXP)
Selected Model: ARDL(1, 2, 0, 0, 0, 1, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 21:49
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -0.269747 | 0.046829 | -5.760290 | 0.0000 |
| DLOG(AREV) | 0.289266 | 0.069182 | 4.181210 | 0.0004 |
| DLOG(AREV(-1)) | -0.317645 | 0.072274 | -4.394996 | 0.0002 |
| D(UEMR) | 0.003157 | 0.005951 | 0.530457 | 0.6011 |
| OILD | -0.002891 | 0.009304 | -0.310776 | 0.7589 |
| CointEq(-1)* | -0.349189 | 0.050051 | -6.976730 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.703070 | Mean dependent var | 0.063720 |
| Adjusted R-squared | 0.650047 | S.D. dependent var | 0.038866 |
| S.E. of regression | 0.022992 | Akaike info criterion | -4.548576 |
| Sum squared resid | 0.014801 | Schwarz criterion | -4.279219 |
| Log likelihood | 83.32580 | Hannan-Quinn criter. | -4.456718 |
| F-statistic | 13.25965 | Durbin-Watson stat | 2.097870 |
| Prob(F-statistic) | 0.000001 | | |

* 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 | 5.463493 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -6.976730 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix H32: Norway Error Correction Form (Short Run Tests) Model 2*

NOR SHORTRUN EQN 2 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(2, 0, 0, 2, 0, 0, 2)
Case 3: Unrestricted Constant and No Trend
Date: 06/26/18 Time: 02:10
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -15.67865 | 1.935746 | -8.099540 | 0.0000 |
| DLOG(AREV(-1)) | 0.413044 | 0.086597 | 4.769719 | 0.0001 |
| DLOG(EXTR) | 0.058419 | 0.031719 | 1.841756 | 0.0804 |
| DLOG(EXTR(-1)) | 0.204334 | 0.032107 | 6.364163 | 0.0000 |
| DLOG(EXCR) | 0.001458 | 0.072663 | 0.020059 | 0.9842 |
| DLOG(EXCR(-1)) | 0.185798 | 0.063527 | 2.924710 | 0.0084 |
| OILD | -0.095232 | 0.013271 | -7.176041 | 0.0000 |
| CointEq(-1)* | -0.471731 | 0.057952 | -8.140089 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.855394 | Mean dependent var | 0.062964 |
| Adjusted R-squared | 0.816461 | S.D. dependent var | 0.066799 |
| S.E. of regression | 0.028618 | Akaike info criterion | -4.067249 |
| Sum squared resid | 0.021293 | Schwarz criterion | -3.708105 |
| Log likelihood | 77.14323 | Hannan-Quinn criter. | -3.944771 |
| F-statistic | 21.97120 | Durbin-Watson stat | 2.165721 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 7.281435 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -8.140089 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

NOR SHORTRUN EQN 2
ARDL Error Correction Regression
Dependent Variable: DLOG(AREV)
Selected Model: ARDL(2, 0, 2, 0, 0, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/11/18 Time: 01:15
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | -13.23029 | 0.894602 | -14.78903 | 0.0000 |
| DLOG(AREV(-1)) | 0.161913 | 0.063131 | 2.564703 | 0.0177 |
| DLOG(OILP) | 0.170056 | 0.011348 | 14.98617 | 0.0000 |
| DLOG(OILP(-1)) | 0.072393 | 0.015960 | 4.535970 | 0.0002 |
| CointEq(-1)* | -0.763043 | 0.051451 | -14.83034 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.944463 | Mean dependent var | 0.062964 |
| Adjusted R-squared | 0.936802 | S.D. dependent var | 0.066799 |
| S.E. of regression | 0.016793 | Akaike info criterion | -5.200681 |
| Sum squared resid | 0.008178 | Schwarz criterion | -4.976216 |
| Log likelihood | 93.41158 | Hannan-Quinn criter. | -5.124132 |
| F-statistic | 123.2930 | Durbin-Watson stat | 2.085855 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 20.85628 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -14.83034 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

## *Appendix H33: Norway Error Correction Form (Short Run Tests) Model 3*

NOR SHORTRUN EQN 3
ARDL Error Correction Regression
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(2, 1, 1, 0, 1, 0, 2, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/24/18 Time: 19:55
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 10.32747 | 0.706746 | 14.61271 | 0.0000 |
| @TREND | 0.012247 | 0.000892 | 13.72310 | 0.0000 |
| DLOG(GDP(-1)) | 0.166910 | 0.066087 | 2.525618 | 0.0211 |
| DLOG(AEXP) | -0.055795 | 0.022959 | -2.430160 | 0.0258 |
| DLOG(OILP) | 0.003492 | 0.003494 | 0.999496 | 0.3308 |
| DLOG(EXTR) | -0.002268 | 0.005749 | -0.394537 | 0.6978 |
| D(UEMR) | -0.001238 | 0.001345 | -0.920809 | 0.3693 |
| D(UEMR(-1)) | -0.006469 | 0.001380 | -4.688570 | 0.0002 |
| CointEq(-1)* | -0.289201 | 0.019850 | -14.56946 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.946450 | Mean dependent var | 0.024837 |
| Adjusted R-squared | 0.929314 | S.D. dependent var | 0.017135 |
| S.E. of regression | 0.004556 | Akaike info criterion | -7.722968 |
| Sum squared resid | 0.000519 | Schwarz criterion | -7.318931 |
| Log likelihood | 140.2904 | Hannan-Quinn criter. | -7.585180 |
| F-statistic | 55.23131 | Durbin-Watson stat | 2.473068 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 19.10423 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -14.56946 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

NOR SHORTRUN EQN 3 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(GDP)
Selected Model: ARDL(1, 1, 0, 1, 0, 2, 0)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/26/18 Time: 02:18
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 8.689180 | 0.631314 | 13.76364 | 0.0000 |
| @TREND | 0.010033 | 0.000801 | 12.53024 | 0.0000 |
| DLOG(AEXP) | -0.026638 | 0.025261 | -1.054482 | 0.3042 |
| DLOG(EXTR) | 0.003027 | 0.006099 | 0.496427 | 0.6250 |
| D(UEMR) | -0.001108 | 0.001392 | -0.795737 | 0.4355 |
| D(UEMR(-1)) | -0.008517 | 0.001402 | -6.076147 | 0.0000 |
| OILD | -0.002883 | 0.002019 | -1.427864 | 0.1688 |
| CointEq(-1)* | -0.235783 | 0.017207 | -13.70280 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.931274 | Mean dependent var | 0.024837 |
| Adjusted R-squared | 0.912771 | S.D. dependent var | 0.017135 |
| S.E. of regression | 0.005061 | Akaike info criterion | -7.532285 |
| Sum squared resid | 0.000666 | Schwarz criterion | -7.173142 |
| Log likelihood | 136.0488 | Hannan-Quinn criter. | -7.409807 |
| F-statistic | 50.33053 | Durbin-Watson stat | 2.222274 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 20.63370 | 10% | 2.53 | 3.59 |
| k | 6 | 5% | 2.87 | 4 |
| | | 2.5% | 3.19 | 4.38 |
| | | 1% | 3.6 | 4.9 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -13.70280 | 10% | -3.13 | -4.37 |
| | | 5% | -3.41 | -4.69 |
| | | 2.5% | -3.65 | -4.96 |
| | | 1% | -3.96 | -5.31 |

## *Appendix H34: Norway Error Correction Form (Short Run Tests) Model 4*

NOR SHORTRUN EQN 4 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(1, 1, 2, 2, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 06/26/18 Time: 02:31
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 31.19402 | 5.352283 | 5.828171 | 0.0000 |
| DLOG(AEXP) | -2.813832 | 0.584724 | -4.812241 | 0.0001 |
| DLOG(AREV) | 1.283783 | 0.434535 | 2.954386 | 0.0078 |
| DLOG(AREV(-1)) | -1.905412 | 0.355521 | -5.359500 | 0.0000 |
| DLOG(GDP) | 0.177507 | 1.599273 | 0.110992 | 0.9127 |
| DLOG(GDP(-1)) | 5.682599 | 1.525264 | 3.725649 | 0.0013 |
| OILD | -0.139970 | 0.047160 | -2.967989 | 0.0076 |
| CointEq(-1)* | -0.449880 | 0.077493 | -5.805468 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.699301 | Mean dependent var | 0.061715 |
| Adjusted R-squared | 0.618344 | S.D. dependent var | 0.167519 |
| S.E. of regression | 0.103490 | Akaike info criterion | -1.496353 |
| Sum squared resid | 0.278467 | Schwarz criterion | -1.137209 |
| Log likelihood | 33.43799 | Hannan-Quinn criter. | -1.373874 |
| F-statistic | 8.637886 | Durbin-Watson stat | 2.213773 |
| Prob(F-statistic) | 0.000018 | | |

* 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 | 3.703676 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -5.805468 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

NOR SHORTRUN EQN 4
ARDL Error Correction Regression
Dependent Variable: DLOG(EXTR)
Selected Model: ARDL(1, 0, 0, 2, 0, 0, 1, 2)
Case 5: Unrestricted Constant and Unrestricted Trend
Date: 06/24/18 Time: 22:09
Sample: 1981 2016
Included observations: 34

ECM Regression
Case 5: Unrestricted Constant and Unrestricted Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 73.63693 | 11.62767 | 6.332903 | 0.0000 |
| @TREND | 0.106549 | 0.017390 | 6.127047 | 0.0000 |
| DLOG(AREV) | 1.698759 | 0.349861 | 4.855521 | 0.0001 |
| DLOG(AREV(-1)) | -1.473053 | 0.334703 | -4.401081 | 0.0003 |
| D(UEMR) | 0.008504 | 0.029686 | 0.286454 | 0.7776 |
| DLOG(EXCR) | 0.010285 | 0.230976 | 0.044528 | 0.9649 |
| DLOG(EXCR(-1)) | -0.807606 | 0.250501 | -3.223964 | 0.0045 |
| CointEq(-1)* | -0.547487 | 0.086593 | -6.322508 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.665502 | Mean dependent var | 0.061715 |
| Adjusted R-squared | 0.575444 | S.D. dependent var | 0.167519 |
| S.E. of regression | 0.109152 | Akaike info criterion | -1.389830 |
| Sum squared resid | 0.309767 | Schwarz criterion | -1.030686 |
| Log likelihood | 31.62711 | Hannan-Quinn criter. | -1.267352 |
| F-statistic | 7.389758 | Durbin-Watson stat | 1.643030 |
| Prob(F-statistic) | 0.000065 | | |

* 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 | 3.651481 | 10% | 2.38 | 3.45 |
| k | 7 | 5% | 2.69 | 3.83 |
| | | 2.5% | 2.98 | 4.16 |
| | | 1% | 3.31 | 4.63 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -6.322508 | 10% | -3.13 | -4.53 |
| | | 5% | -3.41 | -4.85 |
| | | 2.5% | -3.65 | -5.14 |
| | | 1% | -3.96 | -5.49 |

### *Appendix H35: Norway Error Correction Form (Short Run Tests) Model 5*

NOR SHORTRUN EQN 5
ARDL Error Correction Regression
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 0, 1, 1, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 18:37
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 69.88954 | 7.613848 | 9.179266 | 0.0000 |
| DLOG(AEXP) | 16.89410 | 3.242802 | 5.209722 | 0.0000 |
| DLOG(GDP) | -41.95411 | 8.304985 | -5.051679 | 0.0000 |
| DLOG(EXTR) | 0.074557 | 0.774728 | 0.096236 | 0.9242 |
| CointEq(-1)* | -0.845437 | 0.090988 | -9.291763 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.767758 | Mean dependent var | -0.288201 |
| Adjusted R-squared | 0.736792 | S.D. dependent var | 1.403924 |
| S.E. of regression | 0.720267 | Akaike info criterion | 2.313173 |
| Sum squared resid | 15.56352 | Schwarz criterion | 2.535365 |
| Log likelihood | -35.48052 | Hannan-Quinn criter. | 2.389874 |
| F-statistic | 24.79385 | Durbin-Watson stat | 2.121375 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 8.273949 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -9.291763 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |

NOR SHORTRUN EQN 5 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: D(INFR)
Selected Model: ARDL(1, 1, 0, 1, 0, 0, 0)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 22:19
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 120.8704 | 13.95618 | 8.660707 | 0.0000 |
| DLOG(AEXP) | 18.33382 | 3.430912 | 5.343715 | 0.0000 |
| DLOG(GDP) | -36.68662 | 8.310469 | -4.414506 | 0.0002 |
| OILD | 0.700916 | 0.283274 | 2.474341 | 0.0208 |
| CointEq(-1)* | -0.674313 | 0.077417 | -8.710113 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.747653 | Mean dependent var | -0.288201 |
| Adjusted R-squared | 0.714007 | S.D. dependent var | 1.403924 |
| S.E. of regression | 0.750795 | Akaike info criterion | 2.398195 |
| Sum squared resid | 16.91079 | Schwarz criterion | 2.618387 |
| Log likelihood | -36.93341 | Hannan-Quinn criter. | 2.472898 |
| F-statistic | 22.22102 | Durbin-Watson stat | 2.164450 |
| Prob(F-statistic) | 0.000000 | | |

* 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 | 8.670407 | 10% | 2.12 | 3.23 |
| k | 6 | 5% | 2.45 | 3.61 |
| | | 2.5% | 2.75 | 3.99 |
| | | 1% | 3.15 | 4.43 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -8.710113 | 10% | -2.57 | -4.04 |
| | | 5% | -2.86 | -4.38 |
| | | 2.5% | -3.13 | -4.66 |
| | | 1% | -3.43 | -4.99 |

## *Appendix H36: Norway Error Correction Form (Short Run Tests) Model 6*

NOR SHORTRUN EQN 6 WITH DUMMY
ARDL Error Correction Regression
Dependent Variable: D(UEMR)
Selected Model: ARDL(1, 0, 0, 0, 0, 0, 0)
Case 2: Restricted Constant and No Trend
Date: 06/26/18 Time: 03:03
Sample: 1981 2016
Included observations: 35

ECM Regression
Case 2: Restricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| OILD | -0.399072 | 0.133703 | -2.984773 | 0.0061 |
| CointEq(-1)* | -0.389477 | 0.060963 | -6.388715 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.549529 | Mean dependent var | 0.085143 |
| Adjusted R-squared | 0.535879 | S.D. dependent var | 0.685661 |
| S.E. of regression | 0.467117 | Akaike info criterion | 1.370971 |
| Sum squared resid | 7.200539 | Schwarz criterion | 1.459848 |
| Log likelihood | -21.99199 | Hannan-Quinn criter. | 1.401651 |
| Durbin-Watson stat | 2.336891 | | |

* 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 | 4.019726 | 10% | 1.99 | 2.94 |
| k | 6 | 5% | 2.27 | 3.28 |
| | | 2.5% | 2.55 | 3.61 |
| | | 1% | 2.88 | 3.99 |

NOR SHORTRUN EQN 6
ARDL Error Correction Regression
Dependent Variable: D(UEMR)
Selected Model: ARDL(3, 2, 2, 0, 0, 2, 1, 2)
Case 3: Unrestricted Constant and No Trend
Date: 07/24/18 Time: 18:49
Sample: 1981 2016
Included observations: 33

ECM Regression
Case 3: Unrestricted Constant and No Trend

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|---|---|---|---|---|
| C | 374.7447 | 38.76526 | 9.667023 | 0.0000 |
| D(UEMR(-1)) | -0.455278 | 0.114620 | -3.972069 | 0.0016 |
| D(UEMR(-2)) | -0.362936 | 0.106876 | -3.395866 | 0.0048 |
| DLOG(AEXP) | -1.070178 | 1.929445 | -0.554656 | 0.5885 |
| DLOG(AEXP(-1)) | -12.83101 | 2.444902 | -5.248068 | 0.0002 |
| DLOG(OILP) | 3.039303 | 0.385003 | 7.894224 | 0.0000 |
| DLOG(OILP(-1)) | 1.618076 | 0.354528 | 4.564025 | 0.0005 |
| DLOG(EXTR) | -0.093329 | 0.411808 | -0.226633 | 0.8242 |
| DLOG(EXTR(-1)) | -3.839721 | 0.487236 | -7.880627 | 0.0000 |
| D(INFR) | -0.247157 | 0.060061 | -4.115113 | 0.0012 |
| DLOG(EXCR) | 6.198546 | 0.891205 | 6.955238 | 0.0000 |
| DLOG(EXCR(-1)) | -3.708360 | 0.910094 | -4.074701 | 0.0013 |
| CointEq(-1)* | -0.556667 | 0.057572 | -9.669025 | 0.0000 |

| | | | |
|---|---|---|---|
| R-squared | 0.866983 | Mean dependent var | 0.080000 |
| Adjusted R-squared | 0.787174 | S.D. dependent var | 0.705146 |
| S.E. of regression | 0.325306 | Akaike info criterion | 0.879003 |
| Sum squared resid | 2.116480 | Schwarz criterion | 1.468536 |
| Log likelihood | -1.503541 | Hannan-Quinn criter. | 1.077363 |
| F-statistic | 10.86310 | Durbin-Watson stat | 2.075297 |
| Prob(F-statistic) | 0.000003 | | |

* 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 | 7.596066 | 10% | 2.03 | 3.13 |
| k | 7 | 5% | 2.32 | 3.5 |
| | | 2.5% | 2.6 | 3.84 |
| | | 1% | 2.96 | 4.26 |

t-Bounds Test — Null Hypothesis: No levels relationship

| Test Statistic | Value | Signif. | I(0) | I(1) |
|---|---|---|---|---|
| t-statistic | -9.669025 | 10% | -2.57 | -4.23 |
| | | 5% | -2.86 | -4.57 |
| | | 2.5% | -3.13 | -4.85 |
| | | 1% | -3.43 | -5.19 |