OIL AND EXCHANGE RATE IN NIGERIA: A CASE OF DUTCH DISEASE

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by

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ABSTRACT

Dutch Disease occurs when a country discovers a substantial natural resource deposit and begins a large-scale exportation of it. As a result, the country's currency appreciates, thereby reducing the competitiveness of the country's traditional export sector. Therefore, this tradable goods sector should contract, leading to structural changes in the economy. This study examines whether Dutch Disease is present in Nigeria in the light of the rejection of the Dutch Disease thesis in other studies on Nigeria. The study assesses the impact of expanding oil revenues on non-oil sectors of the Nigerian economy, taking the agricultural sector as the non-tradable sector. It produces some empirical evidence for the contraction of Nigerian agriculture in the past five decades or more and it demonstrates that the changes in the direction of the Nigerian economy in general was in part a direct consequence of the increase in oil revenue which pushed up the exchange rate and made agricultural product uncompetitive for export. The study uses annual time series data sourced from official sources from 1960 to 2009. The study covers both fixed and post fixed exchange rate system in Nigeria, grouped into three phases. The data are analyzed through the use of vector autoregressive (VAR) modelling consisting of impulse response functions and variance decomposition analyses. The study diagnoses Dutch Disease and concludes that the contraction of the agricultural sector in Nigeria was a result of the sudden windfall from oil. Finally, the paper discusses several policy implications.

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DEDICATION

To:

THE ALMIGHTY GOD: the beginning and the end of all things, the rock of ages, the pillar that holds my life, the unchangeable changer, a shelter in the time of storm, a helper in the time of trouble, your LOVE, CARE and SUSTAINANCE throughout my academic careers in this University has put another new song in my mouth.

PROF OLAYIWOLA OLUWAJENYO FASORANTI: thank you for being a true father.

PROF NAZEEM OLUFEMI MIMIKO**:** thank you for given me this opportunity.

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LIST OF ACRONYMS

ADF	Augmented Dickey Fuller
AGRICGDP	Share of Agriculture to GDP
CBN	Central Bank of Nigeria
DD	Dutch Disease
ECM	Error Correction Model
ECT	Error Correction Term
E-G	Engle-Granger
GBP	British Pound Sterling
GDP	Gross Domestic Product
IMF	International Monetary Fund
IRF	Impulse Response Function
LDC	Less Developed Countries
MS	Money Supply as share of GDP
mtoe	million tonnes of oil equivalent
NNOC	Nigerian National Oil Corporation
NNPC	Nigerian National Petroleum Corporation
OPEC	Organization of the Petroleum Exporting Countries
PC	Per Capita Income
PON	Price of Oil
PP	Philip Perron
RER	Real Exchange Rate
RGDP	Real GDP
SAP	Structural Adjustment Programme
SFEM	Second-Tier Foreign Exchange Market
SVAR	Structural Vector Autoregressive
VAR	Vector Autoregressive
VEC	Vector Error Correction
VECM	Vector Error Correction Modelling
VOL	Quantity of oil produced

CHAPTER 1: INTRODUCTION

1.1 Background to the Study

This research work examines whether or not Nigeria made the most of the opportunities presented by being the largest oil producing country in sub-Saharan Africa. The discovery of oil in commercial quantity in the mid-1950s, coupled with the oil-boom resulting from the Arab oil embargo on the USA in 1973, has been observed to be the major factor responsible for the contraction in the agricultural sector in Nigeria. The author sees this as a demonstration of Dutch Disease (DD) at work in Nigeria.

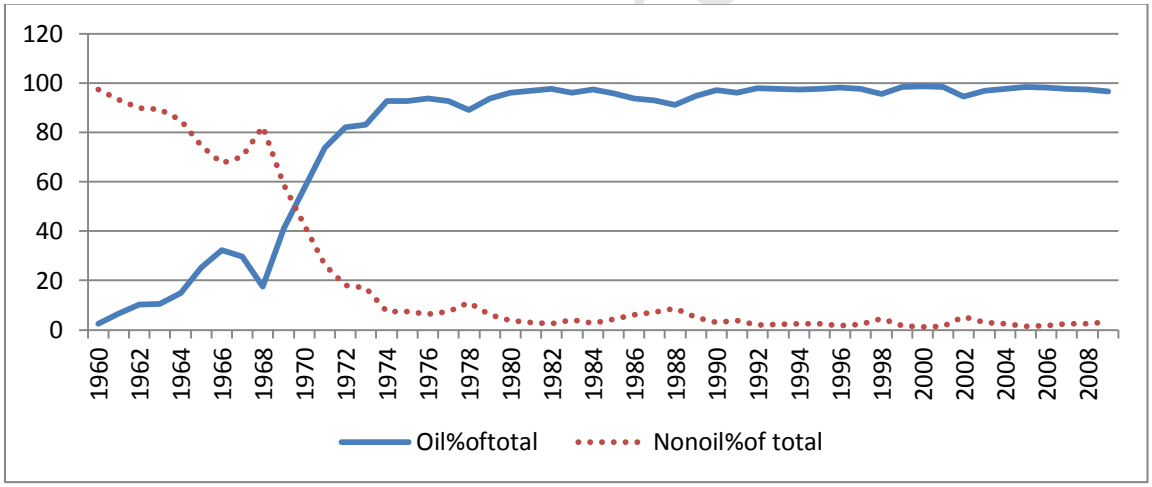
Nigeria is mostly known for its oil and gas wealth. However, it is rich in many other resources such as lead, zinc, kaolin, gold, topaz, sapphire, aquamarine, and rock salt. At the beginning the 1960s, Nigeria was the world's major producer of groundnut, the second biggest producer of cocoa and palm crop, and a key producer of rubber, cotton, and hides and skin. Over 90 percent of the Nigeria's overall export earnings were derived from the primary sector prior to the 1970s. At independence, the country's GDP, valued at 1977 constant prices, amounted to N11369.5 million, the equivalent of N220 (US$341.5) per head. Agriculture accounted for 56 percent of GDP while Transport and Communication, the second largest sector, contributed about 5 percent. Mining, including Petroleum, contributed 4 percent, construction accounted for 3 percent and manufacturing accounted for 2 percent. In the beginning of the second decade of independence, the percentage of agriculture to the growth of the economy was 48.23 percent but by the middle of the decade it had fallen to about 21 percent. The percentage of agriculture to total exports was 20.7 percent in the beginning of the second decade of independence but declined to 5.71 percent in the middle of the decade. Farming products were the leading export component and the prime activity in the early years of independence, but had declined dramatically within three decades.

The oil price revolution of 1973 suddenly changed the balance of political and economic power in the world and gave power to the relatively small number of countries that had reserves of oil –many of the Third World countries. These countries suddenly saw themselves as having found a short-cut to the Golden Era. However, while this represented a great problem to oil importing countries of the west, the oil producing countries themselves welcomed the sudden rise in their material fortunes. Among the Organization of the Petroleum Exporting Countries (OPEC) that welcomed

this sudden change in their fortune was Nigeria. Between 1958, the year Nigeria first exported crude oil, and 1973, Nigeria earned over N5 bn from petroleum exports; but in the next ten years it earned over N70 bn.

As the oil revenue started to flow it should have immediately started to raise the standard of living for Nigerians. Unfortunately, successive governments pursued policies that have reduced the beneficial impact oil should have had on the economy and society of Nigeria and have created undesirable consequences for the long-term development of her political economy. The most direct result of this impact has been its devastating effect on the traditional tradable sector, agriculture. Nigerian economy became deeply dependent on oil, especially for exports. From 1974 up till the year under review in this study, the percentage of crude oil exports as share of total export earnings was never below 90 percent. In fact, the only year between 1992 and 2009 that it fell below 95 percent was in 2002, when it stood at 94.6 percent of total export earnings (CBN, 2009). In addition, we can see from Figure 1.1 below that the traditional agricultural sector has been declining relative to oil while the oil sub-sector has been growing.

Figure 1.1: Oil Exports and Agricultural Exports 1960 – 2009



From Figure 1.1 above, it can be seen that the agricultural sector was hard hit as its contribution to export earnings fell from about 99 percent in 1960 to less than 2 percent in 2009. From the 1970s, oil started to play an ever more important role in exports, though agricultural exports continued to increase. But from 1973 onwards the volume of agricultural exports started to decline in absolute terms. By the mid-1970s most agricultural produce such as palm oil, cotton, groundnuts, etc. had

virtually disappeared from the export scene. Agricultural exports had been completely displaced from the prominence they had occupied at the time of Independence. While other factors may partly be blamed for their disappearance, the author sees this as an effect of Nigerian petroleum policy.

It all started in 1958 when Shell-BP discovered oil at Oloibiri and Afam in the Eastern part of Nigeria. It was then thought by most experts that Nigeria had at last found a huge resource with which to initiate industrial expansion and to provide additional resources to agriculture, which had been the cornerstone of the economy. It was also thought that petroleum would transform the Nigerian balance sheet and her entire economy, and hence provide a short cut to economic development. Within a few years of the discovery, oil revenues started to flow in and the consequences of increased earnings from oil are what this thesis sets out to explore.

As people tried to profit from the oil dividends, rural-urban migration increased and this led to a decline in production of agricultural products for exports. Since 1974, Nigeria came to be a net importer of basic items, and food products became a problem. Foreign exchange earnings were used in purchasing food imports even when the prices of foodstuff remained high. The different policies that government embarked on could not reverse the deteriorating food situation (for example, Obasanjo-Operation Feed the Nation). The Nigerian government developed a pro-agriculture policy with provision of aid to farmer and creation of commodity panels for different kinds of farming and commodity products. There was an increase in the GDP growth rate to 10.5 percent in 1976 but inflation rose as a result of the upsurge in government expenditure to 23 percent. Between 1976 and 1977 inflation fell to 16 percent but rose to about 72 percent in 1995. These conditions begin to look more like 'Dutch Disease', which is a process of re-allocating resource from tradable sectors to non-tradable sector when there is real exchange rate appreciation. A clearer representation of the Nigerian economy can be demonstrated by dividing history into 3 phases (see Figures 1.2 and 1.3).

Figure 1.2: Real Exchange Rate in Nigeria 1960–2009

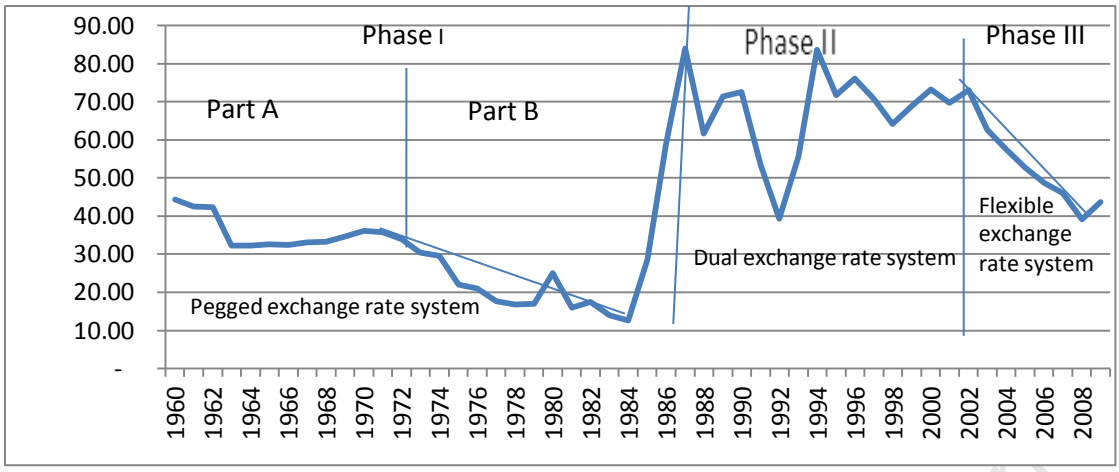
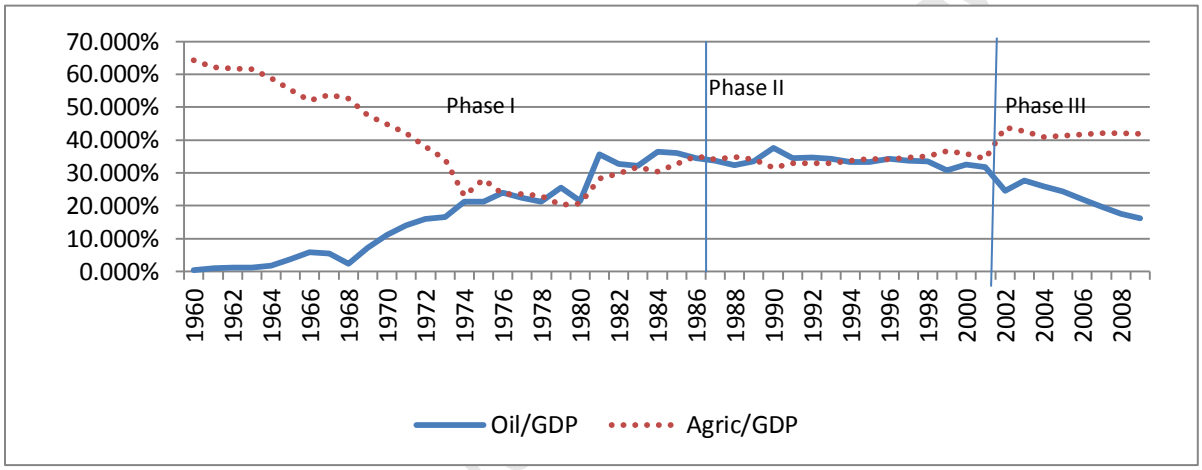


Figure 1.3: Oil and Agriculture as percentage of GDP 1960–2009



Phase I (1970–1984/5) is the period of a pegged exchange rate when the RER appreciation from oil began. This is when oil export earnings were an increasing share of the Real GDP (RGDP) and agriculture was decreasing contribution to the RGDP. Phase II (1985/6–2000) is a period of transition owing to official fixed exchange rate regime but with a strong and large parallel exchange market in addition. During this time, the RER depreciated, oil dominated export earnings and was rising as a share of RGDP. The direction of the economy changed in 1985/6 as it marked the beginning of real exchange rate depreciation in the presence of contracted agricultural sector. This has been greatly attributed to the currency devaluation of the IMF Structural Adjustment Program (SAP) and the successive military regimes. Phase III (2001–2009) is the period of floated exchange rate where the parallel market began to disappear. During this period, the RER appreciated with oil dominating the export earnings but declining as a share of RGDP, while

agriculture increased its contribution to GDP. The agriculture sector as a percentage of GDP fell from its high base of about 64.3 percent in 1960 to about 20.2 percent in 1979 and rose from about 30.5 percent in 1984 to about 41.8 percent in 2009. However, the oil sector contribution to RGDP rose from less than 1.0 percent in 1960 to about 25.5 percent in 1979 and fell from about 36.5 percent in 1984 to about 16.2 percent in 2009. (Figure 1.3)

The above picture of the Nigerian economy suggests the DD, whereas some other studies have claimed that Nigeria had not experienced the Dutch Disease (see section 2.2). Phase I illustrates an increasing oil output (figure 1.3), real appreciation of exchange rate (figure 1.2) and a contracting agriculture (figure 1.3). Phase III illustrates a decreasing oil output (figure 1.3), real appreciation of exchange rate (figure 1.2) and expansion of agriculture (figure 1.3).

This research work is structured into five chapters as follows: Chapter 2 discusses theoretical and empirical literature review. Chapter 3 contains assessment of Nigerian economic history. Chapter 4 examines the model and methodology. Chapter 5 focuses on empirical results and conclusion.

1.2 Statement of the Problem

The term "Dutch Disease" was first used to depict the fear of death of manufacturing in the Netherland economy when natural gas was discovered in the 1960s. It is generally an upward shift in the resource sector, which may come through an increase in resource prices or through the discovery of a large resource stock available with little cost. Thus, large export potential is possible at low cost for a prolonged period of time, which results in a large increase in resource revenue.

A typical example of DD is an economy whose original exports were tradable agricultural goods, but shift to export of booming sector, which consequently leads to a real exchange rate appreciation and the extinction of the original agricultural exporting sector. The total spending on the non-tradable sector increases if its supply is not perfectly elastic and then there is appreciation in the price of tradables if tradables remain unchanged as a result of this. It can create a serious case of de-industrialization or de-agriculturization. In general, it is a process of re-allocating resources from tradable sectors to non-tradable sectors in the presence of real exchange rate appreciation.

What happened in Nigeria resulted from a combination of economic and non-economic factors. The economic factors relate to the underlying fundamentals, to inappropriate economic policies and

planning, while the non-economic factors have more to do with mismanagement of public funds. This study addresses both of these factors from the context of the DD syndrome.

On the economic front, the petroleum export sector led to the creation of a dual economy by giving rise to a new enclave that was only loosely tied into the rest of the economy but created a very large financial surplus. The expansion of Nigeria's petroleum exports also drained resources from other parts of the economy. The oil sector generated an appreciated exchange rate that culminated in a decline in the competitiveness of non-oil exports and of import-competing industries. It also brought about a rise in urbanization to the new oil centres.

Employment increased in non-tradable industries such as construction, internal trade and other private services, and decreased in export industries such as metals, pulp and paper and in import-competing industries such as textiles and clothing. Consumption of domestically produced goods declined, as did agricultural employment and output.

The appreciation in the real exchange rate caused Nigeria to become an ever larger importer of food, where previously it had been largely self-sufficient. It also led to a large increase in imports of industrial goods, thus compounding the negative aspects of the scenario. Nigeria became the "Mecca of the salesmen of the industrial world" (Stevens, 1982). Rice imports rose dramatically from 35 thousand metric tons to 7 million and then 313 million tons in1970, 1975 and 1983 respectively. Wheat, maize and vegetable oil imports also increased dramatically. The dependence of Nigeria on externally produced staples grew markedly after 1972. As Nigerian agriculture stagnated, previous self-sufficiency gave way to ever increasing imports of food, as the payment for imported food was no problem, because of increased oil revenue and a highly valued currency it engendered. The high valued naira was consumer-biased as it apparently became cheaper to import food than to grow it. In any case, cheap imports depressed local food production, and the low prices offered by the marketing Boards had all but quashed export commodity production.

With too many imports and virtually a single export item, petroleum, Nigeria started to develop a current account balance of payments deficit in 1982 (period of recession in the oil market). As imports continued unabated, Nigeria incurred more and more foreign debt. In order to remedy the current account deficit, import controls were instituted which precipitated a black market economy as there was a fixed exchange rate system at the time. One theme of this study is to identify the

squeeze on the non-oil tradable sector of the Nigerian economy since the early 1970s, brought about by the combination of real appreciation of naira and continuous neglect of the rural sector. We call this the "Dutch Disease" syndrome. Our aim is to provide a theoretical and empirical framework for analysing this type of phenomenon.

With exchange rate appreciation, the drive towards industrialization became impossible due to the cheap importation of manufactured products. In addition to this, Nigerian factories could not thrive, owing to inadequate infrastructure facilities such as provision of electricity, which was never there and consequently drove foreign investors away; weak transportation, which continually impeded economic activities even local ones; water supplies that obstructed people's standard of living; telecommunications which was in decline for so many years and human resources development, where free education meant free diversion of funds to private pockets. The national cake was eaten, and many unguided and unhealthy economic policies and social structures were implemented.

A resource boom is not always permanent but may be depletable, thus, if the resource is to be short lived or non-dependable in the long-run, there is a need for diversification into a more broadly based and sustainable economic development. Given the structure of the Nigerian economy, is an opportunity to diversify into the agricultural sector, which can absorb more employment. Therefore, even if the oil export boom is expected to last for a very long time in Nigeria, the government of the day may still need to diversify for employment reason.

1.3 Research Questions

The major research question for the study is: "to what degree is Dutch Disease visible in Nigeria?" This study seeks to answer this question using a Vector Autoregressive (VAR) model with the following variables: Price of oil (PON); quantity of oil produced (VOL); real exchange rate (RER); money supply as share of GDP (MS); per capita income (PC) and the share of agriculture to GDP (AGRICGDP).

The study also seeks to answer the following specific questions:

1. What is the relationship between the price of oil and the real exchange rate in Nigeria?

This question will be answered in line with hypothesis 1 in the next section of this chapter using VAR model.

2. To what extent does the non-tradable booming sector affect the Nigerian economy?

This question goes with the hypothesis 2 which is to be answered by testing the response of agriculture as share of GDP to the real exchange rate and the price of oil in Nigeria.

3. To what extent does an increase in the quantity of oil produced squeeze the agriculture output in Nigeria?

This question is associated with hypothesis 3 which examines the relationship between the quantity of oil produced and the real exchange rate in Nigeria using VAR techniques.

1.4 Research Hypotheses

The following null hypotheses will be tested:

1. The price of oil and quantity of oil have no significant impact on the real exchange rate in Nigeria.

This is to examine the impact of the price of oil and quantity of oil on the traditional output, agriculture through variations in exchange rate in Nigeria.

2. The real exchange rate has no significant impact on agriculture as a percentage of GDP in Nigeria.

This is to determine the reaction of agricultural output to the exchange rate variation in Nigeria.

3. There is no significant relationship between the agricultural output and the quantity of oil produced in Nigeria.

This is to ascertain the impact of the quantity of oil produced and the real exchange rate on the traditional output in Nigeria, agriculture.

1.5 Justification and Significance of the Study

This study attempts to translate what happened in the Dutch industrial setting to the Nigerian agricultural setting. Therefore, our research work aimed towards the examination of the impact of the crude oil export sector on the traditional agriculture export sector. This is opposed to some earlier studies which used the manufacturing sector to represent the contracting tradable sector (see section 2.2), particularly for the period 1960 to 2009. The reason for choosing 1960 is that it will account for the years prior to the oil boom coupled with the fact that it was when Nigeria gained independence. The role of oil, which forms the material base of the export sector, is examined

using Nigeria as a contemporary example of a developing country depending on an export resource sector for economic growth.

Some may question why the Dutch situation should be termed a 'disease'. After all, it could be argued that a shift in relative prices or in the 'domestic terms of trade' in most cases favours certain sectors of the economy at the expense of others. If however, such a shift favoured the agriculture sector against the oil sector, as against the case of Nigeria, there is no rationale in calling the phenomenon a disease, rather it is a normal economic mechanism. Our view is that if one sector of the economy squeezes other sectors so much so that the squeeze results in an overall decline in employment, such a phenomenon is a "disease" rather than an adjustment. This is particularly serious if the resource is an exhaustible one.

A more compelling reason why the lagging agricultural sector must be protected is that since Nigeria is a rural economy and any slowdown in the agricultural sector that creates unemployment faster than people can be absorbed in the non-agriculture sector of the economy is a special problem. Whatever the arguments about making the most of the booming sector and using the income as a transfer payment, most governments see employment as a policy goal. Governments that place a high premium on equity will also find it tempting to protect the lagging sector, which is likely to employ a large share of low-income earners, especially in small-scale farming and labour-intensive manufacturing.

Diverse studies on Dutch disease, both on specific countries and combinations of resource-rich countries, abound in the literature today (Harberger, 1983; Forsyth and Kay, 1980; Gregory, 1976; Corden and Neary, 1982; Edwards and Aoki, 1983; Buiter and Purvis, 1983; Corden, 1981, 1982, 1983, 1984; Van Wijnbergen, 1984). Most of the literature deals directly or indirectly with developed nation involvement, with comparatively few studies on less developed economies. Furthermore, most of these studies typically adopted a theoretical general equilibrium approach that may not be as applicable to less developed economies, which suffer more distortions and do not rebalance easily.

1.6 Method of Analysis

This study employs both descriptive and statistical analysis. The descriptive analysis is used to present economic history of Nigeria and relate it to the Dutch disease theory. A VAR is used to quantify the intersection of the key elements of the Dutch disease. This research work employs a Standard VAR model, which captures simultaneous co-movements which may not be identified in univariate or bivariate models. The VAR impulse response model is ideal to simulate hypothetical macroeconomic shocks. We use an unrestricted VAR model that includes cointegrating relationships among variables of the model to capture the long-run characteristics of variables and separately examines an ECM mechanism to track the short run dynamics. Impulse Response was employed to capture the accumulated response of agriculture as a share of GDP to macroeconomic variable shocks in the economy. The framework developed by Bernanke (1986), Bernanke and Blinder (1992) and Mallick (2010) are adopted in formulating the structural VAR model.

CHAPTER 2: THEORETICAL AND EMPIRICAL LITERATURE REVIEW

2.1 History of Dutch Disease

The name "Dutch disease" can be traced to the rapidly growing natural gas sectorial activity of the Netherlands economy which inflicted damage on the total structure of the economy. Netherlands is small and heavily populated and one of the most greatly developed nations in the world. It also depends very greatly on foreign trade with the highest living standards in Europe.

The euphoria started to wane around the late 1970s and early 1980s. The balance of payments surplus generated by the export of gas pushed up the value of the guilder in relation to other currencies. As the guilder appreciated, imports became cheaper and subsequently rose dramatically. The exchange rate rose steadily over the period 1971-78. Initially many Dutch policymakers welcomed the appreciation because of the benefits of cheap imports. It was thought that a drastic fall in the price of imports would dampen inflation so long as domestic costs (predominantly wages) adjusted fully to the higher external values. But unit wage costs rose faster than import prices (in guilder terms), pushing up real incomes and lowering profit margins. Prices of Dutch goods became significantly less competitive, which caused industrial exports and output to decline. As industrial output declined, unemployment rose rapidly. Government spending had also grown very rapidly and was now taking a larger share of GDP than in most West European countries. The great bulk of this increase went on transfer payments whereas public investment only took an insignificant share from national income. In view of this, it was argued that the benefit of natural gas, instead of being put into more productive use, was being wasted. Natural gas became a major export sector squeezing the 'traditional' sectors such as manufacture and food exports. In other words, the improvement in the gas balance was matched by an equal or worse deterioration in the manufacturing trade of the Netherlands.

As McKinley (2005) pointed out, the Dutch disease phenomenon assumes that the beneficiary countries have no idle productive capacity or are operating on their production frontiers yet most developing countries do have excess capacity, which would increase the spending and absorptive capacity of more resources without Dutch disease.

The Classicalists embrace the theory of Dutch disease, problems of rent-seeking and explanation of political-economy (Corden and Neary 1982; Rodriguez and Sachs (1999); van Wijnbergen 1984).

The cause and effect of Dutch disease in resource-rich nations was examined by Rodriguez and Sachs (1999), who noticed that over-shooting of levels of consumption lead to movement towards the stationary state and result in slow growth.

The political economy literature often argues that abundant natural resource nrevenues lead to poor spending policies. The idea is that "easy" revenues corrupt and bring about conflicts (Ross 2004, 2006), and encourage economically inefficient, but politically important projects. To mitigate such problems, Sala-i-Martin and Subramanian (2003) suggest decentralizing revenues for the case of Nigeria, by distributing them directly to the people, so the government is forced to finance public services by taxes. Yet only a limited number of theoretical studies have tried to explain a diverging experience in resource impact on economic performance, an exception being Mehlum et al. (2006).

The history of Dutch disease dates back to the late 1950s when the Netherlands discovered a large natural gas resource in the north of the country and rapid development of the resource began in 1963. Since then some new finds have been made both onshore and offshore. By the 1970s, what was originally a natural gas importing country started to export gas and by 1976, which represented a peak year for natural gas exports, it exported about 51 billion cubic metres or about 44 million tonnes of oil equivalent (mtoe). In addition, massive long-term export contracts were drawn up, with prices linked to the price of oil. The balance of payments current account benefited accordingly. Apart from natural gas earning foreign exchange to the Netherlands as a result of increased exports, it also made a significant contribution to the national budget (Corden 1984; Kremers 1985).

The next section explores other studies which described how an economy can react to a new booming sector or an increase in a global price of a resource, in this case oil. We shall therefore examine studies that argued that the emergence of the oil sector in most oil exporting countries has had negative repercussions on the rest of the economy, and has particularly affected the export competitiveness of the 'other tradable goods' sector.

2.2 Review of Empirical Literature on Dutch Disease Syndrome

DD implies that the exchange rate has appreciated as a result of a new natural resource which greatly augments the country's foreign exchange earnings. A large inflow of foreign exchange and

a large balance of payments surplus in most oil exporting countries causes the domestic currency to appreciate, and the oil-based rate to be higher than desirable for the non-oil sectors, with a harmful impact on the competitiveness of domestic production and the objective of diversification. The first paper credited on the resource boom paradox was that of Meade and Russel (1957) but the core model of the theory of Dutch disease today can be seen in the studies of Corden and Neary (1982).

Lawrence and John (2011), using the dynamic Computable General Equilibrium Model to investigate how different spending options targeted at particular sectors affect the competitiveness of traded goods sectors in Uganda, found that increased oil resources would lead to significant appreciation of the currency in all scenarios. Stjns (2003), using a dynamic multi-sectoral general equilibrium model, found that a surge of oil revenues leads to a real appreciation.

Neary (2003) pointed out that under a fixed exchange rate regime the inflation spiral is the main driver of exchange rate appreciation whereas the catch-up movement in stability is driven by periods of flexible exchange rates. Imimole et al (2011) discovered that a country always witnesses real exchange rate appreciation when its nominal rate is pegged and inflation is high. It is mostly reversed by devaluing the nominal exchange rates.

However, Ebrahim-Zadeh (2003) found that a country experiences contraction of the traditional sector regardless of the exchange rate system it embraces. They concluded that in each case, fixed or flexible, the RER appreciates.

Kevin and Robin (2005) argued that an appreciation of the real exchange rate made the traditional sector uncompetitive, which had adverse growth effects on the whole economy. Frederiksen (2006) examined the relationship between boom income and growth with an overlapping-generation-welfare-model using altruism, and posited that the boom sector was likely to affect economies' growth in different ways due to the disparity in the degree of altruism.

According to Ebrahim-Zadeh (2003), the expected changes in a country's structure of production after a favourable shock, such as a large discovery of oil, could deny benefits to the economic agents that are engaged in the traditional tradable sector. Using a gravity model of trade, Stijns (2009) found an initial indication that DD may be eased by exchange rate management. Bhome et

al. (2010) conclude that a real appreciation favours non-tradable activities over the export of agriculture and manufacturing, thereby increasing rural and national poverty.

The 'Dutch disease' phenomenon is not limited to any particular economy, either developed or developing. In the developed economies, the traditional sector is the industrial sector while the traditional sector in less developed economies is often the agricultural sector.

In his study, Stijns (2003) opined that for Dutch disease to take effect in the advanced economies it is "de-industrialization" while it is "de-agriculturization" in the less advanced economies. Meanwhile, in the advanced economies, labour leaves the traditional sector and migrates to the booming sector and this has a contractionary effect on the traditional tradable sector. Likewise, the same movement of labour happens in the less advanced economies but the overall effect is a bigger rural decline in employment.

Ross (1986) examined the Dutch disease symptoms in the case of the United Kingdom. According to him, after the commercial exploitation of crude oil in 1975, the RER appreciated by about 10 percent between 1973 and 1982, and this led to a fall in manufacturing output in the United Kingdom. This was also established by Forysth (1985) who confirms that there is evidence of Dutch disease in the UK. However, he affirms that the specific effect of the booming sector (energy) cannot be measured by structural movements of the economy.

Jimenez-Rodriguez and Sanchez (2003) investigated the UK and Norway and found mixed results. They found that the oil price increase benefited Norway but had an adverse effect impact on UK growth. Using the technique of impulse response, Brown and Yucel (1999) note that a temporary oil price shock in US (a non-oil exporter) responded with a decline in real growth. Using the World Trade Data on a comprehensive survey on Dutch disease literature, Stijns (2003) affirmed that the increase in the price of energy tended to impact manufacturing exports negatively.

In the case of less developed economies, Warr (1985) thought that the conclusion about the structure of the economy being affected was not clear, but the energy sector boom had unique effects on domestic prices in Indonesia. However, Roemer (1994) confirms that the Indonesian government, through careful exchange rate management, escaped the impacts of the Dutch disease. This shows that the effect of Dutch disease in Indonesia was rendered insignificant through prudent management of exchange.

In other studies on less developed economies, including Nigeria, most researchers do not find the Dutch disease syndrome. Examples are the studies carried out by Roemer (1985) on Mexico, Nigeria and Venezuela; Looney (1989) on Saudi Arabia; Looney (1991) on Kuwait; Jazayeri (1986) on Nigeria and Iran, and Kuralbayeva et al. (2001) on Kazakhstan, where the exchange rate appreciated due to the advent of oil but the appreciation only had a contractionary impact on industrial productivity. Gelb (1988) and Spatafora and Warner (1999) analysed the development of oil-rich economies and discovered that by shocking the term of trade, there was a rise in non-tradable productivity, although the effect of Dutch disease was absent. Stijns (2005) found that insufficient response of policy to a shock to the booming sector can prompt Dutch disease, although the manufacturing sector growth was higher than that of the non-tradables in the cases of Kuwait, Indonesia, Nigeria and Mexico. The premise is against the evidence of the growth rate of the manufacturing sector to the non-tradable sector in Nigeria and therefore suggests that the model may not be able to capture the real Dutch disease variable.

Most studies are also inconclusive about the effect of booms in other primary commodities, although Columbian coffee appears an exception (Cuddington 1989, Kamas 1986, Davis 1983, and Roca 1999).

From the literature considered above, it can be seen that many oil producing economies have suffered from the disease in one way or another. Nonetheless, it cannot be denied that some benefits resulted to each of these countries - no matter how insignificant, oil brought some benefits. The Nigerian economy became rapidly transformed by oil during its heydays in many respects, and is discussed fully in the next section. It provided new employment, although small compared with agriculture, increased Nigeria's real GDP from its low level in the 1960s and provided some infrastructure development. However, these benefits were sporadic and short-lived. It is imperative to note here that the implications of Dutch disease are everywhere the same and the only difference is the structural ramification.

Our research work differs from some previous studies about less developed economies results, particularly Nigeria. In developed economies, manufacturing is the traditional sector, but in less developed economies, the agricultural sector is the traditional tradables sector. Evidence of this is shown in Figure 2.2 where agriculture suffered more than manufacturing. We also acknowledge other researchers that find evidence of Dutch disease in their works: Cuddington (1989); Gelb

(1988) and Davis (1983). Some researchers relate the Dutch disease to monetary excess and unproductive spending by governments due to the emergence of oil fortunes (Collier and Gunning (1996); Nina and Sweder (2006); Struthers (1990), Auty (1993, 1994) and Ojameruaye (2004). While they talk of "de-industrialization" in the industrial economies like the Netherlands and Britain, they deal with the case of "de-agriculturalization" in Nigeria.

Similarly, most case studies have investigated the resource-boom impact on sectors output and there are few studies examining how to utilize and maintain the boom incomes to avoid harmful growth effects.

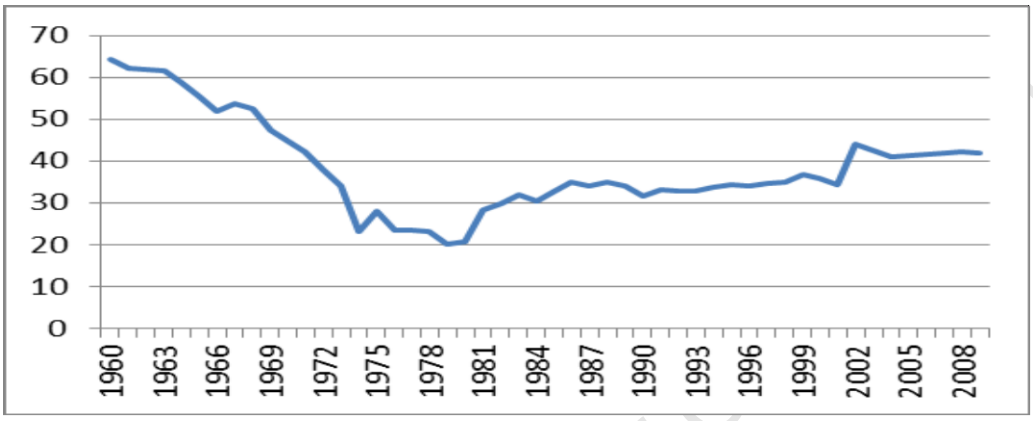
The model in this study is based on Olusi and Olagunju's (2005) work, "The Primary Sectors of the Economy and the Dutch Disease in Nigeria". Their model only use the price of oil, but this study incorporates the quantity of oil produced to demonstrate DD effect, and is more general. This research work highlights that Dutch disease is visible in reference to movement of exchange rate as well as output of the traditional sector. This study relates these conclusions to Nigeria's experience.

CHAPTER 3: ASSESSMENT OF NIGERIA'S ECONOMIC HISTORY

3.1 Agriculture and the Nigerian Economy

Before independence, the Nigerian economy was the epitome of an agrarian economy that relied on agricultural products for consumption, employment, domestic savings and foreign exchange earnings. From Figure 3.1, it can be seen that agriculture formed about 65 percent of the GDP in 1960, signifying the importance of agriculture in the economy at that time.

Figure 3.1: Agriculture as percentage of GDP 1960–2009



"In their own contribution, Omowale and Rodrigues (1979) opined that for most developing countries agriculture has been assigned an important role in national development. To them agriculture has been seen as a means of reducing dependence on certain imports, and a way to control food price increases, earning foreign exchange, absorbing many new entrants to the labour market and increasing farm incomes at times of severe unemployment and rural poverty" (Anyawu (1997:pp12).)

The contribution of agriculture to GDP was very high from independence till the mid-1970s and agricultural exports remained the backbone of the Nigerian economy and provided a significant proportion of foreign exchange earnings. Figure 1.1 showed that in the 1960s, agriculture accounted for 70-95 percent of total exports and fell to about 40 percent in the early 1970s, and then crashed to less than 2 percent in the 1990s, but subsequently rose slightly.

Figure 3.2: Food Import as percentage of Total Imports 1960–2010

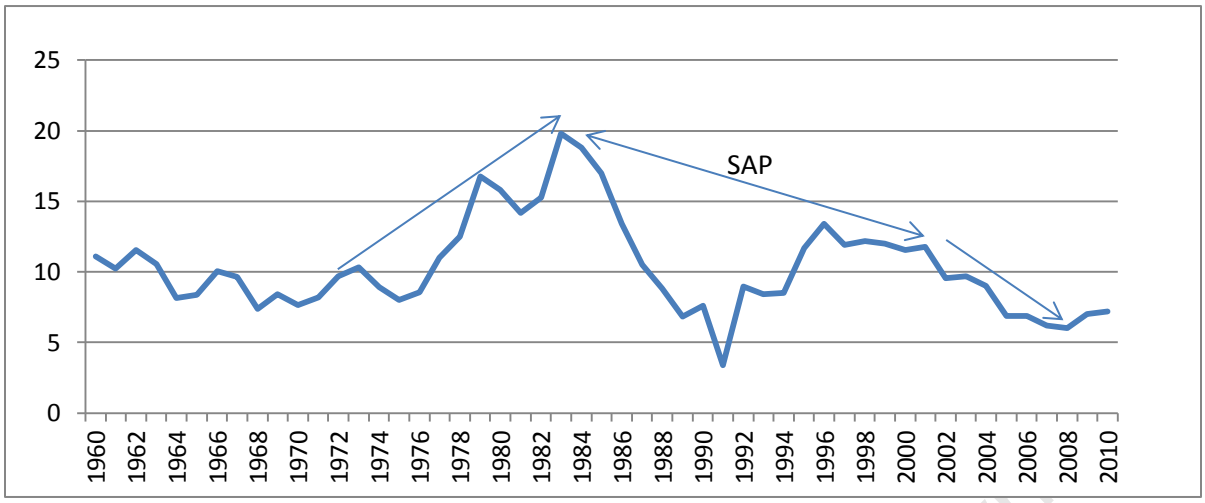


Figure 3.2 demonstrates that since 1984, agriculture has improved as evidenced by reduced food imports. This is attributed to the Structural Adjustment Programme (1985/6 - 1998). Under World Bank structural adjustment, the government tried to eliminate inefficient state intervention and obtain budgetary relief by abolishing agricultural commodity marketing boards and liberalizing cash-crop exports. These measures, together with devaluation, increased the naira prices of export crops, especially cocoa. The state also privatized many public enterprises by selling equity to private investors, while restructuring other parastatals to improve efficiency. The federal government encouraged private investment in the late 1980s, allowed foreign ownership in most manufacturing, and liberalized and accelerated administrative procedures for new investment.

In September 1986, the government introduced a second-tier foreign exchange market (SFEM), where it sold on auction for a near equilibrium price. Under SFEM, the naira quickly depreciated 66 percent and declined further in value through July 1987, when the first and second tiers were merged. When adopting the SFEM, Nigeria abolished the ex-factory price controls set by the Prices, Productivity, and Incomes Board, as well as the 30 percent import surcharge and import licensing system. It reduced its import prohibition list substantially and promoted exports through fiscal and credit incentives and by allowing those selling abroad to retain foreign currency. Although this action opened the way for an IMF agreement and debt rescheduling, the military government declined to use IMF Standby funds. Meanwhile, the naira continued depreciating, especially after the relaxation of fiscal policy early in 1988. The effect of the SFEM in breaking

bottlenecks, together with the slowing of food price increases, dampened inflation in 1986, but the easing of domestic restrictions in 1988 reignited it.

Concurrently, nonoil exports grew from US$200 million in 1986 to US$1,000 million in 1988. This amount, however, represented only 13 percent of export value at the level of the 1970s, and cash crops like cocoa dominated the export market. Large firms benefited from the foreign exchange auction and enjoyed higher utilization than smaller ones. Despite dramatically reduced labour costs, domestic industrial firms undertook little investment or technological improvements.

3.2 Discovery of Oil in Nigeria

The oil story in the Nigerian economy started with the very first attempt by a German company, the Nigerian Bitumen Corporation, to search for hydrocarbons in the southern part of the country in 1908 (Adedipe, 2004). The company was unsuccessful and decided to call off their search in 1914, the year the First World War started. There were three reasons that the search by the Nigerian Bitumen Corporation was unsuccessful. Firstly, the company had insufficient financial resources at their disposal; secondly, qualified manpower was limited and lastly there was an inadequate understanding of the geology and geography of the country. The failure of Nigerian Bitumen Corporation brought with it a major set-back in the search for oil in Nigeria as it created an air of uncertainty as to the prospects of finding oil by any other oil company. Hence investment in oil prospecting in Nigeria became unattractive. However, two decades later, the Anglo-Dutch Consortium/Shell D'Arcy, decided to try again. The Anglo-Dutch Consortium started operations in Nigeria in 1937 and was given exclusive concession privileges covering the whole country. The Second World War in effect interrupted the activities of Shell D'Arcy and work did not resume until 1947. Forewarned by the mistakes of the Bitumen Corporation, Shell D'Arcy left no stone unturned and was rewarded with crude oil at Oloibiri around 1956. By 1958, Shell began oil exploration and exports at Oloibiri in the current Rivers State with a total of 5,100 barrels daily.

With a view to maximizing the benefit accruing from her oil resources, Nigeria established a nationwide oil-company named the Nigerian National Oil Corporation (NNOC) under Decree No. 18 in 1971. In June of the same year, the country joined the Organisation of the Petroleum Exporting Countries and became the 11th member country. Foreign oil companies started to explore in Nigeria from the turn of the 1970s. Nigeria at that time lacked the technological know-how and the financial resources to undertake such risky ventures. Therefore, it is not surprising that

the petroleum industry in Nigeria was developed mainly by foreign capital and expertise supplied by the multinational oil companies.

The petroleum industry is capital intensive: it requires large amounts of investment to pay for heavy capital equipment such as rigs, tankers, refineries, etc. The industry can be seen from two aspects, each of which is capable of standing on its own. The "upstream" operations are concerned with the initial aspect of exploration and exploitation up to production stages. "Downstream" operations deal with all aspects concerned with the transformation of petroleum resources into final products. In order to create a stronger oil agency and optimise the scarce human and infrastructure resources available to Government, the Ministry of Petroleum Resources and the Nigerian National Oil Corporation amalgamated to form the Nigerian National Petroleum Corporation (NNPC) in 1977. The purpose of NNPC was to take over the objectives of the NNOC of exploration, transportation, production, processing oil, refining, marketing of crude oil and products. At different stages in the evolution of the country's oil industry, Government has successfully increased its participating interest in the private oil-producing companies.

3.3 Crude-Oil and the Exchange Rate in Nigeria

"There is virtually no exchange rate system that Nigeria has not tried in order to find the 'realistic' exchange value for the Naira" (Adedipe, 2004). The different exchange rate regimes in Nigeria can be classified into different epochs relating to the vagaries of the international oil market.

a. The Post-Independence Era (1960-1971)

Like some other low income countries of the world, after political independence in 1960, the Nigerian economy used a pegged rate system, where the Nigerian (Pound) was pegged to the British Pound (as can be seen in Figure 1.2). During this period, the Nigerian Pound was pegged at par to the British Pound Sterling (GBP), using administrative measures to sustain the parity. The devaluation of the GBP in 1967 coupled with its being floated in 1972 forced Nigeria switch to a US Dollar, which was deemed better able to develop Nigeria's import substitution industries. During this period the fiscal balance was in surplus for most of these years, inflation rate averaged about 5 percent and the Current Account Balance was in surplus. This period is captured by Part A Phase I of the exchange rate system (Figure 1.2).

b. The 'Oil Boom' Era (1972-1986)

The oil boom is Part B of the Phase I of the exchange rate system (Figure 2.1 above). During this period, the exchange rate mirrored movements in oil prices and the naira remained strong as a result of the huge increase in foreign exchange earnings. The currency was pegged to US Dollar in 1972. This was abandoned between 1974 and 1976, when an independent exchange rate management policy that pegged the naira to either the US dollar or the British pound sterling was put in place and a policy of gradual appreciation of the naira was pursued. The huge earnings from crude petroleum export over this period allowed Nigeria to run persistent external surpluses in the balance of payments, which supported the appreciation of the naira.

This period was the beginning of Dutch Disease in Nigeria. The strong exchange rate that followed helped to cheapen imports of competing food items as well as agro-based and industrial raw materials, which led to rapid expansion in the importation of these goods to the detriment of local production of similar goods. Aggregate import demand later outstripped total foreign exchange available for import and trade restrictions though an import licensing scheme was introduced. A policy reversal was effected in the management of the naira exchange rate towards the latter part of 1976: this was a deliberate policy to depreciate the naira, although it was not systematic. However, in 1978, the naira was anchored on a basket of 12 currencies of Nigeria's major trading partners. This was jettisoned in 1985 and the naira reverted to anchored against the US dollar.

c. The Post-Sap Era (1986 till 2009)

The last exchange rate period in Nigeria began in 1986 (discussed in Chapter 1). A major policy reversal was effected in September 1986 when the fixed exchange rate regime had to be discarded and a flexible exchange rate regime was put in place following the advice of the IMF on restructuring the Nigerian economy through the Structural Adjustment Programme (SAP).

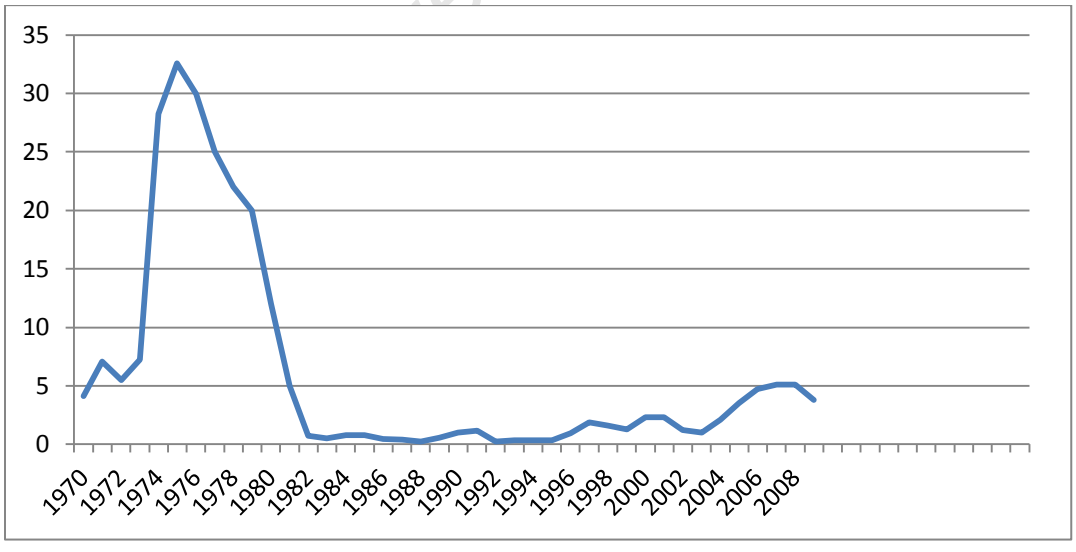
With the adoption of SAP, foreign exchange allocation and import licensing procedures were abolished and transactions in foreign exchange were subjected to market forces under an auction system. The naira was subjected to a managed float in a continuing effort to restructure the economy away from oil dependency. The policy of deregulation of the foreign exchange market in 1986 was aimed at establishing the market exchange value of the naira. The hope was to boost non-oil exports and reduce the dependence on crude petroleum exports.

As noted by Honohan and Lane (2003), exchange rate depreciation had resulted in the dramatic increase in the naira price of imports, which should have discouraged imports. However, it was not until 1999 that a more flexible exchange rate was again introduced to the Nigerian economy. The visible control of the foreign exchange market was totally removed in 1999 and a more pronounced market regulated system was introduced.

3.4 Oil and Foreign Exchange Reserves in Nigeria

The massive increase in oil revenue in the aftermath of the Middle-East war of 1973 created unplanned wealth for Nigeria. Oil became the important commodity of exchange in the international markets, replacing the role of the agricultural sector in the economy. The decline in the agricultural sector has been attributed to the rise in oil revenue in the early 1970s, but the policy put in place to reverse the agricultural decline was not effective. By 1972, Nigeria had become a monoculture economy with an over dependency on crude oil. This followed the sharp rise in oil prices and the discovery of commercial quantities of oil, which dramatically raised official foreign exchange receipts between 1970 and 1974. The global economy during this period experienced an upsurge in demand for petroleum products and thus made the oil sector a prime mover of the economy. It can be seen from Figure 3.3 that foreign exchange reserves experienced a boost during the 1970s and it became clear that better management of foreign exchange resources was necessary for future protection.

Figure 3.3: Official Foreign Exchange Reserves as percentage of GDP 1970–2010



3.5 Oil and Employment in Nigeria

Prior to the oil boom, the Nigerian economy was largely agrarian and about 70 percent of the working population was engaged in agricultural activities in rural areas.

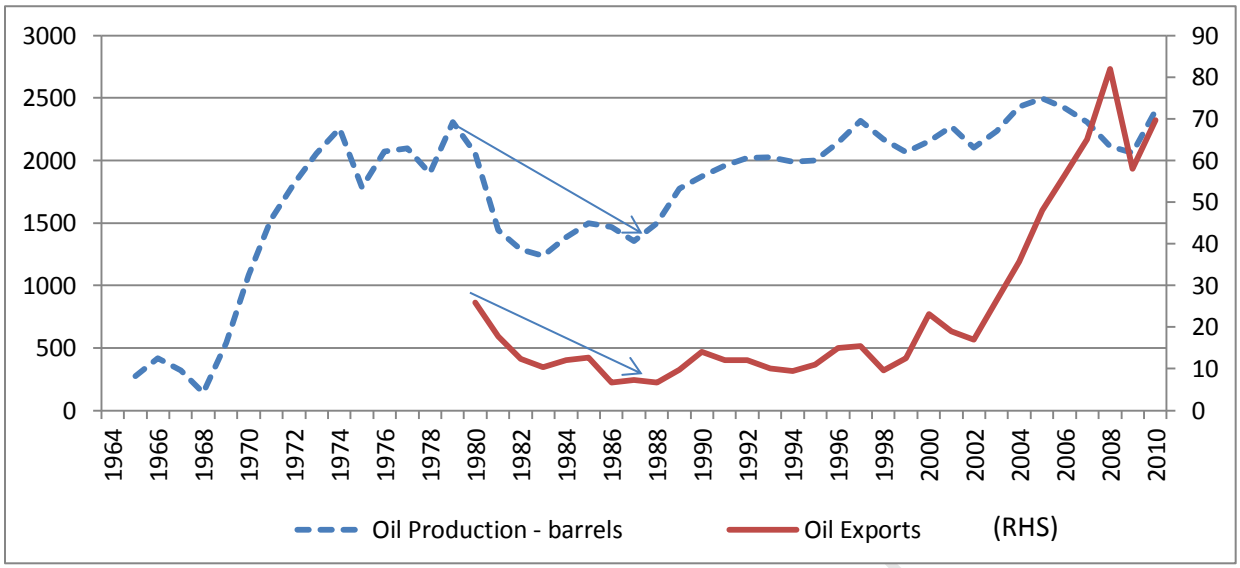
In the 1960s, the emphasis of employment policies was that of shifting labour from the agricultural sector to the manufacturing sector. This appeared to be the conventional path of economic growth and development, following the experience of developed countries. At that time economic policies concentrated more on the development of the manufacturing sector, under an import-substitution strategy. Labour moved from the agricultural sector to the services sector, with little productivity gains, and both agriculture and manufacturing could contribute little to the employment of labour. Since the oil boom of 1970s, the Nigerian labour market has been characterized by a high rate of unemployment and poor working conditions. This situation remains so till present suggesting DD.

3.6 Oil, Consumption and Investment in Nigeria

Nigeria's case was not different from other oil exporting countries of the developing world that depend heavily on oil revenues for their foreign exchange earnings. Such oil producers typically have escalating government expenditure, sometimes reaches as high as 74 percent of GDP.

During the 1980s, there was a world economic slow-down which led to an oil glut and contributed to the steep decline in Nigeria's oil production for most of the 1980s (Figure 3.4). This subsequently led to a great domestic problem given the economy's dependence on oil revenues and the weakened agriculture sector. The Nigerian economy had changed its structure when it shifted its agricultural orientation in favour of an oil-based structure.

Figure 3.4: Oil Production (barrels-LHS) and Oil Exports as percentage of Total Export (RHS) 1965–2010



In the presence of an abrupt decline in oil revenue in the 1980s, the propensity to consume was still high, so savings remained small whereas investment remained slightly higher than 20 per cent (see Figure 3.5). As a result of the high domestic demand and low savings there was 'eating up' of foreign reserves (see Figure 3.6). Between 1986 and 2008, the average propensity to consume declined and savings increased while investment remained around 20 percent of GDP (Figure 3.5). This decline in domestic demand, coupled with a recovery of oil prices after 2002, led to the improvement in the current account balance (see Figure 3.6). The spikes in consumption between 1994 and 1996 may be attributed to high inflation experienced at that period. The overall change may be the positive effects of the Structural Adjustment Programme introduced by the IMF in 1986.

Figure 3.5: Consumption and Investment as a percentage share of GDP 1980–2010

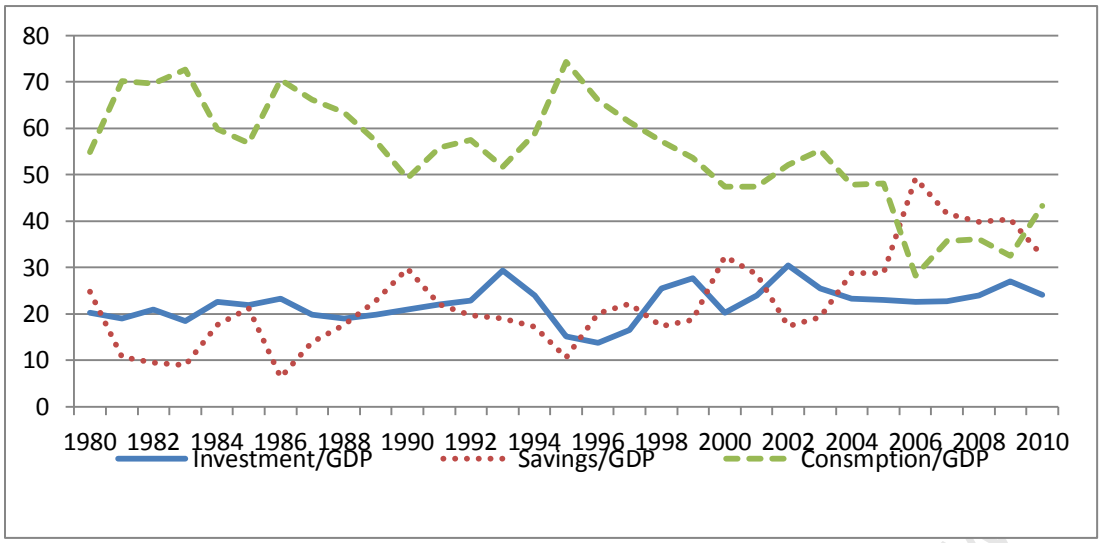
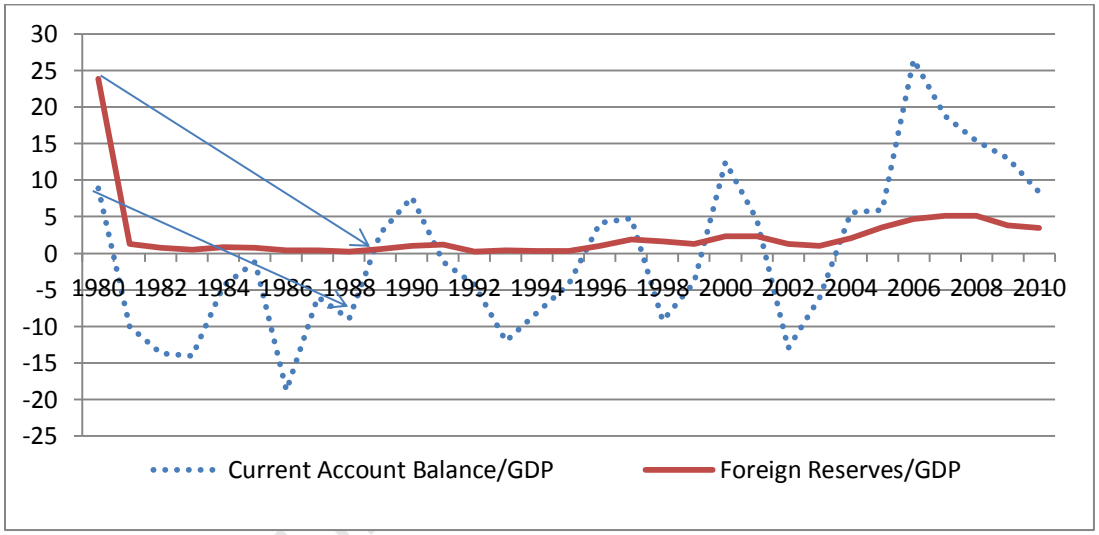


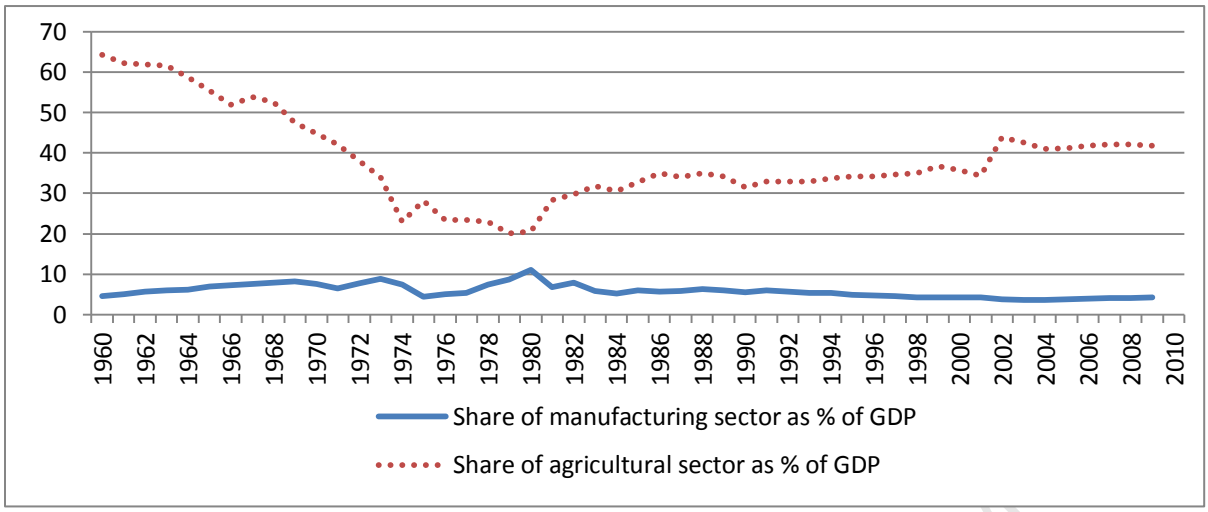
Figure 3.6: Current account balance and foreign reserves as percentage of GDP 1980–2010



3.7 The Manufacturing Sector in Nigeria

Relative to the agricultural sector, manufacturing has not been so vibrant in Nigeria over history. Figure 3.7 demonstrates that in the Nigerian economy; the share of the manufacturing sector as a percentage of GDP relative to the agricultural sector is insignificant and not significantly affected by the oil sector.

Figure 3.7: Share of agricultural sector and manufacturing sector as percentage of GDP 1960–2009



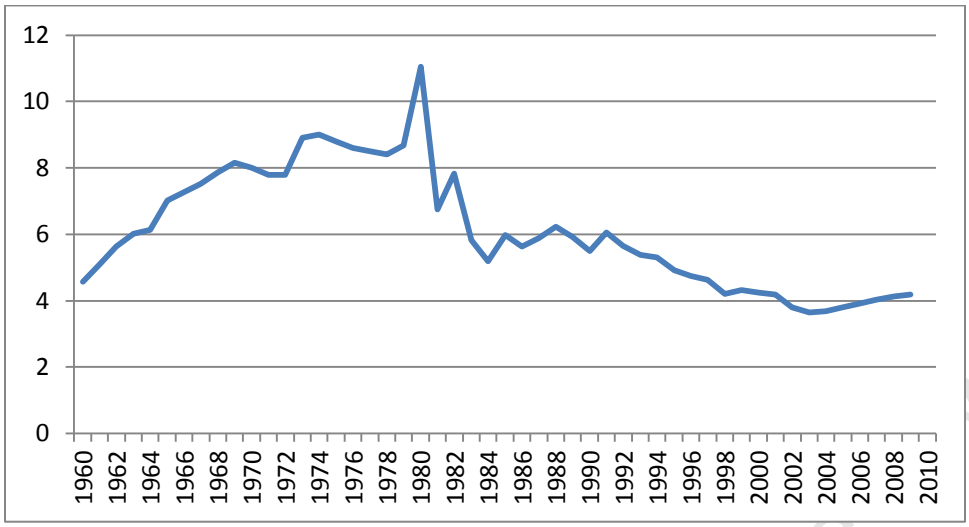
Immediately after independence, the Nigerian economy pursued a vigorous import substitution policy in order to reduce overdependence on foreign trade so as to save foreign exchange. However, this was not productive because almost all items needed by the sector were imported and the sector became an assembly process instead of real manufacturing of the final product. There was very high intervention of government in manufacturing sector in the early years of the oil windfall; many sub-sectors were taken over by the government but embezzlement and corruption rendered them unproductive.

As oil revenues began to dwindle in the 1980s, the government encouraged diversification through export promotion. This strategy continued even during the IMF implemented SAP era in order to revamp the non-oil sector of the economy but this was more rhetoric than practice, as the SAP era witnessed the peak of corruption in Nigeria. To stimulate the manufacturing sector since that time, the government has tried many policies like local sourcing policy and privatization of state owned enterprises, none of which have been successful.

Manufacturing in Nigeria appears a government favoured sector, probably because it is generally believed that the main instrument of rapid growth, structural change and self-sufficiency lies in the manufacturing industry. Thus resources have been channelled into this sector through heavy public sector investment. Import-substitution in basic industries was promoted through generous financial incentives, as well as a high level of protection for private investment. It can be seen from Figure

3.8 that the growth rate of the manufacturing sector was high in the years of Nigeria's fortune rising from 4.58 percent in 1960 to 11.05 percent in 1980.

Figure 3.8: The Nigerian Manufacturing Production share of GDP 1960–2009



CHAPTER 4: THE MODEL AND METHODOLOGY

4.1 Model Description

The model tests if Dutch Disease measured by AGRICGDP is a function of the relative price variable, demand variable, oil effect and the policy stance. The empirical model is given by:

$AGRICGDP = \beta_0 + \beta_1 PON_t + \beta_2 VON_t + \beta_3 RER_t + \beta_4 MS_t + \beta_5 PC_t + \mu_i$ ……..….[4.1.1]

Where

AGRICGDP = share of agriculture to GDP

PON = Price of oil

VOL = VOL

RER = real exchange rate

MS = money supply as share of GDP

PC = per capita income

t is the time trend

μ_i is the error term which is assumed according to OLS assumption to be distributed in zero mean and constant variance $\mu_i \sim N(0,\delta^2)$ where $i \neq j$.

The regression equation for the model is therefore specified as:

AGRICGDP =f(PON, VOL, RER, MS, PC) ----------(4.1.2)

Putting in a linear form, the model takes the form:

$AGRICGDP = \beta_0 + \beta_1 PON + \beta_2 VON + \beta_3 RER + \beta_4 MS + \beta_5 PC + \mu_i$ ……..….. (4.1.3)

From the theory it is hypothesized that the Dutch Disease variables will account for a substantial part of the tradable goods sector contraction.

The model focuses on the agricultural output percentage of GDP as the dependent variable and presents explanatory variables that attempt to capture the impact of the essential theoretical elements detailed in the preceding section.

Types and Sources of Data

Annual time series data were used for the study and they are purely secondary data. The data collected for this study were from official sources including the Central Bank of Nigeria Annual Report and Statistical Bulletin, National Bureau of Statistics, IMF and other relevant sources. This research work covers both fixed and post fixed exchange systems in Nigeria as discussed in previous chapters, for the period 1960 to 2009.

Identification of Variables

The variables identified for utilization in the study is:

The dependent variable (share of agriculture to GDP) and the independent variables (price of oil, quantity of oil, real exchange rate, money supply and per capita income).

a. Relative Price Effect Variable

The relative price effect is brought about due to an increase in expenditures in the domestic economy as the oil windfall flows into the country. Most of the increased spending arises from the government sector as it is the substantial recipient of the oil revenues (through direct ownership or levying taxes on domestic oil producers). Therefore, a variable of government expenditures would capture most of the aspects of the relative price effect. However, when national incomes rise, there is an excess demand for products which is mitigated only by an increase in the price level. The increase in the domestic price level affects the real exchange rate, causing the country's agriculture to become less competitive. Then, production of those goods should decrease as the real exchange rate appreciates. If this is so, then perhaps the real effective exchange rate is a suitable proxy for the relative price effect.

However, it is expected from the Dutch Disease theory that the government expenditures variable and the real exchange rate variable should be highly correlated (Rudd, 1996). Correlation coefficients are presented below.

Table 4.1: Correlation between Government Expenditures and Real Exchange Rate in Nigeria

	GGS	RER
GGS	1	-0.1192
RER	-0.1192	1

Source: Author's computation (2012)

The two variables are correlated and from the econometric perspective it is confusing to include both in the model. This confusion results from a fundamental principle of regression analysis (that all other variables are held constant when examining the effects of anyone variable). For example, when examining the effects of the government expenditures variable, it is necessary to hold constant the real exchange rate if it is included in the model. However, in theory the government expenditures variable works through the changing real exchange rate. But if both are included in the regression, then this econometrics principle prevents them from functioning according to theory (Rudd, 1996).

Therefore, it is necessary to decide which one to include: in this research work the real exchange rate variable is chosen as the proxy for the relative price effect in Nigeria. This is because many LDCs like Nigeria finance government expenditures through the printing of money, the government expenditures variable therefore takes into account much more than just the increase in oil revenue. In fact, the increase in revenue from oil may be totally lost, or at least distorted, if the government does indeed print a large amount of money to finance its expenditures. Data for this are found in the International Financial Statistics. It is predicted that as RER decreases (representing an appreciation of the country's currency), the country's agricultural output should contract. According to the Dutch Disease theory, the nation's currency should appreciate as the government spends more, which will eventually cause its traditional export sector, agriculture, to contract. This real exchange rate employed in this is computed as the ratio of domestic prices to foreign prices.

c. Control Variables

i. Demand Variable

The paper has hypothesized that Nigeria's agricultural output has declined due to the presence of Dutch Disease. However, it is possible that much of these declines are due, in part, to the natural tendency for the agriculture sector to contract as LDCs begin to develop. It is perhaps worthwhile mentioning that in 1820, the US agriculture sector employed 79 percent of the labour force and accounted for over 60 percent of GDP (Johnston and Kilby 1975:196). However, today, the agriculture sector accounts for just 2 percent of GDP and employs a mere 3 percent of the total number of workers. This dramatic redistribution of the economy was merely a result of the country's development process. As such, the US changed from a predominantly agrarian society to an industrialized nation, not due to Dutch Disease, but because that transition was part of its development process. Consequently, it is necessary to account for this in Nigeria. We therefore employ per capita income as an appropriate control variable for this development tendency. Per capita income is used by economists as the most common measure of a country's level of development. As the country develops and devotes more attention to manufactures, per capita incomes should increase. As such, PC is used as a control variable controlling for demand in the economy. This is not to say that the changes in per capita income cause agriculture to expand or contract, but merely that PC accounts for the demand process. A positive relationship is expected to exist between PC and the growth of the tradable sector.

ii. Oil Effect

It is necessary to include the effect of trade with the rest of the world. However, the major dominant variable of export in Nigeria's current account balance has been oil. Therefore, the price and the quantity of oil produced are used as proxy in this study to capture the trade effect. Another argument in the Dutch disease studies is that the oil fortune led to the neglect of the tradable sector in Nigeria through exchange rate appreciation, that is, due to the oil windfall factors of production have moved from tradables to non-tradables, leading to expansion in non-tradables and shocking up of the tradable agriculture. Negative relationships are expected between the price of oil (PON) and quantity of oil produced (VOL) and the growth of the tradable sector.

iii. Policy Stance

Several other control variables are needed to account for possible other explanations of the decline in the agricultural sector in Nigeria. The most obvious of these would be a money supply variable. In an article titled "Dutch Disease or Monetarist Medicine?: The British Economy under Mrs. Thatcher," Chrystal (1984) posits that contractionary monetary policy, rather than Dutch Disease, caused the decline in the UK's manufacturing sector. Using descriptive statistics and convincing argument, the researcher refutes Dutch Disease as an important underlying factor in the contraction of Britain's manufacturing sector. Another study, by Hutchison (1994), decomposes the variance of manufacturing output fluctuations into that part attributable to energy booms and disturbances in monetary conditions, using the Johansen method of co-integration analysis and the vector error correction modelling (VECM) approach. Using his empirical model, he concludes that monetary factors played a large role in the UK, helping to explain slightly over 15 percent of unanticipated manufacturing output restrictions. Thus it is expected from the Dutch Disease theory that an expansionary monetary policy would lead to expansion in the tradable sector while a tight monetary policy would shrink the tradable sector. The money supply share of GDP is represented by the variable MS. A positive relationship is expected to exist between MS and the growth of the tradable sector.

Table 4.2: Variables and Their Expected Signs

Variable	Type	Explanation	Expected Sign
AGRICGDP	Dependent	Percentage share of agriculture to GDP	
RER	Dutch Disease: Relative Price Effect	Real Exchange Rate (₦/$)	Positive
PC	Control: Demand variable	Per Capita Income(GDP/Population)	Positive
MS	Control: Policy Stance	Money supply as percentage of GDP	Positive
PON	Control: Oil Effect	Price of oil (Naira)	Negative
VOL	Control: Oil Effect	Quantity of Oil Produced (barrels)	Negative

Source: Author's computation (2012)

4.2 Model Specification and Methodology

Based on the literature reviewed and condition of the country, this study has adopted the works of Bernanke (1986), and Jimenez-Rodriguez and Sanchez (2003), we represent the reduced form of a

standard open economy macroeconomic model as a multivariate dynamic system. We thus specify the following vector autoregression (VAR) model as:

$$\beta_0 \Upsilon_t = A + \sum_{i=1}^{P} \beta_i \Upsilon_{t-1} + \xi_t \qquad \text{(4.2.1)}$$

where Υ_t is a (6 X 1) vector of endogenous variables being considered as price of oil, quantity of oil produced, percentage of agricultural output to GDP, money supply share of GDP, per capita income and real exchange rate; β_0 and β_i are 6X6 matrices of coefficients; A is a vector of constants; P is the number of lags and ξ_t is a 6 X 1 vector of uncorrelated white noise disturbances. The matrix β_0 is assumed to be lower triangular with 1s along its main diagonal thus guaranteeing that the model is just identified.

a. The VAR Model

A vector autoregressive (VAR) model is the statistical framework chosen for this study given the concerns of the model generality. This study has adopted the model developed by Olusi and Olagunju (2005) with some modifications. The model has been modified to include the percentage of agricultural output to GDP and quantity of oil produced in Nigeria. More importantly is the use of cointegration to establish long-run dynamics of the model, VECM to establish the short-run dynamics of the model and the causality tests.

Standard practice in VAR analysis is to report results from Granger-causality tests, impulse responses, and forecast error variance decompositions. These statistics are computed in this study using the econometrics package Eviews. Because of the complicated dynamics in the VAR, these statistics are more informative than the estimated VAR regression coefficients or R^2s, which typically go unreported.

b. Structural VAR Model

In order to study the interrelationship between macroeconomic variables and agricultural share of GDP in Nigeria, we adopt the VAR model framework extended and applied to Japan by Wijnbergen and Anand (1988). Also, the structural VAR framework of Mallick (2010) is adopted for a shocks identification scheme. Thus this study employs an unrestricted VAR model to measure the true structural effects of macroeconomic variable shocks on the contraction of the tradable

sector in Nigeria. As VAR models have become more tuned to the data, some of the "puzzles" created by the results they produce in the literature have been resolved.

The model used is an unrestricted VAR model that includes cointegrating relationships among variables of the model to capture the long run characteristics of the variables. The framework developed by Bernanke (1986), Bernanke and Blinder (1992), Kim (2003), An and Sun (2008) and Mallick (2010) are adopted in formulating the structural VAR model.

Therefore, the structural unrestricted VAR model for this study is specified as:

$$A_t = \square_i + \sum_{i=1}^{a} \Psi_{1i} A_{t-1} + \sum_{i=1}^{b} \theta_{11i} P_{t-1} + \sum_{i=1}^{c} \theta_{12i} V_{t-1} + \sum_{i=1}^{d} \theta_{13i} R_{t-1} + \sum_{i=1}^{e} \theta_{14i} M_{t-1} + \sum_{i=1}^{f} \theta_{15i} G_{t-1} + \mu_{1t} \text{ ------} - (4.2.2)$$

$$\chi_t = \square_i + \sum_{i=1}^{a} \theta_{j1i} P_{t-1} + \sum_{i=1}^{b} \theta_{j2i} V_{t-1} + \sum_{i=1}^{c} \theta_{j3i} R_{t-1} + \sum_{i=1}^{d} \theta_{j4i} M_{t-1} + \sum_{i=1}^{e} \theta_{j5i} G_{t-i} + \mu_{jt} \text{ ----------} (4.2.3)$$

$$\chi_t = \Upsilon_i + {}^{a}\textstyle\sum_{i=1}\theta_{j1i}P_{t-i} + {}^{b}\sum_{i=1}\theta_{j2i}V_{t-i} + {}^{c}\sum_{i=1}\theta_{j3i}R_{t-i} + {}^{d}\sum_{i=1}\theta_{j4i}M_{t-i} + {}^{e}\sum_{i=1}\theta_{j5i}G_{t-i} + \mu_{jt} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.2.3)$$

Where x_t is a vector (5 x 1) matrix of other endogenous variables excluding agriculture share of GDP A_t ie

$$\chi_t = \begin{pmatrix} p_t \\ v_t \\ r_t \\ m_t \\ g_t \end{pmatrix} \qquad (4.2.4)$$

where:

A_t is the agriculture product as share of GDP;

$P_t$is the domestic price of oil;

V_t is the quantity of oil produced in barrels;

R_t is the real exchange rate of naira vis-à-vis US dollar;

M_t is the domestic monetary aggregate measured by the broad money supply (M2) as share of GDP;

G_t is the per capita income growth;

χ_t is the extension of other macroeconomic variables excluding A_t incorporated in the VAR model above;

Ψ_{ij} and θ_{ij} are parameters to be estimated in each system of equations;

Υ_i is the intercept;

u_{it} is the innovation term that propels shocks in the interdependence equation system (4.2.2) to (4.2.3);

t is time; and

i is the lag length to be determined by the Akaike and Schwarz information criteria.

In re-specifying the VAR system model 4.2.2 to 4.2.3 in matrix form, the matrix (6 x 6) is expressed as:

$$\begin{pmatrix} a_t \\ p_t \\ v_t \\ r_t \\ m_t \\ g_t \end{pmatrix} \begin{pmatrix} \Psi_1 & \theta_{11} & \theta_{12} & \theta_{13} & \theta_{14} & \theta_{15} \\ \Psi_2 & \theta_{21} & \theta_{22} & \theta_{23} & \theta_{24} & \theta_{25} \\ \Psi_3 & \theta_{31} & \theta_{32} & \theta_{33} & \theta_{34} & \theta_{35} \\ \Psi_4 & \theta_{41} & \theta_{42} & \theta_{43} & \theta_{44} & \theta_{45} \\ \Psi_5 & \theta_{51} & \theta_{52} & \theta_{53} & \theta_{54} & \theta_{55} \\ \Psi_6 & \theta_{61} & \theta_{62} & \theta_{63} & \theta_{64} & \theta_{65} \end{pmatrix} \begin{pmatrix} \mu_a \\ \mu_p \\ \mu_v \\ \mu_r \\ \mu_m \\ \mu_g \end{pmatrix} \quad (4.2.5)$$

We therefore proceed with the endogenous variables n=6 and we assume that the structure of the model is consistent with the class of dynamic linear stochastic models. The matrix form of the VAR model is presented in 4.2.5.

The effect of the structural breaks in the exchange rate regime in Nigeria is captured by different phases as discussed in Chapters 1 and 4. Thus, the VAR was conducted using dummy in capturing phase 1 and phase 3.

4.3 Analytical Techniques

a. Properties of most time series data and Unit Root Tests

Macroeconomic time series data often appear to possess a stochastic trend and therefore the mean and variance of these variables vary with time. From Appendix A, a visual plot of the variables show that most of the variables are trending. Such variables may not be stationary, and therefore

the use of these variables may give spurious results. In line with standard practice in modern time-series econometrics, the study began the estimation process by testing the time-series properties of the data. Unit root tests were conducted to determine the order of integration of each variable. This was followed by multivariate co-integration analyses.

The analysis is based on time series data. This therefore requires some specific approaches to the analysis. It is generally known that the econometric estimation of a model based on time series data demands that the series be stationary as non-stationary series usually result in misleading inferences. Engle and Granger (1987) provide a standard technique to deal with this problem. This involves testing the variables of an equation for stationarity. The estimation therefore begins by conducting stationarity tests to ascertain the stationarity or otherwise of the variables and the appropriateness of the specification for VAR estimation.

The first step involves the determination of order of integration of the individual data series. To ascertain this, augmented Dickey and Fuller (1979) and Phillips and Perron (1988) tests for unit roots were conducted. These two tests were done to cross-check the weak power of ADF. The acceptance of the null hypothesis in PP and ADF implies the existence of a unit root (non-stationary). The variables were tested with intercept and intercept plus trend using the following equations:

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad \text{.....[4.3.1]}$$

$$\Delta Y_t = \alpha_0 + \gamma Y_{t-1} + a_2 t + \sum_{i=2}^{p} \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad \text{.....[4.3.2]}$$

Equations 4.3.1 and 4.3.2 test for unit roots with intercept and intercept plus trend respectively. The variable of interest is γ in both cases. The hypotheses to be tested are:

$H_{0:} \gamma = \alpha_0 = 0$ *for equation* 4.3.1 and

$H_{0:} \gamma = \alpha_0 = a_2 = 0$ *for equation* 4.3.2

Log levels are selected for this study since it reduces multicollinearity as well as reducing the large values to relatively manageable ones. It also shows elasticity and thus rate of change.

b. Cointegration Tests

The study used the Johansen and Julius Maximum Likelihood cointegration test that adopts Maximal Eigenvalue and Trace method. We test the null hypothesis of non-co-integration against

the alternative of the existence of co-integration. According to Masih and Masih (2000), unlike the Engle-Granger (E-G) test, the Johansen procedure does not a priori assume the existence of at most a single co-integration vector, rather it tests for the number of cointegration relationships. Also unlike the E-G procedure, which is sensitive to the choice of the dependent variable in the co-integration regression, the Johansen procedure assumes all variables to be endogenous.

c. Pair-wise Granger Causality Tests

In order to examine whether there is a lead-lag relationships between the real exchange rate and agricultural output in Nigeria as well as between the price of oil and the real exchange rate, a pair-wise Granger-causality tests was conducted. From the result of the stationarity tests, since the time series of the variables are non-stationary, I(1) and cointegrated, the Granger-causality tests was run based on the following equations:

$$\Delta X_t = \vartheta_x + \sum_{i=1}^{k} \rho_{x,i} \Delta X_{t-1} + \sum_{i=1}^{k} \psi_{x,i} \Delta Y_{t-1} + \varphi_x ECT_{x,t-1} + \varepsilon_{x,t}, \qquad (4.3.3)$$

$$\Delta Y_t = \vartheta_y + \sum_{i=1}^{k} \rho_{y,i} \Delta Y_{t-1} + \sum_{i=1}^{k} \psi_{y,i} \Delta X_{t-1} + \varphi_y ECT_{y,t-1} + \varepsilon_{y,t}, \qquad (4.3.4)$$

where φ_x and φ_y are the parameters of the ECT term, measuring the error correction mechanism that drives the X_t and Y_t back to their long run equilibrium relationship. The null hypothesis for equation (4.3.3) is $H_o : \sum_{i=1}^{k} \psi_{x,i} = 0$, suggesting that the lagged item ΔY_t does not belong to the regression. Conversely, the null hypothesis for the equations (4.3.4) is $H_0 : \sum_{i=1}^{k} \psi_{y,i} = 0$, that is the lagged term ΔX_t does not belong to the regression. These hypotheses are tested using the F-test.

d. Error Correction Model

After determining that the variables are co-integrated, a vector autoregressive (VAR) model that incorporates an error correction model is specified. The ECM states that if two or more non-stationary time series are co-integrated, then there exists an ECM which describes the long run equilibrium between the non-stationary series. It represents the deviations from the equilibrium in time period t and provides an additional explanatory variable to explain changes in the dependant

variable. Hence the ECM arises from the long run co-integration relationship and has the following form:

$\Delta LNAGRICGDP_t = (\Delta LNPON_t, \Delta LNVOL_t, \Delta LNRER_t, \Delta LNMS_t, \Delta PC_t) + \lambda U_{t-i} + V_t$ …….[4.3.5]

where

Δ = first difference;

λ = coefficient of error correction term, which measures the speed of adjustment to long run equilibrium;

U_{t-i} = reported residuals from the co-integrated regression (long run relationship) and represents the deviation from the equilibrium in time t; and

V_t = the white noise disturbance term.

The long run part of the VEC is given by the five error correction terms, which allow discrepancies between the log-level of the agricultural product share of GDP and the Dutch Disease variables to impact on it in the following period.

e. Long Run Weak Exogeneity

It is important to note that some of the adjustment coefficients infer some information about long-run weak exogeneity of variables to the Dutch Diseases equation. We shall conduct test for long-run weak exogeneity, which in a cointegrated system implies that a variable does not respond to the discrepancy from the long-run equilibrium relationship. Thus, any long-run weak exogenous variable does not experience the type of feedback assumed and used in the VAR.

CHAPTER 5: EMPIRICAL RESULTS AND CONCLUSION

5.1 Unit Root Tests

To test the variables for stationarity and determine the order of integration of the individual data series, Augmented Dickey and Fuller (1979) and the Phillips and Perron (1988) tests for unit roots were conducted. The variables were tested with intercept and intercept plus trend. The results are reported in Table 5.1.

Table 5.1: Unit Root Tests Result

Table 5.1.1: Unit root tests at Levels

	Type of Tests			
	ADF		PPT	
Variables	Intercept	Intercept & Trend	Intercept	Intercept & Trend
LNAGRICGDP	-1.989774	-1.557825	-2.012952	-1.520100
LNPON	-3.444091**	-3.353217*	-3.444091**	-3.353217*
LNVOL	-2.503881	-6.376241***	-2.965170**	-2.349896
LNRER[1]			-1.596798	-1.995326
LNMS	-1.484841	-1.970408	-1.292309	-1.753882
PC	1.998864	-2.705055	1.998864	-2.184420

Source: Author's computation (2012)

Table 5.1.2: Unit root tests at First Differences

	Type of Tests			
	ADF		PPT	
Variables	Intercept	Intercept & Trend	Intercept	Intercept & Trend
LNAGRICGDP	-7.334347***	-7.766072***	-7.330206***	-7.725640***
LNPON	-10.31391***	-10.33207***	-13.28866***	-32.74700***
LNVOL	-6.372755***	-	-6.359255***	-6.583409***
LNRER	-5.585149***	-5.527662***	-5.462629***	-5.396046***
LNMS	-5.040604***	-4.988070***	-5.039060***	-4.986193***
PC	-4.686384***	-4.865722***	-4.566899***	-4.727239***

Source: Author's computation (2012)

***Notes**: (i) Critical Values for **ADF (Intercept)** are **(10** percent**)** -2.59, **(5** percent**)** -2.92 and **(1** percent**)** -3.57 (ii) Critical Values for **ADF (Intercept & trend)** are **(10** percent**)**-3.18, **(5** percent**)**-3.50, **(1** percent**)**-4.16 (iii) Critical Values for **PPT (Intercept)** are **(10** percent**)**-2.59, **(5** percent**)** -2.92, **(1** percent**)** -3.57 (iv) Critical Values for **PPT (Intercept & trend)** are **(10** percent**)**-3.18, **(5** percent**)**-3.50, **(1** percent**)**-4.16*

[1] *We did not use ADF for **LNRER** due to the structural break. According to Enders (2010) **w**hen there are structural breaks, the various Dickey Fuller test [1]statistics are biased towards non rejection of a unit root', Enders (2010)*

Table 5.1.2 reveals that all variables are integrated of order 1 except PON. VOL may be stationary at level as shown in Tables 5.1.1 and 5.1.2. As a result, the variables are integrated of order one i.e. I (1) in levels. The Engle-Granger (1987) co-integration representation theorem is then applied which states that, if a group of time series data is integrated of the same order, then there could be a possible cointegration (long run) relationship among them. The next stage involves the tests and a result of co-integration.

5.2 Cointegration Tests

The cointegration tests results on the variables {price of oil (PON), quantity of oil (VOL), real exchange rate (RER), money supply as share of GDP (MS), per capita income (PC) and the share of agriculture to GDP (AGRICGDP)} are presented below.

Table 5.2.1 reveals that the Trace Test rejects the null hypothesis of zero cointegrating vectors at 1 percent level of significance but could not identify more than 1 cointegrating vector.

Table 5.2: Johansen's Cointegration Tests Results

Table 5.2.1: Trace Test

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	Critical Value (0.05)	Prob.**
None *	0.592768	105.8437	95.75366	0.0084
At most 1	0.357523	63.62020	69.81889	0.1413
At most 2	0.349036	42.82626	47.85613	0.1368
At most 3	0.246156	22.64912	29.79707	0.2637
At most 4	0.180703	9.368360	15.49471	0.3324
At most 5	1.77E-05	0.000831	3.841466	0.9780

Trace test indicates 1 contegrating eqn(s) at the 0.05 level

Table 5.2.2: Max-eigenvalue test

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	Critical Value (0.05)	Prob.**
None *	0.592768	42.22345	40.07757	0.0282
At most 1	0.357523	20.79394	33.87687	0.6995
At most 2	0.349036	20.17714	27.58434	0.3290
At most 3	0.246156	13.28076	21.13162	0.4267
At most 4	0.180703	9.367529	14.26460	0.2568
At most 5	1.77E-05	0.000831	3.841466	0.9780

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Source: Author's computation (2012)

However, to pin down the exact number of cointegrating vectors, we conducted a Maximum Eigenvalue Test as shown in Table 5.2.2. The results of this test confirm that there is at least one cointegration vector as the hypothesis of zero cointegration vectors is rejected at 5 percent level of significance. The hypothesis of at most 1 cointegrating equation cannot be rejected. This means that variables in the system move together towards a stationary long-run equilibrium state defined by the cointegrating vector.

The implication is that even though the series are not individually stationary, a linear combination was found to be stationary. This means that there is a stable long-run relationship between them and so we can avoid both the spurious and inconsistent regression problems which otherwise would occur with regression of non-stationary data. Since we have 1 co-integrating equation from two tests, we can conclude that there is a long-run equilibrium relationship in the system of variables that comprise one Dutch Disease equation in Nigeria. The existence of co-integrating relationships among the variables implies that the Dutch Disease variables in Nigeria are most efficiently represented by an error correction specification. We therefore employ the Vector Error Correction (see Section 5.5) in order to have clarity of the long-run and short-run equilibrium of the variables.

5.3 Pair-wise Granger Causality Tests

Using the tests of causality introduced by Granger (1969) and Sims (1972) we attempted to establish the direction of causation between the real exchange rate and agricultural output as a percentage of GDP as well as between the price of oil and the real exchange rate using an appropriate lag. From the results in Table 5.3.1, it is seen that at 5 percent significance level, the hypothesis that the real exchange rate does not Granger Cause agricultural output is rejected and also the hypothesis that price of oil does not Granger Cause real exchange rate is rejected. These show a unidirectional line of causation in each case—that real exchange rate affects agricultural output and also that price of oil affect real exchange rate.

Table 5.3: Granger Causality Tests Results

Pairwise Granger Causality Tests
Date: 04/11/12 Time: 13:06
Sample: 1960 2009
Lags: 5

Null Hypothesis:	Obs	F-Statistic	Prob.
AGRICGDP does not Granger Cause RER	44	1.95286	0.4120
RER does not Granger Cause AGRICGDP		2.99436	0.0245
PON does not Granger Cause RER	44	3.52308	0.0116
RER does not Granger Cause PON		0.56068	0.7292

Source: Author's computation (2012)

5.4 Error Correction Model

From the short-run dynamics, the results (Appendix B) show that the coefficient of the error-term for the estimated AGRICGDP equation is both statistically significant and negative. The coefficient is 0.26 indicating adjustment of 26 percent (error correction term) from the long run equilibrium relationship between AGRICGDP and PON, VOL, RER, MS and PC. The agricultural product share of GDP adjusts slowly following a shock to the long run equilibrium. The implication is that it will take approximately 4 years to eliminate any shock on AGRICGDP and go back to equilibrium. This is consistent with the fact that agricultural product is relatively less sensitive to changes in the macroeconomic environment. The long run equation as presented in Appendix B therefore becomes:

$$AGRICGDP=-4.9112 - 3.1890PON - 0.7540VOL + 2.0942RER + 6.7277MS + 0.1739PC + \mu_1$$

5.5 Long Run Weak Exogeneity Tests

The results in Table 5.5.1 indicate that the null hypothesis of the long-run weak exogeneity of variables in the Dutch Disease equation is rejected for just two variables: PON and MS. This means that the variables are cointegrated with trend movements of other variables in the system, while in the short term they respond to changes in other variables. In undertaking this test, we linearly restrict the respective coefficients to zero, but preserve the cointegration rank of one. The result of the test is reported in Appendix C.

Table 5.5: Long-Run Weak Exogeneity to the Cointegrating Vector

VARIABLE NAME	CHI^2	DECISION	INFRERENCE
PON	10.26987	Reject null	Not exogenous
VOL	0.12202	Accept null	Exogenous
RER	0.447770	Accept null	Exogenous
MS	26.76277	Reject null	Not exogenous
PC	0.59862	Accept null	Exogenous

5.6 Impulse Response Functions

The Impulse Response Functions (IRFs) are used in this research work because many of the variables have linkages to each other: the problem of the non-exogeneity of some of the variables can be taken care of using the IRFs, which capture the endogeneity of the variables. Using Cholesky Ordering, (Appendix D) shows that all the interrelationships in the model are captured by VAR. The IRFs show the response of a particular variable to one standard deviation shock on each of the variables in the system. The interpretation of the IRFs takes into consideration the use of first differencing of the variables since a one-time shock to the first difference in a variable is a permanent shock to the level of that variable. The following conclusions could be drawn from the IRFs results in Appendix D.

The response of the real exchange rate to innovations in the quantity of oil produced in Nigeria is negative throughout the accumulated period except the first two periods. This shows that an increase in quantity of oil produced for the eight periods led to appreciation of real exchange rate in Nigeria. This tends to suggest that Nigeria is plagued with Dutch disease.

The effect of the price of oil on the contraction of the agricultural sector is also established from the result throughout the observed periods. The signs are negative throughout the accumulated period and the coefficients are strong, which also tends to suggest that Nigeria is plagued with Dutch disease.

The contractionary impact of the real exchange rate for the accumulated periods on agricultural output is established. This is seen from the response of agricultural output to innovations in the real exchange rate. Using the 10-period accumulation, from the second to the tenth period the signs are positive and the coefficients are strong. This tends to suggest that exchange rate appreciation has a

contractionary impact on the agricultural output in Nigeria, which further suggests that Nigeria is plagued with Dutch disease.

Also, the contractionary impact of the quantity of crude oil produced and the price of oil on agricultural output is established. This is seen from the response of agricultural output to their innovations. Using the 10-period accumulation, from the first to the tenth period the signs are negative and the coefficients are strong for the price of oil but weak for the quantity of oil. This tends to suggest that Nigeria is plagued with Dutch disease. This is contrary to the finding of Roemer (1985), whose study was based on Nigeria, Mexico and Venezuela and Jazayeri (1986) who studied Iran and Nigeria among other studies on the LDCs which made similar findings. The problem with these studies, which did not find evidence of the Dutch disease in the LDCs, was that they assumed manufacturing was the sector that suffered whereas agriculture is the traditional export sector of most of the LDCs, especially Nigeria.

5.7 Variance Decomposition

After discussing the findings for the impulse response functions in the previous subsections, we now turn to the results for the variance decomposition, which shows the share of the forecast error attributable to each variable. Appendix E displays the forecast error variance decomposition results for all the variables involved in the SVAR model. From the table, it appears that both the quantity of oil produced and the real exchange rate spread dominate the system to some extent as their forecast errors are largely attributable to their own innovations: about 85 percent and 67 percent respectively of the forecast error variance are explained by their own innovations at the end of the 10-year period considered in the variance decomposition.

Forecast errors of price of oil in the first two months are purely explained by its own shock (100 percent), which reflects the contemporaneous identification scheme. Among all the variables, changes in the agriculture share of GDP are not fully explained by its own innovation (80 percent) in the first period but by the end of 10-year horizon, less than 44 percent of its movement are due to its own shocks while the remaining percentage are mainly due to real exchange rate spread and the quantity of oil produced.

The forecast errors of the exchange rate spread is relatively largely determined by the change in the price of oil — at least for longer term forecasts. This is consistent with the findings for the impulse responses of the previous subsections.

The major finding here is that variations in agricultural output are explained predominantly by own shock followed by the quantity of oil in the short run (two periods) while the real exchange rate explained more than own shock in the long run. Thus, in the long run, the real exchange rate is the most important variable that explains variations in agricultural output as share of GDP if own innovation is assumed away. These further confirm that real exchange rate and the quantity of oil are an important source of variation in agricultural production in Nigeria. Likewise, over the medium to longer term (4–10 years), changes in the real exchange rate (aside from the effects of its own shock) are only explained by shocks to the price of oil spread. These are akin to the response found in the impulse response functions.

This differentiates this research work from prior studies who found no trace of Dutch disease in the Nigerian economy. With this analysis, it is possible to gain a more complete understanding of the dynamic relationship between price of oil, quantity of oil produced, real exchange rates and agriculture share of GDP in Nigeria.

5.8 DIAGNOSTIC CHECKS

Diagnostic checks for normality, autocorrelation and the graphs of the residuals are reported in Appendix F.

The result of the normality test shows that we accept the null hypothesis that the joint residuals of the Dutch disease variables are multivariate normal.

The null hypothesis of no serial autocorrelation is also accepted.

5.9 VALIDATION OF MODEL AND HYPOTHESES

The results from the model will be validated and evaluated by the already carried out battery of conventional diagnostic tests together with other relevant robustness check tests used to test the reliability of the proposed methodology (VAR) and validity of the result estimates.

Since all the E–Views applied in this study show statistically significant relationship of the dependent and independent variables from the model, it therefore follows that we reject the null hypothesis (H_0) in the three cases that:

1. There is no significant relationship between the real exchange rate and the price of oil in Nigeria.
2. The real exchange rate has no significant impact on agriculture as a percentage of GDP in Nigeria.
3. There is no significant relationship between the agricultural output and the oil exports in Nigeria.

Thus, this research study has been able to confirm the presence of Dutch Disease in Nigeria with these empirical analyses. Also, the study has been able to confirm that the quantity of oil produced has a steady impact in the contraction of the tradable goods sector especially in the wake of the euphoria.

5.10 CONCLUSION

The results above offer support for the hypothesis that agriculture as a share of GDP responds to movements in real exchange rates and price and quantity of oil produced and that most of the dynamic interaction takes place in the long run. These results are consistent with Olusi and Olagunju's (2005) model of speculation and theoretical groundwork of Dutch disease. Rising oil prices can breed appreciation of real exchange rate which will lead to contraction of the traditional tradable sector (agriculture).

This study has shown that, contrary to earlier findings that Nigeria is not suffering from the Dutch disease, the disease is present in Nigeria, although in the long run. A possible explanation for earlier findings could be because the authors assumed that oil would impact manufacturing rather than agriculture. But it is a known fact that agriculture and not manufacturing has been the traditional leading foreign exchange earner and therefore the traditional tradable sector of most less developed economies including Nigeria. Likewise, it is also a known fact that manufacturing sectors in the less developed economies are still not developed to the stage where their products will enjoy large foreign patronage and become tradables as in the developed economies.

The contraction of the agricultural sector in resource boom countries, especially Nigeria, was a result of the sudden windfall from oil. It is therefore inescapable that government should focus more on the traditional tradable sector and put more money into agriculture, the sector with long-term potential for sufficiency in food and economic development. It is clear that things changed domestically in this regard in recent years in Nigeria as evidenced in our quantitative analysis although at an insignificant rate. The recent rise in the local contribution of non-oil to GDP (as seen in the third phase of the economy) is a welcome development for the agricultural sector and sectors other than oil in the Nigerian economy.

The results in this thesis have a number of policy implications. As expected, real exchange rates respond to the price of oil and the quantity of oil produced in Nigeria. Also, the agriculture share of GDP responds to both the exchange rate and the price and quantity of oil produced in Nigeria to confirm that Dutch disease is real in a significant way in the economy. Thus, increased oil revenues could hurt the whole economy if not properly managed. In Nigeria, the effects of oil revenues spent on unproductive activities are visible. We find that the real exchange rate appreciation led to a significant contraction of the agricultural sectorial productivity. Such a scenario could be reversed if the revenues of oil were used on productive activities.

Provision of extension services and new technology by the government to the agricultural sector could enhance increase productivity in the sector. In addition, spending a significant proportion of the oil revenues on infrastructural facilities would greatly enhance workers' productivity which would result in both short- and long-term growth. It is important that the government of Nigeria prioritize agricultural sector again with more sense of responsibility and strong effort in reducing the impact of corruption on the implementation of policies.

The country's economic opportunity, however, is not in the foreign exchange earning capability of raw or even partially processed agricultural produce, but rather in linking agriculture to other sectors of the economy. This will lead to the much desired diversified and industrialized economy, with less emphasis on the primary extractive sector, in which crude oil belongs.

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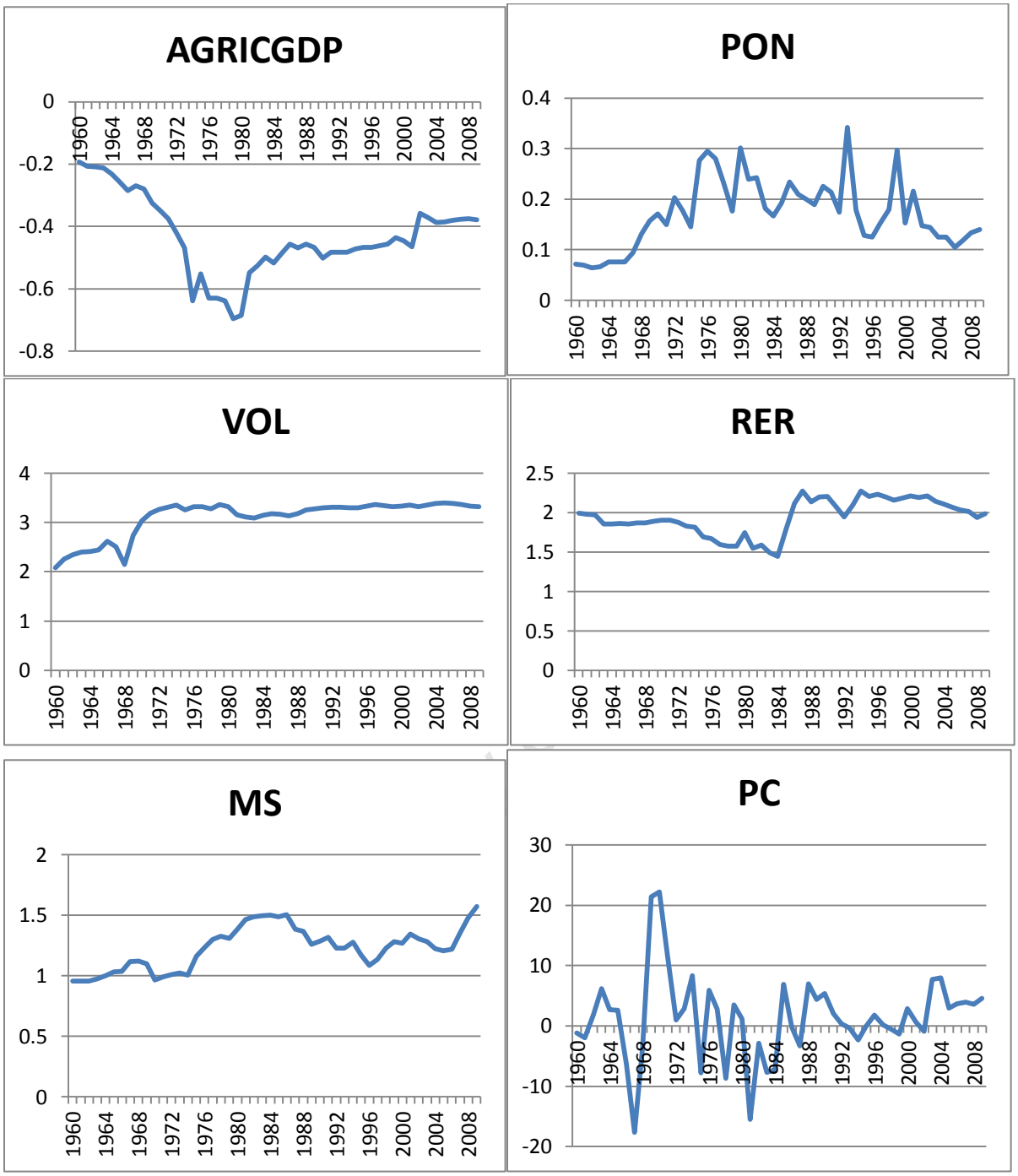
APPENDIX A
GRAPH OF THE VARIABLES



APPENDIX B VEC RESULTS

Vector Error Correction Estimates
Date: 04/15/12 Time: 21:15
Sample (adjusted): 1963 2008
Included observations: 46 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
AGRICGDP(-1)	1.000000
PON(-1)	3.189036 (0.58903) [5.41402]
VOL(-1)	0.754086 (0.34096) [2.21164]
MS(-1)	-6.727680 (1.07822) [-6.23960]
PC(-1)	-0.173940 (0.02067) [-8.41348]
RER(-1)	-2.094196 (0.84669) [-2.47338]
C	4.911217

Error Correction:	D(AGRICGDP)	D(PON)	D(VOL)	D(MS)	D(PC)	D(RER)
CointEq1	-0.261264 (0.04975) [5.25140]	-0.070064 (0.04870) [-1.43865]	-0.132830 (0.02679) [-4.95829]	0.031917 (0.01493) [2.13813]	0.203708 (2.14727) [0.09487]	-0.002185 (0.03182) [-0.06866]
D(AGRICGDP(-1))	0.012100 (0.19209) [0.06299]	0.014909 (0.18806) [0.07928]	0.106636 (0.10345) [1.03083]	0.023383 (0.05764) [0.40566]	6.920079 (8.29160) [0.83459]	0.178723 (0.12288) [1.45442]
D(AGRICGDP(-2))	-0.063657 (0.19321) [-0.32947]	-0.336660 (0.18915) [-1.77982]	-0.116845 (0.10405) [-1.12297]	0.002049 (0.05798) [0.03535]	-14.83084 (8.33999) [-1.77828]	-0.298813 (0.12360) [-2.41758]
D(PON(-1))	0.244218 (0.27450) [0.88969]	-0.283098 (0.26874) [-1.05344]	-0.049418 (0.14783) [-0.33430]	0.205422 (0.08237) [2.49384]	-24.27828 (11.8488) [-2.04901]	-0.362835 (0.17560) [-2.06625]
D(PON(-2))	0.428181 (0.31252) [1.37011]	-0.103413 (0.30596) [-0.33800]	0.259938 (0.16830) [1.54449]	-0.000785 (0.09378) [-0.00837]	-9.723747 (13.4899) [-0.72082]	-0.123361 (0.19992) [-0.61705]
D(VOL(-1))	-0.169730 (0.31316) [-0.54200]	-0.052299 (0.30658) [-0.17059]	-0.684186 (0.16864) [-4.05696]	0.047491 (0.09397) [0.50537]	-20.04964 (13.5175) [-1.48324]	0.050826 (0.20033) [0.25371]

D(VOL(-2))	0.106832	-0.230261	-0.562227	0.220701	-17.64668	-0.097378
	(0.30081)	(0.29450)	(0.16200)	(0.09027)	(12.9848)	(0.19244)
	[0.35514]	[-0.78187]	[-3.47056]	[2.44492]	[-1.35903]	[-0.50602]
D(MS(-1))	0.032674	-0.454079	-1.238322	0.349612	-36.45891	-0.433027
	(0.62216)	(0.60910)	(0.33505)	(0.18670)	(26.8558)	(0.39801)
	[0.05252]	[-0.74549]	[-3.69588]	[1.87260]	[-1.35758]	[-1.08799]
D(MS(-2))	-0.062080	0.398341	-0.017997	0.000614	9.839679	0.048731
	(0.56984)	(0.55788)	(0.30688)	(0.17100)	(24.5973)	(0.36454)
	[-0.10894]	[0.71403]	[-0.05864]	[0.00359]	[0.40003]	[0.13368]
D(PC(-1))	0.006678	-0.009456	-0.006935	0.003021	-0.092753	0.001198
	(0.00684)	(0.00669)	(0.00368)	(0.00205)	(0.29512)	(0.00437)
	[0.97673]	[-1.41275]	[-1.88360]	[1.47254]	[-0.31429]	[0.27400]
D(PC(-2))	-0.005662	-0.007388	-0.004270	0.001451	-0.336680	-0.003209
	(0.00064)	(0.00455)	(0.00250)	(0.00139)	(0.20043)	(0.00297)
	[1.21950]	[-1.62529]	[-1.70758]	[1.04120]	[-1.67979]	[-1.08017]
D(RER(-1))	0.304081	0.349325	-0.036654	-0.159530	17.94521	0.639969
	(0.38757)	(0.37943)	(0.20872)	(0.11630)	(16.7296)	(0.24793)
	[0.78459]	[0.92065]	[-0.17561]	[-1.37169]	[1.07266]	[2.58119]
D(RER(-2))	-0.591688	-0.218726	-0.304275	-0.203000	11.02437	-0.214502
	(0.41534)	(0.40662)	(0.22367)	(0.12463)	(17.9281)	(0.26570)
	[-1.42460]	[-0.53792]	[-1.36036]	[-1.62876]	[0.61492]	[-0.80732]
C	-0.062088	-0.011534	-0.094515	0.028684	2.726074	-0.004711
	(0.02538)	(0.07380)	(0.04060)	(0.02262)	(3.25397)	(0.04822)
	[-0.82362]	[-0.15628]	[-2.32814]	[1.26802]	[0.83777]	[-0.09769]
PHASE3	-0.045133	-0.002165	0.105704	-0.025454	-4.167194	0.003031
	(0.09869)	(0.09661)	(0.05315)	(0.02961)	(4.25979)	(0.06313)
	[-0.45735]	[-0.02241]	[1.98895]	[-0.85952]	[-0.97826]	[0.04801]
PHASE1	-0.052356	0.072972	0.244841	-0.044578	0.429379	0.023147
	(0.09866)	(0.09659)	(0.05313)	(0.02961)	(4.25887)	(0.06312)
	[0.53065]	[0.75545]	[4.60799]	[-1.50565]	[0.10082]	[0.36674]
R-squared	0.881697	0.243780	0.661184	0.609096	0.503065	0.344011
Adj. R-squared	0.766498	-0.134331	0.491775	0.413644	0.254598	0.016016
Sum sq. resids	0.813084	0.779313	0.235810	0.073218	1514.984	0.332747
S.E. equation	0.164629	0.161174	0.088659	0.049402	7.106297	0.105317
F-statistic	7.342789	0.644732	3.902901	3.116346	2.024675	1.048829
Log likelihood	27.54677	28.52247	56.01634	82.91693	-145.6451	48.09613
Akaike AIC	-0.502033	-0.544455	-1.739841	-2.909432	7.028048	-1.395484
Schwarz SC	0.134016	0.091594	-1.103792	-2.273382	7.664097	-0.759435
Mean dependent	-0.037491	0.018379	0.021274	0.011372	0.037276	-0.000743
S.D. dependent	0.173780	0.151330	0.124363	0.064516	8.230916	0.106170

Determinant resid covariance (dof dj.)	9.97E-10
Determinant resid covariance	7.67E-11
Log likelihood	144.0599
Akaike information criterion	-1.828691
Schwarz criterion	2.226123

APPENDIX C EXOGENEITY TESTS

VEC Exogeneity Wald Tests

Date: 02/22/12 Time: 17:48
Sample: 1960 2009
Included observations: 47

Dependent variable: D(LNAGRICGDP)

Excluded	Chi-sq	df	Prob.
D(LNPON)	6.672604	2	0.0356
D(LNVOL)	2.261970	2	0.3227
D(LNRER)	0.107672	2	0.9476
D(LNMS)	0.943833	2	0.6238
D(PC)	7.661772	2	0.0217
All	19.12819	10	0.0387

Dependent variable: D(LNPON)

Excluded	Chi-sq	df	Prob.
D(LNAGRICGDP)	2.239687	2	0.3263
D(LNVOL)	1.588833	2	0.0518
D(LNRER)	2.904655	2	0.2340
D(LNMS)	0.133461	2	0.9354
D(PC)	3.038283	2	0.4189
All	10.26987	10	0.2171

Dependent variable: D(LNVOL)

Excluded	Chi-sq	df	Prob.
D(LNAGRICGDP)	2.483040	2	0.2889
D(LNPON)	2.693679	2	0.2601
D(LNRER)	2.016882	2	0.3648
D(LNMS)	5.326522	2	0.0697
D(PC)	0.221807	2	0.8950
All	0.12202	10	0.0203

Dependent variable: D(LNRER)

Excluded	Chi-sq	df	Prob.
D(LNAGRICGDP)	1.838681	2	0.0988
D(LNPON)	2.465955	2	0.2914
D(LNVOL)	0.441422	2	0.5419
D(LNMS)	0.367499	2	0.5321
D(PC)	0.553928	2	0.7581
All	0.447770	10	0.0549

Excluded	Chi-sq	Df	Prob.
D(LNAGRICGDP)	2.307562	2	0.3154
D(LNPON)	5.526166	2	0.0631
D(LNVOL)	5.706641	2	0.3577
D(LNRER)	10.67577	2	0.0048
D(PC)	1.444768	2	0.4856
All	26.76277	10	0.3028

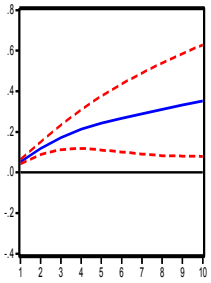
Dependent variable: D(PC)

Excluded	Chi-sq	Df	Prob.
D(LNAGRICGDP)	4.717727	2	0.0845
D(LNPON)	1.182196	2	0.5537
D(LNVOL)	1.728671	2	0.4213
D(LNRER)	1.574894	2	0.4550
D(LNMS)	4.092263	2	0.1292
All	0.59862	10	0.0521

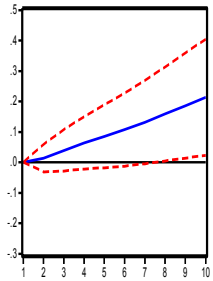
APPENDIX D IMPULSE RESPONSE FUNCTIONS

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.

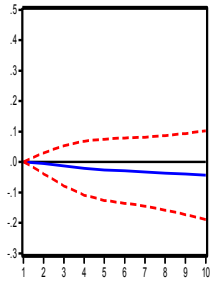
Accumulated Response of PON to PON



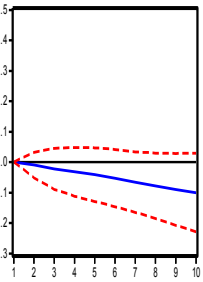
Accumulated Response of PON to VOL



Accumulated Response of PON to RER



Accumulated Response of PON to AGRICGDP



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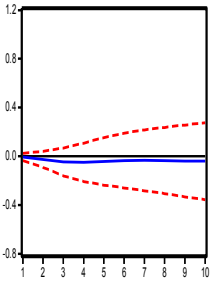
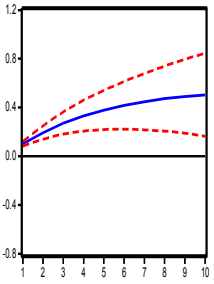


Accumulated Response of VOL to VOL



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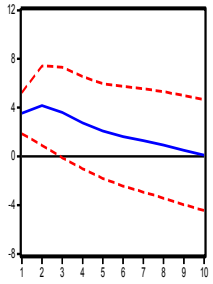

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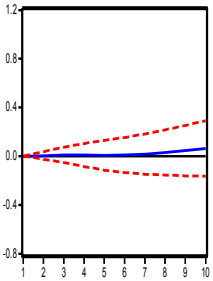
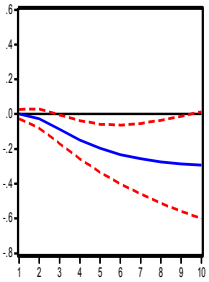
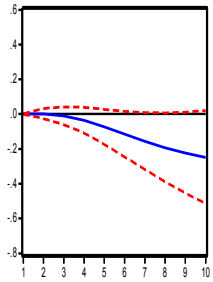


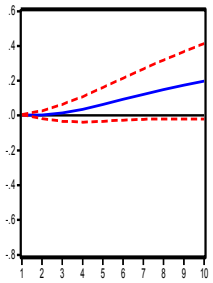
Accumulated Response of RER to PON



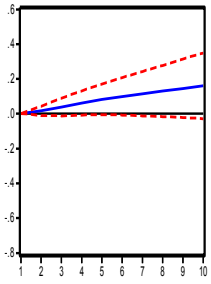
Accumulated Response of RER to VOL



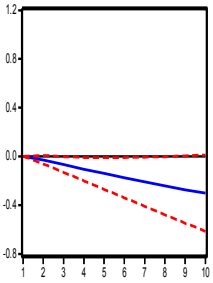
Accumulated Response of RER to RER



Accumulated Response of RER to AGRICGDP



Accumulated Response of AGRICGDP to PON



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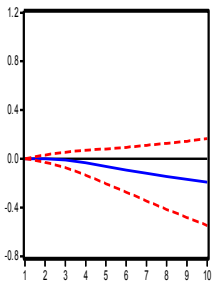

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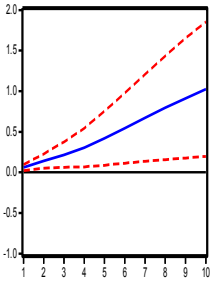
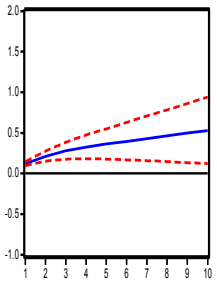


Accumulated Response of AGRICGDP to AGRICGDP



APPENDIX E VARIANCE DECOMPOSITION

Variance Decomposition of PON:

Period	S.E.	PON	VOL	RER	AGRICGDP
1	0.148791	100.0000	0.000000	0.000000	0.000000
2	0.148791	100.0000	0.000000	0.000000	0.000000
3	0.166140	85.29807	3.191673	1.918701	3.795494
4	0.166140	85.29807	3.191673	1.918701	3.795494
5	0.180524	73.12045	7.840269	2.256569	8.392046
6	0.180524	73.12045	7.840269	2.256569	8.392046
7	0.193898	63.71882	12.66387	2.291123	12.41911
8	0.193898	63.71882	12.66387	2.291123	12.41911
9	0.206355	56.40861	16.54105	2.592185	15.62313
10	0.206355	56.40861	16.54105	2.592185	15.62313

Variance Decomposition of VOL:

Period	S.E.	PON	VOL	RER	AGRICGDP
1	0.155647	0.145266	99.85473	0.000000	0.000000
2	0.155647	0.145266	99.85473	0.000000	0.000000
3	0.207108	0.864151	93.82301	1.536809	0.319764
4	0.207108	0.864151	93.82301	1.536809	0.319764
5	0.226099	1.432135	89.21597	3.248403	0.885063
6	0.226099	1.432135	89.21597	3.248403	0.885063
7	0.234269	1.482352	86.73692	4.082343	1.486942
8	0.234269	1.482352	86.73692	4.082343	1.486942
9	0.238603	1.438616	85.28234	4.442483	2.111120
10	0.238603	1.438616	85.28234	4.442483	2.111120

Variance Decomposition of RER:

Period	S.E.	PON	VOL	RER	AGRICGDP
1	0.136786	4.448336	0.323808	95.22508	0.002780
2	0.136786	10.61204	0.668052	86.54524	1.617723
3	0.191691	16.49295	2.676379	77.95388	1.313843
4	0.191691	20.20940	3.260517	72.73374	1.226388
5	0.218984	21.87513	3.185913	70.38246	1.322447
6	0.218984	22.64796	3.020884	69.22653	1.487629
7	0.229285	23.15072	2.924610	68.44955	1.617506
8	0.229285	23.56640	2.883581	67.81495	1.700210
9	0.232557	23.90853	2.860818	67.29852	1.755965
10	0.232557	24.17731	2.839872	66.89343	1.799609

Variance Decomposition of AGRICGDP:

Period	S.E.	PON	VOL	RER	AGRICGDP
1	0.218629	7.088022	9.904618	0.578046	80.09326
2	0.218629	7.088022	9.904618	0.578046	80.09326
3	0.311863	4.415281	8.283552	15.13465	70.05614
4	0.311863	4.415281	8.283552	15.13465	70.05614
5	0.395174	3.060884	6.071267	29.57408	57.83942
6	0.395174	3.060884	6.071267	29.57408	57.83942
7	0.468475	2.362407	4.341705	38.86050	48.79659
8	0.468475	2.362407	4.341705	38.86050	48.79659
9	0.526753	2.072694	3.514375	43.51742	43.25309
10	0.526753	2.072694	3.514375	43.51742	43.25309

Cholesky Ordering:
PON VOL PC MS RER AGRICGDP

APPENDIX F DIAGNOSTIC TESTS

Fi NORMALITY TEST

VEC Normality Tests
Orthogonalization: Cholesky (Lutkepohl)
Null Hypothesis: residuals are multivariate normal
Date: 02/16/12 Time: 14:55
Sample: 1960 2009
Included observations: 47

Component	Skewness	Chi-sq	df	Prob.
1	-0.656960	3.380841	1	0.0660
2	0.552720	2.393082	1	0.1219
3	0.179776	0.253168	1	0.6149
4	1.034989	8.391088	1	0.0038
5	-0.006755	0.000357	1	0.9849
6	-0.611470	2.928847	1	0.0870
Joint		17.34738	6	0.0081

Component	Kurtosis	Chi-sq	df	Prob.
1	5.910068	16.58413	1	0.0000
2	3.237725	0.110671	1	0.7394
3	5.564190	12.87618	1	0.0003
4	5.106726	8.691660	1	0.0032
5	2.343629	0.843694	1	0.3583
6	3.155396	0.047290	1	0.8278
Joint		39.15363	6	0.0000

Component	Jarque-Bera	df	Prob.
1	19.96498	2	0.0000
2	2.503753	2	0.2860
3	13.12935	2	0.0014
4	17.08275	2	0.0002
5	0.844051	2	0.6557
6	2.976137	2	0.2258
Joint	56.50101	12	0.0000

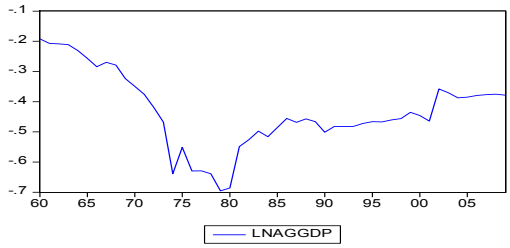
Fii AUTOCORRELATION

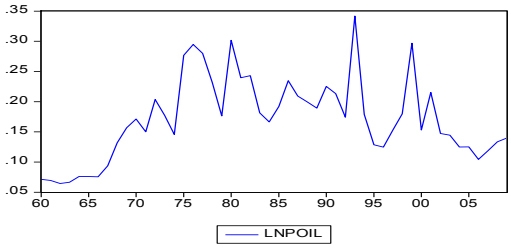
VEC Serial Correlation LM Tests
Null Hypothesis: no serial correlation at lag order h
Date: 02/16/12 Time: 14:59
Sample: 1960 2009
Included observations: 47

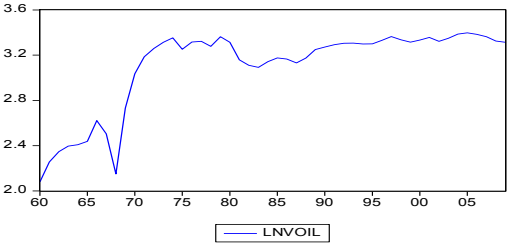
Lags	LM-Stat	Prob
1	25.80141	0.8958
2	38.89440	0.3407
3	18.84646	0.9917
4	36.05741	0.4660
5	44.54193	0.1553
6	45.16689	0.1407
7	52.88296	0.0344

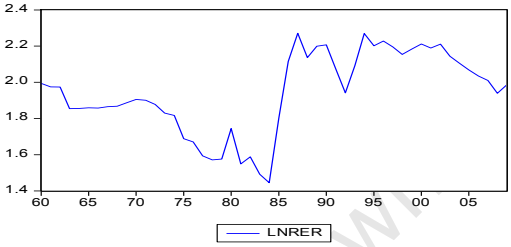
Probs from chi-square with 36 df.

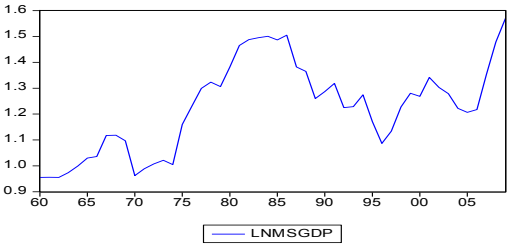
Fiii ENDOGENOUS GRAPHS

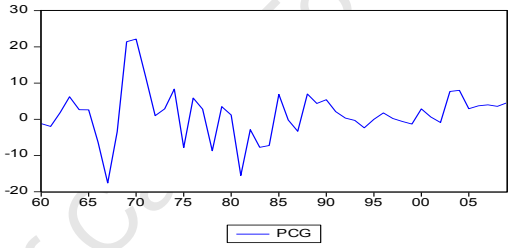












FIV. GRAPH OF THE RESIDUALS