CHAPTER ONE: INTRODUCTION

1.1 Background to the Study

The economy of any country, irrespective of its structure is regulated by certain policies developed by the government. Some of these include economic policies, social policies, and monetary policies, among others. Of all these policies, the economic policies appear the most fundamental with fiscal policy the most essential arms of it. Fiscal policy generally implies basic duty of any government to manipulate the receipt and expenditure sides of its budget in order to achieve certain national objectives such as increase in per-capita income, low unemployment rate, positive balance of payments (BOP) position and price stability. The essence of fiscal policy anywhere in the world, is basically to stimulate economic and social development by pursuing a policy stance that ensures a sense of balance between taxation, expenditure and borrowing that is consistent with sustainable economic growth.

Consequently, a nation can not achieve macroeconomic stability without fiscal policy. The government increases aggregate demand by stabilizing taxes and increasing expenditure. It also boosts demand through tax cuts and increased transfer payments. These measures increase average household incomes and encourage consumer spending. In addition to regulating the demand side of the economy, fiscal policy influences aggregate output and employment by raising the level of infrastructure spending. Overall, fiscal policy can be deployed to correct economic imbalances in periods of recession and depression.

However, in oil-exporting countries, government expenditures often depend on oil revenue, which in turn depends on movement of oil price in the international market. Hence, government revenues in such economies tend to be highly volatile due to the unpredictable nature of oil price thereby making fiscal policy more challenging. The crash in oil prices in

2014 and the domestic oil production shocks significantly hurt projected revenues and increased the country's fiscal deficit. During the period of low oil prices for example, the Federal Ministry of Finance borrowed significantly from both the domestic debt market and the international capital market. Domestic debt jumped by almost 50% from N8.40trn in June 2015 to N12.59trn in December 2017. The Finance Minister justified the borrowing on the sub-optimal performance of revenue, the need to plug the fiscal deficit and the need to invest in infra-structure such as roads, railway transport system etc.

The challenges tend to be greater as the larger the share of oil revenues is, in the government's overall revenues and the larger the oil sector is, in the economy. Being the largest oil producer in Africa, government fiscal policy in Nigeria has shown a tendency of over reliance on oil revenues since the country discovered crude oil in commercial quantity. As consequence, the uncertainty nature of oil price in the international market has had its share on fiscal instability in Nigeria, and the effects have been channeled to the rest of the economy with fundamental effect on government revenue and spending.

Also, the Nigeria foreign reserve depleted from about $42 billion USD to about $30 billion USD. This was mainly due to the drastic drop in the international crude oil prices, from over $110 USD in the fourth quarter of 2014 to about $40 USD in the first quarter of 2015. This particularly has seen a number of Nigerian states at subnational level struggling to effectively perform their fiscal responsibility due to their over dependent on proceeds from the sale of crude oil at the national level. It thus become apparent in this regard that the overall fiscal balance in Nigeria can be driven by any changes in the oil price given the country's reliance on oil income, which by nature is volatile and uncertain.

However, despite the vastness of literature on macroeconomic consequence of oil price shocks particularly its implication for oil exporting economy, only few of the extant studies namely, Farzanegan (2011) and El Anshasy and Bradley (2012) directed their examination of the impact of oil price on fiscal policy variables. Yet a puzzle however, is whether the effect of oil price shock is asymmetric, that is whether the impact of oil price increases and oil price decreases are not the same. It is in this light, that this present study is revisiting the literature on oil price and fiscal policy nexus in the context of net oil exporting economy using the case of Nigeria.

1.2 Statement of the Problem

Beside the fact that Nigeria is one of the developing economies, one of its major economic challenges is that it is susceptible to volatile macroeconomic environment constrained by external terms of trade shocks and reliance on crude oil export. With about 75% of her revenue sourced from crude oil export earnings and petroleum tax, fiscal policy in Nigeria is likely to be influenced by oil-driven volatility impacting both revenue and expenditure profiles of her fiscal policy. The fact that oil revenue largely originates from abroad, its fiscal use can have significant effects on the domestic economy.

Not only has the uncertainty nature of oil price in the international market had its share on the instability of fiscal policy in Nigeria, the effect has largely channeled to the rest of the economy with fundamental effect on the revenue and expenditure profiles of the country’s fiscal policies. Many oil producers have had difficulties designing and implementing policies in this context.Recent practical experience in this regard has been the inability of some Nigerian state governors to effectively perform their fiscal responsibility at sub national level; mainly due to the falling oil price that started in the third quarter of 2014.

However, the uncertainty that characterizes the international oil price movements and the variability of fiscal policy in response to such movements is likely to differ for positive and negative oil price shocks. This among other implies that the way in which government adjusts their fiscal policies to oil price shocks is likely to be predicated on whether the oil price shocks is negative or positive; as well as on the short or long run dynamics of the shocks.

Downturns in oil prices (i.e. negative oil price shocks) have in a number of cases led to fiscal deficit crises and the reverse is the case for a positive oil price shocks. What this portends is that a pattern of fluctuating fiscal expenditures associated with negative oil price shocks cannot be said to be exact to fiscal expenditiure fluctuations that is associated with positive oil price shocks. In this light therefore, ignoring the asymmetric implications of the response of fiscal policy, particularly where it matter is likely to undermine the effectiveness of any policy design to mitigate adverse consequence of the vulnerability of the country fiscal policy to changes in oil prices.

Thus, while acknowledging the contribution of Aregbeyen and Fasanya (2017) on the role of asymmetries in the extent to which oil price shocks impact fiscal policy in Nigeria; however, limitating the measure of fiscal policy to its expenditure component only is likely to introduce biasness in the evaluation of asymmetric impact of oil price shocks on fiscal policy. What then constitute a problem of statement in the context of this study is whether the extent to which the response of fiscal policy to oil price shokcs is symmetric or asymmetric dependes on which dimensions of fiscal policy is under consideration. More so, is the issue of the extent to which the short or long run dynamics of fiscal policy in Nigeria matter for its symmetric or asymmetric responses to changes in oil prices.

1.3 Research Questions

Against the foregoing, the following questions become pertinent:

i. Is the response of fiscal policy to oil price shocks asymmetric or symmetric in the case of Nigerian economy?

ii. Is the response of fiscal policy to oil price shocks a short or long run asymmetric or symmetric phenomenon?

iii. Which dimensions of fiscal policy namely; expenditure, tax revenue, borrowing and/or transfer payment is more vulnerable to oil price shocks?

1.4 Objectives of the Study

The broad objective of this study is to find out how fiscal policies in Nigeria respond to notable oil price shocks – positive – negative that has occurred in the last 35 years. To achieve this broad objective, the study specifically hopes to:

i. Examine if the response of fiscal policy to oil price shock is asymmetric or symmetric in the case of Nigerian economy.

ii. Determine if the response of fiscal policy to oil price shock is short or long run asymmetric or symmetric phenomenon.

iii. Determine which the dimension of fiscal policy measures namely, expenditure, tax revenue, borrowing and/or transfer payment is more vulnerable to oil price shocks.

1.5 Research Hypotheses

In line with the main and various specific objectives of this study, the following hypotheses were tested in the course of this study:

1. H_O: The response of fiscal policy to oil price shocks is not asymmetric but symmetric in the case of Nigerian economy.

   H_I: The response of fiscal policy to oil price shocks is asymmetric and not symmetric in the case of Nigerian economy.

2. H_O: The response of fiscal policy to oil price shocks is not both short and long run asymmetric or symmetric phenomenon.

H_I: The response of fiscal policy to oil price shocks is both short and long run asymmetric or symmetric phenomenon.

3. H_O: The vulnerability of fiscal policy to oil price shocks do not depends on the dimension of fiscal policy profiles that is under consideration.

   H_I: The vulnerability of fiscal policy to oil price shocks depends on the dimension of fiscal policy profiles that is under consideration.

1.6 Significance of the Study

The study is significant as follows: Firstly, it will help to improve the understanding of the Nigeria's economic reformers and regulators who are striving to improve the effectiveness of fiscal policy in Nigeria. Secondly, it will help to mitigate policy erroneous that might arise from assuming exact preventive action/policies to mitigate adverse effects of positive and negative oil price shocks on fiscal policy particularly when asymmetries matter for understanding the extent to which oil price shocks impact fiscal policy in Nigeria. Thirdly, it will help providing more insights on which of the fiscal policy profiles including expenditure, tax revenue, borrowing and transfer payment is potentially more vulnerable to oil price shocks. For example, if policymaker knows that when compare to taxation or borrowing, the expenditure component of the fiscal policy is likely be more susceptible to oil price shock, policy that mitigate against such vulnerability may be designed to lessen the dependency of the country's expenditure profiles on oil revenue.

1.7 Scope and Limitation of the Study

The focal point of this study is though on the response of fiscal policy to oil price shocks covering the period between 1985 and 2015. However, unlike Aregbeyen and Fasanya (2017) that limit their scope of fiscal policy mainly to expenditure of fiscal policy, fiscal policy in the context of this study include expenditure profiles such as Total Government Expenditure (TGE), Government Capital Expenditure (GCE), and Government Recurrent Expenditure (GRE). Others are tax revenue using petroleum profit tax and royalty (PTR), Borrowing (BORR) and Transfer Payment (TRSF).The major limitation the study encountered is the unavailability of daily data which would have been the appropriate data to capture the accurate volatility of the oil price for the study. Also, there was no sufficient quarterly data for the intended years to cover for the study. An attempt to extend the data length to 1980 or further was constraint by unavailability of complete macro series from both domestic and foreign official sources.

CHAPTER TWO: REVIEW OF RELATED LITERATURE

This chapter focuses on the views of other researchers and scholars related to our study. The purpose of this is to examine the ideas and the arguments of other researchers and scholars in order to present key gap between the present and the previous related studies. The review sections cover theoretical literature, empirical literature, summary of the literature review and justification of the study.

2.1 Theoretical Literature Review

2.1.1 Conceptual Issues

I. Fiscal Policy

The term fiscal policy define government measures designed to influence the quantum and allocation of revenue and expenditure with the aim to achieving internal and external economic balance, as well as sustainable development. Essentially, the fiscal policy is required for economic growth and stabilization and is often deployed to control the production and consumption of particular goods, services and products.Taxes and government expenditure are the primary tools of fiscal policy, though in some jurisdictions grants and aid constitutes significant complementary tools. Fiscal policy is composed of a suit of revenue and expenditure policies/actions. The revenue arm of the fiscal policy can be categorized into tax and non-tax. The tax revenue can be conventioanallycategorized as direct tax and indirect taxes, but the non-tax revenue in the context of Nigeria economy can be categorized into oil and non-oil revenue. However, while the non-oil revenue segment of the non-tax revenue includes proceeds from sale of government property, privatization proceeds, rents and leaves, surpluses of public corporations and dividends, it is the oil revenue component of the non-tax revenue that has been critical for the management of fiscal policy in Nigeria.

In a similar development, the expenditure arm of the fiscal policy can be categorized into recurrent and capital expenditure, respectively. The latter involves government expenditure on capital goods such as acquiring of physical assets, namely;property, industrial buildings or equipment for public usage with a life span of more than a year. This includes expenditure on roads construction, building of Hospitals, communication systems, public research spending and the provision of basic education and medical services etc. It can also be described as government investments on productive channels of the economy. The recurrent expenditure on the other hand have been described as an expenditure of government on the provision of goods and services consumed by the public within a fiscal year. This spending is recurrent because of the need for sustenance in the provision of these services. In Nigeria, recurrent expenditure includes domestic and foreign debt service as well as non-debt related expenditure such as; payment of salaries, pension, unemployment benefits, spending on subsidies and grants.

Overall, the fiscal policy generally involves government's programme of taxation, expenditure and other financial operations to achieve certain national goals. The instruments of fiscal policy through which government of a country exhibits their fiscal responsibilities are taxation, government expenditure (capital and recurrent), public debts (or borrowing), subsidy and/or transfer payment. Government intervention in the economy through these instruments is usually enunciated in the budget. The government increases aggregate demand by stabilizing taxes and increasing expenditure. It also boosts demand through tax cuts and increased transfer payments. These measures increase average household incomes and encourage consumer spending. In addition to regulating the demand side of the economy, the fiscal policy also influences aggregate output and employment by raising the level of infrastructure spending.

According to Peter and Simeon (2011), it is the process of government management of the economy through the manipulation of its income and expenditure in order to achieve certain desired macroeconomic objectives. For Mark and Asma (2009), it is changes in the level and composition of taxation and government spending which in turn affects aggregate demand, level of economic activity, pattern of resource allocation, and the distribution of income. This therefore implies that fiscal policy is an instrument with which government perform their fiscal responsibilities. Olawunmi and Tajudeen (2007) opine that the implementation of fiscal policy is essentially routed through government's budget, while Valmont (2006) defined fiscal policy as "the economic term which describes the actions of a government in setting the level of public expenditure and the way in which that expenditure is funded". For Anyanwu (1993), an important objective of fiscal policy is to promote economic conditions conducive to business growth while ensuring that any such government actions are consistent with economic stability.

There are two main approaches through which government perform their fiscal activities namely, exapansionary and contractionary fiscal policy. Starting with the former, an expansionary fiscal policy entails a reduction in taxes or increase in government spending to induce increase in aggregate consumption, demand, investment and production levels. It is typically deployed to stimulate growth when the economy is operating below its full employment capacity. It is facilitated by an expansionary budget when government expenditure exceeds its revenue. In the case of the latter, a contractionary fiscal policy entails an increase in taxes or decrease in government expenditure to moderate aggregate consumption, demand, investment and production levels. It is typically deployed when the economy is operating above its full employment capacity, overheating and faced with rising inflation. It is facilitated by a contractionary budget when government revenue exceeds its expenditure.

II. Oil Price Shock

Conventional oil price shocks can be described as an instance that involves at least a doubling of the oil price within a year or two. Oil shocks are usually defined in terms of price fluctuations, but these may in turn emanate from changes in either the supply of or the demand for oil. In practice it is unlikely for demand to grow rapidly enough to cause a price shock unless it is motivated by fears of supply shortage. That is, the supply side has been primarily responsible for observed oil price shocks, at least as an initial trigger. According to Chuku (2012), oil price shocks are unexpected and unpredictable changes in global oil prices, caused by exogenous factors, which are likely to impact on endogenously determined economic variables.

The oil price shocks may of course be negative (a fall) or positive (a rise) and there are at least two important dimensions of oil price shocks. The first is the magnitude of the shocks, which may be measured in absolute terms or in percentage changes. The second aspect is the one with timing such as the speed and durability of the oil price shocks and there at least three cases that can be identified and such includes; a rapid (e.g. oil price changes occurring within a few quarters) and sustained oil price changes (a "break"); a rapid and temporary oil price hike (a "spike"); and a slower but sustained rise in oil prices (a "trend").

2.1.2 Review of Basic Theories

The body of literature dealing with the response of fiscal policy to macroeconomic fundamentals is essentially anchored on three broad theoretical fronts. These basic theories include Neoclassical, Keynesian, and the Ricardian Equivalence hypotheses. Precisely, the neoclassical view says that "every dollar increase in real government spending is offset by a dollar reduction in private spending, so crowding out is complete" (Kukk, 2008). On the contrary the Keynesian view suggests that consumption has a positive effect on the economy, while the alternative under this circumstance is the Ricardian perspective, which suggests the level of national output is basically neutral to government policy. A summary of these three paradigms is presented as follows:

2.1.2.1 The Neoclassical Theory

The neoclassical school proposes an adverse relationship between fiscal deficits and macroeconomic variables. They argue that fiscal deficits leads to higher interest rates, discourages the issue of private bonds, private investments and private spending, increases inflation level, and cause a similar increase in the current account deficits and finally slows the growth rate of the economy through resources crowding out. The Neoclassical school considers individuals planning their consumption over their entire cycle. By shifting taxes to future generations, fiscal deficits increase current consumption.

Other Assumption of neoclassical theory are:

i. Full employment
ii. According to Solow, “for steady state equilibrium, it is necessary to assume that technological progress is entirely augmenting”. That is, neutrality of technological progress.

By assuming full employment of resources, the neoclassical school argues that increased consumption implies a decrease in savings. Interest rate must rise to bring equilibrium in the Capital markets. Higher interest rates, in turn, result in a decline in private investment, domestic production and an increase in the aggregate price level (Asuka&Chioma, 2012).

Furthermore, Yellen (1989) argues that in standard Neoclassical Macroeconomic models, if resources are fully employed, so that output is fixed, higher current consumption implies an equal and offsetting reduction in other forms of spending. Thus, investment and/or net exports must be “fully crowding out”. It is worth noting that it is important to distinguish between "financial" crowding out and "resource" crowding out which occurs when the government competes with the private sector in purchasing certain resources (skilled labour, raw materials and so on). When the government sector expands, the private sector will contract because of the increase in prices on these resources due to an excess demand by the government, hence this leads to a fall in investment and consumption by the private sector. Thus the government sector's expansion crowds out the private sector. It is worth noting here as well that resource crowding out is an important issue to take into account especially in developing countries where resources are scarce even sometimes to the private sector, so any excess demand for these resources by the government will severely impinge on private sector productivity.

Following Solow (1956), the neoclassical model predicts that long-run growth is certainly determined by exogenous technical progress, typically assumed to grow at a constant rate in the 'steady state'. That is, physical or human capital accumulation, can only affect growth during 'transitional' periods when the economy is out of its steady-state (e.g. following an increase in savings rates), (Mankiw, Romer& Well, 1992). In this case, productive growth-fiscal policy may influence innovation, Research and Development among others (Romer, 2000). In developing countries however, a more likely channel is the impact of fiscal policy on the acquisition of foreign technologies such as those embodied in imported capital and/or final goods.

Main strength of neoclassical theory which makes it relevant to this study are:

i. The neoclassical theory has merit of demonstrating the influence of capital accumulation and per capital real income over time.

ii. In the neoclassical theory, the long run rate of growth is determined by an expanding labour force and technical progress. Thus, Professor Solow had successfully shunted aside all difficulties and rigidities which goes into the modern Keynesian income analysis.

The weaknesses and failure of neoclassical theory are as stated:

i. The assumption which states that "for steady state equilibrium, it is necessary to assume that the technical progress is entirely augmenting". There is, however, little empirically justification for this assumption.

ii. The adjustment mechanism envisaged by neoclassical model rests on flexibility of factor prices. But the adjustability of factor prices, for instance, interest rates, may be prevented by 'liquidity trap' which does not allow interest rate to go below a certain level, and "this may prevent the capital output ratio from being as high as may be necessary for growth equilibrium.

Neoclassical effects of fiscal policy emerge from new classical models which address well-known shortcomings of the Keynesian approach and in particular its lack of microeconomic foundations. In addition, studies have shown that fiscal policies are procyclical in developing countries and in Oil Producing Countries (OPC_S). They increase spending with an increase in oil revenue during an oil price boom. They are forced to reduce spending because of a revenue decline as a result of a drop in oil prices. Since, in general, these countries are not able to accumulate savings in years with high oil revenues; they can only finance deficits by cutting expenditure during revenue shortfalls (Ilzetzki&Vegh, 2008).

Two broad arguments that have been proposed as an explanation for procyclical policies in developing countries also apply to Oil Producing. These are constraints on financing (or limited access to credit markets) and factors related to the structure of the economy (the budget, political, power, and social structure, and weak institutions). In general, these factors are different, but they go together and are likely to reinforce each other. For example, weak institutions, the budget structure, or a corrupt government may hinder prudent fiscal policy, which may, in turn, affect fiscal responsibility (Gavin &Perotti, 1997).

2.1.2.2 The Keynesian Theory

The Keynesian theory was introduced in 1930 by the British Economist, John Maynard Keynes. The theory advocates for active policy responses through appropriate use of fiscal policy actions by the government and monetary policy actions by the central bank to stabilize output over the business cycle.

The Keynesian economists propose a positive relationship between budget deficits and macroeconomic variables. They argue that usually budget deficits result in an increase in domestic production, increases aggregate demand, increases savings and private investment at any given level of interest rate. The Keynesian theory advocates the use of fiscal policy to offset imbalances in the economy. According to Keynes, a government should use fiscal policy to stimulate an economy slowed down by recession through deficit, which means it should spend more than what it collects from taxes. On the other hand, to slow down an economy that is threatened by inflationary pressures, government should increase taxes or cut expenditure to create a budget surplus that would act as a drag on the economy (Grossman 1987).

The Keynesian absorptive theory suggests that an increase in the budget deficits would induce domestic absorption and thus, import expansion, causing current account deficit. In the Mundell-Fleming framework, an increase in the budget deficit would induce an upward pressure on interest rate, causing capital inflows and an appreciation of the exchange rate that will increase the current account balance. The Keynesians provide a counter argument to the crowd-out effect by making reference to the expansionary effects of budget deficits. They argue that usually budget deficits result in an increase in domestic production, which makes private investors more optimistic about the future course of the economy resulting in them investing more. This is known as the “crowding-in” effect.To be precise, the Keynesian relies on three assumptions as stated:

The Keynesian model is based on assumption of price rigidity which hindered some market from attaining equilibrium in the short run. The Keynesian model assumptions also based on effective demand which means that consumptions expenditures are based on income not full employment or equilibrium. Another assumption that Keynesian theory relies on is important savings and investment determinants income expectations and other influences beyond the interest rate.

It is worth noting here that the traditional Keynesian view differs from the standard neoclassical paradigm in two fundamental ways. First, it permits the possibility that some economic resources are unemployed. Second, it presupposes the existence of a large number of liquidity-constrained individuals. This second assumption guarantees that aggregate consumption is very sensitive to changes in disposable income.

The main strength of Keynesian theory which makes it relevant to this study is that the theory believed that government can manage consumer demand through policy and taxation thereby avoiding inflation and unemployment which are results of too much and too little demand respectively.

Also, many traditional Keynesians argue that deficits need not crowd out private investment. Eisner (1989) suggests that increased aggregate demand enhances the profitability of private investments and leads to a higher level of investment at any given rate of interest. Hence deficits may stimulate aggregate savings and investment, despite the fact that they raise interest rates.

The weaknesses or failure of the Keynesian theory are as stated:

i. It addressed to the problems concerning capitalistic economic system and payless or no consideration in the recent economic system in the form of communism and socialism.

ii. It is more of aggregative aspect. That is, it takes less or no cognizance of micro aspect.

iii. It pays much attention on short run effect than the long run effects.

iv. The theory was criticized for wrong choice of units in measuring the total output of the economy.

Eisner (1989) concludes that "evidence is thus that deficits have not crowded-out investment. There has rather been crowding-in". Heng (1997) utilized an overlapping-generations (OLG) model to provide a theoretical framework to analyze the "crowding-in" issue of private capital by public capital. He shows that public capital crowds-in private capital through two channels, namely, via its impact on the marginal productivity of labour and savings, and via (gross) complementarity or substitutability between public and private capital.

2.1.2.3 The Ricardian Equivalence Hypothesis

Ricardian equivalence, or the Barro-Ricardo equivalence proposition, is an economic theory which suggests that government budget deficits do not affect the total level of demand in an economy. In simple terms, the theory can be described as follows. Governments may either finance their spending by taxing current taxpayers, or they may borrow money. However, they must eventually repay this borrowing by raising taxes above what they would otherwise have been in future. The choice is therefore between "tax now" and "tax later". Suppose that the government finances some extra spending through deficits (i.e. tax later), Ricardo argued that although taxpayers would have more money now, they would realize that they would have to pay higher tax in future and therefore save the extra money in order to pay the future tax. The extra saving by consumers would exactly offset the extra spending by government, so overall demand would remain unchanged. In Ricardian Equivalence hypothesis, a Keynesian approach is based on an assumption that consumption is related to current income.

Thus, Ricardian Equivalence or the Barro-Ricardo equivalence proposition or assumption states that if consumers are Ricardianin the sense that they are forward-looking, and are fully aware of the government's inter-temporal budget constraint, they will anticipate that a tax cut today, financed by issuing government debt, will result in higher taxes being imposed on their infinitely lived family in the future. Permanent income is therefore unaffected, and in the absence of liquidity constraints and with perfect capital markets, consumption will not change (Barro, 1974)

Ricardian Equivalence suggests that government attempts to influence demand using fiscal policy will prove fruitless. He argues that an increase in budget deficits, due to an increase in government spending, must be paid for either now or later, with total present value of receipts fixed by the total present value of spending. Thus, a cut in today's taxes must be matched by an increase in future taxes, leaving real interest rates, and thus private investment, and the current account balance, exchange rate and domestic production unchanged. Therefore, budget deficits do not crowd-in nor crowd out macroeconomic variables.

One of the strength that makes Ricardian theory to be relevant in this study is that it has the merit of consumption smoothing. That is, for instance, the Ricardian equivalence behaviour will force the households not to spend the increase of their income rather they will save it to face the tax increase in the future as their permanent income is unaffected.

In all, there exists a consensus in the literature that an adequate and effective macroeconomic policy is critical to any successful development process aimed at achieving high employment, sustainable economic growth, price stability, long-viability of the balance of payments and external equilibrium. Because of the fact that the development of World economy particularly in the developing part, is an on-going process, majority of governments World over often engage in massive investment activities (fiscal deficit) which they believe will not only enhance the development of the domestic economy but also situate the economy on the path of sustainable growth and Nigeria is not an exception. This is because, increases in public expenditure if efficiently utilized could translate into improved infrastructural developments and consequently enhance general welfare and also put the economy on the path of growth.

One of the weakness or failure of Ricardian equivalence hypothesis is the issue of interest rate premier and creditability. That is, when the government makes a fiscal expansion, it has to issue more debt to finance it. More debt will lead to an increase in the interest rate and that means risk premia including inflation and default risk will also rise.

The bone of contention, however, on the use of this type of fiscal policy (i.e. expansionary fiscal policy) is how the proposed increase in public expenditure over its revenue should be financed. The two contending options have been money printing and borrowing. Money printing is an exclusive right of relevant monetary authority (usually the Central Bank) which involves raising money supply to match demand in the economy. However, where the rate of increase in money supply (usually called Seignorage rate) rises above the rate of growth of economic activity, and given a stable demand function for base money, inflation will result (Ndung'u, 1995). Furthermore, Easterly and Fischer (1990) argue that where governments print money to cover budget deficits, it is unlikely that rapid money supply growth takes place without fiscal imbalances.

The second contending option of deficit financing is borrowing. The use of borrowing (from both domestic economy and foreign countries) particularly since the World War II has been an inevitable and veritable source of macroeconomic financing most especially in such situations where domestic resources are inadequate to put the economy on the path of sustainable economic growth and development. However, borrowing which may result in debt crisis may lead to high real interest rates in the domestic economy and crowd out private sector investments (Easterly & Schmidt, 1990, 1993; &Ndung'u, 1995).

2.1.3 Other Related Theoretical Review

The influence of oil price fluctuations on the economy and the magnitudes of its effects varied and evolved overtime (Lescaroux& Mignon, 2008). Thus, the response of government revenue and expenditure to oil price shock in net-oil exporting economy is likely to vary from that of net-oil importing economy. Theoretically, there are several economic channels through which oil price shock affect economic activities and fiscal policy particularly. Most of the extant theoretical literature tends to explore the impact of oil price shock on the economic activities of oil exporting from two main sides to include the symmetry (direct) and asymmetry (indirect) channels (Herrera, Lagalo& Wada, 2015).

2.1.3.1 The Symmetry/Direct Effects of Oil Price Shock

Most theoretical models of the transmission of oil price shocks have focused on the implications of exogenous variation in the price of imported crude oil. The transmission of such oil price shocks relies on two main channels. One immediate effect of an unexpected increase in the price of imported crude oil is a reduction in the purchasing power of domestic households, as income is being transferred abroad. This first effect is akin to an adverse aggregate demand shock in a macroeconomic model of aggregate demand and aggregate supply. The other immediate effect is to increase the cost of producing domestic output to the extent that oil is a factor of production along with capital and labor, which is akin to an adverse aggregate supply shock. These direct effects of an exogenous increase in the real price of oil are symmetric in oil price increases and decreases. An unexpected increase in the real price of oil will cause aggregate production and income to fall by as much as an unexpected decline in the real price of oil of the same magnitude will cause aggregate income and production to increase.

2.1.3.2 Supply Side Channel

By means of the supply side channel, oil price shocks, changes the marginal costs of production and, hence, contracts production. The decline in productivity reduces total output and increases unemployment. Saying it differently, an increase in oil price leads to an upward shift in the aggregate supply curve, and this leads to increase in prices and decrease in output on a downward sloping aggregate demand curve. Oil price volatility change firms' optimal production plans by altering the incentive to utilize energy resources. Therefore, existing capital and labour do not produce output as before resulting in a reduction in potential output. However, this transmission mechanism is typical for an oil-importing economy. For an oil-exporting economy, oil price shocks can have positive effects on the savings–investment relation. Receipts accruing from oil exports can be used to embark on domestic investment ventures that will increase capacity utilization, increase output and reduce unemployment rates.

2.1.3.3 Demand/Wealth Side Channel

The wealth transfer effect is another mechanism that captures the transfer of income from oil-importing nations to oil-exporting nations following an increase in oil prices. Oil price increases lead to windfall oil revenue for oil-exporting countries. The transfer of income reduces the consumer demand in the oil-importing countries, and at the same time, increases the consumer demand in the oil-exporting countries though not proportionally because of an assumed higher marginal propensity to consume that is common in oil exporting economies. From the perspective of an oil-importing country, an oil price shock is transmitted through the demand side of the economy by triggering a reduction in the demand for goods and services (or consumer spending).

2.1.3.4 The Asymmetry/Indirect Effects of Oil Price Shock

The asymmetry channels involve indirect transmission channels developed by researchers in order to account for a larger impact of oil price changes than implied by the direct channels. The rationale for asymmetric responses to oil price shocks hinges on the existence of additional indirect effects of unexpected changes in the real price of oil. It has been stressed that oil price shocks are relative price shocks that can be viewed as allocative disturbances which cause sectoral shifts throughout the economy (Hamilton, 1988). To this end, theoretical literature have suggested that sectoral reallocation could result in an asymmetric response of economic activity to positive and negative oil price movements (Davis, 1987; Bresnahan& Ramey, 1993; Davis &Haltiwanger, 2001). The sector adjustment effect channel explains the asymmetric impact of oil price shocks within the sectors of an economy. Brown and Yucel (2002) argued that possible explanations for asymmetric sectoral adjustments are monetary policy regimes, adjustment costs and petroleum product prices.

As pointed out by Brown and Yucel (2002), adjustment costs arise due to sectoral imbalances and coordination problems between firms or because the energy-to-output ratio is part of the capital stock. In the case of sectoral imbalances, increasing (decreasing) oil prices would require energy-intensive sectors to contract (expand) and energy-efficient sectors to expand (contract). By implication, asymmetry in oil prices will result in underutilization of resources and rising unemployment. Hence, for oil exporting countries, costly sectoral reallocations would amplify the recessionary effect of a negative oil price shock and mitigate the expansionary effect of a positive shock. For an oil exporting country, a reduction in oil price may cause concern regarding future impacts on employment and decline in real income, inducing an increase in precautionary saving, which then lead to a demand-driven decline in production. The magnitude of this effect on aggregate production would depend on the composition of the economy, the degree of energy intensity in consumption, and relies on the assumption that future employment levels are uncertain. This implies that the transmission channels are asymmetry (Herrera et al., 2015).

2.1.3.5 An Overview of Public Finance Management in Nigeria

The major macroeconomic objective of every nation is to achieve efficient allocation of resources as well as stabilization of the business cycles. In the context of Nigeria particularly, the last two decades has witnessed a number of economic policies initiated and implemented to assist in the better management of her economy. Parts of these reforms were aimed at improving the quality of the country's Public Financial Management (PFM) systems. PFM as described by Prakash and Cabezon (2008) is a critical instrument in the implementation of economic policy, and it works by influencing the allocation and use of public resources through the budget and overall fiscal policy.

Thus, a well-functioning PFM system is expected to provide the assurance that the funds released through revenue generation and appropriation processes as well as from debt forgiveness (cancelation) mechanism would be productively used in a transparent and effective manner. More so, the PFM system if well-functioning has the tendency to improve the use of aid as well as overall budget performance, and in turn contribute to macroeconomic stability and growth of an economy while improving the overall governance through protection of public resources against the risk of expropriation and corruption. However, while a well-functioning PMF is require for the attainment of certain fiscal policy outcome, the effectiveness or otherwise of PMF in this direction cannot be in isolation of the quality of the institutional settings responsible for the implementation of PMF goals and objectives. Nigeria has several fiscal institutions that are committed to the wellness of the function of PFM for the attainment of certain pre-determine fiscal policy outcome. Examples of those institutions are as described in the following sub-sections.

2.1.3.6 Fiscal Institutions in Nigeria

I. Federal Inland Revenue Service Commission

The Federal Inland Revenue Service Establishment Act No. 13 of 2007 formally established the Federal Inland Revenue Service to control and administer the different taxes and laws specified in the First Schedule or other laws made from time to time by the National Assembly or other regulations made thereunder by the Government of the Federation and to account for all taxes collected. The same Act also established the Federal Inland Revenue Service Board to have overall supervision of the Service. This Board replaced the Federal Board of Inland Revenue. They were clearly charged with the following responsibility of “accessing, collecting and accounting for the various taxes to the federal government”.The Nigerian Inland Revenue Department now Federal Inland Revenue Board consisted of:

a. Chiefs and elders in each district
b. The Resident
c. Any native council or group of persons appointed by the Governor
d. Any native authority, which by native law and custom was recognized as a tax collection authority

- **Functions of the Service Commission**

i. Assess, collect, account and enforce payment of taxes as may be due to the government or any of its agencies.
ii. Assess persons, including companies, enterprises chargeable to tax.

iii. Ensure sufficient focus on the myriad of modernization projects across the service
iv. Collect, recover and pay to the designated account, any provision of the Act or any other enactment or law.
v. Be able to determine clear accountability for all support service related functions
vi. In collaboration with the relevant law enforcement agencies, carry out examination and investigation with a view to enforcing compliance with the provisions of the Act.
vii. Increased focus on taxpayer market segments.
viii. Align related groups and departments together for improved accountability and effectiveness
ix. In collaboration with the relevant ministries and agencies, review tax regimes and promote the application of tax revenues to stimulate economic activities and development.

2.1.3.7 Revenue Mobilization Allocation and Fiscal Commission (RMAFC)

The Revenue Mobilization, Allocation and Fiscal Commission is a corporate body with perpetual succession and a common seal and may sue and be sued in its corporate name, and whose members shall exercise the functions specified in the Constitution of the Federal Republic of Nigeria, 1999. The major rationale for establishing the RMAFC is monitoring the accruals to the Federal account as well as disbursement of revenue from the Federal Account and reviewing, from time to time, the revenue allocation formulae to ensure conformity with changing realities. The Commission consists of a chairman and one member from each State of the Federation and the Federal Capital Territory, Abuja, who are persons of unquestionable integrity with requisite qualifications and experience, to be appointed by the President.

❖ **Functions of the Commission**

i. Advise the Federal, State and Local Governments on fiscal efficiency and methods by which their revenue is to be increased.

ii. Monitor the accruals into and disbursement of revenue from the Federation Account.

iii. Determine the remuneration appropriate to political office holders, including the President, Vice-President, Governors, Deputy Governors, Ministers.

iv. Review from time to time, the revenue allocation formulae and principles in operation to ensure conformity with changing realities: Provided that any revenue formula which has been accepted by an Act of the National Assembly shall remain in force for a period of not less than five years from the date of commencement of the Act.

2.1.3.8 The State Boards of Internal Revenue

The State Boards of Internal Revenue are the bodies that are responsible for generating revenue for the government of the different states in Nigeria. The board in each state has the power to and is responsible for:

- **Functions of the Board**

i. Assessing, collecting and accounting for all taxes, fees, and levies in the state. The Commissioner of Finance is to prescribe the manner the board is to account for the taxes, fees and levies collected.

ii. Supervising the collection of all revenues due to the state government.

iii. Revising all obsolete rates collected by the board and initiate review and advice the government on it.

iv. Liaising on tax and revenue matters with the Federal Government's directly, through the Joint Tax Board and make recommendations to the Joint Tax Board, where appropriate, on tax policy, tax reform, tax registration, tax treaties and exemption as may be required from time to time.

v. Administering the provisions of the Personal Income Tax Act, 1993, and other relevant tax laws in the state.

2.1.3.9 Fiscal Responsibility Commission

Fiscal responsibility and the urgent need for prudent management of public resources came into our nation's public consciousness and became central to our economic management efforts with the enactment of the Fiscal Responsibility Act 2007. It is an Act to provide for prudent management of the nation's resources, ensure Long-term macroeconomic stability of the national economy, secure greater accountability and transparency in Fiscal operations within the Medium Term Fiscal Policy Framework, and the establishment of the Fiscal Responsibility Commission to ensure the promotion and enforcement of the nation's economic objectives; and for related matters.

The mission of this notably significant commission is to reform the management of Nigeria's public finances through regular monitoring of Government financial activities, uncompromising investigation and public reporting, backed by a firm commitment to enforcement under the rule of law. The vision on the other hand, is to enthrone a regime of prudent, ethical and effective management of public monies and resources across all tiers of Government. The Commission is composed of the following:

a. A chairman, who is the Chief Executive and accounting officer of the Commission.
b. A representative of the Federal Ministry of Finance of a level not below the rank of a Director; and
c. One member to represent each of the six geographical zones of the country, that is: North-Central, North-East, North-West, South-East, South-West, and South-South.
d. One member representing: (i) the organized private sector; (ii) Organized labour and (iii) Civil Society engaged in causes relating to probity, transparency and good governance.

Furthermore, the Chairman and other members of the Commission other than ex-officio members were appointed by the President and Commander in Chief of the Federal

Republic of Nigeria after confirmation by the Senate. Additionally, the Chairman and members representing the six geographical zones shall be full time members while the others are part time members but all with a tenure of single term of five years.

- **Functions of the Commission**

The Fiscal Responsibility Commission has mandate under the enabling Act to compel any person or government institution to disclose information relating to public revenues and expenditure; and cause an investigation into whether any person has violated any provisions of this Act. However, if the Commission is satisfied that such a person has committed any punishable offence under this Act violated any provisions of this Act, the Commission shall forward a report of the investigation to the Attorney-General of the Federation for the possible prosecution.

On a general note, the Commission has functions to; (i) monitor and enforce the provisions of this Act and by so doing, promote the economic objectives contained in section 16 of the Constitution; (ii) disseminate such standard practices including international good practice that will result in greater efficiency in the allocation and management of public expenditure, revenue collection, debt control and transparency in fiscal matters; (iii) undertake fiscal and financial studies, analysis and diagnosis and disseminate the result to the general public; (iv) make rules for carrying out its functions under the Act; and (v) perform any other function consistent with the promotion of the objectives of this Act.

2.1.3.10 The Local Government Revenue Committee

The Local Government Revenue Committee is the body responsible for ensuring that financial credibility and stability of local authorities (cities, towns, villages, resort villages, etc).The committee is required by provincial legislation, including The Municipal Act, 2010 and The Local Improvement Act, 1993 to carry out the following functions:

- **Functions of the Committee**

i. Review and authorize borrowing.

ii. Review and establish debt limits for cities.

iii. Inquire into the financial and other affairs of city, village, resort village, rural municipality, etc.

2.1.3.11 Some Stylized Facts on PFM and the Effectiveness of Fiscal Institutions in Nigeria.

Due to misrule under the military administration (1966-1999), there was no clear cut fiscal policy rule that guided fiscal actions throughout the 1990s. Thus, a visible and damaging debt overhang manifested for the nation. Following the advent of democratic governance in 1999, more coordinated fiscal policy measures were put in place through a number of initiatives. The government established the Due Process Office now the Bureau for Public Procurement (BPP), Debt Management Office (DMO) as well as Oil Based Fiscal Rule under the Medium Term Expenditure Framework (MTEF) and the Fiscal Strategy Paper (FSP) and the establishment of the excess crude account for stabilization of the government fiscal actions. The BPP manages the conduct of contract award to ensure that contracts are awarded in a transparent manner. The office carries out market surveys and develops templates on how tenders are to be conducted in the process of doing government business. This mechanism has reduced to some extent, bureaucracies and wastage of funds appropriated to MDAs which have been weak in the implementation of programmes. However, given the restriction on the BPP's mandate regarding contract award only, the office has not been able to carefully monitor abandoned projects which at certain times are often reviewed upward.

In 2000, the federal government also established the DMO to develop a framework for managing the debilitating nation's debt overhang. This agency had other mandates such as managing and reporting from time to time, the government debt portfolios and providing a strategic framework for managing it. After securing a debt relief (cancellation) package of about US$ 18 billion in 2005 from the Paris and London Clubs, the nation's debt profile particularly the domestic debt component has risen again to an alarming level. This puts debt management strategies and debt sustainability as well as the sovereign risk level of the nation in another bad light.

Similarly, in 2007, the Federal Government of Nigeria passed the Fiscal Responsibility Act, which among other things was designed to compel any person or government institution to disclose information relating to public revenues and expenditures; and cause investigation into whether any person has violated any provisions of this act. However, the policy actions of the Commission seem advisory rather than being a key player in the management of the nation's resources. Thus, fiscal outcomes in Nigeria have been less efficient, particularly given the consistent government borrowing amidst the huge accumulation in the excess crude account.

More so, the creation of Excess Crude Account (ECA) as an oil based fiscal rule in 2004 was meant to set a benchmark for predicting/projecting oil revenue and aligning government expenditures in line with the international and domestic macroeconomic environment. This has also not yielded the much expected benefits. Recently, the government commissioned a committee to manage the sovereign wealth fund such as those accruing from the excess crude account. The overall idea is to efficiently manage the proceeds from the ECA as well as utilize them as stabilization instrument or window in tough times. Nevertheless, these policy initiatives seem not to have made any meaningful impact, given the myriad of issues facing public finance management systems in Nigeria.

2.1.3.12 An Overview of the Nigerian Fiscal Structure

Despite the fact that Nigeria has a federal government structure even before independent, there has been a limited degree of fiscal decentralization in Nigeria since 1954 when the country adopted federalism. At independence in 1960, the constitution gave the federal government exclusive powers over the imposition of some taxes. The regional governments were then left with the power to impose any other tax not reserved for the federal government. However, when the military assumed power in 1966, the fiscal relationship changed as a result of the suspension of the constitution. This, in effect, empowered the federal government to impose any tax, thereby curtailing the fiscal powers of the states. State governments, therefore, became administratively and financially dependent on the federal government as the revenues from regional or state taxes remained grossly inadequate to meet their expenditure responsibilities. Therefore, states had to fall back on their share of federally collected revenues, but the federal government retained fiscal supremacy.

Revenue allocation in Nigeria has always been subject to controversy, and various revenue allocation commissions have been set up to look into the allocation formula. Some categories of revenue were allocated to the states and local government and revenues that do not fall under this category are federally collected and paid into the federation account for sharing. The revenue is shared vertically among the three tiers of government, and horizontally among the units within the same level of government. The vertical sharing revenue formular is in the following percentages; 48.5: 24.0 and 20.0% to federal, state and local governments, respectively while the balance of 7.5% is allocated to special funds. The horizontal counterpart is based on the following principles including equality, population, internal revenue effort, and geographical size among others.

Revenues accruing to the three levels of government consist of tax and non-tax financial flows which are derived from internal and external sources. The internal sources are those revenue heads assigned to the threelevels of government by the Constitution, while the external source is made up of statutory revenue allocation, discretionary grants and value added tax (VAT). The different formulas that have been used for revenue allocation have consistently increased the financial powers of the federal government against the other levels of government. The allocation of the most productive income-elastic taxes to the federal government has made the centrefinancially stronger than the states and local governments. The principal effect of this is the increasing fiscal dependence of the lower governments on federally collected revenue (both statutory and non-statutory), and their inability to meet the cost of functions assigned to them.

It is widely documented that the federal government enjoys a greater ability to raise revenues to meet its functional expenditure obligations than the state and local governments. Tax assignment in Nigeria had changed at different periods essentially as determined by the federal structure in operation. Between 1966 and 1999, the fiscal decentralization arrangement changed remarkably, following the intervention of the military. The military government introduced some measures which systematically eroded the revenue potentials of the lower tiers of government. The combination of military rule, civil war, and an arrangement whereby all the proceeds from oil goes to the federal government totally reversed the situation in the early 1960s when there was substantial revenue and expenditure decentralization.

Today, what exist is a situation in which all fiscal resources are centralized at the federal level which is then transferred to the states and local governments through the federation account and the local government joint account, respectively. This situation has been compounded by shifts in fiscal responsibilities from the federal to other levels of government, especially the local governments (for example primary education and primary health care, among others). From the above analysis, it is clear that the Federal Government had assumed a near absolute control of revenue matters in the country.

2.1.3.13 Oil Revenue and Fiscal Policy in Nigeria

I. Trends in Oil Price Movements and Fiscal Policy in Nigeria

Being the largest oil producer in Africa, fiscal policy in Nigeria is likely to be sensitive to oil price shocks. Fiscal policy in Nigeria has shown a tendency of over reliance on oil revenues since the country discovered crude oil in commercial quantity. Oil has dominated the economy of the country, accounting for more than 90% of its exports and close to 80% of the government revenues. Thus, a small oil price changes can have a large impact on the country's fiscal policy. Table 2.1 for example, reveals substantial responses of Nigerian fiscal policy to various historical episodes of oil prices fluctuation.

Before 1980s, the Organization of the Petroleum Exporting Countries (OPEC) seems to have firm grips of oil market, and to a very large extent determine the movement of oil prices. However, in the period 1982 to 1985, OPEC was faced with lower demand and higher supply from outside the organization. As a consequence, the OPEC attempted to set production quotas low in order to stabilize prices. This attempt however, failed as various members of OPEC rather producebeyond their quotas.

Table 2.1: The Epistle of Oil Collapse and its Effect on Nigerian Economy (1981-2014)

EPISODE OF OIL PRICE FLUCTUTATIONS		**TGR (N'BLN)**	**TOR (N'BLN)**	**TOR/TGR %SHARE**	**TGE (N'BLN)**	**TGE/TGR %SHARE**	**PTR (N'BLN)**	**PTR/TGR %SHARE**
PRE-OPEC COLLAPSE	1981-1982	12.35	8.20	66.40	11.67	94.49	5.59	45.26
	1983-1984	10.90	7.80	71.56	9.78	89.72	4.25	38.99
BETWEEN OPEC COLLAPSE AND GULF WAR	1985-1986	13.85	9.50	68.59	14.63	105.63	5.76	41.59
	1987-1988	26.50	19.40	73.21	24.88	93.89	9.66	36.45
	1989-1990	76.00	55.50	73.03	50.65	66.64	18.75	24.67
PERIODS BEFORE ASIAN FINANCIAL CRISIS	1991-1992	145.75	123.40	84.67	76.69	52.62	45.05	30.91
	1993-1994	197.35	161.15	81.66	176.06	89.21	51.01	25.85
	1995-1996	491.80	366.65	74.55	292.99	59.58	59.76	12.15
BTW ASIAN FIN. CRISIS AND SEPTEMBER 11TH TERRORIST ATTACK	1997-1998	523.20	370.55	70.82	457.66	87.47	68.28	13.05
	1999-2000	14270.70	1158.05	81.11	824.37	5.78	344.67	2.42
	2001-2002	1981.70	1469.25	74.14	1018.09	51.37	515.72	26.02
BTW 2ND GULF WAR AND GLOBAL FIN. CRISIS	2003-2004	3247.80	2714.55	83.58	1326.08	40.83	933.49	28.74
	2005-2006	5756.30	5025.00	87.30	1880.05	32.66	1971.60	34.25
	2007-2008	6791.10	5496.75	80.94	2845.86	41.91	2156.45	31.75
	2009-2010	6074.15	4294.00	70.69	3823.78	62.95	1600.60	26.35
RECENT OIL PRICES TREND	2011-2012	3247.80	2714.55	83.58	1326.08	40.83	4170.85	128.42
	2013-2014	9983.53	7113.40	71.25	4881.69	48.90	2123.86	21.27

Source: CBN statistical Bulletin (2014)

Note: TGR is total government revenue; TOR is total oil revenue; TGE denotes total government expenditures, while (PTR) which represent petroleum tax royalty is a proxy for tax revenue.

When the prices kept falling despite the several attempts to keep it stable particularly by Saudi Arabia, the Saud Arabia in turn left their role as a swinger producer in OPEC to enable them increase their market share instead and the market was immediately flooded with oil. These developments resulting from inability of OPEC to unanimously agree on how to respond to the lower demand and higher supply by economies outside the organization further prompted a free fall of oil price from $29 in the last quarter of 1985 to as low as $11 per barrel in the last quarter of 1986.

The episode of OPEC collapse is not without its impact on Nigerian economy. For instance, unlike the period before the collapse of OPEC, average percentage share of oil revenue to total revenue between 1985 and 1986 was less than 70% and by implication 4% decline in oil revenue when compared to the periods before also on five years average. However, as the oil price follows an upward-trend in the international market later during the 1990 Gulf war period, the Nigeria economy over the same period benefited from this upward trend such as more than 100% average increase in the country's oil revenue and total revenue, respectively. In a similar development, average tax and royalties from petroleum profits also increased from N9.66 billion between 1987 and 1988 to N18.75 between 1989 and 1990. As expected of a net oil exporting economy, the surge in the Nigerian government expenditure from average of N24.88 billion between 1987 and 1988 to N50.65 billion between 1989 and 1990 may not be unconnected to the improved revenue stream witnessed over the same period of time.

While the collapse of OPEC and the 1990 Gulf war episodes of oil prices fluctuation are more of political, the Asian financial crisis attributed to the falling oil prices to as low as $10, is the first major demand-side event in the history of crude oil prices. However, like the first Gulf war of 1990, the second Gulf war in 2003 also resulted in an upward rise of oil price. The oil price increase in 2003 was triggered by the political instabilities in the OPEC member countries namely the political unrest in Venezuela, U.S. invasion of Iraq as well as political unrest in the Niger Delta area of Nigeria.

Between 2007 and 2008, crude oil price regularly reached its ultimate heights, reaching its all-time record of $127.02 per barrel. Due to the outbreak of global financial crisis however, the second half of year 2008 saw oil price dropping rapidly below $40 per barrel in the late-2008/early-2009. In response, average percentage share of oil revenue to total revenue declined by 10%. Although, excess demand for crude oil and the inadequacy of its availability have been identified as the source of the rapid increase in the price of oil between late 2010 to early 2014; however; the recent dwindling in the international price of crude oil which started in the third quarter of 2014 (see Figure 2.1) could be attributed to pressure on oil exporting countries that rely on higher oil prices to finance their budgets, fuel subsidies to citizens and expand drilling.

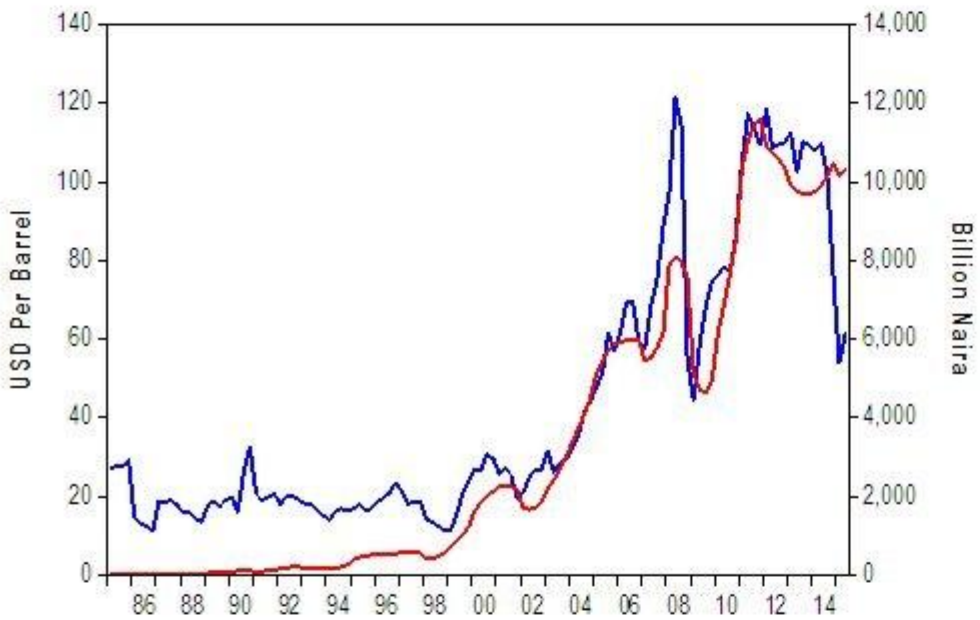
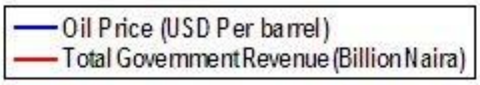


Figure 2.1: Trend in Oil Price and Total Government Revenue (1985Q1-2015Q4)



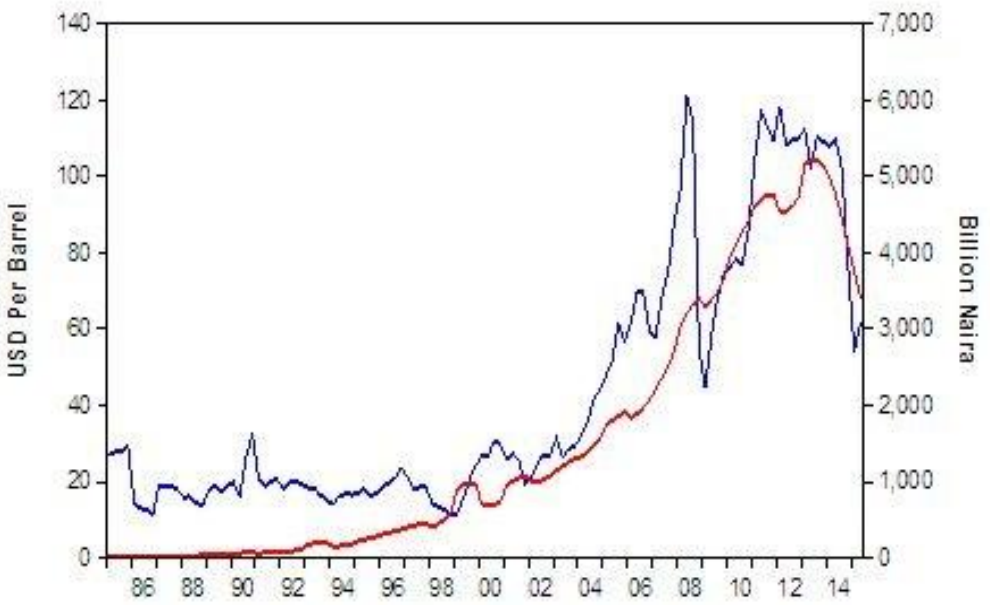


Figure 2.2: Trend in Oil Price and Total Government Expenditures (1985Q1-2015Q4)

As demonstrated in the figures above, we also examined if there has been any historical co-movement between oil price and fiscal policy in Nigeria. Depicted in Figures 1.1 and 1.2are indications of possible co-movements between oil price and total government revenue as well as oil price and total government expenditure, respectively. The fiscal policy as shown in each of the figures seems to have responded strongly to the increasing oil price, which is as a result of the loss of production capacity in Iraq, Venezuela and Nigeria combined with the increasing demand worldwide.

2.2 Review of Empirical Literature

Reyes-Loyaand Blanco (2008) uses the case of Mexican economy to measuring the importance of oil related revenues in total fiscal income by using weighted Mexican price of oil, non- tax revenues, oil related revenues, government expenditure and industrial production variables. The Autoregressive Integrated moving Average methodology was used to carry out the research and the findings indicates significant evidence of inverse relationship between oil-related revenues and tax revenue from non-oil sources..

For Villafuerteand Lopez-Murphy (2010), they studied fiscal policy in oil producing countries (OPC) and carried out their investigation on fiscal policy in oil producing countries during the recent oil price cycle by using Real oil price, fiscal policy indications and other macroeconomic variables. The methodology used was descriptive analysis approach. The findings shows that the OPCs though worsened their non-oil primary balances substantially during 2003–2008 as result of increase in their primary spending, but the trend was partially reversed when oil prices went down in 2009. Premised on their additional finding that fiscal policies in the investigated OPCs has been procyclical and exacerbated the fluctuations in economic activity, the study therefore, asserted that a small reduction in oil prices could lead to very large financing needs in the near future.

In attempt to find out if the fast increase in oil revenue caused a similar increase in government expenditures in Saudi Arabia, Khatib (2011) explored a linear regression estimation approach to indicate a positive relationship between oil revenue and government expenditures on education in Saudi Arabia during the period of 1975-2007 and therefore, attribute the rise in education expendituresas experienced in the period to improveoil revenue also recorded in the same period.

ElAnshasyand Bradley (2012) empirically investigates the role that oil prices play in determining fiscal policy in oil-exporting countries by constructing a theoretical framework to understand how policymakers will respond to oil price changes in an intertemporal framework. In order to focus on the policy implications of their model, the study control for the differences in institutional qualities and exchange rate regimes, and more so allows for the lagged response of government spending to the model’s explanatory variables and for time-specific shocks that are common to all countries. Methodologically, the study utilized dynamic panel-data techniques and finds that, in the long-run, higher oil prices induce larger government size while government expenditures rise less than proportionately to the increase in oil revenues in the short-run reflecting increasing prudence in fiscal policy in oil producing countries.

Ogujiuba and Abraham (2012) employs correlation analysis, granger causality test, regression analysis, lag regression model, vector error correction model and impulse response analysis to show that, short term shocks from crude oil price passes through oil revenue to affect expenditure in the case of Nigerian economy. On the basis of its conclusion that it is the pass-through of the oil price shock that prompted the swings in public expenditure pattern with sustained increase of recurrent expenditure over capital, the study therefore, agitates for policies that has the potential enhance the performance of the non-oil sector and expenditure framework that accounts for possible decline in crude oil prices for enhancing a healthy revenue-expenditure relationship in Nigeria.

While examining oil revenue shocks and government spending behavior in Iran, Farzanegan (2011) for example, uses impulse response functions (IRF) and variance decomposition analysis (VDC) techniques to revealed that Iran's military and security expenditures significantly respond to a shock in oil revenues (or oil prices). However, the indication of insignificant response of social spending component of Iranian government spending to shocks due to oil revenue as further reported in the study may be taking to mean that military and security are accords more priority relative to the social spending in the allocation of budget in Iran.

To confirm the “revenue –spend” hypothesis in the case of oil exporting economy, Petanlar andSadeghi (2012) explore a panel vector autoregressive (PVAR) modeling framework to reveal a positive unidirectional long-run relationship between oil revenue and government expenditures. To examine the effect of oil price shock on the Nigerian fiscal policy, Aremo, Orisadare and Ekperiware (2012) employs a structural vector autoregression (SVAR) methodology to show that oil prices have significant effect on fiscal policy in Nigeria. The study also indicate evidence of significant oil price shock impact on the Nigerian government revenue and therefore, suggests that for the diversification of the economy in order to minimize the consequences of oil price fluctuations on government revenue.

In their analysis of symmetric impact of oil price shocks, Bekhet and Yussof (2013) employs the generalized impulse response function and variance decomposition under the VAR methodology to examine the mechanism through which oil price shocks impact fiscal policy. In addition to its empirical finding of positive and direct impact on oil revenue on government expenditure, the study further indicate fiscal policy as the main channel for mitigating the adverse effects oil price shocks to the economy.

In their examination of the dynamic relationships between oil revenues, government spending and economic growth in the Kingdom of Bahrain, Hamdi and Sbia (2013) employs a multivariate cointegration technique and error-correction model to empirically indicate oil revenues as the main channel for financing government spending.

Analyzing the effects of oil price shocks on government expenditure in the Iranian economy, Pazouki and Pazouki (2014) relies on VAR econometric model to empirically reveal the Iranian government social spending as not significantly affected by oil price shocks. Still on the case of Iranian economy,Dizaji (2014) employs a vector autoregression (VAR) and vector error correction (VEC) models to indicate evidence of strong causality from government revenues to government expenditures irrespective of whether the latter is recurrent or and capital. On the whole, the results support the revenue–spending hypothesis in the case of the Iranian economy.

Monjazeb, Choghayi and Rezae (2014) examine the effect of oil revenues on budget deficit in a selected oil exporting countries. Using Ordinary Least Squares (OLS) method of estimation, finding from the study indicate negative influence of oil revenues on budget deficit.

Using the case of Suadi Arabia to examine the link between the continuous oil price changes and government revenues, Dandan and Maharmah (2015) explores VAR and cointegrating estimation techniques to indicates a significant and positive long run relationship between the oil price and government expenditures in Saudi Arabia over the period considered in the study.

Rahma, Perera and Tan (2016) employs vector auto-regression (VAR) model to examine the impact of oil price shocks on the various components of the Sudan's government budget. The empirical outcomes of the study indicate evidence of significant influences of negative changes in oil price on government revenues, current expenditure and budget deficit. Strengthened the viability of the finding of the study are the impulse response functions and forecast error variance decomposition results with both suggesting that oil price shocks have asymmetric effect on government budget.

In his empirical investigation of the effect of oil returns and external debt on government investment in Syria using Johansen cointegration and granger causality tests, Moshen (2016) finds that oil returns and external debt have a positive and significant long run relationship with government investment and also indicate evidence of bidirectional causality relationships between oil returns, external debt and government investment in both the short and long run situation.

Ekesiobi, Oguanobi and Mgbemena (2016) examine the empirical relationship between external shocks and government revenue in Nigeria using cointegration approach and error correction mechanism (ECM). The result of the study confirms a long run relationship between government revenue and the explanatory variables included in the model including oil revenue, government expenditure, tax revenue, terms of trade shock and exchange rate. According to the study, their evidence of negative and significant impact of external shocks on government revenue was an indication that the external shocks exert substantial pressure and uncertainty on government revenues in Nigeria. It is in this light; that the study recommends among others things that government should intensify its commitment towards the diversification of its source of revenue.

Alley (2016) examines the impact of oil price volatility on the fiscal policy of oil exporting countries. The study estimated a small open-economy aggregate demand model in which the various measures of oil price volatility included in the model are externally determined in a vector error correction (VEC) estimation framework. In its finding, the study established that fiscal policies in oil exporting country are though not procyclical but they have the tendency of been driven by changes in oil price.

Aregbeyen and Fasanya (2017) examine the response of Nigerian fiscal policy to oil price volatility using a multivariate vector autoregression model. Following its finding of significant evidence of long run relationship between real oil prices and government as well as the volatility nature of the oil price, the study therefore, suggests that the government should diversify its sources of foreign exchange inflows to avoid over reliance on foreign exchange earnings from crude oil prices.

Table 2.2: Summary of Review of Empirical Literature on Fiscal Policy and Oil Price Relationship

Author(s)/Year	Location	Topic	Variable	Methodology	Findings	Knowledge Gap
Reyes-Loya and Blanco (2008)	Mexico	Measuring the importance of oil-related revenues in total fiscal income for Mexico	Weighted Mexican price of oil, non-oil tax revenues, oil-related revenues, government expenditure and industrial production	Autoregressive Integrated Moving Average (ARIMA)	Indicates inverse relationship between oil-related revenues and tax revenue from non-oil sources.	The study did not take into cognizance, the likelihood of the fiscal income responding differently to positive and negative oil revenue/price shocks.
Villafuerte and Lopez-Murphy (2010)	Oil producing countries	Fiscal policy in oil producing countries during the recent oil price cycle	Real oil price, fiscal policy indicators and other macroeconomic variables	Descriptive analysis approach	Shows that the worsened non-oil balances driven by an increase in spending trend was partially reversed when oil prices went down in 2009.	Findings from the study are mainly based on trend analysis. Hence, may not be viable for policy inference since the evidences are not empirical.
Khatib (2011)	Saudi Arabia	The effect of the increase in oil revenue on government expenditures on education in Saudi Arabia	Oil revenue and education expenditure	Linear Regression Model	Finds positive relationship between oil revenue and government expenditures on education.	The study only considers the effect of increase in oil revenue on education expenditure and not on the total fiscal spending/expenditure.
Farzanegan (2011)	Iran	Oil revenue shocks and government spending behavior in Iran	Oil revenues per capita and a number of government expenditure variables	Impulse response functions and variance decomposition analysis (VDC) techniques	Finds that Iran's military and security expenditures significantly respond to a shock in oil revenues (or oil price).	The study ignores the likelihood of asymmetries in the response of government spending to oil revenue shocks.

Source: Researcher’s Compilation (2017)

Table2.2: Summary of Review of Empirical Literature on Fiscal Policy and Oil Price Relationship (Continued)

Author(s)/Year	Location	Topic	Variable	Methodology	Findings	Knowledge Gap
Petanlar and Sadeghi (2012)	Oil Exporting Countries	Relationship between government spending and revenue: Evidence from oil exporting countries	Government expenditure and oil revenue	Panel Vector Autoregression (P-VAR) model	Shows that there is a positive unidirectional long-run relationship between oil revenue and government expenditures.	This study employs a VAR framework and by implication implicitly assumes that causation can also run from expenditure to revenue. The ideal however, is to explicitly assumes otherwise in the case of oil economy.
Aremo et al. (2012)	Nigeria	Oil price shocks and fiscal policy management: Implications for Nigerian economic planning	Oil price, government revenue and government expenditure	Structural Vector Autoregression (SVAR)	Shows that oil prices have significant effect on fiscal policy in Nigeria.	The study fail to shows whether the significant effect of oil price shocks on fiscal policy is robust to positive and negative changes in oil price.
Ogujiuba and Abraham (2012)	Nigeria	Testing the Relationship between government revenue and expenditure: Evidence from Nigeria	Total revenue, oil revenue, non-oil revenue and oil price	Vector Autoregression (VAR) and Vector Error Correction Model (VECM)	That short term shocks from crude oil price passes through oil revenue to affect expenditure.	The study does not consider whether distinguishing the oil price into positive and negative changes matter for the pass through or not.
El Anshasy and Bradley (2012)	Net oil exporting countries	Oil prices and the fiscal policy response inoilexporting countries	Government spending, budget surplus, oil price and other macroeconomic variables	Dynamic panel-data model via GMM and PMG estimation techniques.	Shows that a higher oil price induces larger government size, but government expenditures rise less than proportionately to the increase in oil revenues.	The study does not capture the likelihood of asymmetries in the response of fiscal policy to oil price shocks.

Source: Researcher’s Compilation (2017)

Table2.2: Summary of Review of Empirical Literature on Fiscal Policy and Oil Price Relationship (Continued)

Author(s)/Year	Location	Topic	Variable	Methodology	Findings	Knowledge Gap
Bekhet and Yussof (2013)	Malaysia	Evaluating the mechanism of oil price shocks and fiscal policy responses in the Malaysian economy	Oil price, oil revenue, non-oil revenue, total subsidy and GDP	Vector Autoregression (VAR) model.	Suggests that symmetric oil price shock has a positive and direct impact on oil revenue and government expenditure.	The study fails to provide any statistical bases such as Wald test for determine if the symmetric approach is superior to asymmetric approach
Hamdi and Sbia (2013)	Kingdom of Bahrain	Dynamic relationships between oil revenues, government spending and economic growth in an oil-dependent economy	Oil revenue, government spending and GDP	Multivariate Cointegration analysis and Error-Correction Model	Indicates oil revenues as the main channel which finances the government spending.	The study focuses on relationship between oil revenues, government spending and economic growth. Hence, its findings cannot be assumed as same with studies that focus on the direct impact of oil price on fiscal policies.
Dizaji (2014)	Iran	The effects of oil shocks on governmentexpenditures and governmentrevenues nexus (with an application to Iran's sanctions)	Oil prices, the ratio of the oil revenues to GDP and the ratio of the government total expenditures to GDP	Vector Autoregression Model (VAR), Vector Error Correction Model (VECM) and Structural Vector Autoregression Model (SVAR)	Shows that the contribution of oil revenue shocks in explaining the government expenditures is stronger than the contribution of oil price shocks.	The study fails to account for the role asymmetries in the response of government expenditure to oil price changes.
Monjazeb et al. (2014)	Oil Producing Countries	The impact of oil revenues on budget deficit in selected oil countries	Budget deficit, oil revenue, GDP and taxes	Pooled Panel Regression	Indicate negative influence of oil revenues on budget deficit.	The study used pool panel regression estimation framework and fail to accounts for the cross-sectional effect of oil revenue on the budget deficit of the concern countries.

Source: Researcher’s Compilation (2017)

Table2.2: Summary of Review of Empirical Literature on Fiscal Policy and Oil Price Relationship (Continued)

Dandan and Maharmah (2015)	Saudi Arabia	Oil Price, Revenues and Expenditures in Saudi Arabia	Government revenue, budget expenditure, oil revenue and non-oil revenue, recurrent expenditure, capital expenditure	Simple Linear Regression Model	Finds that there is an adverse relationship between oil price and government expenditures in Saudi Arabia.	The study do not account for the role asymmetries and as a consequence, fails to show whether the evidence of adverse relationship is sensitive to positive and/or negative oil price changes.
Alley (2016)	Oil exporting countries	Oil price volatility and fiscal policies in oil-exporting countries	Primary fiscal balance, oil price and other macroeconomic variables	Vector Error Correction (VEC) model	That fiscal policies in OEC were not procyclical but driven by oil price volatility.	The study fails to establish a theoretical stance upon which oil price –fiscal policy nexus can be explored, rather it uses atheoretical VEC approach.
Ekesiobi et al. (2016)	Nigeria	An Examination of External Shocks and Government Revenue in Nigeria	Government revenue, oil revenue, government revenue and other macroeconomic variables.	Johansen Cointegration and Error Correction Mechanism (ECM)	Shows that oil revenue remains the main determinant of government revenue in Nigeria.	The study mainly focuses on oil revenue as determinant of government revenue, rather than the implication of changes in oil revenue/price for fiscal policy.
Moshen (2016)	Syria	Effects of oil returns and external debt on the government investment: A case study of Syria	Oil return, government investment and external debt	Vector Autoregression (VAR) model	Shows that both oil returns and external debt play a vital role in supporting the Syrian economy by financing the government investment.	The study fails to distinguish between the positive and negative impacts of oil price returns on government investment.

Source: Researcher's Compilation (2017)

Table 2.2: Summary of Review of Empirical Literature on Fiscal Policy and Oil Price Relationship (Continued)

Author(s)/Year	Location	Topic	Variable	Methodology	Findings	Knowledge Gap
Rahma et al. (2016)	Sudan	Impact of oil price shocks on Sudan's government budget	Total government revenue, current expenditure, development expenditure, tax revenues, budget deficit and oil prices	Vector Autoregression (VAR) model	Shows that oil price decreases significantly influences oil revenues, current expenditure and budget deficit, while oil price increases do not Granger cause budget variables.	The study though distinguishes between positive and negative impact of oil prices. The use of VAR however, implicitly assumes bi-directional causation between fiscal policies and oil price shocks, which is not supposed to be the case when the concern is oil producing economy.
Aregbeyen and Fasanya (2017)		Oil price volatility and fiscal behaviour of government in Nigeria	Discounted rate differential, oil revenue, non –oil revenue and oil prices	Vector Autoregression (VAR) model	Finds no asymmetric effect of oil price shocks on the government spending.	The study accounts for the role of asymmetries though, but its methodological approach is not accurate, It fails to test for the significance or otherwise of asymmetry in the analysis.

Source: Researcher's Compilation (2017)

2.3 Summary of Literature Review

Despite the proliferation of papers and literatures on the macroeconomic implications oil price shocks couple with the vastness of studies on fiscal policy behaviour. The extant literature on oil price –fiscal policy relationship is yet fewer in number and focused mainly on the oil producing economies. Although a number of these studies, namely, Khatib (2011) for the case of Saudi Arabia; Farzanegan (2011) and Garkaz et al. (2012) for the case of Iran; Ogujiuba and Abraham (2012) and Aremo et al. (2012) for the case of Nigeria; Bekhet and Yussof (2013) for the case of Malysia; Rahma et al. (2016) for the case of Sudan; and Alley (2016) for the case of selected oil exporting nations; among others, indicates significant and positive response of fiscal policy to oil price shocks. There are still some of these studies whose finding rather suggests otherwise.

Contrary to Khatib (2011) for example, Dandan and Maharmah (2015) also for the case of Saudi Arabia finds that there is an adverse relationship between oil price and government expenditures in Saudi Arabia. Pazouki and Pazouki (2014) shows that the Iranian government social spending is not significantly affected by oil price shocks contrary, while Dizaji (2014) also for the case of Iran suggests that fiscal policy responds more significantly to shocks due to oil revenue rather than shocks due to oil price movement. For El Anshasy and Bradley (2012), even when a higher oil price induces larger government size, government expenditures still rise less than proportionately to the increase in oil revenues. While Bekhet and Yussof (2013) suggests that symmetric oil price shock has a positive and direct impact on oil revenue and government expenditure in Malaysia.Aregbeyen and Fasanya (2017) on the other hand find no asymmetric effect of oil price shocks on the government spending in the case of Nigeria.

As further reflected in Table 2 that summarizes the findings of the extant literature on fiscal policy –oil price relationship. The mixed findings on the response of fiscal policy to oil price shocks is an indication that, debate as to the direction and significance of fiscal policy response to oil price shock yet remain unresolved. While this may be partially due to differences in the procedures of estimation and data measurement adopted. None of these extant studies to the best of our knowledge considered the likelihood of fiscal policy response to oil price shock being asymmetric in nature. The only notable study that seems to have dealt with asymmetry in its evaluation of fiscal policy –oil price relationship is Aregbeyen and Fasanya (2017).

However, there is tendency that the asymmetry as captured in the study by Aregbeyen and Fasanya (2017) may not be entirely valid as later confirmed in their findings. This may not be unconnected to multivariate VAR estimation approach that is used in the study, which implicitly assumes bi-directional causation between oil price and fiscal policy. Since it is better to assumes that fiscal policy response to oil price shocks and the reverse does not hold. This present study therefore, adopts nonlinear (asymmetric) ARDL proposed by Shin et al. (2014) which allows us to explicitly capture the asymmetry response of fiscal policy to oil price shock and not the other way round. Unlike, Aregbeyen and Fasanya (2017) that restrict their measure of fiscal policy mainly to the expenditure profile, the present study further contribute to the literature in the context of Nigerian economy by taken cognizance of other fiscal policy profiles namely, tax revenue, borrowing and transfer payment.

2.4 Justification of the Study

Fiscal policy in oil producing economies is inevitably vulnerable to oil price fluctuations, but the way in which government in these economies adjust their fiscal policy in response to oil price shocks is likely to be predicated on whether the oil price shocks is symmetric or asymmetric; as well as on the short or long run dynamics of the shocks. Although, a number of studies have mainly investigated the macroeconomic implications of oil price shocks for both oil-exporting and oil-importing economies (see Table 2), yet a quite notable number of these extant studies namely; Aregbeyen and Fasanya (2017), Rahma et al. (2016), Dizaji (2014), Bekhet and Yussof (2013), Aremo et al. (2012), El Anshasy and Bradley (2012), Farzanegan (2011) focus on response of fiscal policy to oil price shocks. More so, the fact that fiscal policy is likely to respond differently to positive and negative oil price shocks have alsoreceived some reasonable level of attention in the literature. However, while understanding the extent to which fiscal policy respond to asymmetric oil price shocks is essential to avoid policy erroneous that might arise from the misconception of assuming that fiscal policy respond identically or symmetrically to both the negative and positive oil price shocks, whether such asymmetric response of fiscal policy to oil price shocks vary for variant profiles of fiscal policy remains the novelty of this present study. Thus, while we acknowledge the contribution of Aregbeyen and Fasanya (2017) on the role of asymmetries in the extent to which oil price shocks impact fiscal policy in Nigeria; however, their limitation of the measure of fiscal policy to expenditure component of the fiscal policy is likely to introduce biasness in the evaluation of asymmetric impact of oil price shocks on fiscal policy. To bridge this gap, the present study disaggregates the fiscal measure (i.e. government expenditure into disaggregate capital and recurrent expenditure) and further include other prominent fiscal policy profiles namely, tax revenue, borrowing and transfer payment (to government revenue) that are ignored by Aregbeyen and Fasanya (2017) in their study.

CHAPTER THREE: RESEARCH METHODS

This chapter focuses on the adequate appropriate research methods used for this study. The chapter is organized in sections. This section covers theoretical framework, model specification, estimation techniques, nature and source of data.

3.1 Theoretical Framework

The main objective of this study is to investigate the response of fiscal policy to oil price shocks; such a task first requires constructing a theoretical framework on fiscal policy and later relates it to its response to oil price shocks through the model specification.Fiscal policy generally implies the basic duty of any government to manipulate the revenue and expenditure side of its budget in order to achieve certain macroeconomic or national objectives such as increase in per capita income, price stability, regulate full employment, stable balance of payment position and maintain equilibrium between effective demand and supply services at a particular time.

Thus, the major instrument of fiscal policy through which government of a country exhibits their fiscal policy are budget, government (public) revenue and government expenditure. Precisely, budget is the estimated statement of the government revenues and expenditures. There are three types of budgetary policies; these are balanced budget policy which occurs when the government keeps its total expenditure equals to its revenue. Deficit budget policy occurs when the government spends more than its expected revenue, as a matter of policy. Surplus budget policy occurs when government follows a policy or keeps its expenditure considerably below its current revenue. These budgetary policies affect the economy in different ways and in different directions. Government revenue is the income of government which is obtained through sources such as taxes, grants, fees and borrowings.

Tax revenue is a fund raised through taxes while a tax is a compulsory payment to the government. Tax may be direct or indirect. The tax which is paid by a person on whom it is imposed and cannot be shifted is called a direct tax. Examples are income tax, property tax, corporate profit tax and capital gains tax. Indirect tax is the tax which is mutually paid by one individual but the burden of which is driven over to some other individual who ultimately bears it. Examples of indirect taxes are excise duty; value added tax (VAT) and customs duty. Tax function can be mathematically expressed as:

$$T = t_0 + t_{yd}$$

Where T represents this year's total tax revenues, but is now divided into two parts. The t_0 term represents autonomous tax that is, the level of all non-income taxes, such as sales and property taxes. The t terms shows the amount of revenue generated by the income tax, since Y_d is before tax total income and t is the income tax rate. Y_d = Y –T, that is, disposable income. Borrowing by the government occurs as a result of public debt which the government owes its subject or nationals of other countries. The two type of government borrowing are internal borrowing which refers to the public loans floated within the country while external borrowing refers to the obligations of a country to borrow from a foreign government or an international organization. Government expenditure can be classified into three ways: recurrent and capital, productive and unproductive, direct and transfer expenditure.

Thus, government expenditure includes government spending on the purchase of goods and services. Government expenditure also includes payment of wages and salaries of public servants, public investment and transfer payment.Transfer payments are the expenditure which takes the form of payment made without corresponding return any current factor services. Examples are expenditure on pensioners, the disabled and the unemployed.From the above discussion about fiscal policy, we are made to realize that:

Fiscal Policy (F_p) = Government Expenditure (GE) + Government Revenue (GR)

Expenditure (E) is a function of Revenue (R)

This implies E = f (R)

Revenue is a function of tax, borrowing

R = f (Tax, Borrowing)

Tax is a function of income

Tax = f (income)

3.2 Model Specification

The theory guiding this study is based on Ricardian equivalence hypothesis. We derive our model using framework above by adopting ElAnshasy and Bradley (2012) approach.Having established a theoretical framework which provides guidance for determine the set of relevant variables to include in an empirical investigation of the implication of oil price shocks on the Nigerian fiscal policy. The empirical model can therefore, be expressed as follows:

$$fp_t = f(dr, oil, noil, ops, z) \quad (3.1)$$

Equation (3.1) expressed fiscal policy equation to capture the Nigerian fiscal policy – oil price relationship in a functional form. Although, El Anshasy and Bradley, 2012; González et al., 2013; and Aregbeyen and Fasanya, 2017 are some of the related studies that have also expressed fiscal policy –oil price relationship as depicted in equation (3.1).

For robustness sake, the fiscal expenditure in the context of this study is measure as total government expenditure (TGE), government recurrent expenditure (GRE) and government capital expenditure (GCE). Others as earlier stated are transfer payments (TRSF), tax revenue using petroleum profits tax and royalties (PTR), while the sum of federal government domestic and international debts is the proxy for government borrowing (BORR).

In addition to thesevariantmeasures fiscal policy which are expressed in natural logarithm form, the various explanatory variables includingdifferential rate (DFR) measured asdifference between the private and government subjective discount rates, non-oil output (*NOIL*) and oil output (*OIL*)measures as total non-oil real GDP and oil real GDP, respectively are equally expressed in log form, while the Brent crude oil price which is in USD per barrel is used to measured oil price shock (*ops*). The Z in the model is a $k \times 1$ vector of control variables including inflation rate (*INF*) measured as log of consumer price index and exchange rate (*EXR*) measure using Naira/US dollar exchange rate. The functional specification as expressed in equation (3.1) can therefore, be re-specified in an empirical and estimable framework as follows:

$$fp_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t + \beta_5 exr_t + \beta_6 inf_t + \varepsilon_t \qquad (3.2)$$

While all the variables remain as earlier defined, $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ and β_6 are the regression parametersand ε_t is the regression disturbance term.The present study however explored GARCH framework particularly AR(*k*)-GARCH(1,1) models to obtain oil price shocks series from an estimated oil price variance.

The apriori expectations based on the specification in (3.2) are as follows: the impact of the differential rate (dfr) on fiscal policy is expected to be positive. Thus, the coefficient of the differential rate is expected to be positive ($\beta_1 > 0$). The study is however interested in testing whether the impact of differential rate on fiscal policy is statistically significant. Similarly, the oil and non-oil outputs are expected to affects fiscal policy positively. Thus, their coefficient are expected to be positive ($\beta_2, \beta_3 > 0$).Likewise exchange rate and inflation rate are expected to have positive impacts on fiscal policy.

However, the impact of oil price shock on fiscal policy could be negative or positive depending on the direction of the shocks as depicted in equation (3.3). Thus, their coefficients are expected to be positive and negative respectively ($\beta_4 > 0; \beta_5 < 0$). In other words, a negative oil price shocks do not have an equivalent effect with positive oil price shocks. Hence, we partition oil price in equation (3.2) into positive and negative oil price shocks, hence; the revised model becomes;

$$fp_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 noil_t + \beta_4 ops_t^+ + \beta_5 ops_t^- + \beta_6 exr_t + \beta_7 inf_t + \varepsilon_t \quad (3.3)$$

Where ops^+ and ops^- denote the positive and negative oil price shocks/volatility respectively. Equations (3.2) and (3.3) represents the study's baseline models, where the response of fiscal policy to oil price shock is assumed to be symmetric in the former and asymmetric in the latter. As earlier stated, the fp_t denote government fiscal policy.Tax revenue, transfer payment and borrowing with the expenditure profile further categorized into total expenditure, capital and recurrent government expenditures. Empirically expressed in equations (3.4, 3.5, 3.6, 3.7, 3.8 and 3.9) is fiscal policy –oil price shock relationship using the variants measure of fiscal policy described herein.

$$tge_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t + \beta_5 exr_t + \beta_6 inf_t + \varepsilon_t (3.4)$$

$$gce_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t + \beta_5 exr_t + \beta_6 inf_t + \varepsilon_t (3.5)$$

$$gre_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t + \beta_5 exr_t + \beta_6 inf_t + \varepsilon_t (3.6)$$

$$ptr_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t + \beta_5 exr_t + \beta_6 inf_t + \varepsilon_t (3.7)$$

$$borr_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t + \beta_5 exr_t + \beta_6 inf_t + \varepsilon_t (3.8)$$

$$trsf_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t + \beta_5 exr_t + \beta_6 inf_t + \varepsilon_t (3.9)$$

Thus, the variants fiscal policy –oil price shock models specified in equations (3.4) through to (3.9) can be represented in an asymmetric version as follows:

$$tge_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t^+ + \beta_5 ops_t^- + \beta_6 exr_t + \beta_7 inf_t + \varepsilon_t \quad (3.10)$$

$$gce_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t^+ + \beta_5 ops_t^- + \beta_6 exr_t + \beta_7 inf_t + \varepsilon_t \quad (3.11)$$

$$gre_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t^+ + \beta_5 ops_t^- + \beta_6 exr_t + \beta_7 inf_t + \varepsilon_t \quad (3.12)$$

$$ptr_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t^+ + \beta_5 ops_t^- + \beta_6 exr_t + \beta_7 inf_t + \varepsilon_t \quad (3.13)$$

$$borr_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t^+ + \beta_5 ops_t^- + \beta_6 exr_t + \beta_7 inf_t + \varepsilon_t \quad (3.14)$$

$$trsf_t = \beta_0 + \beta_1 dfr_t + \beta_2 noil_t + \beta_3 oil_t + \beta_4 ops_t^+ + \beta_5 ops_t^- + \beta_6 exr_t + \beta_7 inf_t + \varepsilon_t \quad (3.15)$$

In equations (3.10) through to (3.15), the oil price shock is disaggregated into positive and negative oil price shocks to account for probable asymmetric impact of oil price shocks on fiscal policy in Nigeria.

3.3 Explanation of Variables

Variables used in this study are selected based ontheirtheoretical importance, performance measures of the economy, and alsotheir uses and findings in the previous empirical literature. In line with the objective of this study and following the existing literature, the dependent variable used in the study includes variant classes of fiscal policy that reflects a number of fiscal policy activities in Nigeria namely, government expenditure; taxrevenue; borrowing; and transfer payment. More specifically, total government expenditure (*TGE*), government capital expenditure (*GCE*) and government recurrent expenditure (*GRE*) are used to capture the expenditure component of fiscal policy in Nigeria, while petroleum profits tax and royalties (PTR) is a proxy for tax revenue. Others are government transfer payment (TRSF) and government borrowing (BORR) using sum national government domestic and international debt profiles.Although, there are other measures of taxation or tax revenue including personal income tax, company tax, custom exercise duties, among others, our preference for petroleum profits tax and royalties however, hinges on the oil dependent peculiarity of Nigerian economy.

The explanatory variables in the study are also classifies into three to include those that captures country specific effects, such as differential discount rate (*DFR*) measured as the difference between the private sector and the government discount rates. Others are non-oil real GDP (*NOIL*) and oil real GDP (*OIL*) reflecting the non-oil and oil sectors of the economy. The second group of variables captures both the internal and external macroeconomic effects and such in the context of this study are measure using inflation and foreign exchange rates. The third group of variables, which is central to our investigation, is the variable associated with oil price shocks. While there are a number of oil price benchmarks, prominent among which are; Brent crude oil prices (BCOP), West Texas Intermediate (WTI) oil prices, Dubai-Oman oil prices, among others, the BCOP is preferred to other oil benchmarks mainly because it is used to price two thirds of the crude oil internationally traded.

3.4 Estimation Technique and Procedures

To empirically implement the various specific objectives of this study, the estimation procedures are structured into three stages. The first stage of the estimation procedures will involves some pre-tests, namely; unit root and cointegration tests. The second stage is concerned with the estimation proper, while the final stage of the empirical analysis will include some post diagnostic tests to ascertain the liability of the estimated models.

Starting with the first stage of the estimation procedures, this study employs three different unit root and stationarity tests such as; Augmented Dickey Fuller (ADF) test, Ng-Perron test and Kwiatkowski-Phillips-Schmidt-Shin (KPSS) test to stationarity and/or nonstationarity properties of the series. It follows that if some of the variables are stationary and others are non-stationary, then the latter should be incorporated into the preferred time series model in their first-differences to avoid problems of spurious regression. This however, also depends on the cointegrating status of the series.

Prominent among the many alternative co-integration tests in the literature include the conventional Johansen co-integration test and Pesaran et al. (2001) bounds test approach.

However, the Johansen co-integration test is rather restrictive and can only be applied when the series under consideration are of same order of integration say I(1), while the bounds co-integration test on the other hand can be used regardless of whether the underlying variables are I(0), I(1) or fractionally integrated. The fact that latter involves just a single-equation set-up makes it the more appropriate for the present study. The bounds cointegrating test also allows for combination of variables with mixed order of integration say I(0) and I(1) series and as well as for different lag-lengths to be assigned to different variables as they enter the model. Stemming from the single equation models specified in equations (3.2and 3.3), respectively,the following are linear and nonlinear ARDL specifications of short and long run dynamics of oil price shocks -fiscal policy relationship in Nigeria.

3.4.1 Linear ARDL Model (the Symmetric Approach)

Following the standard framework of Peasaran et al (2001), the specification of the symmetric ARDL model is as given below:

$$\Delta gfp_t = \alpha_0 + \alpha_1 gfp_{t-1} + \alpha_2 dr_{t-1} + \alpha_3 oil_{t-1} + \alpha_4 noil_{t-1} + \alpha_5 ops_{t-1} + \alpha_6 exr_{t-1} + \alpha_7 \inf_{t-1} + \sum_{i=1}^{N1} \lambda_i \Delta gfp_{t-i} + \sum_{j=0}^{N2} \gamma_j \Delta dr_{t-j}$$
$$+ \sum_{j=0}^{N3} \gamma_j \Delta oil_{t-j} + \sum_{j=0}^{N4} \gamma_j \Delta noil_{t-j} + \sum_{j=0}^{N5} \gamma_j \Delta ops_{t-j} + \sum_{j=0}^{N6} \gamma_j \Delta exr_{t-j} + \sum_{j=0}^{N7} \gamma_j \Delta \inf_{t-j} + \varepsilon_t \quad (3.16)$$

where gfp_t as earlier defined is a vector for variants fiscal policy measure under consideration. The long run parameters for the intercept and slope coefficients are computed as $-\frac{\alpha_0}{\alpha_1}$, $-\frac{\alpha_2}{\alpha_1}, -\frac{\alpha_3}{\alpha_1}, -\frac{\alpha_4}{\alpha_1}, -\frac{\alpha_5}{\alpha_1}, -\frac{\alpha_6}{\alpha_1}$,and $-\frac{\alpha_7}{\alpha_1}$ respectively since in the long run it is assumed that $\Delta gfp_{t-i} = 0$, $\Delta dr_{t-j} = 0$, $\Delta oil_{t-j} = 0$, $\Delta noil_{t-j} = 0$, $\Delta ops_{t-j} = 0$, $\Delta exr_{t-j} = 0$,and $\Delta \inf_{t-j} = 0$.

However, the short run estimates are obtained as λ_i for oil price shocks and γ_j for other explanatory variables in the model. Since the variables in first differences can accommodate more than one lag, determining the optimal lag combination for the ARDL becomes necessary. The optimal lag length can be selected using Akaike Information Criterion (AIC), Hannan-Quinn Information Criterion (HIC) or Schwartz Information Criterion (SIC).

The lag combination with the least value of the chosen criterion among the competing lag orders is considered the optimal lag. Consequently, the preferred ARDL model is used to test for long run relationship in the model. This approach of testing for cointegration is referred to as Bounds testing as it involves the upper and lower bounds. The test follows an F distribution and therefore, if the calculated F-statistic is greater than the upper bound, there is cointegration; if it is less than the lower bound, there is no cointegration and if it lies in between the two bounds, then, the test is considered inconclusive. In the spirit of our model, the null hypothesis of no cointegration can be expressed as $H_0: \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = 0$ while the alternative of cointegration is symbolized as $H_1: \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq 0$. While other variables in the model remains as earlier defined, ε_t denotes error term. Equation (3.16) can be re-specified to include an error correction term as follows:

$$\Delta gfp_t = \delta\upsilon_{t-1} + \sum_{i=1}^{N1}\lambda_i \Delta gfp_{t-i} + \sum_{j=0}^{N2}\gamma_j \Delta dr_{t-j} + \sum_{j=0}^{N3}\gamma_j \Delta oil_{t-j} + \sum_{j=0}^{N4}\gamma_j \Delta noil_{t-j} + \sum_{j=0}^{N5}\gamma_j \Delta ops_{t-j} + \sum_{j=0}^{N6}\gamma_j \Delta exr_{t-j} + \sum_{j=0}^{N7}\gamma_j \Delta \inf_{t-j} + \varepsilon_t \qquad (3.17)$$

Where υ_{t-1} is the linear error correction term; the parameter δ is the speed of adjustment while the underlying long run parameters remain as previously defined. Note that in both equations (3.16) and (3.17), there are no decompositions of oil price into positive and negative shocks; hence, the assumption of symmetric behaviour of oil price shocks on fiscal policy under this scenario.

3.4.2 Nonlinear ARDL Model (the Asymmetry Approach)

Here, the oil price shock variable (*ops*) is decomposed into positive and negative shocks such that in the analysis, we are able to capture probable asymmetric response of fiscal policy to oil price shock. The consideration of oil price asymmetry is premised on the fact that economic agents such as households, business entities and government, may respond differently to positive and negative changes in oil price. However, the approach used here follows the NARDL of Shin et al. (2014) which appears less computationally intensive compared to other asymmetric models and does not require identical order of integration [i.e. $I(1)$] for all the series in the model. The NARDL is given as:

$$\begin{aligned}\Delta gfp_t = {} & \alpha_0 + \alpha_1 gfs_{t-1} + \alpha_2 dr_{t-1} + \alpha_3 oil_{t-1} + \alpha_4 noil_{t-1} + \alpha_5 ops^{+}_{t-1} + \alpha_6 ops^{-}_{t-1} + \alpha_7 exr_{t-1} + \alpha_8 \inf_{t-1} + \\ & \sum_{i=1}^{N1} \lambda_i \Delta gfp_{t-i} + \sum_{j=0}^{N2} \gamma_j \Delta dr_{t-j} + \sum_{j=0}^{N3} \gamma_j \Delta oil_{t-j} + \sum_{j=0}^{N4} \gamma_j \Delta noil_{t-j} + \sum_{j=0}^{N5} (\gamma_j^{+} \Delta ops^{+}_{t-j} + \gamma_j^{-} \Delta ops^{-}_{t-j}) \\ & + \sum_{j=0}^{N6} \gamma_j \Delta exr_{t-j} + \sum_{j=0}^{N7} \gamma_j \Delta \inf_{t-j} + \varepsilon_t \end{aligned} \qquad (3.18)$$

In equation (3.18), the oil price shock variable (ops_t) has now been decomposed into ops_t^{+} and ops_t^{-} denoting positive and negative oil price shocks respectively. These decomposed prices are defined theoretically as:

$$ops_t^{+} = \sum_{j=1}^{t} \Delta ops_j^{+} = \sum_{j=1}^{t} \max\left(\Delta ops_j, 0\right) \qquad (3.19)$$

$$ops_t^{-} = \sum_{j=1}^{t} \Delta ops_j^{-} = \sum_{j=1}^{t} \max\left(\Delta ops_j, 0\right) \qquad (3.20)$$

We can re-specify equation (3.16) to include an error correction term as thus:

$$\Delta gfp_t = \rho\psi_{t-1} + \sum_{i=1}^{N1}\lambda_i \Delta gfp_{t-i} + \sum_{j=0}^{N2}\gamma_j \Delta dr_{t-j} + \sum_{j=0}^{N3}\gamma_j \Delta oil_{t-j} + \sum_{j=0}^{N4}\gamma_j \Delta noil_{t-j} + \sum_{j=0}^{N5}(\gamma_j^{+}\Delta ops_{t-j}^{+} + \gamma_j^{-}\Delta ops_{t-j}^{-}) + \sum_{j=0}^{N6}\gamma_j \Delta exr_{t-j} + \sum_{j=0}^{N7}\gamma_j \Delta \inf_{t-j} + \varepsilon_t \quad (3.21)$$

In equation (3.19), the error-correction term that captures the long run equilibrium in the NARDL is represented as ψ_{t-1} while it's associated parameter (ρ) [the speed of adjustment] measures how long it takes the system to adjust to its long run when there is a shock. It is important to note here that, just like the linear ARDL (symmetry), the long run is estimated only if there is presence of cointegration. Thus, pre-testing for cointegration is necessary even under NARDL and this involves the Bounds testing that is$F$ distributed. Here, the underlying hypothesis for cointegration involves the long run asymmetric parameters, where the null hypothesis of no cointegration expressed as $H_0:\ \alpha_1 = \alpha_2 = \alpha_3 = \alpha_4 = \alpha_5 = \alpha_6 = \alpha_7 = \alpha_8 = 0$ is tested against the alternative hypothesis of cointegration given as $H_1:\ \alpha_1 \neq \alpha_2 \neq \alpha_3 \neq \alpha_4 \neq \alpha_5 \neq \alpha_6 \neq \alpha_7 \neq \alpha_8 \neq 0$.

More so, we employ the Wald test for testing restrictions to ascertain whether the asymmetries matter both in the long run and short run. For the Wald test, the null hypothesis of no asymmetries - $H_0:\ \alpha_5 = \alpha_6$ (for long run) and $H_0: \sum_{j=0}^{N4}\gamma_j^{+} = \sum_{j=0}^{N4}\gamma_j^{-}$ (for short run) is tested against the alternative of presence of asymmetries - $H_1:\ \alpha_5 \neq \alpha_6$ (for long run) and $H_1: \sum_{j=0}^{N4}\gamma_j^{+} \neq \sum_{j=0}^{N4}\gamma_j^{-}$ (for short run).

3.5 Evaluation of the Estimates

Before drawing conclusions/policy inference on the basis of our empirical findings, it is only rationale and standard to evaluate the accuracy of the models from which the empirical estimates are obtained. Essentially, relevant post-estimation tests used for the evaluation of the accuracy or viability of the estimated models in the course of this study are; Normality Test (using Jarque-Bera test), Serial Correlation test (using the LM test), and Heteroscedasticity test (using ARCH LM test).To check if our specifications do not suffer from autocorrelation problem, the Breusch-Godfrey LM test remains the most prominent in literature and the null hypothesis of the test is that there is no serial correlation in the residuals up to the specified order. A number of heteroscedasticity tests namely, Harvey, Glejser, White and Breusch-Pagan-Godfrey are often employs to validate or refute the assumption of homoscedasticity, the ARCH LM test yet remain the most prominent. The assumption of normality test is that the disturbances are normally distributed and its violation is that the regression residual is not normally distributed.

3.6 Nature and Source of Data

The data used contain quarterly figures covering the period from 1980Q1 to 2015Q4. All the data are sourced from the database of the Central Bank of Nigeria (CBN) with the exception being the crude oil price, which is sourced from the Energy Information Administration (EIA).

CHAPTER FOUR: RESULTS PRESENTATION, ANALYSIS AND DISCUSSION OF FINDINGS

This chapter also presents and analyses the various empirical outcomes that resulted from the implementation of the theoretical framework described in Chapter three of the study. Essentially, section 4.2 present unit root test results, section 4.3 presents the empirical results of linear and non-linear ARDL estimate, section 4.4 presents evaluation of research hypotheses, while section 4.5 presents discussion of findings.

4.1 Results Presentation and Analysis

The present study utilizes time-series data to analyze and present its results. The data used in analyzing this research is shown in Appendix A. The analysis comprises of descriptive and actual empirical analysis.

4.1.1 Presentation of Pre-Estimation Results

The pre-estimation and/or preliminary stage of empirical analysis can be further categorized into informal and formal preliminary analysis. The former in the context of this present study comprises descriptive and summary statistics, while the latter on the other hand involves the establishment of the stationarity properties of the series under consideration.

4.1.2 Summary and Descriptive Statistics

The process of examining the statistical features of a time series data is known as summary and/or descriptive statistics, where the statistic of interest include the mean, maximum, minimum, standard deviation, skewness, kurtosis and normality property of the concern series. The Mean statistic for example tells us the historical average value of the series by adding up the series over the period under consideration and divides it by number of observations. The Maximum and Minimum statistics reflects the maximum and minimum values of the series in the current sample. Standard Deviation (Std. Dev.) measures dispersion or spreadness in the series. While the Skewness measures the asymmetry of the distribution of the series around its mean, Kurtosis on the other hand centered on the peakedness or flatness of the distribution of the series. The Jarque-Bera (JB) statistic test for normality in the distribution of the data and the null hypothesis for JB test is that the series is normally distributed.

Table 4.1: Descriptive and Summary Statistics

Variable	Mean	Max	Min	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
TGE	572,762.10	2,013,643.00	2,806.68	654,950.90	0.87	2.22	18.87 (0.00)
GCE	62,190.80	301,069.60	53.27	71,642.06	1.14	3.36	27.64 (0.00)
GRE	510,571.30	1,713,258.00	2,725.75	604,066.30	0.92	2.31	20.06 (0.00)
PTR	908,251.30	4,513,778.00	4,024.59	1226423	1.44	4.16	49.56 (0.00)
BORR	3,741.63	14,537.12	69.89	3,569.35	1.18	3.95	33.32 (0.00)
TRSF	469.12	2,047.42	5.50	522.65	1.24	3.95	36.56 (0.00)
NOIL	92,371.89	275,758.40	30,460.75	64,026.22	1.10	3.14	25.41 (0.00)
OIL	26,387.76	38,552.97	15,815.29	5,467.64	-0.13	2.13	4.26 (0.12)
OP	43.94	127.35	11.26	34.44	1.07	2.72	24.22 (0.00)
DR	2.27	3.45	-0.12	1.08	-1.34	3.13	37.28 (0.00)
EXR	80.68	196.99	0.85	64.23	0.01	1.34	14.20 (0.00)

Source: Author's Computation using EViews9

Represented in Table 4.1 above is the summary statistics of the various dependent and independent time series variables that are utilizes for empirical analysis in the context of this present study. Starting with government fiscal policy, the statistical summary as reported in Table 4.1 shows that, average total government expenditure between the first quarter of 1985 and the fourth quarter of 2015 was ₦572,762.10 million with the corresponding maximum and minimum statistics indicating ₦2,013,643.00 billion and ₦2,806.68 million respectively as the highest and lowest level of total government expenditure recorded within the period under consideration. As typical of developing economy such as Nigeria, average recurrent expenditure component of the Nigerian government fiscal spending was ₦510,571.30 million as compare to the country's average capital expenditure of ₦62,190.80 million over the same period of time (that is, 1985 to 2015).

In the case of tax revenue (*PTR*), the maximum and minimum ever recorded in Nigeria within the period under consideration was ₦4,513,778.00 million and ₦4,024.59 million respectively. With respect to statistical distribution feature of the fiscal expenditure variables, the standard deviation statistic reveals recurrent expenditure as being the more volatile out of the two component of government expenditure in Nigeria. However, government expenditure tend to be skewed positively either in its whole sum or when disaggregated into recurrent or capital expenditures. The distribution is however, platykurtic for recurrent expenditure and leptokurtic for the capital expenditure. This non-zero skewness couple with the indication of left/right tails implies non-normality of the fiscal policy variables as further statistically confirmed by the Jarque-Bera (JB) statistic that takes into consideration information from skewness and kurtosis to tests.

In what appears to be a surprising outcome for an economy that structurally and overly depends on crude oil production. The mean value for real non-oil GDP which proxy for non-oil revenue and real oil GDP which proxy for oil revenue was ₦92,371.89 million and ₦26,387.76 million respectively. This by indication suggests that, despite the dependent of the economy on crude oil production, the non-oil production sector of the economy yet on average relative accounts for more than 70% of the real GDP recorded between 1985 and 2015. From the statistical distribution point of view however, the non-oil real GDP is (or non-oil revenue) appears to be more volatile as against the oil real GDP (or oil revenue).

Furthermore, the non-oil revenue was reveals as positively skewed and leptokurtic while the oil revenue on the other hand, seems to be negatively skewed and platykurtic in nature. On the basis JB test however, the oil revenue is rather shown as relatively normally distributed as against the non-oil revenue. For the world oil price, the average quarterly dollar per barrel was $43.94, while the corresponding maximum and minimum quarterly oil price for the period 1985 and 2015 was $127.34 and $11.25 respectively.

The unprecedented depreciation of exchange rate notwithstanding, the maximum quarterly official exchange rate between the period 1985 and 2015 was ₦196.99 to $1 USD on average. Relative to the country's domestic prices, average maximum consumer price index (CPI) for the same period was 180.145. The variation using the standard deviation statistics show the discounted rate differential (DR) as the least volatile of all the variables, but compare to consumer price index, exchange rate is the more volatile. Consequently, the discounted rate differential exhibit negative skewness and leptokurtic in nature, while the exchange rate and consumer price index are both positively skewed and platykurtic in nature. This again, further reaffirms the non-normality of all the series under consideration with the exception being the oil price series.

4.1.3 Unit Root Test

In line with a standard time series analysis procedure in the literature, all the series under consideration, which includes; fiscal policy variables namely, TGE, GCE, GRE, BORR and TRSF and its determinants including discounted rate differential (DFR), non-oil revenue

(NOIL), oil revenue (OIL), oil price shocks (OPS), exchange rate (EXR) and inflation rate (INF) are further tested for evidence of unit root to ascertain their individual stationarity status. This however, is necessary to verify and ascertain that none of the series included in the specified models exhibits an integrated order higher than one (i.e. I(1). Essentially, we explore efficient unit root tests namely Augmented Dickey-Fuller (ADF), Ng-Perron (Ng-P) and Kwiatkwoski-Phillips-Schmidt-Shin (KPSS) unit root tests.

Table 4.2: Unit Root Test Results

Variable	ADF			Ng-P			KPSS		
	Level	*First Diff.*	*I(d)*	*Level*	*First Diff.*	*I(d)*	*Level*	*First Diff.*	*I(d)*
GFP	-2.3195[a]	-9.1579[b]***	***I(1)***	-0.7603[b]	-2.7659[b]*	***I(1)***	0.3163[b]	0.0725[b]***	***I(1)***
GCE	-5.1665[b]***	-	***I(0)***	-3.3564[b]**		***I(0)***	0.2336[b]	0.0761[b]***	***I(1)***
GRE	-2.3195[a]	-9.1579[a]***	***I(1)***	-0.9690[b]	-4.5591[b]***	***I(1)***	0.2778[b]	0.0930[b]***	***I(1)***
PTR	-1.4445[a]	-6.7127[b]***	***I(1)***	-2.8669[b]*	-	***I(0)***	0.1472[b]	0.0824[b]***	***I(1)***
BORR	-2.3262[b]	-4.0848[b]***	***I(1)***	-1.6049[b]	-2.0934[a]**	***I(1)***	1.2002[a]	0.2464[a]***	***I(1)***
TRSF	-2.9102[b]	-11.9387[b]***	***I(1)***	-2.0096[b]	-5.5095[b]***	***I(1)***	0.2285[b]	0.0539[b]***	***I(1)***
OIL	-1.9804[a]	-5.3154[b]***	***I(1)***	-1.8430[b]	-8.2730[b]***	***I(1)***	0.2038[b]	0.0540[b]***	***I(1)***
NOIL	-0.2224[b]	-4.9723[b]***	***I(1)***	0.3061[b]	-3.4825[b]***	***I(1)***	0.3410[b]	0.0661[b]***	***I(1)***
OPS	-9.2289[b]***	-	***I(0)***	-4.8379[b]***	-	***I(0)***	0.0565[a]***	-	***I(0)***
DR	-2.1923[a]	-11.4288[b]***	***I(1)***	-0.8957[b]	-5.5224[a]***	***I(1)***	0.2950[b]	0.0851[b]***	***I(1)***
EXR	-2.0908[b]	-9.5328[b]***	***I(1)***	-1.6371[b]	-5.4691[b]***	***I(1)***	0.1162[b]***	-	***I(0)***
INF	3.4334[b]	-3.9485[b]**	***I(1)***	-2.4254[b]	-3.4788[b]***	***I(1)***	0.3254[b]	0.1129[b]***	***I(1)***

Note: [a]Indicates a model with constant but without deterministic trend; [b] is the model with constant and deterministic trend as exogenous lags are selected based on Schwarz info criteria. ****, **, * imply that the series is stationary at 1%, 5% and 10% respectively. ADF, Ng-P and KPSS represent Augmented Dickey-Fuller, Ng-Perron and Kwiatkwoski-Phillips-Schmidt-Shin Unit Root tests respectively. The null hypothesis for ADF and Ng-P is that an observable time series is not stationary (i.e. has unit root) while that of KPSS tests for the null hypothesis is that the series is stationary.

Represented in Table 4.2 above, is the outcomes of the stationarity tests for the respective aforementioned series (see appendix B for the full unit root test results). The test results shows that the order of integration hovered around I(0) and I(1) across the variables and the various unit root tests considered. While fiscal policy measures such as total government expenditure (TGE), government recurrent expenditure (GRE), government borrowing (BORR) and transfer payment (TRSF) exhibits higher order of integration for instance I(1), irrespective of the unit root test that is implemented. The order of integration is mixed for government capital expenditure and tax revenue (PTR) respectively. In the case of the independent variables included in the various models specified, the exchange rate for example exhibits mixed order of integration across the varying unit root tests considered, while the oil price volatility on the other hand consistently exhibit level order of integration for instance I(0) across all the three tests. Variables such as discounted rate of differential, non-oil revenue, oil revenue and inflation rate are all I(1) or difference series.

In the lieu of the above unit root test results, the study will hence, focus on a class of linear and/or non-linear regression that allow us to find out if despite their difference order of cointegration, there exists a long run relationship or equilibrium among the series.

4.1.4 Presentation of the Empirical Results of Linear and Non-Linear ARDL Estimates

The empirical results presented in Table (4.3), (4.4), (4.5), (4.6), (4.7) and (4.8) below, are regression results obtained from empirical implementations of the linear and nonlinear models specified in equation (3.3) and (3.4), where fp_t in each of the equation is a vector for different measures of fiscal policy, namely; total government expenditure (*TGE*), government capital expenditure (*GCE*), government recurrent expenditure (*GRE*), tax revenue (*PTR*), government borrowing (BORR) and transfer payment (TRSF).Using both the linear and non-linear ARDL framework, the following Tables present the short and long run dynamics symmetric and asymmetric impacts of oil price shock on fiscal policy in Nigeria. In the first column of each of the regression results table are the lists of the independent variables in the estimated models. The second and third columns are the empirical estimates resulting from the implementation of the symmetric and asymmetric models, which are further sub-divided into three each to include; coefficients of the dependent variables, the standard error, and the t-statistic.

Table 4.3: Regression Results for TGE Models/Equations

Table 4.3(a): Short-Run Linear and Non-Linear ARDL Estimates						
Variable	**Symmetry Model**			**Asymmetry Model**		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
Constant	0.0559	2.2091	0.0253	-1.2739	2.6556	-0.4796
Trend	-0.0006	0.0057	-0.1167	-0.0015	0.0058	-0.2593
ΔTGE_{t-1}	-0.2567***	0.0847	-3.0295	-0.2961***	0.0849	-3.4855
ΔDR_t	0.0324	0.0471	0.6877	0.0291	0.0471	0.6174
ΔOil_t	-0.0232	0.1655	0.1405	-0.0744	0.1603	-0.4645
ΔOil_{t-1}	0.5031***	0.1598	3.1483	0.6111***	0.1395	4.3782
$\Delta Noil_t$	0.2769*	0.1601	1.7293	0.3330*	0.1803	1.8466
ΔOPS_t	0.1029**	0.0335	2.2216			
ΔOPS_t^+				0.1781**	0.0241	1.0291
ΔOPS_t^-				-0.0828	0.0766	-0.0558
ΔEXR_t	0.2913***	0.0546	5.3314	0.2806***	0.0527	5.3253
ΔINF_t	-0.3496	0.3005	-1.1635	-0.4024	0.3040	-1.3237
ECT	-0.5808***	0.0957	-6.0669	-0.5648***	0.0971	-5.8160
$AdjR^2$	0.9937			0.9937		
JB stat.	1.5949 (0.4504)			1.0454 (0.5928)		
F – stat.	1282.224 (0,0000)			1265.375 (0.0000)		
LM test	0.2682 (0.7653)			0.1879 (0.8290)		
ARCH test	0.5030 (0.6060)			0.2824 (0.7544)		
Bound Test (F-stat.)	3.3877*			3.1011*		
Lag Selection (SIC)	(2, 0, 0, 3, 0, 0, 0, 0, 1)			(2, 0, 0, 3, 0, 0, 0, 0, 1)		
Table 4.3(b): Long-Run Linear and Non-Linear ARDL Estimates						
Variable	**Symmetry Model**			**Asymmetry Model**		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
DR_t	0.0558	0.0812	0.6870	0.0515	0.0834	0.6177
Oil_t	0.3461	0.3710	0.9327	0.4774	0.4051	1.1783
$Noil_t$	0.4768*	0.2746	1.7357	0.5895*	0.3294	1.7894
OPS_t	-0.0395	0.1775	-0.2226			
OPS_t^+				-0.1383	0.1542	-0.8970
OPS_t^-				-0.1465	0.1593	-0.9200
EXR_t	0.5016***	0.0764	6.5603	0.4969***	0.0759	6.5430
INF_t	0.4184***	0.1398	2.9919	0.4068***	0.1438	2.8285
Constant	0.0964	3.8046	0.0253	-2.2553	4.7248	-0.4773
Trend	-0.0011	0.01001	-0.1164	-0.0027	0.0105	-0.2566

Table 4.3(c): Asymmetry Wald test Results

Short-Run Asymmetry Wald test Results	***Long-Run Asymmetry Wald test Results***
W_{SR} F – stat. = 0.2636 (0.6087)	W_{LR} F – stat. = 0.2549 (0.6147)

Note: ***, ** and * denotes significance at 1%, 5% and 10% level of significance, while the figures in parenthesis are the probability values.

Table 4.4: Regression Results for GCE Models/Equations

4.4(a): Short-Run Linear and Non-Linear ARDL Estimates

Variable	Symmetry Model			Asymmetry Model		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
Constant	24.2782*	14.3226	1.6950	21.2514	16.8347	1.2623
Trend	-0.0007	0.0375	-0.0191	-0.0182	0.0377	-0.4824
ΔDFR_t	-0.6014	0.5813	-1.0346	-0.4810	0.5610	-0.8575
ΔDFR_{t-1}	-1.4202**	0.6112	-2.3235	-1.6553***	0.6140	-2.6959
ΔOil_t	-0.5101	0.9181	-0.5555	-0.3073	0.9382	-0.3276
ΔOil_{t-1}	3.5847***	0.9502	3.7725	3.6837***	0.9459	3.8941
$\Delta Noil_t$	1.4869	0.9929	1.4976	1.7596	1.1369	1.5477
ΔOPS_t	1.5730**	0.6722	4.8523			
ΔOPS_t^+				0.1051***	0.0052	2.0098
ΔOPS_t^-				0.0518	0.5373	0.0965
ΔEXR_t	0.3883	0.2646	1.4675	0.4689*	0.2548	1.8398
ΔINF_t	-4.7545**	1.8613	-2.5543	-5.3560***	1.8678	-2.8674
ECT	-0.3074***	0.0863	-5.1368	-0.3365***	0.0263	-0.1819
$AdjR^2$	0.7892			0.7957		
JB stat.	13.8976 (0.0009)			11.5715 (0.0003)		
F – stat.	31.2096 (0.0000)			28.72388 (0.0000)		
LM test	0.7161 (0.4910)			1.4307 (0.2439)		
ARCH test	0.1452 (0.8649)			0.1066 (8989)		
Bound Test (F-stat.)	36.9018***			33.1553***		
Lag Selection (SIC)	(1, 2, 0, 2, 0, 0, 0, 0, 1)			(1, 2, 0, 2, 0, 1, 0, 0, 0, 1)		

4.4(b): Long-Run Linear and Non-Linear ARDL Estimates

Variable	(Symmetry Model)			(Asymmetry Model)		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
DFR_t	1.2045***	0.2481	4.8537	1.2186***	0.2389	5.0998
Oil_t	-2.3568**	0.9954	-2.3676	-2.2938**	1.0304	-2.2261
$Noil_t$	1.1373	0.7754	1.4666	1.3165	0.8610	1.5290
ΔOPS_t	-0.4382	0.5151	-0.8507			
OPS_t^+				0.0038	0.3907	0.0098
OPS_t^-				0.1384	0.4099	0.3376
EXR_t	0.2970	0.2038	1.4571	0.3508*	0.1920	1.8264
INF_t	-0.2336	0.4373	-0.5342	-0.1542	0.4251	-0.3627
Constant	18.5695*	10.9398	1.6974	15.8999	12.6440	1.2574
Trend	-0.0005	0.0287	-0.0191	-0.0136	0.0283	-0.4804

4.4(c): Asymmetry Wald test Results

Short-Run Asymmetry Wald test Results	***Lon-Run Asymmetry Wald test Results***
W_{SR} F – stat. = 4.7769 (0.0311)	W_{LR} F – stat. = 0.0247 (0.8754)

Note: ***, ** and * denotes significance at 1%, 5% and 10% level of significance, while the figures in parenthesis are the probability values.

Table 4.5: Regression Results for GRE Models/Equations

Table 4.5(a): Short-Run Linear and Non-Linear ARDL Estimates

Variable	**Symmetry Model**			**Asymmetry Model**		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
Constant	0.1142	0.7558	0.1511	0.1235	0.7590	0.1627
Trend	0.0012	0.0025	0.4852	0.0012	0.0025	0.4936
ΔGRE_{t-2}	1.1964***	0.0874	13.6865	1.1941***	0.0879	13.5845
ΔGRE_{t-2}	-0.3877***	0.0802	-4.8336	-0.3870***	0.0805	-4.8057
ΔDFR_t	0.0042	0.0198	0.2122	0.0042	0.0199	0.2135
ΔOil_t	0.0358	0.0600	0.5966	0.0350	0.0602	0.5807
$\Delta Noil_t$	0.1007	0.0713	1.4124	0.1020	0.0716	1.4237
ΔOPS_t	2.0445***	0.1457	7.9726			
ΔOPS_t^+				0.0673**	0.0209	1.4486
ΔOPS_t^-				-0.9829*	0.2188	-4.6071
ΔEXR_t	0.1120***	0.0261	4.2818	0.1131***	0.0263	4.2876
ΔINF_t				0.0474	0.0392	1.2074
$Adj R^2$	0.9988			0.9988		
$JB\, stat.$	160.9760 (0.0000)			166.7404 (0.0000)		
$F - stat.$	9350.694 (0.0000)			8508.011 (0.0000)		
LM test	0.6290 (0.5350)			0.6538 (0.5221)		
ARCH test	0.1646 (0.8484)			0.1620 (0.8506)		
Bound Test (F-stat.)	1.9112			1.7138		
Lag Selection (SIC)	(2, 0, 0, 0, 0, 0, 0, 0, 0)			(2, 0, 0, 0, 0, 0, 0, 0, 0, 0)		

4.5(b): Asymmetry Wald test Results

Short-Run Asymmetry Wald test Results	***Long-Run Asymmetry Wald test Results***
W_{SR} F – stat. = 0.2628 (0.6092)	(Not Applicable)

Note: ***, ** and * denotes significance at 1%, 5% and 10% level of significance, while the figures in parenthesis are the probability values.

Table 4.6: Regression Results for PTR Models/Equations

4.6(a): Short-Run Linear and Non-Linear ARDL Estimates						
Variable	**Symmetry Model**			**Asymmetry Model**		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
Constant	0.1592	1.4771	0.1078	-2.2649	1.8152	-1.2477
Trend	-0.0011	0.0044	-0.2554	0.0013	0.0047	0.2786
ΔTXR_{t-1}	0.5227***	0.0764	6.8375	1.4998***	0.0798	18.7851
ΔDFR_t	0.0101	0.0391	0.2585	0.0056	0.0421	0.1335
ΔOil_t	0.0927	0.1136	0.8166	0.2736**	0.1191	2.2978
$\Delta Noil_t$	0.1197	0.1356	0.8830	0.0534	0.1449	0.3688
ΔOPS_t	0.2852***	0.0983	2.8989			
ΔOPS_t^+				0.9232	1.3325	0.6928
ΔOPS_t^-				-0.0893	1.7263	-0.0517
ΔEXR_t	0.0942**	0.0415	2.2680	0.0545	0.0371	1.4689
ΔINF_t	-0.0163	0.0705	-0.2311	-0.0292	0.0795	-0.3682
ECT	-0.0666**	0.0272	-2.4440	Not Applicable		
$AdjR^2$	0.9925			0.9952		
JB stat.	122.5435 (0.0000)			42.2255 (0.0000)		
F – stat.	2221.108 (0.0000)			2299.539 (0.0000)		
LM test	5.0937 (0.0078)			2.9395 (0.0571)		
ARCH test	1.2212 (0.2987)			1.4981 (0.2278)		
Bound Test (F-stat.)	4.6090***			2.0143		
Lag Selection (SIC)	(2, 0, 0, 0, 4, 0, 0)			(2, 0, 0, 1, 0, 0, 0, 0)		

4.6(b): Long-Run Linear and Non-Linear ARDL Estimates				
Variable	**(Symmetry Model)**			
	Coefficient	***Std. Error***	***T – stat.***	
DFR_t	0.1521	0.5884	0.2584	**Not Applicable**
Oil_t	1.3927	1.8282	0.7617	
$Noil_t$	1.7984	1.9605	0.9173	
ΔOPS_t	9.0402*	5.1269	1.7632	
EXR_t	1.4148**	0.6928	2.0419	
INF_t	-0.2447	1.0671	-0.2293	
Constant	2.3902	22.3620	0.1068	
Trend	-0.0169	0.0673	-0.2522	

4.6(c): Asymmetry Wald test Results	
Short-Run Asymmetry Wald test Results	***Lon-Run Asymmetry Wald test Results***
W_{SR} F – stat. = 0.6398 (0.5293)	(Not Applicable)

Note: ***, ** and * denotes significance at 1%, 5% and 10% level of significance, while the figures in parenthesis are the probability values.

Table 4.7: Regression Results for BORR Models/Equations

Table 4.7(a): Short-Run Linear and Non-Linear ARDL Estimates

Variable	Symmetry Model			Asymmetry Model		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
Constant	8.8537***	2.0226	4.3773	15.4420***	2.7824	5.5499
Trend	0.0199***	0.0052	3.7822	0.0423***	0.0077	5.5136
ΔDFR_t	0.2574***	0.0766	3.3603	0.4449***	0.0820	5.4253
ΔOil_t	0.4440***	0.1052	4.2207	1.1420***	0.2205	5.1792
$\Delta Noil_t$	-0.5268***	0.1390	-3.7892	0.3958	0.2669	1.4830
ΔOPS_t	0.9405	1.1867	0.7925			
ΔOPS_t^+				-0.3457	1.1413	-0.3029
ΔOPS_t^-				-1.4727	1.4543	-1.0127
ΔEXR_t	-0.0638**	0.0305	-2.0919	-0.0630**	0.0304	-2.0702
ΔINF_t	-0.3845***	0.0929	-4.1379	-0.3942***	0.0930	-4.2382
ECT	-0.2559***	0.0415	-6.1620	-0.2548***	0.0414	-6.1502
$AdjR^2$	0.9889			0.9902		
JB stat.	1373.019 (0.0000)			1592.872 (0.0000)		
F – stat.	896.6460 (0,0000)			673.6847 (0.0000)		
LM test	0.6338 (0.5326)			0.3601 (0.6985)		
ARCH test	0.0460 (0.9550)			0.1207 (0.8864)		
Bound Test (F-stat.)	2.9807*			6.6585***		
Lag Selection (SIC)	(1, 1, 4, 4, 0, 0, 0,)			(1, 1, 4, 4, 0, 0, 0,)		

Table 4.7(b): Long-Run Linear and Non-Linear ARDL Estimates

Variable	Symmetry Model			Asymmetry Model		
	Coefficient	***Std. Error***	***T – stat.***	Coefficient	Std. Error	T – stat.
DFR_t	1.0453***	0.2259	4.6268	1.0629***	0.2275	4.6722
Oil_t	-1.7673**	0.6976	-2.5334	-1.8343**	0.7042	-2.6049
$Noil_t$	-3.6491***	0.7186	-5.0778	-3.6559***	0.7200	-5.0775
OPS_t	-1.4046	4.4536	-0.3154			
OPS_t^+				-1.3566	4.4617	-0.3041
OPS_t^-				-5.7789	5.7222	-1.0099
EXR_t	-0.2495**	0.1215	-2.0529	-0.2473**	0.1217	-2.0331
INF_t	-1.5022***	0.3216	-4.6715	-1.5468***	0.3257	-4.7498
Constant	59.8160***	8.9877	6.6553	60.5941***	9.0667	6.6831
Trend	0.1641***	0.0220	7.4725	0.1659***	0.0221	7.5007

Table 4.7(c): Asymmetry Wald test Results

Short-Run Asymmetry Wald test Results	***Long-Run Asymmetry Wald test Results***
W_{SR} F – stat. = 1.5254 (0.2197)	W_{LR} F – stat. = 1.4543 (0.2307)

Note: ***, ** and * denotes significance at 1%, 5% and 10% level of significance, while the figures in parenthesis are the probability values.

Table 4.8: Regression Results for TRSF Models/Equations

Table 4.8(a): Short-Run Linear and Non-Linear ARDL Estimates						
Variable	**Symmetry Model**			**Asymmetry Model**		
	Coefficient	***Std. Error***	***T – stat.***	***Coefficient***	***Std. Error***	***T – stat.***
Constant	-1.1340	1.5887	-0.7138	-1.0918	1.5901	-0.6866
Trend	0.0208	0.0048	4.3679	0.0213***	0.0048	4.4348
ΔDFR_t	0.0430	0.0457	0.9409	0.0481	0.0461	1.0434
ΔOil_t	0.5827***	0.1159	5.0274	0.5844***	0.1160	5.0387
$\Delta Noil_t$	-0.3974***	0.1366	-2.9102	-0.4021***	0.1367	-2.9413
ΔOPS_t	1.8839	1.3270	1.4197			
ΔOPS_t^+				1.8413	1.3284	1.3861
ΔOPS_t^-				0.8187	1.7410	0.4703
ΔEXR_t	0.0090	0.0347	0.2590	0.0067	0.0348	0.1914
ΔINF_t	-0.1757**	0.0777	-2.2602	-0.1868**	0.0787	-2.3750
$AdjR^2$	0.9889			0.9919		
$JB\,stat.$	1373.019 (0.0000)			116.7130 (0.0000)		
$F-stat.$	1877.510 (0,0000)			1667.454 (0.0000)		
LM test	1.2863 (0.2803)			1.3941 (0.2524)		
ARCH test	0.4984 (0.6088)			0.4714 (0.6253)		
Bound Test (F-stat.)	1.655			1.4695		
Lag Selection (SIC)	(1, 0, 0, 0, 0, 0, 0,)			(1, 0, 0, 0, 0, 0, 0,)		

4.8(b): Asymmetry Wald test Results	
Short-Run Asymmetry Wald test Results W_{SR} F – stat. = 0.2196 (0.6403)	***Long-Run Asymmetry Wald test Results*** (Not Applicable)

Note: ***, ** and * denotes significance at 1%, 5% and 10% level of significance, while the figures in parenthesis are the probability values.

The regression results as shown in each of the tables presented above can also be analyzed from the perspective of short run and long run dynamics impact of oil price shocks. In the final section of the tables are the Wald test results for determine the long and short run asymmetry response of fiscal policy to oil price shocks, particularly where it matters. Also included in each of the regression results table, are the post estimation reports resulting from the implementation of various post estimation diagnostic tests such as; normality test (using Jarque-Bera test), serial correlation test (using Breusch-Godfrey Serial Correlation LM test) and heteroscedasticity test (using ARCH LM test). Others are the adjusted R-square and F-statistic which measures the explanatory powers and the joint significant of the independent variable included in the model respectively. The Bound test F-statistic in the table is meant to determine the long run dynamic of the response of fiscal policy in Nigeria to oil price volatility.

4.2 Evaluation of Research Hypotheses

Starting with the study's first hypothesis which predicts that the response of fiscal policy to oil price shocks is non-asymmetry in the case of Nigerian economy. Supporting this hypothesis is the overwhelm evidence of non-rejection of the null-hypothesis of no asymmetry in the response of fiscal policy to oil price shocks as suggested by the non-significance of the asymmetry Wald test results except for the case of government capital expenditure profile of fiscal policyin Table 4.4.

On whether the asymmetric response of fiscal policy to oil price shocks is a short or long run phenomenon, the empirical evidence supporting the alternative hypothesis of short and long run dynamics asymmetric impacts of oil price shocks on fiscal policy appears to be relatively more evident in the case of short run phenomenon.

On whether the vulnerability of fiscal policy to oil price shock depends on the dimension of fiscal policy measure that is considered, the empirical results seem to have supported the alternative hypothesis, which predicts that the vulnerability of fiscal policy to oil price shocks depends on which the dimension of fiscal policy measure or profiles is under consideration.

4.3 Discussion of Findings

Although, the empirical findings from the above reported symmetric and asymmetric short and long run results shows that, fiscal policy when measured via government capital expenditure (*GCE*) has the tendency of responding asymmetrically to oil price shocks particularly in the short run as suggested by the Wald asymmetry test results in Table 4.4(c). However, the overwhelm non-significance evidence of the Wald asymmetric test results has not only fails to reject the null hypothesis of no asymmetry impact of oil price shock on total government expenditure and recurrent expenditure component of Nigerian fiscal policy, the evidence is also consistent for tax revenue (*PTR*), borrowing and transfer payment. Consequently, the statistical significance of the ARDL bound cointegration test results particularly when the fiscal policy in the case of Nigerian economy is expressed via government total and capital expenditures suggest that, the asymmetric long run impact of oil price shocks on fiscal policy tend to matter more for government fiscal expenditure as against tax revenue which is measure using petroleum tax and royalties (PTR) in the case of this study.

On the other hand however, the empirical findings based on the estimated coefficients show that, regardless of whether the estimated model is symmetry or asymmetry model, the likelihood of the Nigerian fiscal policy responding positively to oil price shocks is rather a short run phenomenon, except for the petroleum tax and royalties whose long run symmetric coefficient shown to responding significantly, but weakly to oil price shocks. More so however, is the fact that the magnitude of the response of fiscal policy to oil price shocks is more significantly pronounced when the shock to oil price is positive. This by implication suggests that the likelihood of asymmetry in the response of fiscal policy to oil price shocks cannot be entirely neglected even though the asymmetry Wald test results tend to suggests otherwise in most cases. For instance, the estimated coefficients show that shocks to oil price matters for short run capital expenditure, but it is the positive oil price shocks that exhibits the tendency of enhancing capital expenditure positively at least in the long run.

Noticeable in the analysis of the different dimension of fiscal policy analyzed, that is, total government expenditure, capital expenditure, recurrent expenditure, tax revenue, borrowing and transfer payment is the fact that; the equilibrium adjustment process that correct for disequilibrium in the short run only matter in the case of total government expenditure, capital expenditure and the borrowing profiles, where the error correction coefficients are found to be consistent both theoretically and empirically. The significant of the negative error term coefficients suggest that, on average; fiscal policy measures via total government expenditure, capital expenditure and government borrowinghas the tendency of adjusting to equilibrium in the short run. However, adjustment to the long run equilibrium was faster when the shock is assumed to be identical (symmetry)except for the case of government borrowing where there seem no significant difference in the extent to which adjustment to equilibrium vary for symmetric and asymmetric models.

On the significance of the additional oil and non-oil macroeconomic variables included in the model to further explain the short and long dynamics of fiscal policy in Nigeria. The study finds that the short run significant and positive impact of oil revenue on fiscal policy such as total government expenditure and capital expenditure only became effective after a quarter of period had passed. This by implication is an indication that oil price and/or proceeds from the sale of crude oil may not necessary matter for fiscal policy in Nigeria in the long run. However, the significant and positive impact of oil revenue on capital expenditure is only a short run phenomenon. In the long run, it is non-oil revenue that is likely to stimulate capital expenditure positively, and reverse is the case for oil revenue in the long run. Somehow interesting however, is the indication of positive impact of non-oil revenue on fiscal policy both in the short and long run situations.

In what appears to be in consistent with the apriori expectation of the study, a 1% appreciation in the Nigerian exchange rate tends to increase the country fiscal policy as measures total government expenditures by 0.3% and 0.5% in the short and long run situations respectively. Consequently, the likelihood of rising price level (inflation rate) leading to increasing fiscal spending appears to be significantly viable in the long run, where a 1% increase in the price level tend to accounts for 0.42% of changes in fiscal policy. This again, reaffirms the oil-based structure of the Nigeria which is expected as reflected to fluctuate more in line to movement in the relative price (exchange rate) both in the short and long run situations as against the domestic price (inflation rate).As expected of the driver of government public and private borrowing, the differential interest rate (dfr) rather than shock to oil prices is consistently reveal as significant for explaining government borrowing in the short and long run dynamics and across the symmetric and asymmetric models.

CHAPTER FIVE: SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

In attempt to validate and/or refute the assertion that fiscal policy in countries that highly depend on earning from oil to finance public expenditure is vulnerable to oil price shocks. This study uses the case of Nigeria to evaluate the oil price consequence of fiscal policy. Using quarterly time series data set that ranges from 1985 to 2015, this study employs both the linear and nonlinear ARDL framework to determine the symmetry and asymmetry impacts of oil price shocks on fiscal policy in Nigeria. To achieve its set objectives, the study was sub-divided into five chapters such as: general introduction in chapter one; literature review in chapter two; theoretical framework and research methodology in chapter three; results presentation in chapter four; and the current chapter (that is, chapter five) summarizes the main findings of the study, draws conclusions from the findings and offered policy recommendations while relevant suggestions are provided for future research.

As a pre-condition for dealing with time series data, the study commenced its empirical analysis by establishing the stationarity property of the series. Using essential and prominent unit root tests in the literature, we finds that the series under consideration exhibits mixed order of integration such as I(0) and I(1). It is this unit root test outcomes that validates the appropriateness of ARDL as the more robust and efficient empirical model for examine the response of fiscal policy to oil price shock in Nigeria. In consistent with the historical evaluation of trends in the country's fiscal policy and oil price movement, where possible co-movement between fiscal policy and oil price was indicated. The Bound cointegration test results indicate evidence of long run relationship between fiscal policy and oil price movement in Nigerian such that; fiscal policy in the short run adjusts to equilibrium in both the symmetry and asymmetry models.

The Wald test results on the other hand fails to reject the null hypothesis of no asymmetry, but the estimated coefficients show that, the significant and positive response of fiscal policy to oil price is likely to be more viable if the oil price shock is positive shocks. Saying it differently, we finds that while shock to oil price significantly matter for fiscal policy particularly in the short run, the magnitude of the impact is likely to be more pronounced if the shock is a positive shock. Similar to the short run dynamic nature of the impact of oil price shock on fiscal policy, we also finds that oil revenue only matter for fiscal policy in the short run.

Thus, we generally finds that regardless of the dimension of fiscal policy measures consider, the probable of positive and significant impacts of oil price shocks on fiscal policy matters, but only in the short run, while the magnitude of the impacts is likely to be more pronounced if the shock is a positive shock. Hence, in the long run, fiscal policy in Nigeria tends to respond the more to non-oil source of financing. This is as evidently indicated by the long run estimated coefficients that constantly reveals positive and significant long run relationship between fiscal policy and non-oil revenue irrespective of the symmetry or asymmetry nature of the relationship.

5.2 Conclusion

Regression results from both the symmetry and asymmetry models show that, oil price and fiscal policy relationship is rather a short term phenomenon in the case of Nigerian economy. More so, the extent to which oil price shocks impact fiscal policy in Nigeria tends to be predicated on whether the oil price shock is positive or negative even in the short run. Based on the major findings of this study, one may therefore, conclude that, the indication of probable positive and short run significant impact of oil price shocks on fiscal policy is more pronounced if the oil price shock is a positive shock.

Consequently, despite the evidence of long run relationship between oil price shock and fiscal policy, revenues source from non-oil production is likely to be more significant and liable for explaining fiscal policy in the long run. This by extension may not be unconnected to volatile and uncertainty nature of oil prices. Finally, the non-significance of the various Wald test performed though, the likelihood of asymmetric response of fiscal policy to oil price shock cannot be entirely ignored. This for example, is due to the fact that fiscal policies in Nigeria respond more significantly to positive oil price shocks, but the response is consistently insignificant in the case of negative oil price shocks. This therefore, suggests that asymmetry matters for oil priceand fiscal policy relationship in Nigeria.

5.3 Recommendations

The findings of this study offer some avenues that can be helpful on the effective management of both the positive and negative consequences of oil price shocks on the country's fiscal planning. In view of our empirical findings, this study therefore recommends as follows: That since the positive oil price shocks that benefits fiscal planning and the economy at large appears to matter only in the short run. It is only rationale that windfall due to this short run positive oil price shock is safe to augment the lesser non-oil revenues for future fiscal planning to cater for unforeseen negative oil price shock.

The long run statistical significance impacts of non-oil revenue on fiscal policy as against the short run impact of oil revenue, which may not be unconnected to the uncertainty and volatile nature of the latter further gives credence to while the country's long term fiscal project cannot be centered around oil. The insignificant long run impact of oil price or oil revenue on fiscal policy seems to be reaffirming the agitation for diversification of the country's economic base from oil to non-oil which seems to be more pronunced for fiscal policy sustainability in the long run.

Finally, having shown that asymmetries matter in the response of fiscal policy to oil price shocks, the fact that, fiscal policy in Nigeria has the tendency of responding more significantly to positive oil price shock suggests that, policy that addresses fiscal policy challenges due to positive oil price shocks will automatically work as well for challenges due to negative oil price shock. Hence, we recommends that asymmetry oil price implication of fiscal policy must be accord due attention when developing strategies meant to strengthening fiscal policy in the country.

5.4 Contributions to Knowledge

The main contribution of this study to knowledge which made this research work different from that of other researchers such as Farzanegan (2011) using the case study of Iran to capture some expenditure profile but ignore the likelihood of asymmetrics in the response of fiscal policy to oil price shock. El-Anshasy and Bradlay (2012) using case study of net oil exporting countries who also restricted to some expenditure profile and as well do not capture the likelihood of asymmetrics in the reponse of fiscal policy to oil price shocks. Villafuerte and Lopez-Murphy (2010) using the case study of oil producing countries, who also restricted to some expenditure profile and as well do not capture the likelihood of asymmetrics in the reponse of fiscal policy to oil price shocks. Also, Aregbeyen and Fasanya (2017) using the case study of Nigeria but captured asymmetrics in its evaluation of oil price shocks on fiscal policy in the context of Nigeria who as well restricted their measure of fiscal policy mainly to the expenditure profile, the present study further contribute to the literature in the context of Nigerian economy by taken cognizance of other fiscal policy profile namely, tax revenue, borrowing and transfer payment.

Secondly, in this present study, we considered expenditure component of fiscal policy and further disaggregated it into capital and recurrent fiscal expenditure to examine the likelihood of asymmetric response of fiscal policy to oil price shocks which is being sensitive to the measure of fiscal policy adopted unlike previous researchers which did not employ this approach.

Thirdly, this study use NARDL approach to capture both linear and non-linear symmetry and asymmetry response of fiscal policy to oil price shocks which was lack in the previous study by the other researchers.

Finally, there is asymmetry in the fiscal measure of capital expenditure in the short run which shows that oil price and fiscal policy relationship is rather a short term phenomenon in the case of Nigeria. This means that the hypothesis of no asymmetry do not hold when fiscal measure is capital expenditure at least in the short run.

5.5 Suggestions for Further Study

The assertion that oil price shocks affect oil producing economy first and foremost through their fiscal policy is rather a global one. However, to refute or validate this assertion on the inference based on a single country analysis as we did in the case of Nigeria may not be substantial enough to assume same empirical outcomes for other oil producing economies. There is no gainsaying that the degree of fiscal policy dependence on oil and oil prices varies across difference oil producing economies. To this end therefore, the tendency of these economies responding differently to different oil price shocks is an important suggestions for future research that this study dwells on. For instance a comparative analysis of the impact of oil price shocks on fiscal policy involving a number of selected oil producing economies depending on the availability of data is likely to offers a more general inference on the impact oil price shocks on fiscal policy of such economies.

Again, while this present study test for the robustness of the regression results to determine if the symmetry or asymmetry oil price implication of fiscal policy is sensitivity to varying dimension of fiscal policy measures. Future research can also consider testing for the robustness of the empirical findings from the perspective of more than one variant of oil price measures. The present study for instance used Brent crude oil price to proxy for oil price, future study can therefore, in addition explore other international oil price benchmark to proxy for oil price and then compare their results for robustness purpose.

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APPENDICES

Appendix A: Data used for Research Analysis

PERIOD	TGE	GCE	GRE	PTR	DR	NOIL	OIL	OP	LOP	OPS	D_OPS	OPSP	OPSN	CPI	TOP	EXR
Mar-85	4595.08	1599.59	2995.49	4234.85	-0.1	30460.75	21179.74	27.67	3.32	0.02				0.91	9.18	0.85
Jun-85	3731.53	644.75	3086.78	4546.92	-0.11	32353.59	17574.22	27.16	3.3	0.02	0	0	0.02	0.91	8.31	0.89
Sep-85	3561.51	415.98	3145.52	4917.43	-0.07	32092.2	16863.84	27.62	3.32	0.02	0	0	0.02	0.89	7.24	0.90
Dec-85	4063.45	891.73	3171.72	5346.39	-0.09	33977.72	16534.21	28.67	3.36	0.02	0	0	0.02	0.88	9.57	0.94
Mar-86	2806.68	80.92	2725.75	6581.4	-0.12	31969.43	20780.22	18	2.89	0.02	0	0	0.02	0.88	5.99	1.00
Jun-86	4436.11	1573.41	2862.7	6828.2	-0.07	33957.55	17242.71	13	2.56	0.06	0.04	0.06	0	0.94	5.83	1.06
Sep-86	3225.68	82.73	3142.95	6834.4	-0.03	33796.06	16545.73	12.61	2.53	0.05	0	0	0.05	1.01	6.23	2.41
Dec-86	7371.86	3805.36	3566.49	6600	0.11	35457.42	16222.31	14.74	2.69	0.03	-0.02	0	0.03	1	11.1	3.61
Mar-87	4910.81	269.45	4641.35	4024.59	0.08	32245.94	20258.83	18.01	2.89	0.03	0	0	0.03	1.01	18.35	3.56
Jun-87	5852.43	704.14	5148.29	4149.16	-0.03	34038.11	16810.09	18.7	2.93	0.03	0	0.03	0	1.03	22.4	4.04
Sep-87	6400.09	804.77	5595.32	4873.28	0.12	33798.22	16130.59	19.25	2.96	0.02	-0.01	0	0.02	1.07	23.07	4.03
Dec-87	8346.2	2363.77	5982.44	6196.97	0.23	35709.47	15815.29	18.12	2.9	0.02	0	0	0.02	1.1	24.61	4.24
Mar-88	7155.01	1084.84	6070.17	11710.16	0.25	35275.72	20793.93	15.89	2.77	0.02	0	0.02	0	1.44	20.66	4.25
Jun-88	8642.13	2208.86	6433.27	12796.99	0.26	37364.92	17254.09	16.24	2.79	0.02	0	0.02	0	1.66	20.51	4.17
Sep-88	6885.52	53.27	6832.25	13047.42	0.26	37112.46	16556.65	14.54	2.68	0.02	0	0	0.02	1.78	21.88	4.64
Dec-88	9341.21	2074.09	7267.11	12461.43	0.29	39284.83	16233.02	13.84	2.63	0.02	0	0.02	0	1.77	25.77	5.09
Mar-89	7613.49	96.08	7517.41	7467.8	0.29	37384.34	23284.4	17.89	2.88	0.02	0	0	0.02	2.26	28.87	7.23
Jun-89	13567.2	5454.97	8112.22	6637.48	0.31	39528.67	19320.6	19.1	2.95	0.03	0.01	0.03	0	2.67	34.84	7.48
Sep-89	9006.68	175.57	8831.11	6399.24	0.4	39157.67	18539.63	17.65	2.87	0.02	-0.01	0	0.02	2.57	36.43	7.25
Dec-89	13719.6	4045.54	9674.06	6753.08	0.51	41337.02	18177.24	19.51	2.97	0.02	0	0	0.02	2.56	43.72	7.51
Mar-90	14507.64	3128.13	11379.51	7221.84	0.31	39780.4	29419.89	20.14	3	0.02	0	0	0.02	2.58	48.42	7.9
Jun-90	18544.46	6369.23	12175.23	8950.71	0.36	42121.76	24411.62	16.44	2.8	0.02	0	0	0.02	2.68	45.1	7.94
Sep-90	12953.23	153.6	12799.63	11462.54	0.35	41514.43	23424.86	27.26	3.31	0.03	0.01	0.03	0	2.65	59.17	7.96
Dec-90	19233.36	5980.63	13252.73	14757.31	0.31	43910.04	22966.98	33.12	3.5	0.06	0.04	0.06	0	2.65	63.48	8.35
Mar-91	12600.35	87.44	12512.9	21511.79	1.91	41194.13	26804.59	21.39	3.06	0.04	-0.02	0	0.04	2.76	53.43	9.43
Jun-91	16782.51	3750.47	13032.04	25301.76	1.9	43812.87	22241.53	19.11	2.95	0.06	0.02	0.06	0	3.02	83.39	9.47
Sep-91	18059.66	4271.14	13788.52	28803.99	1.95	43198.26	21342.49	20.34	3.01	0.04	-0.02	0	0.04	3.07	77.98	10.87

Source: Crude oil price data is sourced from Energy Information Administration while other data are sourced from Central Bank of Nigeria

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	TGE	GCE	GRE	PTR	DR	NOIL	OIL	OP	LOP	OPS	D_OPS	OPSP	OPSN	CPI	TOP	EXR
Dec-91	25094.87	10312.53	14782.34	32018.46	1.93	45859.96	20925.31	21.15	3.05	0.03	-0.01	0	0.03	3.26	79.22	9.87
Mar-92	19114.83	5905.63	13209.21	34045.52	1.88	42263.53	27479.85	18.48	2.92	0.02	0	0	0.02	3.65	83.48	12.47
Jun-92	22130.61	6331.18	15799.43	37044.36	1.95	44733.25	22801.85	20.69	3.03	0.02	0	0.02	0	4.48	125.56	18.47
Sep-92	23773.77	4025.06	19748.71	40115.32	2	44156.82	21880.16	20.75	3.03	0.02	0	0	0.02	4.75	146.97	18.76
Dec-92	34641.33	9584.28	25057.05	43258.4	2.18	46597.61	21452.46	19.9	2.99	0.02	0	0	0.02	4.85	174.06	19.5
Mar-93	43072.72	2304.53	40768.19	47455.45	2.26	43195.6	27537.31	18.78	2.93	0.02	0	0	0.02	5.69	128.87	22.33
Jun-93	51199.4	6022.24	45177.15	50350.03	2.11	45539.94	22849.52	18.83	2.94	0.02	0	0.02	0	7.01	159.26	22.10
Sep-93	54210.59	6882.91	47327.68	52923.99	2.55	45015.04	21925.91	17.06	2.84	0.02	0	0	0.02	7.52	135	21.89
Dec-93	67436.26	20216.48	47219.77	55177.33	2.73	47272.65	21497.32	15.57	2.75	0.02	0	0.02	0	7.82	118.16	21.89
Mar-94	44825.45	9224.72	35600.73	60079.73	2.62	43911.47	26826.15	14.55	2.68	0.02	0	0.02	0	8.58	92.45	22.00
Jun-94	53459.63	18782.6	34677.03	60503.97	2.64	46328.82	22259.42	16.49	2.8	0.02	0	0	0.02	9.92	79.99	22.00
Sep-94	35648.93	452.96	35195.98	59419.72	2.64	45829.97	21359.66	16.95	2.83	0.02	0	0.02	0	12.05	58.97	22.00
Dec-94	54794.19	17636.63	37157.56	56826.98	2.68	47992.94	20942.14	16.8	2.82	0.02	0	0	0.02	13.83	61.36	22.00
Mar-95	81800.26	35458.79	46341.46	46382.65	2.71	44956.7	27457.07	17.23	2.85	0.02	0	0	0.02	15.56	187.82	22.00
Jun-95	63168.93	14292.46	48876.47	43310.18	2.74	47339.86	22782.94	18.38	2.91	0.02	0	0	0.02	18.81	274.64	22.00
Sep-95	59763.56	9221.31	50542.25	41266.47	2.85	46834.98	21862.02	16.44	2.8	0.02	0	0.02	0	20.46	359.38	22.00
Dec-95	71106.15	19767.34	51338.81	40251.51	3.1	48739.13	21434.68	17.4	2.86	0.02	0	0.02	0	20.96	351.17	22.00
Mar-96	47840.41	489.6	47350.81	37563.15	3.1	46291.62	29424.5	19.28	2.96	0.02	0	0	0.02	22.07	298.84	22.00
Jun-96	68973.61	20998.54	47975.06	39686.57	3.16	48803.88	24415.44	19.91	2.99	0.02	0	0.02	0	24.24	380.45	22.00
Sep-96	73209.97	23913.75	49296.23	43919.61	3.15	48275.31	23428.53	21.38	3.06	0.02	0	0	0.02	25.31	440.83	22.00
Dec-96	109053.3	57739.01	51314.3	50262.27	3.11	50135.53	22970.57	24.13	3.18	0.02	0	0.02	0	23.97	486.99	22.00
Mar-97	90777.12	35075.01	55702.1	70535.77	2.85	47946.98	29858.33	21.69	3.08	0.02	0	0.02	0	25.11	381.89	22.00
Jun-97	129861.7	71416.82	58444.88	76369.17	2.84	50558.79	24775.43	18.46	2.92	0.02	0	0.02	0	27.06	409.53	22.00
Sep-97	62937.71	1722.27	61215.44	79583.7	2.86	50004.63	23773.96	18.96	2.94	0.02	0	0.02	0	26.96	410.38	22.00
Dec-97	131073.3	67059.5	64013.78	80179.35	2.85	51795.1	23309.25	18.89	2.94	0.02	0	0	0.02	26.41	432.43	22.00
Mar-98	96692.88	40195.28	56497.6	70436.22	2.93	49711.74	30506.04	14.17	2.65	0.02	0	0	0.02	26.85	299.1	22.00
Jun-98	145330.7	81842.28	63488.44	68882.08	3.04	52251.28	25312.87	13.29	2.59	0.03	0.01	0.03	0	28.78	295.26	22.00
Sep-98	76617.69	1973.69	74644	67797.03	3.11	51693.86	24289.68	12.58	2.53	0.03	-0.01	0	0.03	28.84	264.54	22.00

Source: Crude oil price data is sourced from Energy Information Administration while other data are sourced from Central Bank of Nigeria

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	TGE	GCE	GRE	PTR	DR	NOIL	OIL	OP	LOP	OPS	D_OPS	OPSP	OPSN	CPI	TOP	EXP
Dec-98	166813.2	76848.89	89964.26	67181.07	3.24	53309.71	23814.89	11.26	2.42	0.02	0	0	0.02	29.56	283.74	22.0
Mar-99	190651.2	64781.06	125870.2	53070.3	3.21	51841.36	28218.08	11.36	2.43	0.02	0	0.02	0	30.49	524.45	85.9
Jun-99	274853.3	131901.8	142951.5	58978.07	3.33	54577.66	23414.4	15.57	2.75	0.02	0	0	0.02	31.16	631.61	92.9
Sep-99	160810.1	3180.91	157629.2	70940.48	3.39	54006.85	22467.95	20.67	3.03	0.03	0.01	0.03	0	29.48	664.46	94.4
Dec-99	293757.3	123854.2	169903.2	88957.54	3.45	55628.4	22028.77	24.21	3.19	0.04	0	0.04	0	29.63	702.62	96.0
Mar-00	204717.3	35563.13	169154.2	86835.74	2.9	53315.13	31358.5	27.21	3.3	0.03	-0.01	0	0.03	30.06	1037.98	99.8
Jun-00	218994.4	38125.78	180868.6	127439.5	2.88	56193.43	26020.22	26.93	3.29	0.02	0	0	0.02	32.99	1127.97	101.1
Sep-00	218665.6	24238.55	194427.1	184575.3	2.88	55581.81	24968.43	30.35	3.41	0.02	0	0	0.02	34.06	979	103.5
Dec-00	267545.2	57715.62	209829.6	258243.1	2.88	57260.84	24480.38	29.83	3.4	0.02	0	0.02	0	33.93	907.25	103.
Mar-01	290782.7	57063.56	233719.1	428310.3	2.88	58400.04	32999.37	25.73	3.25	0.02	0	0	0.02	35.53	829.63	110.0
Jun-01	366340.6	116188.1	250152.6	503095.3	2.86	61899.26	27381.75	27.41	3.31	0.02	0	0.02	0	38.29	835.98	113.2
Sep-01	268574.9	2801.96	265772.9	562465.4	2.87	61442.33	26274.94	26.76	3.29	0.02	0	0	0.02	40.57	824.44	111.7
Dec-01	389679.3	109099.1	280580.2	606420.6	2.87	62835.22	25761.34	19.46	2.97	0.02	0	0	0.02	39.53	718.57	112.1
Mar-02	294184.5	13589.03	280595.5	652859.2	2.86	76306.88	31116.2	21.15	3.05	0.04	0.02	0.04	0	41.7	560.1	114.7
Jun-02	334879.1	35511.06	299368	658825.2	2.86	83157.73	25819.16	24.97	3.22	0.03	-0.01	0	0.03	42.97	632.4	117.0
Sep-02	363505.2	40586.13	322919	642217	2.85	83893.08	24775.51	27.08	3.3	0.03	0	0	0.03	44.61	842.89	125.3
Dec-02	470458	119209.6	351248.5	603034.6	2.81	83843.73	24291.22	27.62	3.32	0.02	0	0	0.02	44.34	938.35	126.7
Mar-03	476009	70704.25	405304.7	400732.2	2.71	80417.28	38552.97	32.06	3.47	0.02	0	0	0.02	44.15	1023.19	127.1
Jun-03	463310.6	28498.93	434811.7	372619.5	2.74	87890.74	31989.94	26.53	3.28	0.02	0	0.02	0	48.98	1137.69	127.0
Sep-03	479105	18387.14	460717.8	378150.9	2.72	89037.03	30696.86	28.67	3.36	0.03	0	0.03	0	52.81	999.67	128.0
Dec-03	522438.8	39415.74	483023	417326.3	2.71	88851.32	30096.82	28.9	3.36	0.02	0	0	0.02	54.89	1054.47	134.5
Mar-04	484469.5	2244.97	482224.6	541640.5	2.72	80068.13	34549.5	32.3	3.47	0.02	0	0	0.02	54.06	1262.65	135.2
Jun-04	632581.9	127452.9	505129.1	627506.1	2.74	90401.12	33301.8	36.09	3.59	0.02	0	0.02	0	55.88	1127.59	133.0
Sep-04	536336	4102.15	532233.8	726417.7	2.77	108867.9	33505.69	41.88	3.73	0.02	0	0.02	0	57.63	1237.25	132.8
Dec-04	658060.8	94522.03	563538.8	838375.3	2.75	112568.2	34313.72	44.63	3.8	0.02	0	0.02	0	60.39	1436.3	132.8
Mar-05	608497	4930.45	603566.5	961403	2.76	86800.73	33248.19	46.48	3.84	0.02	0	0	0.02	62.86	1469.87	132.8
Jun-05	691455.5	95863.3	595592.2	1100243	2.84	98021.83	30733.62	51.66	3.94	0.02	0	0	0.02	66.26	1504.6	132.8
Sep-05	599629.3	5040.3	594589	1252920	2.91	118170.8	35762.76	63.42	4.15	0.02	0	0.02	0	71.64	1546.85	132.3

Source: Crude oil price data is sourced from Energy Information Administration while other data are sourced from Central Bank of Nigeria

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	TGE	GCE	GRE	PTR	DR	NOIL	OIL	OP	LOP	OPS	D_OPS	OPSP	OPSN	CPI	TOP	EX
Dec-05	832406.9	231850.1	600556.8	1419434	2.91	122592.5	36600.95	58.34	4.07	0.03	0.01	0.03	0	67.37	1456.07	130
Mar-06	615200.2	1704.37	613495.9	1726250	2.92	95250.23	33329.55	63.39	4.15	0.02	0	0	0.02	70.43	1920.5	129
Jun-06	706505.4	73099.46	633406	1869850	2.9	107056.4	28382.2	70.86	4.26	0.02	0	0	0.02	71.88	1669.55	128
Sep-06	743535	83247.78	660287.2	1976700	2.92	128908.8	33589.94	71.08	4.26	0.02	0	0.02	0	76.12	1928.36	128
Dec-06	895138.7	200999.2	694139.6	2046800	2.92	134412.6	34891.88	61.33	4.12	0.02	0	0	0.02	73.13	1543.52	128
Mar-07	842480.2	99098.09	743382.1	2093134	2.93	103460.6	32314.13	59.94	4.09	0.02	0	0.02	0	74.12	2039.91	128
Jun-07	989584.3	201775.3	787809.1	2084541	2.99	116069.2	26721.3	71.38	4.27	0.02	0	0	0.02	76.51	1892.42	127
Sep-07	840705.5	4865.97	835839.5	2034003	3.03	140753.3	32314.13	77.76	4.35	0.02	0.01	0.02	0	79.25	1849.66	126
Dec-07	1076938	189464.5	887473.4	1941522	3.1	149683	32935.56	90.77	4.51	0.02	0	0	0.02	77.93	1279.25	120
Mar-08	1030647	35709.78	994936.8	1413269	3.1	111873.4	30197.99	98.71	4.59	0.03	0	0.03	0	79.89	2692.19	118
Jun-08	1235243	202355.4	1032887	1394431	3.1	125479.6	25382.64	127.35	4.85	0.02	0	0	0.02	85.72	3196.72	117
Sep-08	1224114	170563.1	1053551	1491181	3.15	153329.3	30349.57	119.13	4.78	0.03	0.01	0.03	0	89.58	2462.26	117
Dec-08	1272875	215947.6	1056928	1703519	2.98	164925.8	30664.37	58.9	4.08	0.02	-0.01	0	0.02	89.66	1437.05	120
Mar-09	1056885	125283	931601.7	2768459	2.93	120932	28259.43	47.06	3.85	0.1	0.08	0.1	0	91.36	1828.77	146
Jun-09	1128301	183329.9	944970.9	2917166	2.91	135739.9	26361.24	61.14	4.11	0.06	-0.04	0	0.06	95.32	2003.32	147
Sep-09	1215932	230312.5	985619.5	2886653	2.87	165967.1	31117.25	70.25	4.25	0.04	-0.01	0	0.04	98.88	1945.02	150
Dec-09	1263940	210392.3	1053548	2676922	2.83	179216.9	31383.44	77.16	4.35	0.03	-0.01	0	0.03	102.15	2031.27	149
Mar-10	1360068	123757.5	1236310	1489300	2.82	130669.2	29447.88	77.65	4.35	0.03	-0.01	0	0.03	104.9	3106.4	149
Jun-10	1456450	132675.4	1323775	1240600	2.81	147103.1	27630.9	79.54	4.38	0.02	0	0	0.02	108.76	2791.43	150
Sep-10	1487846	84348.68	1403497	1132150	2.79	180061.6	32710.12	78.43	4.36	0.02	0	0	0.02	112.38	2423.24	150
Dec-10	1676323	200846.8	1475476	1163950	2.79	195229.5	33480	87.97	4.48	0.02	0	0	0.02	114.22	2259.65	150
Mar-11	1635224	63747.32	1571477	1476719	2.77	141802.8	29463.07	107.03	4.67	0.02	0	0.02	0	118.3	3492.78	152
Jun-11	1678284	63018.93	1615265	1732731	2.74	159930.6	27902.51	119.98	4.79	0.03	0.01	0.03	0	119.89	3588.82	154
Sep-11	1863759	225155	1638604	2072706	2.71	195829.3	32625.55	115.19	4.75	0.03	0	0	0.03	124	3040.5	153
Dec-11	1816045	174550.1	1641495	2496644	2.71	212994.3	33452.83	112.83	4.73	0.02	0	0	0.02	125.97	2663.22	155
Mar-12	1638599	100995.1	1537604	3471091	2.64	153340.5	28778.93	121.23	4.8	0.02	0	0	0.02	132.63	3851.2	157
Jun-12	1601650	67518.36	1534131	3876334	2.65	172132.4	27699.15	111.25	4.71	0.02	0	0.02	0	135.34	3264.97	157
Sep-12	1665841	121098.3	1544743	4178922	2.67	210611.9	32651.17	110.91	4.71	0.02	0	0	0.02	137.95	2320.23	157

Source: Crude oil price data is sourced from Energy Information Administration while other data are sourced from Central Bank of Nigeria

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	TGE	GCE	GRE	PTR	DR	NOIL	OIL	OP	LOP	OPS	D_OPS	OPSP	OPSN	CPI	TOP	EXR
Dec-12	1763701	194261	1569440	4378853	2.69	230491.7	33187.23	111.49	4.71	0.02	0	0	0.02	141.06	2170.59	157.3
Mar-13	1792107	109989.8	1682117	4513778	2.72	165440.7	28622.78	115.61	4.75	0.02	0	0	0.02	144.02	2977.77	157.3
Jun-13	1856689	151264.1	1705425	4493337	2.71	184802.8	27379.67	105.87	4.66	0.02	0	0.02	0	146.65	3259.76	157.3
Sep-13	1935993	222734.9	1713258	4355179	2.67	227362.2	32477.27	110.4	4.7	0.02	0	0.02	0	148.92	2358.81	157.3
Dec-13	1814996	109378.8	1705617	4099306	2.66	250689.8	33338.89	112.06	4.72	0.02	0	0.02	0	152.29	2069.12	157.3
Mar-14	1766578	145364.1	1621214	3431425	2.58	179203.6	26919.33	110.16	4.7	0.02	0	0	0.02	155.23	2866.8	157.3
Jun-14	1627784	20642.7	1607141	3057835	2.56	197245.1	28821.49	112.3	4.72	0.02	0	0	0.02	158.62	2785.88	157.2
Sep-14	1724270	122161	1602109	2684245	2.54	244569.8	31452.05	103.41	4.64	0.02	0	0.02	0	161.31	2046.59	157.2
Dec-14	1699897	93778.1	1606119	2310655	2.53	267000.8	33908.19	75.73	4.33	0.02	0	0.02	0	164.44	1875.37	162.3
Mar-15	1697548	78377.65	1619171	1937065	2.77	189379.8	24912.89	54.53	4	0.03	0.01	0.03	0	168.42	2421.59	182.1
Jun-15	1746753	105489.8	1641263	1563475	2.83	204294.3	27095.13	61.53	4.12	0.04	0.01	0.04	0	173.17	2321.3	196.9
Sep-15	1719398	47000.2	1672398	1189885	2.86	252059.8	31812.14	50.73	3.93	0.03	-0.01	0	0.03	176.46	1736.27	196.9
Dec-15	2013643	301069.6	1712573	816295	2.87	275758.4	31506.76	43.83	3.78	0.03	0	0	0.03	180.15	1442.37	196.9

Source: Crude oil price data is sourced from Energy Information Administration while other data are sourced from Central Bank of Nigeria

The unit of TGE, GCE, GRE, PTR, NOIL, OIL, OP and TOP are in Billion Naira.

EXR is in Naira per 1 US Dollar and DR is in percentage.

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	BORR	TRANSF
Mar-85	69.8911	5.4969
Jun-85	69.8911	5.4969
Sep-85	69.8911	5.4969
Dec-85	69.8911	5.4969
Mar-86	137.5782	10.8109
Jun-86	137.5782	10.8109
Sep-86	137.5782	10.8109
Dec-86	137.5782	10.8109
Mar-87	180.9859	10.2962
Jun-87	180.9859	10.2962
Sep-87	180.9859	10.2962
Dec-87	180.9859	10.2962
Mar-88	287.4433	14.0746
Jun-88	287.4433	14.0746
Sep-88	287.4433	14.0746
Dec-88	287.4433	14.0746
Mar-89	382.7075	24.6697
Jun-89	382.7075	24.6697
Sep-89	382.7075	24.6697
Dec-89	382.7075	24.6697
Mar-90	444.6525	27.3094
Jun-90	444.6525	27.3094
Sep-90	444.6525	27.3094
Dec-90	444.6525	27.3094
Mar-91	722.2258	39.9333
Jun-91	722.2258	39.9333
Sep-91	722.2258	39.9333
Dec-91	722.2258	39.9333
Mar-92	906.9808	83.7473
Jun-92	906.9808	83.7473
Sep-92	906.9808	83.7473
Dec-92	906.9808	83.7473
Mar-93	1056.396	55.4440
Jun-93	1056.396	55.4440
Sep-93	1056.396	55.4440
Dec-93	1056.396	55.4440
Mar-94	1194.599	79.1332
Jun-94	1194.599	79.1332
Sep-94	1194.599	79.1332

Source: Central Bank of Nigeria

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	BORR	TRANSF
Dec-94	1194.6	79.1332
Mar-95	1037.3	57.2019
Jun-95	1037.3	57.2019
Sep-95	1037.3	57.2019
Dec-95	1037.3	57.2019
Mar-96	1097.68	74.1186
Jun-96	1097.68	74.1186
Sep-96	1097.68	74.1186
Dec-96	1097.68	74.1186
Mar-97	1193.85	94.4029
Jun-97	1193.85	94.4029
Sep-97	1193.85	94.4029
Dec-97	1193.85	94.4029
Mar-98	3372.18	107.5772
Jun-98	3372.18	107.5772
Sep-98	3372.18	107.5772
Dec-98	3372.18	107.5772
Mar-99	3995.64	203.6929
Jun-99	3995.64	203.6929
Sep-99	3995.64	203.6929
Dec-99	3995.64	203.6929
Mar-00	4193.27	265.8602
Jun-00	4193.27	265.8602
Sep-00	4193.27	265.8602
Dec-00	4193.27	265.8602
Mar-01	5098.89	225.1534
Jun-01	5098.89	225.1534
Sep-01	5098.89	225.1534
Dec-01	5098.89	225.1534
Mar-02	5808.01	477.6484
Jun-02	5808.01	477.6484
Sep-02	5808.01	477.6484
Dec-02	5808.01	477.6484
Mar-03	6260.59	610.7037
Jun-03	6260.59	610.7037
Sep-03	6260.59	610.7037
Dec-03	6260.59	610.7037
Mar-04	4220.98	670.6031
Jun-04	4220.98	670.6031

Source: Central Bank of Nigeria

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	BORR	TRANSF
Sep-04	4220.98	670.6031
Dec-04	4220.98	670.6031
Mar-05	2204.72	594.0475
Jun-05	2204.72	594.0475
Sep-05	2204.72	594.0475
Dec-05	2204.72	594.0475
Mar-06	2608.53	527.1655
Jun-06	2608.53	527.1655
Sep-06	2608.53	527.1655
Dec-06	2608.53	527.1655
Mar-07	2843.56	739.6620
Jun-07	2843.56	739.6620
Sep-07	2843.56	739.6620
Dec-07	2843.56	739.6620
Mar-08	3818.47	635.7500
Jun-08	3818.47	635.7500
Sep-08	3818.47	635.7500
Dec-08	3818.47	635.7500
Mar-09	5241.66	878.3400
Jun-09	5241.66	878.3400
Sep-09	5241.66	878.3400
Dec-09	5241.66	878.3400
Mar-10	6519.69	956.1772
Jun-10	6519.69	956.1772
Sep-10	6519.69	956.1772
Dec-10	6519.69	956.1772
Mar-11	7564.44	1145.6000
Jun-11	7564.44	1145.6000
Sep-11	7564.44	1145.6000
Dec-11	7564.44	1145.6000
Mar-12	8506.31	967.8293
Jun-12	8506.31	967.8293
Sep-12	8506.31	967.8293
Dec-12	8506.31	967.8293
Mar-13	9535.55	1392.9329
Jun-13	9535.55	1392.9329
Sep-13	9535.55	1392.9329
Dec-13	9535.55	1392.9329
Mar-14	10948.5	1520.0128

Source: Central Bank of Nigeria

APPENDICES

Appendix A: Data used for Research Analysis (Continued)

PERIOD	BORR	TRANSF
Jun-14	10948.5	1520.0128
Sep-14	10948.5	1520.0128
Dec-14	10948.5	1520.0128
Mar-15	14537.1	2047.4197
Jun-15	14537.1	2047.4197
Sep-15	14537.1	2047.4197
Dec-15	14537.1	2047.4197

Source: Central Bank of Nigeria

Appendix B: Unit Root Test Results

ADF Unit Root Test

Null Hypothesis: LTGE has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.319573	0.1675
atTest critical values:	1% level	-3.485586	
	5% level	-2.885654	
	10% level	-2.579708	

*MacKinnon (1996) one-sided p-values.

At the level without trend

Null Hypothesis: LTGE has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.424160	0.9856
Test critical values:	1% level	-4.036310	
	5% level	-3.447699	
	10% level	-3.148946	

*MacKinnon (1996) one-sided p-values.

At the level with trend

Null Hypothesis: D(LTGE) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.020230	0.0000
Test critical values:	1% level	-4.037668	
	5% level	-3.448348	
	10% level	-3.149326	

*MacKinnon (1996) one-sided p-values.

1^{st} difference (with trend)

Null Hypothesis: D(LTGE) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.157942	0.0000
Test critical values:	1% level	-3.485586	
	5% level	-2.885654	

1^{st} difference (without trend)

10% level	-2.579708	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(PTR) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.444540	0.5582
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOG(PTR)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.712713	0.0000
Test critical values:	1% level	-4.036983	
	5% level	-3.448021	
	10% level	-3.149135	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(GCE) has a unit root
Exogenous: Constant
Lag Length: 7 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.898240	0.3322
Test critical values:	1% level	-3.487550	
	5% level	-2.886509	
	10% level	-2.580163	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOG(GCE)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 6 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.325889	0.0000
Test critical values:	1% level	-4.039075	

	5% level	-3.449020	
	10% level	-3.149720	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(GRE) has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.611514	0.0935
Test critical values:	1% level	-3.486551	
	5% level	-2.886074	
	10% level	-2.579931	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOG(GRE)) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.396659	0.0005
Test critical values:	1% level	-3.486551	
	5% level	-2.886074	
	10% level	-2.579931	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.192346	0.2102
Test critical values:	1% level	-3.484198	
	5% level	-2.885051	
	10% level	-2.579386	

At Level without trend

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LDR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.461256	0.8375
Test critical values:	1% level	-4.034356	

Level with trend

	5% level	-3.446765	
	10% level	-3.148399	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.21020	0.0000
Test critical values:	1% level	-3.484653	
	5% level	-2.885249	
	10% level	-2.579491	

1st difference (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LDR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.42888	0.0000
Test critical values:	1% level	-4.034997	
	5% level	-3.447072	
	10% level	-3.148578	

1st difference with trend

*MacKinnon (1996) one-sided p-values.

Null Hypothesis:L NOIL has a unit root
Exogenous: Constant
Lag Length: 5 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		2.773594	1.0000
Test critical values:	1% level	-3.486551	
	5% level	-2.886074	
	10% level	-2.579931	

At level without trend

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LNOIL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 5 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.222495	0.9919
Test critical values:	1% level	-4.037668	

At level with trend

5% level	-3.448348	
10% level	-3.149326	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNOIL) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.807496	0.0602
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

1st difference (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LNOIL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.972328	0.0004
Test critical values:	1% level	-4.037668	
	5% level	-3.448348	
	10% level	-3.149326	

1st difference (with trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOIL has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.980496	0.2951
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

At level (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOIL has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.916711	0.6396
Test critical values:	1% level	-4.036983	

At level (with trend)

	5% level	-3.448021	
	10% level	-3.149135	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOIL) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.168074	0.0000
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

1st difference (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOIL) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.315432	0.0001
Test critical values:	1% level	-4.036983	
	5% level	-3.448021	
	10% level	-3.149135	

1st difference (with trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LEXR has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.178743	0.9702
Test critical values:	1% level	-3.484198	
	5% level	-2.885051	
	10% level	-2.579386	

At level (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LEXR has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.090848	0.5454
Test critical values:	1% level	-4.034356	

At level (with trend)

	5% level	-3.446765	
	10% level	-3.148399	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LEXR) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.527023	0.0000
Test critical values:	1% level	-3.484653	
	5% level	-2.885249	
	10% level	-2.579491	

1st difference (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LEXR) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.532850	0.0000
Test critical values:	1% level	-4.034997	
	5% level	-3.447072	
	10% level	-3.148578	

1st difference (with trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(CPI) has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.433424	1.0000
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

At level (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: LOG(CPI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 4 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.995475	0.9999

At level (with trend)

Test critical values:	1% level	-4.036983	
	5% level	-3.448021	
	10% level	-3.149135	

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOG(CPI)) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.532572	0.5138
Test critical values:	1% level	-3.486064	
	5% level	-2.885863	
	10% level	-2.579818	

1st difference (without trend)

*MacKinnon (1996) one-sided p-values.

Null Hypothesis: D(LOG(CPI)) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 3 (Automatic - based on SIC, maxlag=5)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-3.948582	0.0130
Test critical values:	1% level	-4.036983	
	5% level	-3.448021	
	10% level	-3.149135	

1st difference (with trend)

*MacKinnon (1996) one-sided p-values.

NG-PERRON UNIT ROOT TEST RESULTS

Null Hypothesis: LTGE has a unit root
Exogenous: Constant
Lag length: 2 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		1.10171	1.95065	1.77057	208.518
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

At level (without trend)

*Ng-Perron (2001, Table 1)

Null Hypothesis: LTGE has a unit root
Exogenous: Constant, Linear Trend
Lag length: 3 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-2.08532	-0.76037	0.36463	30.6386
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

At level (with trend)

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.010154

Null Hypothesis: D(LTGE) has a unit root
Exogenous: Constant
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-0.81064	-0.52641	0.64938	22.8591
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

1st difference (without trend)

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.002010

Null Hypothesis: D(LOG(TGE)) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 2 (Fixed Spectral GLS-detrended AR)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-15.3058	-2.76599	0.18072	5.95604
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

1st different with trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.021329

Null Hypothesis: LOG(PTR) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=12)
Sample: 3/01/1985 12/01/2015
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-20.1436	-2.86694	0.14232	6.33717
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

Null Hypothesis: LOG(GCE) has a unit root
Exogenous: Constant
Lag length: 7 (Spectral GLS-detrended AR based on SIC, maxlag=12)
Sample: 3/01/1985 12/01/2015
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		0.97125	1.05455	1.08577	80.6098
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

Null Hypothesis: LOG(GCE) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 7 (Spectral GLS-detrended AR based on SIC, maxlag=12)
Sample: 3/01/1985 12/01/2015
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-1.78283	-0.94272	0.52878	51.0014
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

Null Hypothesis: LOG(GRE) has a unit root
Exogenous: Constant
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=12)
Sample: 3/01/1985 12/01/2015
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		0.92000	1.15333	1.25362	104.028
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.052962

Null Hypothesis: LOG(GRE) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=12)
Sample: 3/01/1985 12/01/2015
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-3.28897	-0.96902	0.29463	21.9907
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

Null Hypothesis: LNOIL has a unit root
Exogenous: Constant
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT	
Ng-Perron test statistics		4.30264	4.22223	0.98131	111.668	At level (without trend)
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000	
	5%	-8.10000	-1.98000	0.23300	3.17000	
	10%	-5.70000	-1.62000	0.27500	4.45000	

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	41733409

Null Hypothesis: NOIL has a unit root
Exogenous: Constant, Linear Trend
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		0.70010	0.30619	0.43735	53.0949
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

At level (with trend)

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	40244203

1st difference with trend

Null Hypothesis: D(LOG(NOIL)) has a unit root
Exogenous: Constant
Lag length: 4 (Fixed Spectral GLS-detrended AR)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-0.36947	-0.40352	1.09215	59.2702
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

1st difference (without trend)

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.000114

Null Hypothesis: D(LOG(NOIL)) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 2 (Fixed Spectral GLS-detrended AR)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-24.3893	-3.48252	0.14279	3.79451
Asymptotic critical	1%	-23.8000	-3.42000	0.14300	4.03000

1st difference (with trend)

values*:					
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

Null Hypothesis: LOIL has a unit root
Exogenous: Constant
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-0.98288	-0.51409	0.52304	16.6146
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

At level (without trend)

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.001869

Null Hypothesis: LOIL has a unit root
Exogenous: Constant, Linear Trend
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-6.85241	-1.84300	0.26896	13.3076
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

At the level with trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.002198

Null Hypothesis: D(LOIL) has a unit root
Exogenous: Constant
Lag length: 3 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124

Included observations: 123 after adjustments

1st difference (without trend)

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-0.27999	-0.29672	1.05977	57.6091
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.000297

Null Hypothesis: D(LOG(OIL)) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 2 (Fixed Spectral GLS-detrended AR)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

At the level with trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-136.960	-8.27303	0.06040	0.67272
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.063954

Null Hypothesis: OPS has a unit root
Exogenous: Constant
Lag length: 1 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

At the level without trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-100.851	-7.08974	0.07030	0.26435
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.042713

Null Hypothesis: OPV has a unit root
Exogenous: Constant
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

At the level without trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-46.8536	-4.83769	0.10325	0.5293
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	8.96E-05

Null Hypothesis: OPV has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

At the level with trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-46.8348	-4.83798	0.10330	1.95167
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	8.97E-05

Null Hypothesis: D(OPV) has a unit root
Exogenous: Constant
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

1st difference without trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-56.9194	-5.33457	0.09372	0.43091
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.000119

Null Hypothesis: D(OPV) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-55.2632	-5.25562	0.09510	1.65357
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

1st difference with trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.000111

Null Hypothesis: LEXR has a unit root
Exogenous: Constant
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		1.71075	1.81244	1.05944	88.6078
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

At the level without trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	46.26920

Null Hypothesis: LEXR has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-5.64658	-1.63717	0.28994	16.0492
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

At the level with trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	43.82354

Null Hypothesis: D(LEXR) has a unit root
Exogenous: Constant
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

1st difference without trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-59.3948	-5.44942	0.09175	0.41277
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	45.23541

Null Hypothesis: D(LEXR) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 0 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

1st difference with trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-59.8770	-5.46915	0.09134	1.53344
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	44.22124

Null Hypothesis: CPI has a unit root
Exogenous: Constant
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

At the level without trend

	MZa	MZt	MSB	MPT
Ng-Perron test statistics	3.12458	3.18642	1.01979	103.028

Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	26.94517

Null Hypothesis: LOG(CPI) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

At the level with trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-13.7441	-2.42540	0.17647	7.74643
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	110.3664

Null Hypothesis: D(LOG(CPI)) has a unit root
Exogenous: Constant
Lag length: 3 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

1st difference without trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-1.62855	-0.67601	0.41510	11.4895
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.182293

Null Hypothesis: D(LOG(CPI)) has a unit root
Exogenous: Constant, Linear Trend

Lag length: 2 (Fixed Spectral GLS-detrended AR)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

1st difference with trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-24.2387	-3.47888	0.14353	3.77414
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.001429

Null Hypothesis: LGCE has a unit root
Exogenous: Constant
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

At the level without trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		0.61780	0.49541	0.80189	43.9684
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.086579

Null Hypothesis: LGCE has a unit root
Exogenous: Constant, Linear Trend
Lag length: 1 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-22.5372	-3.35647	0.14893	4.04580
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.708946

Null Hypothesis: D(LGCE) has a unit root
Exogenous: Constant
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-0.20774	-0.16400	0.78946	35.6843
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

1st difference without trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.063065

Null Hypothesis: D(LGCE) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-1.00748	-0.66144	0.65653	80.4457
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.088474

Null Hypothesis: LGRE has a unit root
Exogenous: Constant
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		0.92000	1.15333	1.25362	104.028
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

At the level without trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.052962

Null Hypothesis: LGRE has a unit root
Exogenous: Constant, Linear Trend
Lag length: 5 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample: 1 124
Included observations: 124

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-3.28897	-0.96902	0.29463	21.9907
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

At the level with trend

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.013189

Null Hypothesis: D(LGRE) has a unit root
Exogenous: Constant
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-31.2392	-3.95155	0.12649	0.78619
Asymptotic critical values*:	1%	-13.8000	-2.58000	0.17400	1.78000
	5%	-8.10000	-1.98000	0.23300	3.17000
	10%	-5.70000	-1.62000	0.27500	4.45000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.003916

Null Hypothesis: D(LGRE) has a unit root
Exogenous: Constant, Linear Trend
Lag length: 4 (Spectral GLS-detrended AR based on SIC, maxlag=5)
Sample (adjusted): 2 124
Included observations: 123 after adjustments

1st difference with trend

		MZa	MZt	MSB	MPT
Ng-Perron test statistics		-41.5832	-4.55911	0.10964	2.19499
Asymptotic critical values*:	1%	-23.8000	-3.42000	0.14300	4.03000
	5%	-17.3000	-2.91000	0.16800	5.48000
	10%	-14.2000	-2.62000	0.18500	6.67000

*Ng-Perron (2001, Table 1)

HAC corrected variance (Spectral GLS-detrended AR)	0.005064

KPSS UNIT ROO TEST RESULTS

Null Hypothesis: LTGE is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

At the level without trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.313681
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LTGE is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

At the level with trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.316380
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LTGE) is stationary
Exogenous: Constant
Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

1st difference without trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.265902
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LTGE) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.072512
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

1st difference with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LDR is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.821129
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

At the level without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOG(PTR) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.147243
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOG(PTR) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.147243
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LDR is stationary

Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.295054
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

At the level with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LDR) is stationary
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.418430
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

1st difference without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LDR) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.085103
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

1stdifference with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: NOIL is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.203755
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

At the level without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: NOIL is stationary

Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

At the level with trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.341086
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(NOIL) is stationary
Exogenous: Constant
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

1st difference without trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.461183
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(NOIL) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

1st difference with trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.066152
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOIL is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.118844
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOG(OIL) is stationary

Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.203880
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

At the level with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LOG(OIL)) is stationary
Exogenous: Constant
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.054072
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

1st difference without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LOIL) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 13 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.054258
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

1st difference with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LEXR is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.281956
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LEXR is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

At the level with trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.116283
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LEXR) is stationary
Exogenous: Constant
Bandwidth: 1 (Newey-West automatic) using Bartlett kernel

1st difference without trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.116120
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LEXR) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 0 (Newey-West automatic) using Bartlett kernel

1st difference with trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.079521
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOG(CPI) is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

At the level without trend

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.238181
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOG(CPI) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.325441
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

At the level with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LOG(CPI)) is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.146162
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

1st difference without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LOG(CPI)) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.112900
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

1st difference with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LGCE is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.191286
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

At the level without trend

Null Hypothesis: LGCE is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 8 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.233668
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

At the level with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LGCE) is stationary
Exogenous: Constant
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.074752
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

1st difference without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LGCE) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 11 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.076136
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

1st difference with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOG(GRE) is stationary
Exogenous: Constant
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		1.320749
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: LOG(GRE) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 9 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.277849
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

At the level with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LOG(GRE)) is stationary
Exogenous: Constant
Bandwidth: 6 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.373758
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

1st difference without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(LOG(GRE)) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 10 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.093065
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

1st difference with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: OPS is stationary
Exogenous: Constant
Bandwidth: 3 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.109789
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

At the level without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: OPV is stationary
Exogenous: Constant
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.056545
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

At the level without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: OPV is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 5 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.056709
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

At level with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(OPV) is stationary
Exogenous: Constant
Bandwidth: 38 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.158675
Asymptotic critical values*:	1% level	0.739000
	5% level	0.463000
	10% level	0.347000

1st difference without trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Null Hypothesis: D(OPV) is stationary
Exogenous: Constant, Linear Trend
Bandwidth: 38 (Newey-West automatic) using Bartlett kernel

		LM-Stat.
Kwiatkowski-Phillips-Schmidt-Shin test statistic		0.157483
Asymptotic critical values*:	1% level	0.216000
	5% level	0.146000
	10% level	0.119000

1st difference with trend

*Kwiatkowski-Phillips-Schmidt-Shin (1992, Table 1)

Appendix C: Main Empirical Results

SYMMETRY RESULTS

Dependent Variable: LOG(TGE)
Method: ARDL
Date: 02/20/17 Time: 07:03
Sample (adjusted): 4 124
Included observations: 121 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): DR LOG(NOIL) LOG(OIL) OPV LOG(EXR) LOG(CPI)
Fixed regressors: C @TREND
Number of models evalulated: 1562500
Selected Model: ARDL(2, 0, 0, 3, 0, 0, 0, 0, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(TGE(-1))	0.162411	0.092412	1.757475	0.0818
LOG(TGE(-2))	0.256766	0.084754	3.029560	0.0031
DR	0.032413	0.047131	0.687716	0.4931
LOG(NOIL)	0.276937	0.160136	1.729387	0.0867
LOG(OIL)	-0.023272	0.165571	-0.140555	0.8885
LOG(OIL(-1))	0.238644	0.161658	1.476228	0.1429
LOG(OIL(-2))	-0.503154	0.159816	-3.148340	0.0021
LOG(OIL(-3))	0.488814	0.164859	2.965051	0.0037
OPV	0.102910	0.033547	0.221625	0.0075
LOG(EXR)	0.291373	0.054652	5.331447	0.0000
LOG(CPI)	-0.349693	0.300534	-1.163575	0.2472
LOG(CPI(-1))	0.592721	0.292565	2.025943	0.0453
C	0.055996	2.209153	0.025347	0.9798
@TREND	-0.000677	0.005799	-0.116795	0.9072

R-squared	0.994570	Mean dependent var	12.07508
Adjusted R-squared	0.993795	S.D. dependent var	1.964074
S.E. of regression	0.154717	Akaike info criterion	-0.771803
Sum squared resid	2.513430	Schwarz criterion	-0.402111
Log likelihood	62.69405	Hannan-Quinn criter.	-0.621657
F-statistic	1282.224	Durbin-Watson stat	1.942217
Prob(F-statistic)	0.000000		

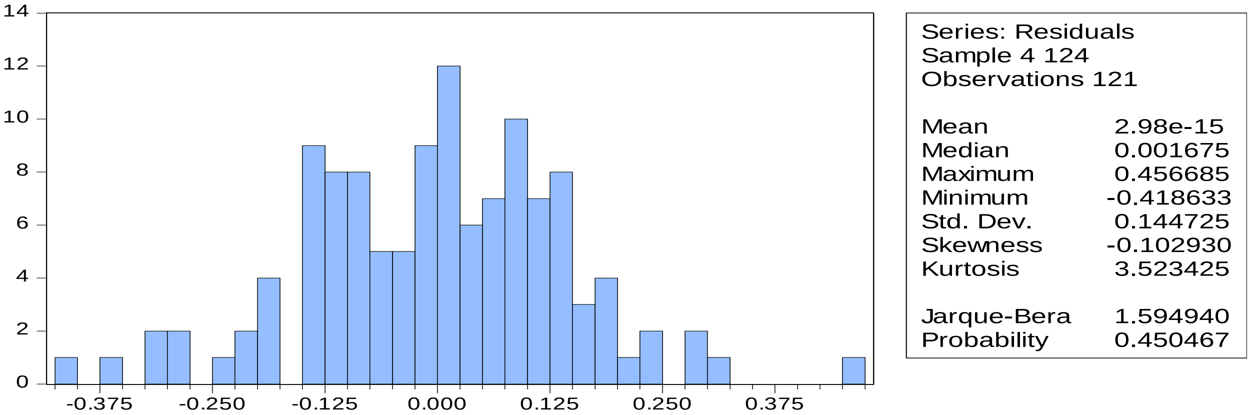
*Note: p-values and any subsequent tests do not account for model selection.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.268237	Prob. F(2,103)	0.7653
Obs*R-squared	0.626961	Prob. Chi-Square(2)	0.7309

Heteroskedasticity Test: ARCH

F-statistic	0.503056	Prob. F(2,116)	0.6060
Obs*R-squared	1.023258	Prob. Chi-Square(2)	0.5995



ARDL Bounds Test
Date: 02/20/17 Time: 07:07
Sample: 4 124
Included observations: 121
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	3.387779	8

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.34
5%	2.55	3.68
2.5%	2.82	4.02
1%	3.15	4.43

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(TGE)
Selected Model: ARDL(2, 0, 0, 3, 0, 0, 0, 0, 1)
Date: 02/20/17 Time: 07:08
Sample: 1 124
Included observations: 121

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(TGE(-1))	-0.256766	0.084754	-3.029560	0.0031
D(DR)	0.032413	0.047131	0.687716	0.4931
DLOG(NOIL)	0.276937	0.160136	1.729387	0.0867
DLOG(OIL)	-0.023272	0.165571	-0.140555	0.8885
DLOG(OIL(-1))	0.503154	0.159816	3.148340	0.0021
DLOG(OIL(-2))	-0.488814	0.164859	-2.965051	0.0037
D(OPV)	0.102910	0.033547	0.221625	0.0075
DLOG(EXR)	0.291373	0.054652	5.331447	0.0000
DLOG(CPI)	-0.349693	0.300534	-1.163575	0.2472
D(@TREND())	-0.000677	0.005799	-0.116795	0.9072
CointEq(-1)	-0.580823	0.095736	-6.066924	0.0000

Cointeq = LOG(TGE) - (0.0558*DR + 0.4768*LOG(NOIL) + 0.3461*LOG(OIL)
-13.8741*OPV + 0.5017*LOG(EXR) + 0.0002*TOP + 0.4184
LOG(CPI) + 0.0964 -0.0012@TREND)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DR	0.055805	0.081223	0.687053	0.4936
LOG(NOIL)	0.476801	0.274693	1.735757	0.0855
LOG(OIL)	0.346116	0.371076	0.932736	0.3531
OPV	-0.039574	0.177540	-0.222642	0.1404
LOG(EXR)	0.501656	0.076467	6.560386	0.0000
TOP	0.000247	0.000068	3.626962	0.0004
LOG(CPI)	0.418420	0.139848	2.991963	0.0035
C	0.096408	3.804651	0.025340	0.9798
@TREND	-0.001166	0.010016	-0.116426	0.9075

ASYMMETRY

Dependent Variable: LOG(TGE)
Method: ARDL
Date: 02/20/17 Time: 07:11
Sample (adjusted): 4 124
Included observations: 121 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): DR LOG(NOIL)

LOG(OIL) POPV
NOPV LOG(EER) LOG(CPI)
Fixed regressors: C @TREND
Number of models evalulated: 1562500
Selected Model: ARDL(2, 0, 0, 3, 0, 0, 0, 0, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(TGE(-1))	0.139012	0.090699	1.532667	0.1284
LOG(TGE(-2))	0.296142	0.084962	3.485599	0.0007
DR	0.029108	0.047142	0.617453	0.5383
LOG(NOIL)	0.333018	0.180338	1.846635	0.0676
LOG(OIL)	-0.074474	0.160302	-0.464587	0.6432
LOG(OIL(-1))	0.349396	0.144268	2.421855	0.0172
LOG(OIL(-2))	-0.611197	0.139599	-4.378232	0.0000
LOG(OIL(-3))	0.605967	0.152823	3.965164	0.0001
POPV	0.178146	0.024101	1.029196	0.0419
NOPV	-0.082805	0.086629	-0.955867	0.3413
LOG(EXR)	0.280682	0.052706	5.325381	0.0000
LOG(CPI)	-0.402493	0.304046	-1.323787	0.1884
LOG(CPI(-1))	0.632319	0.294700	2.145635	0.0342
C	-1.273910	2.655665	-0.479695	0.6324
@TREND	-0.001527	0.005889	-0.259323	0.7959

R-squared	0.994498	Mean dependent var	12.07508
Adjusted R-squared	0.993713	S.D. dependent var	1.964074
S.E. of regression	0.155738	Akaike info criterion	-0.758647
Sum squared resid	2.546713	Schwarz criterion	-0.388956
Log likelihood	61.89815	Hannan-Quinn criter.	-0.608501
F-statistic	1265.375	Durbin-Watson stat	1.931882
Prob(F-statistic)	0.000000		

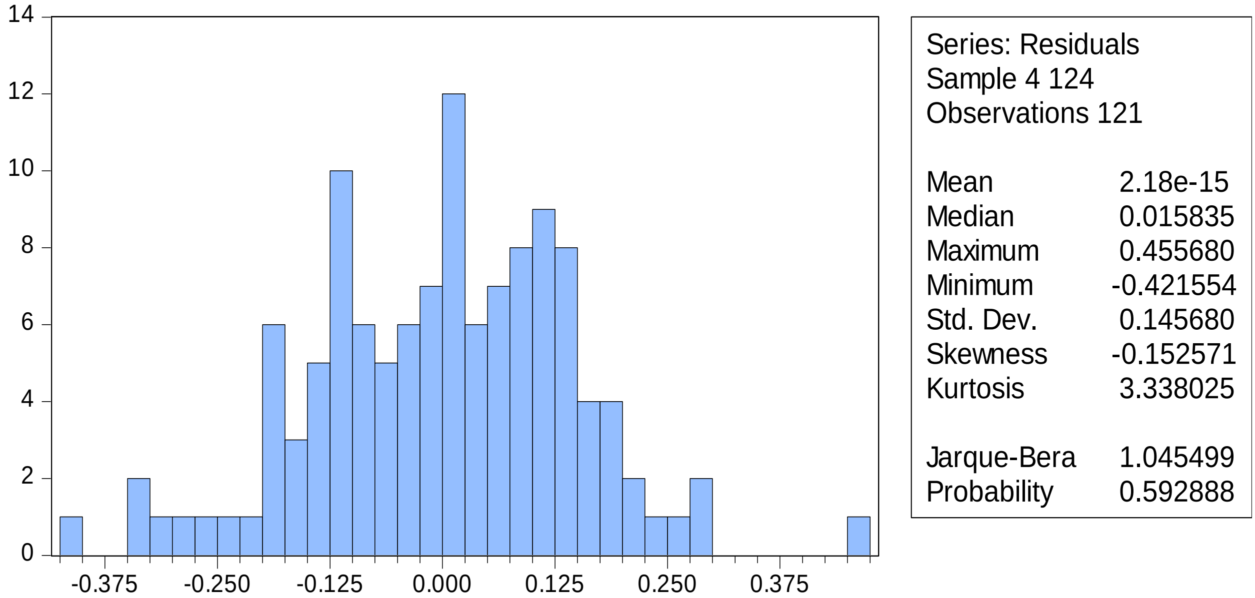
*Note: p-values and any subsequent tests do not account for model selection
.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.187924	Prob. F(2,103)	0.8290
Obs*R-squared	0.439924	Prob. Chi-Square(2)	0.8025

Heteroskedasticity Test: ARCH

F-statistic	0.282455	Prob. F(2,116)	0.7544
Obs*R-squared	0.576711	Prob. Chi-Square(2)	0.7495



ARDL Bounds Test
Date: 02/20/17 Time: 07:14
Sample: 4 124
Included observations: 121
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	3.101144	8

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.34
5%	2.55	3.68
2.5%	2.82	4.02
1%	3.15	4.43

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(TGE)
Selected Model: ARDL(2, 0, 0, 3, 0, 0, 0, 0, 1)
Date: 02/20/17 Time: 07:15
Sample: 1 124
Included observations: 121

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(TGE(-1))	-0.296142	0.084962	-3.485599	0.0007
D(DR)	0.029108	0.047142	0.617453	0.5383
DLOG(NOIL)	0.333018	0.180338	1.846635	0.0676
DLOG(OIL)	-0.074474	0.160302	-0.464587	0.6432
DLOG(OIL(-1))	0.611197	0.139599	4.378232	0.0000
DLOG(OIL(-2))	-0.605967	0.152823	-3.965164	0.0001
D(POPV)	0.178146	0.024101	1.029196	0.0419
D(NOPV)	-0.082805	0.086629	-0.955867	0.3413
DLOG(EXR)	0.280682	0.052706	5.325381	0.0000
DLOG(CPI)	-0.402493	0.304046	-1.323787	0.1884
D(@TREND())	-0.001527	0.005889	-0.259323	0.7959
CointEq(-1)	-0.564846	0.097118	-5.816083	0.0000

Cointeq = LOG(TGE) - (0.0515*DR + 0.5896*LOG(NOIL) + 0.4775*LOG(OIL)
-0.1383*POPV -0.1466*NOPV + 0.4969*LOG(EXR) + 0.4069
LOG(CPI) -2.2553 -0.0027@TREND)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DR	0.051533	0.083416	0.617786	0.5381
LOG(NOIL)	0.589573	0.329468	1.789471	0.0764
LOG(OIL)	0.477460	0.405196	1.178344	0.2413
POPV	-0.138349	0.154224	-0.897068	0.3717
NOPV	-0.146598	0.159342	-0.920020	0.3597
LOG(EXR)	0.496917	0.075946	6.543001	0.0000
LOG(CPI)	0.406883	0.143848	2.828564	0.0056
C	-2.255320	4.724889	-0.477328	0.6341
@TREND	-0.002703	0.010532	-0.256696	0.7979

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	0.513456	105	0.6087
F-statistic	0.263637	(1, 105)	0.6087
Chi-square	0.263637	1	0.6076

Null Hypothesis: C(9)=C(10)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(9) - C(10)	0.004659	0.009074

Restrictions are linear in coefficients.

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	0.504944	105	0.6147
F-statistic	0.254968	(1, 105)	0.6147
Chi-square	0.254968	1	0.6136

Null Hypothesis: C(9)/(1-C(1)-C(2))=C(10)/(1-C(1)-C(2))
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(9)/(1 - C(1) - C(2)) - C(10)/(1 - C(1) - C(2))	0.008249	0.016336

Delta method computed using analytic derivatives.

GCE: SYMMETRY

Dependent Variable: LOG(GCE)
Method: ARDL
Date: 02/20/17 Time: 07:22
Sample (adjusted): 3 124
Included observations: 122 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): DR LOG(NOIL) LOG(OIL)
OPV LOG(NER) LOG(CPI)
Fixed regressors: C @TREND
Number of models evalulated: 1562500
Selected Model: ARDL(1, 2, 0, 2, 0, 0, 0, 0, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(GCE(-1))	-0.307421	0.086373	-3.559202	0.0006
DR	-0.601454	0.581304	-1.034663	0.3032
DR(-1)	0.755968	0.770041	0.981724	0.3285
DR(-2)	1.420278	0.611258	2.323533	0.0221
LOG(NOIL)	1.486993	0.992901	1.497624	0.1372
LOG(OIL)	-0.510103	0.918184	-0.555557	0.5797
LOG(OIL(-1))	1.013515	0.919664	1.102049	0.2729
LOG(OIL(-2))	-3.584761	0.950217	-3.772571	0.0003
OPV	1.573024	0.672280	4.852359	0.0359
LOG(EXR)	0.388360	0.264632	1.467551	0.1452
LOG(CPI)	-4.754571	1.861383	-2.554322	0.0121
LOG(CPI(-1))	4.449115	1.786897	2.489856	0.0143
C	24.27826	14.32262	1.695099	0.0930
@TREND	-0.000718	0.037541	-0.019135	0.9848

R-squared	0.815378	Mean dependent var	9.768193
Adjusted R-squared	0.789252	S.D. dependent var	2.177819
S.E. of regression	0.999778	Akaike info criterion	2.959146
Sum squared resid	105.9529	Schwarz criterion	3.326886
Log likelihood	-164.5079	Hannan-Quinn criter.	3.108510
F-statistic	31.20969	Durbin-Watson stat	1.900738
Prob(F-statistic)	0.000000		

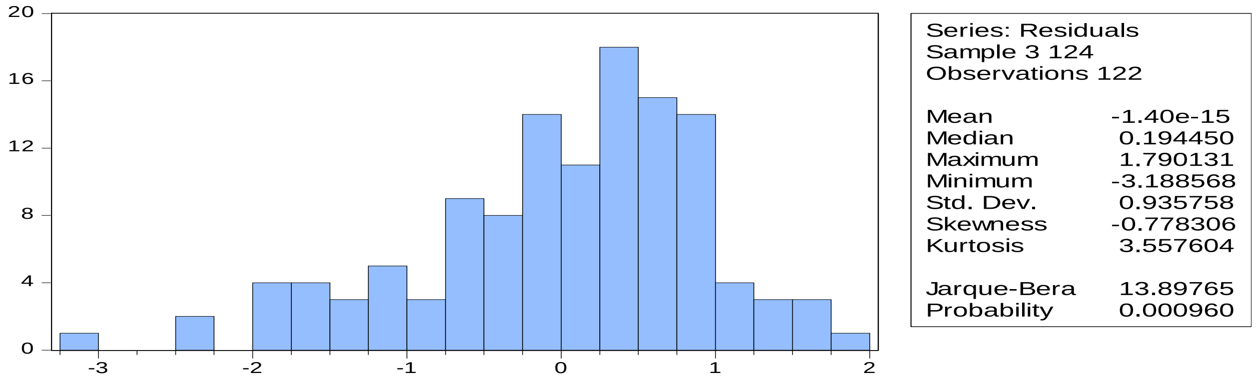
*Note: p-values and any subsequent tests do not account for model selection

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.716166	Prob. F(2,104)	0.4910
Obs*R-squared	1.657408	Prob. Chi-Square(2)	0.4366

Heteroskedasticity Test: ARCH

F-statistic	0.145289	Prob. F(2,117)	0.8649
Obs*R-squared	0.297291	Prob. Chi-Square(2)	0.8619



ARDL Bounds Test
Date: 02/20/17 Time: 07:29
Sample: 3 124
Included observations: 122
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	36.90188	8

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.34
5%	2.55	3.68
2.5%	2.82	4.02
1%	3.15	4.43

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(GCE)
Selected Model: ARDL(1, 2, 0, 2, 0, 0, 0, 0, 1)
Date: 02/20/17 Time: 07:29
Sample: 1 124

Included observations: 122

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DR)	-0.601454	0.581304	-1.034663	0.3032
D(DR(-1))	-1.420278	0.611258	-2.323533	0.0221
DLOG(NOIL)	1.486993	0.992901	1.497624	0.1372
DLOG(OIL)	-0.510103	0.918184	-0.555557	0.5797
DLOG(OIL(-1))	3.584761	0.950217	3.772571	0.0003
D(OPV)	1.573024	0.672280	4.852359	0.0359
DLOG(NER)	0.388360	0.264632	1.467551	0.1452
DLOG(CPI)	-4.754571	1.861383	-2.554322	0.0121
D(@TREND())	-0.000718	0.037541	-0.019135	0.9848
CointEq(-1)	-1.307421	0.086373	-15.136831	0.0000

Cointeq = LOG(GCE) - (1.2045*DR + 1.1373*LOG(NOIL) - 2.3568*LOG(OIL)
-0.4383*OPV+ 0.2970*LOG(NER) -0.2336
LOG(CPI) + 18.5696 -0.0005@TREND)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DR	1.204503	0.248159	4.853752	0.0000
LOG(NOIL)	1.137349	0.775457	1.466681	0.1454
LOG(OIL)	-2.356816	0.995405	-2.367696	0.0197
OPV	-0.438286	0.515190	-0.850726	0.3968
LOG(EXR)	0.297043	0.203857	1.457115	0.1480
TOP	0.000390	0.000193	2.024187	0.0455
LOG(CPI)	-0.233632	0.437319	-0.534237	0.5943
C	18.569584	10.939825	1.697430	0.0925
@TREND	-0.000549	0.028720	-0.019131	0.9848

GCE: ASSYMETRY

Dependent Variable: LOG(GCE)
Method: ARDL
Date: 02/20/17 Time: 07:31
Sample (adjusted): 3 124
Included observations: 122 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)

Dynamic regressors (4 lags, automatic): DR LOG(NOIL) LOG(OIL) POPV
NOPVLOG(EXR) LOG(CPI)
Fixed regressors: C @TREND
Number of models evalulated: 7812500
Selected Model: ARDL(1, 2, 0, 2, 0, 1, 0, 0, 0, 1)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(GCE(-1))	-0.336574	0.086331	-3.898645	0.0002
DR	-0.481096	0.561025	-0.857531	0.3931
DR(-1)	0.454656	0.757031	0.600577	0.5494
DR(-2)	1.655309	0.614001	2.695938	0.0082
LOG(NOIL)	1.759662	1.136947	1.547708	0.1247
LOG(OIL)	-0.307380	0.938237	-0.327614	0.7439
LOG(OIL(-1))	0.925283	0.902739	1.024972	0.3078
LOG(OIL(-2))	-3.683757	0.945978	-3.894126	0.0002
POPV	0.105124	0.005291	2.009810	0.0022
NOPV	0.051856	0.537301	0.096513	0.9233
NOPV(-1)	0.133145	0.057344	2.321879	0.0222
LOG(EXR)	0.468939	0.254882	1.839827	0.0686
TOP	0.000654	0.000374	1.748463	0.0833
LOG(CPI)	-5.356095	1.867888	-2.867461	0.0050
LOG(CPI(-1))	5.149940	1.795667	2.867981	0.0050
C	21.25142	16.83477	1.262353	0.2096
@TREND	-0.018234	0.037792	-0.482471	0.6305

R-squared	0.824415	Mean dependent var	9.768193
Adjusted R-squared	0.795714	S.D. dependent var	2.177819
S.E. of regression	0.984331	Akaike info criterion	2.941744
Sum squared resid	100.7665	Schwarz criterion	3.355452
Log likelihood	-161.4464	Hannan-Quinn criter.	3.109779
F-statistic	28.72388	Durbin-Watson stat	1.851542
Prob(F-statistic)	0.000000		

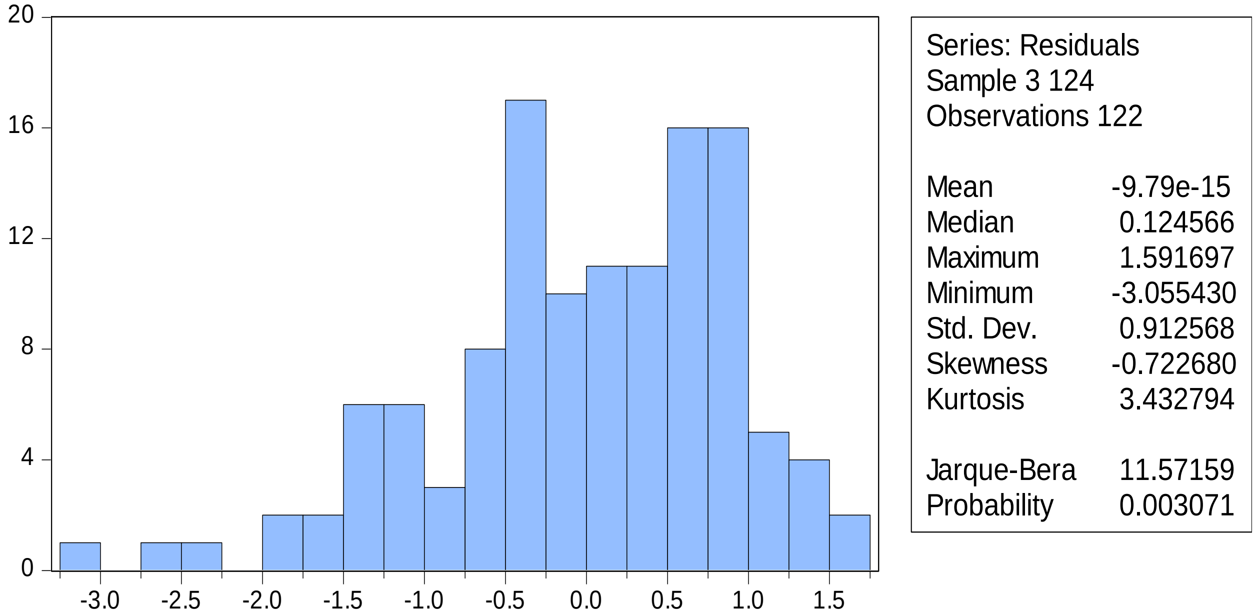
*Note: p-values and any subsequent tests do not account for model
selection.

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	1.430732	Prob. F(2,102)	0.2439
Obs*R-squared	3.329141	Prob. Chi-Square(2)	0.1893

Heteroskedasticity Test: ARCH

F-statistic	0.106626	Prob. F(2,117)	0.8989
Obs*R-squared	0.218322	Prob. Chi-Square(2)	0.8966



ARDL Bounds Test
Date: 02/20/17 Time: 07:33
Sample: 3 124
Included observations: 122
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	33.15533	9

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.16	3.24
5%	2.43	3.56
2.5%	2.67	3.87
1%	2.97	4.24

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(GCE)
Selected Model: ARDL(1, 2, 0, 2, 0, 1, 0, 0, 0, 1)
Date: 02/20/17 Time: 07:34

Sample: 1 124
Included observations: 122

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(DR)	-0.481096	0.561025	-0.857531	0.3931
D(DR(-1))	-1.655309	0.614001	-2.695938	0.0082
DLOG(NOIL)	1.759662	1.136947	1.547708	0.1247
DLOG(OIL)	-0.307380	0.938237	-0.327614	0.7439
DLOG(OIL(-1))	3.683757	0.945978	3.894126	0.0002
D(POPV)	0.005124	0.522291	0.009810	0.9922
D(NOPV)	0.051856	0.537301	0.096513	0.9233
DLOG(EXR)	0.468939	0.254882	1.839827	0.0686
DLOG(CPI)	-5.356095	1.867888	-2.867461	0.0050
D(@TREND())	-0.018234	0.037792	-0.482471	0.6305
CointEq(-1)	-1.336574	0.086331	-15.481976	0.0000

Cointeq = LOG(GCE) - (1.2187*DR + 1.3165*LOG(NOIL) - 2.2938*LOG(OIL)
+ 0.0038*POPV + 0.1384*NOPV+ 0.3509*LOG(NER)
-0.1542*LOG(CPI) + 15.8999 -0.0136*@TREND)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DR	1.218690	0.238964	5.099879	0.0000
LOG(NOIL)	1.316547	0.861021	1.529053	0.1293
LOG(OIL)	-2.293816	1.030404	-2.226132	0.0282
POPV	0.003834	0.390793	0.009810	0.9922
NOPV	0.138415	0.409928	0.337657	0.7363
LOG(NER)	0.350852	0.192094	1.826455	0.0707
LOG(CPI)	-0.154241	0.425194	-0.362755	0.7175
C	15.899923	12.644081	1.257499	0.2114
@TREND	-0.013642	0.028392	-0.480489	0.6319

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-2.185614	104	0.0311

F-statistic	4.776910	(1, 104)	0.0311
Chi-square	4.776910	1	0.0288

Null Hypothesis: C(9)=C(10)+C(11)
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(9) - C(10) - C(11)	-0.179878	0.082301

Restrictions are linear in coefficients.

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	-0.157193	104	0.8754
F-statistic	0.024710	(1, 104)	0.8754
Chi-square	0.024710	1	0.8751

Null Hypothesis: C(9)/(1-C(1))=C(10)+C(10)/(1-C(1))
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(9)/(1 - C(1)) - C(10) - C(10)/(1 - C(1))	-0.086821	0.552321

Delta method computed using analytic derivatives.

GRE: SYMMETRY

Dependent Variable: LOG(GRE)
Method: ARDL
Date: 02/20/17 Time: 07:40
Sample (adjusted): 3 124
Included observations: 122 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): DR LOG(NOIL) LOG(OIL) OPV
LOG(EXR) LOG(CPI)
Fixed regressors: C @TREND

Number of models evalulated: 1562500
Selected Model: ARDL(2, 0, 0, 0, 0, 0, 0, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(GRE(-1))	1.196402	0.087414	13.68657	0.0000
LOG(GRE(-2))	-0.387796	0.080228	-4.833682	0.0000
DR	0.004215	0.019857	0.212291	0.8323
LOG(NOIL)	0.100741	0.071324	1.412436	0.1606
LOG(OIL)	0.035829	0.060046	0.596694	0.5519
OPV	2.004548	0.145799	7.972688	0.0028
LOG(EXR)	0.112060	0.026171	4.281866	0.0000
LOG(CPI)	0.047343	0.039121	1.210156	0.2288
C	0.114280	0.755893	0.151186	0.8801
@TREND	0.001229	0.002534	0.485236	0.6285

R-squared	0.998932	Mean dependent var	11.83789
Adjusted R-squared	0.998825	S.D. dependent var	2.046591
S.E. of regression	0.070157	Akaike info criterion	-2.382971
Sum squared resid	0.541427	Schwarz criterion	-2.107165
Log likelihood	157.3612	Hannan-Quinn criter.	-2.270947
F-statistic	9350.694	Durbin-Watson stat	2.070233
Prob(F-statistic)	0.000000		

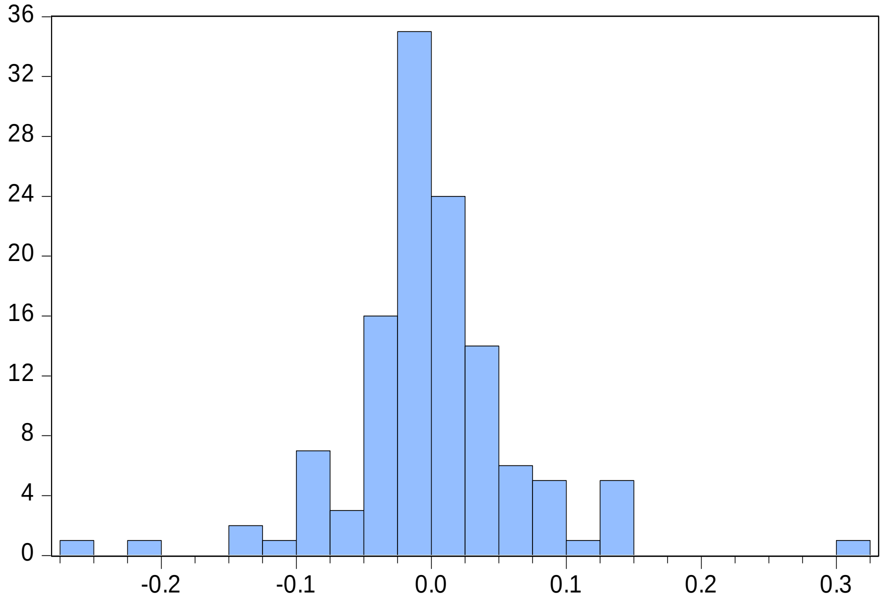
*Note: p-values and any subsequent tests do not account for model selection

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.629095	Prob. F(2,108)	0.5350
Obs*R-squared	1.404921	Prob. Chi-Square(2)	0.4954

Heteroskedasticity Test: ARCH

F-statistic	0.164671	Prob. F(2,117)	0.8484
Obs*R-squared	0.336839	Prob. Chi-Square(2)	0.8450



Series: Residuals
Sample 3 124
Observations 122

Mean	-1.61e-16
Median	-0.005555
Maximum	0.324181
Minimum	-0.254188
Std. Dev.	0.066892
Skewness	0.374411
Kurtosis	8.577336
Jarque-Bera	160.9760
Probability	0.000000

ARDL Bounds Test
Date: 02/20/17 Time: 07:43
Sample: 3 124
Included observations: 122
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	1.911235	8

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.26	3.34
5%	2.55	3.68
2.5%	2.82	4.02
1%	3.15	4.43

GRE: ASYMMETRY
Dependent Variable: LOG(GRE)
Method: ARDL
Date: 02/20/17 Time: 07:45
Sample (adjusted): 3 124
Included observations: 122 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): DR LOG(NOIL)

LOG(OIL) POPV
NOPVLOG(EXR) LOG(CPI)
Fixed regressors: C @TREND
Number of models evalulated: 7812500
Selected Model: ARDL(2, 0, 0, 0, 0, 0, 0, 0, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(GRE(-1))	1.194104	0.087902	13.58450	0.0000
LOG(GRE(-2))	-0.387073	0.080544	-4.805726	0.0000
DR	0.004256	0.019931	0.213529	0.8313
LOG(NOIL)	0.102010	0.071650	1.423720	0.1574
LOG(OIL)	0.035018	0.060299	0.580738	0.5626
POPV	0.027332	0.060924	0.448627	0.6546
NOPV	-0.002229	0.005177	-0.430605	0.6676
LOG(EXR)	0.113187	0.026398	4.287656	0.0000
LOG(CPI)	0.047412	0.039267	1.207419	0.2299
C	0.123536	0.759012	0.162759	0.8710
@TREND	0.001256	0.002544	0.493603	0.6226

R-squared	0.998934	Mean dependent var	11.83789
Adjusted R-squared	0.998816	S.D. dependent var	2.046591
S.E. of regression	0.070419	Akaike info criterion	-2.368277
Sum squared resid	0.540507	Schwarz criterion	-2.069488
Log likelihood	157.4649	Hannan-Quinn criter.	-2.246918
F-statistic	8508.011	Durbin-Watson stat	2.077174
Prob(F-statistic)	0.000000		

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

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.653813	Prob. F(2,107)	0.5221
Obs*R-squared	1.472937	Prob. Chi-Square(2)	0.4788

Heteroskedasticity Test: ARCH

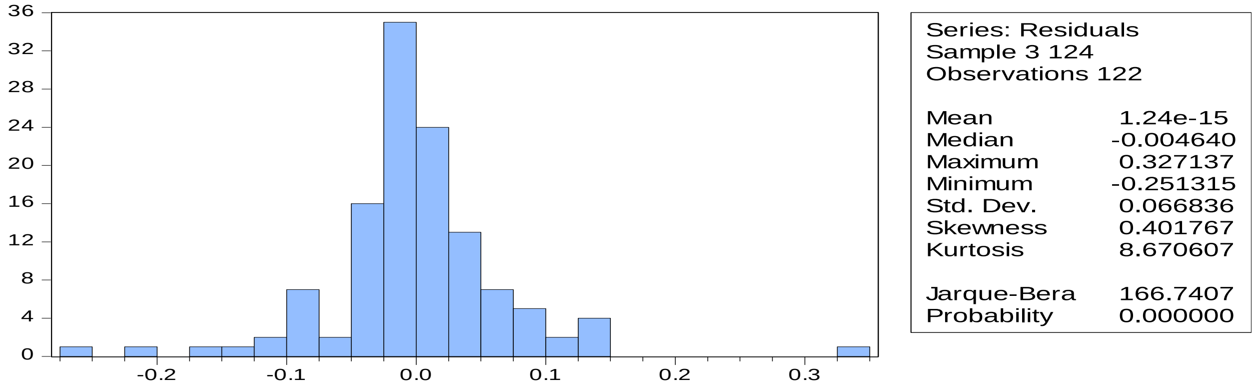
F-statistic	0.162071	Prob. F(2,117)	0.8506
Obs*R-squared	0.331535	Prob. Chi-Square(2)	0.8472

ARDL Bounds Test
Date: 02/20/17 Time: 07:50
Sample: 3 124
Included observations: 122
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	1.713864	9

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.16	3.24
5%	2.43	3.56
2.5%	2.67	3.87
1%	2.97	4.24



Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
t-statistic	0.512688	109	0.6092
F-statistic	0.262849	(1, 109)	0.6092
Chi-square	0.262849	1	0.6082

Null Hypothesis: C(6)=C(7)
Null Hypothesis Summary:

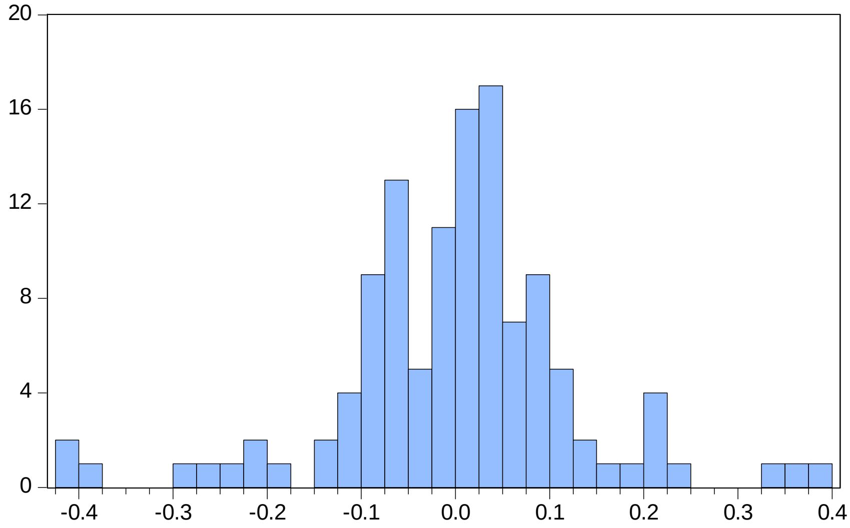
Normalized Restriction (= 0)	Value	Std. Err.
C(6) - C(7)	0.029561	0.057659

PTR SYMMETRIC
Dependent Variable: LOG(PTR)
Method: ARDL
Date: 07/08/17 Time: 19:29
Sample (adjusted): 6/01/1986 12/01/2015
Included observations: 119 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): DR LOG(OIL) LOG(NOIL) OPS
LOG(NER) LOG(CPI)
Fixed regressors: C @TREND
Number of models evalulated: 62500
Selected Model: ARDL(2, 0, 0, 0, 4, 0, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(PTR(-1))	1.456164	0.073619	19.77985	0.0000
LOG(PTR(-2))	-0.522772	0.076457	-6.837508	0.0000
DR	0.010131	0.039185	0.258556	0.7965
LOG(OIL)	-0.092770	0.113603	-0.816614	0.4160
LOG(NOIL)	0.119794	0.135660	0.883044	0.3792
OPS	-0.061651	0.094655	-0.651330	0.5163
OPS(-1)	-0.053668	0.093809	-0.572098	0.5685
OPS(-2)	0.285247	0.098395	2.898997	0.0046
OPS(-3)	-0.040644	0.093369	-0.435305	0.6642
OPS(-4)	0.472875	0.091493	5.168427	0.0000
LOG(NER)	0.094240	0.041551	2.268061	0.0254
LOG(CPI)	-0.016302	0.070525	-0.231148	0.8176
C	0.159211	1.477052	0.107790	0.9144
@TREND	-0.001131	0.004427	-0.255468	0.7989

R-squared	0.996377	Mean dependent var	12.25785
Adjusted R-squared	0.995928	S.D. dependent var	2.144025
S.E. of regression	0.136813	Akaike info criterion	-1.030279
Sum squared resid	1.965357	Schwarz criterion	-0.703323
Log likelihood	75.30158	Hannan-Quinn criter.	-0.897512
F-statistic	2221.108	Durbin-Watson stat	2.349444
Prob(F-statistic)	0.000000		

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



Series: Residuals	
Sample 6/01/1986 12/01/2015	
Observations 119	
Mean	-1.80e-15
Median	0.011735
Maximum	0.381670
Minimum	-0.408193
Std. Dev.	0.129056
Skewness	-0.298539
Kurtosis	5.263811
Jarque-Bera	27.17833
Probability	0.000001

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	5.093748	Prob. F(2,103)	0.0078
Obs*R-squared	10.71065	Prob. Chi-Square(2)	0.0047

Heteroskedasticity Test: ARCH

F-statistic	1.221190	Prob. F(2,114)	0.2987
Obs*R-squared	2.454077	Prob. Chi-Square(2)	0.2932

ARDL Bounds Test
Date: 07/08/17 Time: 19:36
Sample: 6/01/1986 12/01/2015
Included observations: 119
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	4.609078	6

Critical Value Bounds

Significance	I0 Bound	I1 Bound
10%	2.53	3.59
5%	2.87	4
2.5%	3.19	4.38
1%	3.6	4.9

ARDL Cointegrating And Long Run Form
Dependent Variable: LOG(PTR)
Selected Model: ARDL(2, 0, 0, 0, 4, 0, 0)
Date: 07/08/17 Time: 19:37
Sample: 3/01/1985 12/01/2015
Included observations: 119

Cointegrating Form

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DLOG(PTR(-1))	0.522772	0.076457	6.837508	0.0000
D(DR)	0.010131	0.039185	0.258556	0.7965
DLOG(OIL)	0.092770	0.113603	-0.816614	0.4160
DLOG(NOIL)	0.119794	0.135660	0.883044	0.3792
D(OPS)	0.285247	0.098395	2.898997	0.0046
D(OPS(-1))	0.040644	0.093369	0.435305	0.6642
D(OPS(-2))	-0.472875	0.091493	-5.168427	0.0000
DLOG(NER)	0.094240	0.041551	2.268061	0.0254
DLOG(CPI)	-0.016302	0.070525	-0.231148	0.8176
D(@TREND())	-0.001131	0.004427	-0.255468	0.7989
CointEq(-1)	-0.066608	0.027254	-2.444015	0.0162

Cointeq = LOG(PTR) - (0.1521*DR -1.3928*LOG(OIL) + 1.7985*LOG(NOIL)
+ 9.0403*OPS + 1.4148*LOG(NER) -0.2447*LOG(CPI) + 2.3903 -0.0170
*@TREND)

Long Run Coefficients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
DR	0.152104	0.588464	0.258477	0.7965
LOG(OIL)	1.392768	1.828288	0.761788	0.4479
LOG(NOIL)	1.798485	1.960595	0.917316	0.3611
OPS	9.040288	5.126994	1.763272	0.0808
LOG(NER)	1.414836	0.692898	2.041910	0.0437
LOG(CPI)	-0.244739	1.067168	-0.229335	0.8191

C	2.390259	22.362065	0.106889	0.9151
@TREND	-0.016979	0.067320	-0.252207	0.8014

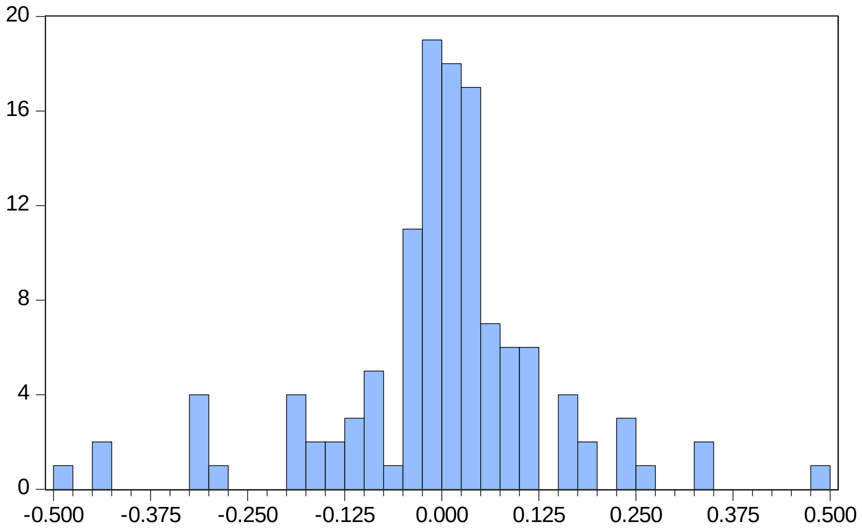
PTR ASYMMETRIC

Dependent Variable: LOG(PTR)
Method: ARDL
Date: 07/08/17 Time: 19:46
Sample (adjusted): 9/01/1985 12/01/2015
Included observations: 122 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Schwarz criterion (SIC)
Dynamic regressors (4 lags, automatic): DR LOG(NOIL) LOG(OIL) OPVP
OPVN LOG(NER) LOG(CPI)
Fixed regressors: C @TREND
Number of models evalulated: 312500
Selected Model: ARDL(2, 0, 0, 1, 0, 0, 0, 0)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LOG(PTR(-1))	1.499813	0.079840	18.78514	0.0000
DR	0.005635	0.042189	0.133555	0.8940
LOG(NOIL)	0.053482	0.144985	0.368880	0.7129
LOG(OIL)	0.273671	0.119101	2.297801	0.0235
OPSP	0.923270	1.332597	0.692835	0.4899
OPSN	-0.089307	1.726356	-0.051732	0.9588
LOG(NER)	0.054551	0.037136	1.468967	0.1447
LOG(CPI)	-0.029298	0.079561	-0.368241	0.7134
C	-2.264931	1.815267	-1.247712	0.2148
@TREND	0.001333	0.004786	0.278629	0.7811

R-squared	0.995670	Mean dependent var	12.16853
Adjusted R-squared	0.995237	S.D. dependent var	2.191417
S.E. of regression	0.151237	Akaike info criterion	-0.846754
Sum squared resid	2.515996	Schwarz criterion	-0.570948
Log likelihood	63.65198	Hannan-Quinn criter.	-0.734730
F-statistic	2299.539	Durbin-Watson stat	2.204294
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selction



Series: Residuals
Sample 9/01/1985 12/01/2015
Observations 122

Mean	5.77e-15
Median	0.005213
Maximum	0.496098
Minimum	-0.492072
Std. Dev.	0.144199
Skewness	-0.504701
Kurtosis	5.699585
Jarque-Bera	42.22548
Probability	0.000000

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	2.939509	Prob. F(2,108)	0.0571
Obs*R-squared	6.298265	Prob. Chi-Square(2)	0.0429

Heteroskedasticity Test: ARCH

F-statistic	1.498129	Prob. F(2,117)	0.2278
Obs*R-squared	2.996352	Prob. Chi-Square(2)	0.2235

ARDL Bounds Test
Date: 07/08/17 Time: 19:49
Sample: 9/01/1985 12/01/2015
Included observations: 122
Null Hypothesis: No long-run relationships exist

Test Statistic	Value	k
F-statistic	2.014377	7

Wald Test:
Equation: Untitled

Test Statistic	Value	df	Probability
F-statistic	0.639813	(2, 110)	0.5293
Chi-square	1.279625	2	0.5274

Null Hypothesis: C(7)=C(8)=0
Null Hypothesis Summary:

Normalized Restriction (= 0)	Value	Std. Err.
C(7)	0.923270	1.332597
C(8)	-0.089307	1.726356

Restrictions are linear in coefficients.