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# Economic Growth Paradox in Nigeria: A Perspective from Natural Resource Wealth Time Series Analysis for the Period 1980 - 2013

Jamiu Amusa

Eastern Illinois University

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#### **Abstract**

This thesis empirically examines the paradox of economic growth in Nigeria with a viewpoint from natural resource wealth. The question involved in this study is that whether natural resource wealth has a positive impact on economic growth in Nigeria or not. The economy of Nigeria is observed to be growing on paper but deplorably, poverty and unemployment is on a progressive increase in reality. The study uses the endogenous growth theory (AK Model) in terms of how resource wealth can influence economic growth. It exploits time series analysis (Unit Root and Co-integration) techniques to test for the existence of a relationship. It also applies the Error Correction Mechanism (ECM) in testing for the existence of a relationship as it captures the short-run dynamics and provides a measure to resolve the behaviour of the series in the short run with its performance in the long run. The result confirms that that natural resource (Oilrent and Agriculture) based growth strategy will not lead to sustained economic growth for the Nigerian economy. Thus it was recommended that Nigeria should follow an industrial growth strategy with a vibrant real sector that would result in the diversification of the economy with the aim of addressing and tackle the issue of wide spread corruption and mismanagement of public funds in all respective areas and sectors of its economy. The involvement of this study lies in the reality that it provides additional confirmation on the ongoing debate of resource wealth on the economic growth development within a specific country.

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#### Chapter 1

#### Introduction.

## 1.1 Background to the Study.

Achieving sustainable economic growth and development in Nigeria has been a long-standing concern over the past decades. Despite its full potentials, the "Giant of Africa" due to its vast population of approximately 147 million, the most populous nation in Africa and abundant wealth in fertile land fields, forestry, hunting and fishing (substituted by Agriculture) and Crude oil resources, the Nigerian economy continues to struggle to alleviate its challenges ranging from poverty, unemployment etc.

Nigeria is a region abundant in natural resources and rich in vast oil reserves. In recent years, the economy has witnessed an accelerated GDP growth rate. In many cases the petroleum industry has played a pivotal role in this growth. Some would see the widespread presence of oil as route to unlocking growth and securing development in the region. Nigerian oil projects have attracted substantial investment. The oil and gas sector is a foundational element of economic growth for the nation as it accounts for a significant part of the state's revenues and represents a prime mover for employment, domestic power development, and in many cases, infrastructure development. In the last five years, Nigeria's economy grew by an average of 7 per cent, primarily driven by the oil sector which accounts for more than 30 per cent of gross domestic product and 70 per cent of all exports (OECD 2011). According to OECD, in 2011, mining and quarrying (including oil) accounted for 33.5 per cent of total GDP. Unfortunately, Negative growth of the oil sector has drag down overall growth. The performance of the oil sector was hampered by supply disruptions arising mainly from oil theft, illegal oil bunkering and pipeline vandalism. The non-passage of the Petroleum Industry Bill also seems to be contributing to weak investment in exploration and exploitation of oil and gas, resulting in no new finds during 2013.

As a result, crude-oil production dropped to an average of 2.21 million barrels per day (mbpd) in 2013 from 2.31 (mbpd) in 2012 (World Bank, 2013).

Despite the oil sector's dominance, agriculture is also an important contributor to the economy. It contributed more than 75% of export earnings before 1970 (World Bank, 2013). In 1960, the proportion of the national output accounted for by agriculture (defined generally to include crops, animal husbandry, fishing and forestry) stood at 67%. By the mid 1990s, the agriculture share of export had declined to less than 5% and the overall agricultural production rose by 28% while per capita output rose by only 8.5% during the same decade. Agriculture has suffered from years of mismanagement, inconsistency, poorly conceived government policies and lack of basic infrastructure. However, the sector accounts for 33.4% of the gross domestic product (GDP) and two-thirds of employment (World Bank, 2013). The country has not been able to satisfy internal demand and has to import a considerable amount of food products to meet domestic demand.

Manufacturing sector has strengthened in recent years, the sector still accounted for less than 5 per cent of GDP. The low share of the manufacturing sector in GDP reflects long-standing problems of competitiveness. The loss of competitiveness of Nigerian industry appeared during the oil-boom period of the early 1970s with the resulting real appreciation of the exchange rate which led to a surge in imports (World Bank, 2013). The inability to compete with imports can also be traced to high costs of production caused by poor infrastructure and a deficient business environment. The problems include: power shortages, poor transport infrastructure, widespread insecurity and crime, lack of access to finance, corruption, and inefficient trade-facilitation institutions. With incessant power cuts in Nigeria, manufacturers rely increasingly on expensive generators. This problem is particularly acute for small and medium-sized enterprises (SMEs).

However, over the past decades, Nigeria has maintained impressive growth with a record estimated at 7.4% growth of real gross domestic product (GDP) in 2013, up from 6.5% in

2012 (AEO 2014). This growth rate is higher than the West African sub regional level and far higher than the sub-Saharan Africa level. Thus, are prospects in Nigeria for sustained growth driven by an improved performance of the key non-oil sectors (agriculture, information and communication technology, trade and services). But decline in the contribution of the oil sector may dampen the positive outlook. Nevertheless, there is much discussion on the topic of what can be done to ensure continuous economic growth. Hence, there is a need for the Nigerian economy to look to other, more manageable sources of earnings and government revenue to spur economic growth.

#### 1.2 Statement of the Problem.

Does a resource based growth strategy lead to sustained economic growth? The resource based growth strategy followed by Nigeria and many developing countries with an abundance of natural resources appear to not be working. Most Latin American and African countries still struggle to develop, while developed countries follow industrialization strategies which have led to economic growth. Hence, it is important to better understand the roots of failure in natural resource-led development.

#### 1.3 Objective and Motivation of the Study.

The primary objective of this research is to examine the paradox of economic growth in Nigeria with a key focus on natural resource wealth (Oil and Agriculture.) To examine the direction of causality between Oil, Agriculture and economic growth in Nigeria. To highlight policy implications for Nigeria in view of the findings from the research.

In the empirical literature for developing countries, there seems to be a lack of clarity between economic growth and natural resource wealth. Casual observation also confirms that extremely resource abundant countries have not experienced sustained rapid economic growth. Is natural resource wealth then a curse?

## 1.4 Organization of the Study.

This study is divided into five chapters. Chapter one consist of the introduction to the study. Chapter two covers the literature review. Various research work related to the study will be examined with a remarkable conclusion drawn from them. Chapter three is the research methodology which presents different statistical and econometric tools used to test the hypothesis of the model. Chapter four discusses the data presentation and the analysis of result generated from the research. Chapter five takes the account of the summary and conclusion, main contributions of the Study, policy implications and recommendations, limitations of the study and suggestions for further research.

#### Chapter 2

#### A Review of Relevant Literature

#### 2.1 Introduction.

The trend of inconsistent growth in developing countries has been examined by many economists over the years. Due to this trend, economists have propounded ways of solving the problem of poor growth. This literature will address previous studies by mainstream economists that suggest comparative advantage based on the Heckscher-Ohlin model of factor endowment. It will also observe the perspective of new institutional economists and the structural economists with concentration on the effects of commodity price volatility and specialization on growth. Finally, the overview of the Nigerian economy will be discussed demonstrating the observed gaps in existing literature.

## 2.2 Resource-Based Growth Perspective Based on Mainstream Economists.

These economists claim that countries should produce and export based on their comparative advantage. The theory of comparative advantage proposed that a country benefits the greatest economic gain relative to other countries by producing at lower overall cost which a country has in abundance. Other countries will therefore benefit if they accept the cost advantage of the country and focus on producing a commodity in which they have an advantage. This was the theory that propelled mainstream economists belief in specialization, international division of labour and free trade. In addition, (O'Toole 2007) it geared their notion on the need for some nations to manufacture industrial goods and others fabricate agricultural and mineral goods.

Based on Heckscher-Ohlin (HO) theory, nations produce and export the commodities which require the use of its abundant productive factors intensely.

In line with Feenstra 2003, the Heckscher-Ohlin (HO) theory is based on two countries, two goods and two factors with the assumption that both countries have free trade in goods and different factor endowments, the same technologies and equal tastes. Provided two countries

have diverse factor endowments, they will gain from trade. A mainstream economist asserts that this will allows for efficient use of resources leading to additional gains from trade (WTO 2010). According to (Clarke et al. 2009: 114), Heckscher and Ohlin proposed that nations with large quantity of capital would import labor intensive goods and export capital intensive goods, while nations with large quantity of labor would import capital intensive goods and export labor intensive goods.

To prove the principle of comparative advantage, Leontief (1953) studies the U.S economy utilizing U.S. economy data on input-output accounts and U.S trade data from 1947. To evaluate the model, he measures labor and capital used directly and indirectly in each exporting firm to determine the amount of labor and capital required in the production of one million dollars of U.S exports and imports. He observed that each person employed works with about \$13,700 worth of capital in producing the exports and each person employed works with \$18,200 worth of capital in producing the imports. While the U.S was capital abundant in 1947, Leontief's findings appear to contradict the HO theory as his study translated into what is known as the Leontief Paradox (Feenstra 2003: 36).

In a further study of the HO model in the perspective of natural resources, Kemp and Long (1984) came up with a three scenario test. in the first situation, the good is produced by only exhaustible resources, while in the second circumstance, the good is produced by one exhaustible and one non-exhaustible resource and finally in the third situation, the good is produced by two non-exhaustible resources and an exhaustible resource. They observed that nations well endowed in exhaustible resources will specialize in that resource sector and produce goods related to the resource. This result deduced that trade is driven by comparative advantage and disparity in factor endowments (World Trade Report 2010).

In an investigation by Clarke and Klkarni (2009) with the use of data from Asia to test the soundness of the HO model. Singapore, a capital rich country was compared with Malaysia a fairly labor abundance country with less capital.

Their aim was to find out if the exports of both countries would be derived based on the HO theory. Based on their hypothesis that capital abundant country will export capital goods and the labor intensive country will export labour intensive goods. Comparing the data between the two countries, they concluded that Singapore's exports are fairly capital intensive in contrast to Malaysia's exports that are relatively labour intensive. They find out that capital intensive exports were 32 per cent of all Singapore's exports which is relatively low by HO theory standards. They concluded that the Singapore-Malaysia trade in 1997 performed in line with the theory of comparative advantage and therefore they will both experience growth.

The determining reason for a nation to exports primary goods or manufactured commodities depends on the quantity of skilled labour relative to natural resource wealth Wood and Berge (1997). From their analysis, they enquiry on why East Asia has developed swiftly with manufacturing however Africa has presented poorly producing primary goods. They concluded that the disparity does not stem from the composition of exports but the availability of human capital and natural resources. Using the HO model to test their hypothesis, a country with an abundance of natural resources and unskilled labor will produce labor intensive goods. This is for the reason that the skill needed for manufacturing is greater than for primary goods. For a nation with a low skill/land endowment ratio, the comparative ad-vantage lies in agriculture and resource extraction. Their findings suggest that cross-country correlation exist between development and export composition. Conversely, they discover that manufacturing exporters grow faster than primary good exporters. They attributed the correlation on the magnitude of skill as a determinant of comparative advantage.

In line with mainstream economists, a country will certainly develop provided developing countries continue to produce and export the goods they can produce hugely. Nonetheless, numerous issues are raised by economists on the literature of comparative advantage for the reason that markets and information are not perfect as most of the previous studies assume.

#### 2.3 The New Institutional Economics.

This is a division of mainstream economics. They assume people don't have perfect information and thus requires the need for formal and informal institutions to guide the society and reduce ambiguity. They assert that the performance of the economy dependent on the formal and informal institutions, rules, laws and contracts (Menard et al. 2008: 1). They endeavour to investigate the problem of countries to spur sustainable growth. Hence concentrating on the role of institutions to profound solutions. Empirical evidence from 1965-1990 was provided by Sachs and Warner (1997) to elucidate the slow growth in Sub Saharan Africa. Their theory explains that factors such as economic policy, geography and demography explain growth in Africa in recent decades. They used a number of variables as determinants of growth and assess diverse factors to influence growth in Africa. Natural resource endowments were found to associate with sluggish growth. Their result confirms that as exports from natural resource increased gross domestic product, annual growth was projected to decrease by 0.33 percentage points. They also affirm that the institutional quality index (bureaucratic quality index, risk of expropriation index, rule of law index, corruption in government index and government repudiation of contract index) is significant to growth in their result. As the institutional quality index increases by one unit, growth rate will increase by 0.28 per cent annually. However, majority of the slow growth was explained by poor quality of policies and institution in Africa.

In agreement with Sachs and Warner, Mehlum et al. (2006) posits that the natural resource curse applies to nations with weak institutions. Using data from 87 resource abundant countries with more than 10% of their GDP from resource exports and their average yearly

growth from 1965 to 1990, they assume that natural re-source abundance is hurtful for economic development in countries with institutions which are 'grabber friendly'. Grabber friendly institutions have competing production and rent-seeking activities while producer friendly institutions have complementary production and rent-seeking activities. Testing their hypothesis using similar data and methodology as Sachs and Warner, where the dependent variable is GDP growth and explanatory variables comprise of openness, resource abundance, initial income level, institutional quality (index ranges from zero upward) investment and an interaction term (resource abundance and institutional quality). Their regression analysis depicts that the interaction term was significant and strong meaning that the resource curse deteriorate as the institutional quality raises. Their conclusion was that divergence in growth losers and growth winners results from the quality of institution.

In another study by Robinson et al. (2006) contend that the impact of re-source abundance is largely dependent on the political motivation generated from the resource endowments. To test their theory, they set up a two-period probabilistic voting model with two parties. The design is that the current politician seeking re-election must settle on measures to extract resources and redistribute rents to secure re-election votes through support. Results from the study show that the presence of permanent resource abundance makes it further expensive for the politician to remain in power in the future. Thus leading to increased efficiency of the extraction path. They conclude that the choice chosen is decided by the quality of institution administering the resources.

With the use of panel data from 1980-2004 for 124 countries, Bhattacharyya et al. (2010) examine the relationship between natural resources and corruption and the consequence of the quality of democratic institutions on the relationship. Presenting a game theoretic model where one economy has current president and challenger. In equilibrium, a bad challenger is clever to take off a good current president in the presence of quality democratic institutions. An expansion

in the variation in probability, the better the institutions. Their finding is that resource rents have a statistically significant negative effect on natural resources and income. This proposes that natural resource wealth relate to high levels of corruption. Adding an interaction term including lagged democracy measure and resource rents to assess if corruption is effected by the quality of institution. Their result showed that resource rents lead to corruption except the democracy score is above 0.93 and a POLITY2 score of 8.6. They validate their findings by showing that in 2004, Bolivia and Mexico had a POLITY2 score of 8 while Botswana had a POLITY2 score of 9.

Lane and Tornell (1998) contend that the combination of weak institutions and fractionalization leads to rent-seeking behaviour and poor growth performance from their study of economic growth, multiple powerful groups, political and legal institutions. They observed a two-sector growth model with a formal sector that is efficient and an inefficient shadow sector. While the formal sector is taxable, the shadow sector is not taxed as this is the event that occurs in most economics. According to Hodler (2006), aggressive activities (rent-seeking) between multiple rival groups result to an unproductive activities and thus slow growth. Setting up a model to analyze natural resources and fractionalization and its effects on property rights and incomes, natural resources are measured by World Bank proxies and "the share of natural capital in the sum of physical, human and natural capital as a proxy for per capita natural resources". Fractionalization is measured by the index of ethnic fractionalization as a proxy for the number of rival groups. Property rights are measured by the Heritage Foundation and the Fraser Institute indices of economic freedom. His finding depicts that as ethnic fractionalization increases, the income effect on natural resources decreases.

Using a staple model and the hypothesis of rent cycling, Auty (2007) argues that natural resource rich countries witness economic growth when resource rents are recycled into productive and efficient, action. In a further argument, he affirms that government in resource poor countries focuses on wealth building activities as a result of to low rent, while in resource

rich countries, government centres on rent seeking. New institutional economists' literature differs in the scope in which facts are presented. However institutional economists all agree that the role of institutions is imperative. The lack of economic growth in developing countries is traced to the weak institutions governing the countries.

#### 2.4 Structural Economists view.

Structural economists support the concept of industrialization and less dependence on primary product production. They considered that the economy is influenced by politics and power. According to the structural Economists, markets are controlled by the elite with less contribution to create growth. They argue that free trade leads to high development in developed countries. Thus hurting growth in less developed countries. They encourage trade among developing countries in order to reduce dependence on developed economies. According to (O'Toole 2007), a main consideration of the structural economics is the belief that developing countries are all categorized by free market failures thus; the state has a significant role to certify development. Prebisch and Singer (1950) argue that agricultural and mineral good prices have a downward pricing movement in the long-run in contrast to manufactured goods. As household income rises, demand for manufactured goods turns out to be more elastic and increases more rapidly than the demand for primary goods. Thus, primary goods demand as a share of GDP will reduce. (Frankel 2010), countries depending on primary goods grow slower than countries which rely on manufactured goods.

According to all structural economists, diversification is a key factor to economic growth. However, diversifying into manufactured goods will enhance long run sustainable growth. The fast growth in East Asian countries has been linked with the change from a primary goods exporter to industrial sector exports, while countries in Latin America and Sub Saharan Africa are yet to advance towards manufacturing. Hesse (2008) who provided empirical facts that diversified economies do better in the long run. In his argument, export diversification can

unravel problems of commodity dependent nations that repeatedly experience export instability as a result of in-elastic and unstable global demand. In other to test the relationship between export diversification and GDP per capita growth, he estimated an augmented Solow growth model with a data set of average export concentration and cumulative GDP per capita growth. He observed that most of the East Asian countries emerge in the lower right corner of his scatter plot with moderately low levels of export concentration. Poor growth performers appear in the upper left corner with high level of export concentration.

Le-derman and Maloney (2007) studied the connection between natural resource exporters and GDP per capita between 1980 and 2005. From their result, they observed that GDP per capita grew slower in natural resource exporters than in natural resource importing countries. This implies that it becomes more complicated for countries specializing in mineral resources like crude oil to diversify into other products due to the facility required for oil production.

Disagreement against many of the supposition of main-stream and new institutional economist were put forward by Structural Economist, but do not disagree with the importance of institutions. This literature centres on their argument for industrialization and manufacturing as an explanation to poor growth.

### 2.5 An Overview of the Nigerian Economy and its Growth.

Historically the country has relied on exports of primary products to support the economy. The country is highly dependent on exports of crude petroleum. Since the 1970s petroleum has become the most important single commodity in the Nigerian economy and sales of petroleum make up about 90 per cent of the Nigeria's export earnings and about 75 per cent of government revenues. This reliance on petroleum as the main source of the country's wealth has contributed greatly to economic instability since the late 1970s, as fluctuations in world petroleum prices and high levels of corruption and mismanagement among government officials have made sustainable development elusive and brought extreme poverty to the majority of

Nigeria's citizens (Iyoha and Oriakhi 2002). The World Bank has estimated that as a result of corruption, 80% of energy revenues in the country only benefit 1% of the population. Over the past decades, Nigeria Economy continues to struggle to alleviate its challenges of poverty, unemployment, corruption, mismanagement, huge population growth, unpredictable fluctuations in crude oil prices and political instabilities despite its full potentials for economic growth and abundant wealth in Agriculture and Crude oil resources. These issues have had major structural effects on the economy, contributing to a massive shortfall between income and expenditure and thereby having a negative effect on economic growth.

Agricultural products in Nigeria include cassava (tapioca), cocoa, corn, millet, palm oil, peanuts, rice, rubber, sorghum, and yams. Livestock products include cattle, chickens, goats, pigs, and sheep. Its agricultural industry, which accounts for 17.6% of GDP and two-thirds of employment, has seen a decline in productivity due to years of neglect. The sector suffers from extremely low productivity, reflecting reliance on antiquated methods. Agriculture has failed to keep pace with Nigeria's rapid population growth, so that the country, which once exported food, now relies on imports for sustainability. With abundant deposits of solid minerals, including barites, coal, columbite, gemstones, gold, graphite, gypsum, kaolin, marble, iron ore, salt, soda, sulphur, tantalite, tin, and uranium. Notwithstanding, the mining industry, which exported significant amounts of coal and tin until the 1960s, has declined due to deterioration of publicly controlled infrastructure and concentration on the petroleum industry. Today mining accounts for only 1% of GDP and a minor employer of labour. Mining suffers from extremely low productivity and high production costs. Nigeria is seeking to strengthen its mining industry through privatization and deregulation.

Industry and manufacturing accounts for 53.1% of Nigeria's gross domestic product (GDP), much of which is attributable to the lucrative energy sector, employing about 10 percent of the labor force. Manufacturing's share of export revenues is estimated at 1 percent, a

relatively low rate that policy makers hoped to increase by reversing capital flight and removing impediments to private-sector activity. Services accounted for an estimated 29.3 percent of gross domestic product. The most important branch of the services sector is banking and finance. Overall, Nigeria's economic structure is dominated by industry and services sector. The growth and development of the Nigerian economy from self-rule to current times can be classify into five diverse periods Balogun (2007). The pre-oil boom decade (1960-70); the oil boom (1971-1977); stabilisation and structural adjustment (1986-1993); deregulation era (1994-1998); and consolidation (1999–present).

#### 2.5.1 Pre-oil boom era (1960-1970):

The Nigerian economy was extremely dependent on agriculture as argued by Balogun (2007), agriculture accounted for 65 per cent of GDP and about 70 per cent of total exports. The sales of raw materials from agricultural produce to advanced nations were the main drive of the economy. In other to address complete reliance on agricultural production, the federal government formulated policies to encourage the growth of the economy.

The First National Development Plan (FNDP) 1962-1968, earned state direct and indirect contribution to economic activities. Hence, the government should supply the necessary and sufficient investment, in other to enhance the rate of growth of the economy. An import substitution industrialisation (ISI) strategy was established. Protective measures, such as tariffs and quotas, were adopted to allow domestic industries grow as jobs were created in the short run. Inflation and unemployment rates remained relatively low during this period. Increases in the level of productivity helped to maintain price stability as unemployment decreased to about 1.5 per cent.

#### 2.5.2 Oil boom era (1971-77)

During this time, the economy was exemplified by an intense dependence on crude oil production. Agriculture's contribution to the GDP turn down from 48.23 per cent in 1971 to

about 21 per cent in 1977, a plummet of about 30 percent within 6 years. In the same phase the agriculture's contribution to export fell from 20.7 per cent to 5.71 per cent (Iyoha and Oriakhi, 2002).

Due to the quick increase in the price of oil, the Arab Oil prohibition of 1973 caused a shift from a high reliance on the agricultural sector to oil. The oil sector became the prevailing sector and accounts for 85 per cent of total exports revenue (CBN 2008). Thus, guaranteeing that foreign exchange inflows outweigh outflows, this encouraged a culture of import-oriented consumption and Nigeria became a net importer. When the revenue from oil plummet, it led to a negative balance of trade situation. Inflation rate and unemployment had increased, by 1978 Nigeria was strained to borrow, to finance the shortfall from creditors in the European financial market. The period had encouraged economic policies which were geared towards supporting consumption at the expenses of production. The private sector had little contribution to the economy, thus economic growth measured by GDP growth rate fell from 10.5 per cent to 5.7 per cent. Hence, the Nigerian economy began to witness recession, giving rise to additional stabilisation policies to repeal the trend.

### 2.5.3 Stabilisation and structural adjustment (1978-1993)

Ekpo and Egwakhide (2003) identified that the oil boom era lead to various alterations in the real sector of the economy. With a weak productive base and heavy dependence on oil, the economy was largely caused by imprudent policies that made it become heavily dependent on the oil sector, with complete disregard of the other sectors. During this period, the bulk of Nigeria's external debt was attained Akpan (2009), as the debt increased substantially from \$4.3 billion to \$11.2 billion. Majority of this borrowing consist of short-term loans at floating interest rates. The terms of these loans became them expensive, as they required large amounts to continue to service them. The nation cut down into arrears on some of the loans and deserves penalties which further restrict the country's access to credit at the global market. This added to

an increase in level of unemployment. In other to address the situation and structural problems facing the economy, a structural adjustment programme (SAP) was adopted in 1986 as a means to appropriate and stabilise the imbalances within the Nigerian economy.

#### 2.5.4 Deregulation Era (1994-1998)

The period of the Structural Adjustment Programme witnessed some gains and initially appears to be achieving its intended objective Balogun (2007). This situation led to problems with commitment to the policies in the long term. The growth in the value of the GDP over this period was from 1.3 per cent in 1994 to 2.4 per cent in 1998, but whatever little growth occurred was adjudge by the higher growth rate of the population, which grew on mean rate of 2.83 per cent (Osunubi et al 2003).

The faster rate of growth of the population in relation to the GDP during this period impacted negatively on the welfare of the population and increased unemployment from 3.2 per cent to 14 per cent from 1994 to 1998. Beside the high unemployment rate, there was a very high level of inflation that reduced the living standard of an average Nigerian. The private sector during this period experienced very little growth and government policy to ameliorate demand to help control price fluctuation further hampered the growth of the sector. These policies constricted economic growth and worsened the problems of low capacity utilisation, unemployment and inflation.

## 2.5.5 Consolidation (1999-2007)

The viewpoint of this period was that government should have a reduced role in the economy and allow market forces to take lead in development (National Planning Commission 2009). The government adopted the ten broad proposal of the Washington Consensus, which involved the imposition of fiscal discipline via a Fiscal Responsibility Bill. Tax reform to encourage private investments and interest rate liberalisation were implemented, to allow banks' and other financial institutions' operations to be governed by market forces. Market-determined

exchange rates policies were practised within this period, which regrettably caused recurrent currency devaluations. Thus, making foreign imports more expensive. Trade was liberalised and regulation abandoned; inflows of foreign direct investment (FDI) were encouraged. The government believed that foreign direct investment would act as an engine of growth for the economy (Nzotta and Okereke, 2009).

The consolidation has witnessed revival in private enterprise taking the initiative in addressing socio-economic problems. For instance, the telecommunications industry has become one of the fastest growing sectors of the economy. The deregulation of this sector allowed entry of foreign and local mobile telecommunications companies that have succeeded in creating employment and income. However, not all privatisation exercises have been totally flourishing. While the consolidation era has witnessed a significant gain, there are still issues of unemployment and the low productive capacity of manufacturing sectors that are yet to be addressed.

### 2.6 Current trend in Nigerian Economic growth.

Going by the official statistics, the Nigerian economy exhibited strong economy growth over the last decade which averaged over 8% (World Bank 2013 report). This would imply that the size of the Nigerian economy is 170% times larger today than at the beginning of the decade. Reported growth in the non-oil economy has been even higher, meaning that the country's non-oil economy is now 240% times higher than a decade ago. More so, in contrast to the boom-bust cycles of earlier years, the country didn't experienced general macroeconomic crisis over this period, and the trend of annual GDP growth didn't decline below 6%. Growth in 2012 slowed fairly relative to the recent past, recorded at 6.6% by initial estimates, as opposed to 7.4% in 2011. Growth weakened particularly in oil, trade, and agriculture. The oil sector consists of 40% of the nation's gross domestic product at current prices, but growth in oil has been consistently slower than that of the non-oil economy. Oil production (exports) in Nigeria was essentially

stagnant in 2011-2012. Growth in oil is expected to remain low over the medium term, until potential investments that could expand production significantly occur. Non-oil growth has been driven by domestic demand and hence concerted in sectors servicing the domestic market. Non-oil exports remain quite small in Nigeria (5% of all exports). As trade and agriculture comprise 75% of the non-oil economy, the strong registered growth rates in those sectors have been chiefly important for explaining the non-oil economic expansion. The rapidly growing sector of telecommunications has been significant. Real estate and housing/construction have also witnessed twofold digit growth in recent years, although their shares in GDP remain modest.

#### Chapter 3

#### The Research Methodology

#### 3.1 Research Methodology Techniques.

This chapter centres on explaining the ideas supporting this research and considers the practical approach taken and the kind of data that will provide evidence on economic growth paradox in Nigeria. Gray (2009) identified that the choice of research technique is influenced by the research methodology chosen. The theoretical perspective is influenced in turn by the researcher's position. This is pursued by a report of the methods and techniques used. The model for the analysis is introduced and the choice of variables explained. How the data are sourced, issues of data quality and reliability of the data.

#### 3.2 Methods Used for the Research and the Research Question.

The most suitable methodology for this study is a time series econometric approach, since the relationship under examination is a cause and effect association. Some measures of time-series study or others are used in bulk of the studies relating to economic growth in a single country. This research examines the paradox of economic growth using time series for a single country (Nigeria), similar to the studies explored in the literature; it is a suitable tool to answer the research question. In addition, it is an accepted method within the literature for this kind of research. It is expected that this method will give insights into the relationships between the variables of interest and how they behave as a system. This method is mainly relevant because the research aims to examine the strength of the relationships.

The primary research question of the study is weather a resource based growth strategy lead to sustained economic growth or not? To better understand resource base growth strategy, it is imperative to test for certain kind of relationship. Hence, is there a relationship among the sectors of interest (AMSO) and economic growth in Nigeria? What are the direction in the relationship among the variables of interest and economic growth? This question requires

inspection for evidence of the presence of a relationship among the variables of interest over time. From the literature, the most appropriate method of doing this is an econometric framework, specifically a time-series analysis.

In terms of econometric framework, co-integration approach proffers useful insights towards testing for a relationship Engle and Granger (1987). Co-integration is a pattern of time series study frequently used by researchers within the literature to identify the continual patterns of co-movement among variables and also to estimate long- run equilibrium. Two or more variables are co-integrated when they share a familiar trend. If noticed that the variables have unit roots (non- stationary), the testing procedure becomes more complex. For certain groups of non-stationary variables, a linear arrangement of these variables may be stationary Engle and Granger (1987). The basic thought behind this is that, if two or more series move closely together in the long run, the difference between the series is constant Engle and Granger (1987). Even if the series are trended, then it may be said that the variables exhibit a co-integration relationship. Given that time-series data tends to be non-stationary, knowing the order of integration of the variables becomes important Engle and Granger (1987). The order of integration of a time series involve the number of times a time series must be differenced to make it stationary Engle and Granger (1987). Many economic time-series appear to be integrated of order one i.e. I (1), necessitating to be differenced once to attain stationarity.

Newest advancement in non-stationarity and co-integration theory has added to a better perceptive of the short-run and long-run dynamics in economics and the equilibrium behaviour of economic variables. Co-integration testing provides proof in support of continued existence of a linear relationship. The existence of relationships which attain equilibrium in the long-run have important inference for the short-run behaviour of the core variables, given that there must be a means that drives the variables to their long-run relationship. This adjustment procedure is

modelled by an error-correction mechanism as this leads to the specification of an error-correction model (ECM). Intuitively, econometric evaluation technique should be able to:

- "(1) Integrate all prior knowledge about the existence of unit roots.
- (2) Report the simultaneous determination of several variables in other avoid bias.
- (3) Capture sufficiently both short and long run dynamics" Engle and Granger (1987)

Using modern Econometric Approach, firstly, the test of the stationarity of the variables is conducted by using Augmented Dickey-Fuller (ADF) test of unit root. The term 'augmented' implies an improved version and more suitable than the basic Dickey–Fuller (Dickey and Fuller 1981). Secondly, the test of co- integration of the variable and the error correction mechanism. And finally, the test of causality among the variables of interest and economic growth. At the conclusion of the econometric tests, a test of statistical error will be performed.

### 3.3 Stationary, Unit Roots and Co-integration Methodology.

A stationary time series with no deterministic components has an infinite moving average representation that can be approximated by a finite process, Changes around its mean, and as the lag increases, autocorrelation declines rapidly (Granger 1986, Engle and Granger 1987). If non stationary time series (x) needs to be differenced the times until reaching stationary, then the time series is said to integrated of order d, denoted by  $X_1 \sim I(d)$ .

For a pair of series,  $X_t$  and  $Y_t$ , which are both integrated of the same order or I (d), any linear combination of the form  $Z_t = Y_t - aX_t$ , will be integrated of order (d), where 'a' is a constant. If "a" fulfils the relations  $Z_t$ ,  $\sim$  I (d-b), b > 0, then  $X_t$  and  $Y_t$  are integrated.

According to Engle and Granger methodology, the first step is to examine whether the time series contained in the equation has a unit root. In the co integration literature, the more frequently used test for a unit root are the Dickey – Fuller (1979 and 1981), Philips – Perron (1988), and Person (1986 and 1988) test. These Tests agreed in their treatment to the intercept parameter U. Thus, the test equation used for the ADF unit root test can be specified below:

$$\Delta X_{t} = \; \alpha_{0} + \; \theta X_{t-1} + \; \alpha_{1} \Delta X_{t-1} + \; \alpha_{2} \Delta X_{t-2} + \; ... \; ... \; \; \alpha_{p} \Delta X_{t-p} + \; U_{t}$$

The test equation above has an intercept term but no time trend. The numbers of augmented lag p is determined by minimizing the Akaike information criterion.

The null hypothesis model to test for unit root has the following forms:

$$X_t = \mu + \alpha X_{t\text{-}1} + e_t$$

And the model under the alternative hypothesis,

$$X_t = \mu + \theta(t-T/2) + \alpha X_{t-1} + e_t$$

Where  $X_t$  is the logarithm of the time series and under the null hypothesis;  $\alpha = 1$  and  $\theta = 0$ . T represents the number of observations. The maximum likelihood procedure suggested by Johansen (1988 and 1991) is particularly preferable when the number of variables in the study exceeds two due to the possibility of existence of multiple co-integrating vectors. The advantage of Johnson's test is not only limited to multivariate case, but is also preferable than Engle – Granger approach even with a two-variable model (Gonzalo, 1994). To determine the number of co-integrating vectors, Johnson (1988 and 1991) and Johnson and Juselius (1990) suggested two statistic tests. The first one is the true test ( $\lambda_{trace}$ ). It tests the null hypothesis that the number of distinct co-integrating vectors is less than or equal to (q), against a general unrestricted alternative (q - r). The second statistical test is the maximal eigenvalue test ( $\lambda_{max}$ ). This test concerns a test of the null hypothesis that there is (r) co-integrating vectors against the alternative that there is (r + 1) co-integrating vectors.

Conversely, determining the optimal number of lags is the most serious criticism of Johansen's method. Where more than one co-integrating vector is found, it is often difficult to interpret each economic relationship. If when the variables are not stationary at level I(0) or first difference I(1), the implementation of this technique becomes more complicated and somewhat burdensome. The Granger representation theorem is one of the most vital implications of co-

integration .According to the theorem, if two or more variables are co-integrated, then the data can be characterize by an error correction model, discussed below.

An error correction model (ECM) is for use with non-stationary series that are known to be co-integrated (Lutkepohl, 2006). An easy example is to consider a model with two variables and one co-integrating vector and no lags. The co-integrating equation is:

$$y_{2,t} = \beta y_{1,t}$$

 $y_{2,t}$  and  $y_{1,t}$  are the variables and  $\beta$  is the coefficient.

The corresponding EC model is:

$$\Delta y_{1,t} = \alpha_1 (y_{2,t-1} - \beta y_{1,t-1}) + \epsilon_{1,t}$$

$$\Delta y_{2,t} = \alpha_2 (y_{2,t-1} - \beta y_{1,t-1}) + \epsilon_{2,t}$$

The error correction term is identified by the right-hand side of the model equal to zero in the long run (equilibrium).  $y_1$  and  $y_2$  deviate from the equilibrium, the value of the error correction term is found to be nonzero; thus, the  $y_1$  and  $y_2$  's continually adjust to return the relationship to equilibrium. The  $\alpha_2$  captures the rate at which the *i*th variables in the model revert to their equilibrium state. The ECM model requirement can be relevant for application only in series that are co-integrated, the first step is to run the Johansen co-integration test and determine the number of co-integrating associations. This sequence is necessary as part of the estimation of the error correction model (Lutkepohl 2006).

#### 3.4 Co-integration Tests and Limitations.

If two series shares a common stochastic trend, they are said to be co-integrated, signifying a long-run relationship between the two series. The idea here is to study the co-movement by testing correspondingly for stationarity and cointegration. Cointegration implies that two or more variables move together over time and the difference between them is stable over time. The most widely adopted co-integration methods are the two-step residual procedure of Engle and Granger (1987) and the system-based reduced rank approach of Johansen (1991,

1995). The advantage of the system-based reduced rank approach is that it can estimate the number of co-integrating vectors in the system. The two-step residual procedure suppose that there is only one unique co-integrating vector, while the system-based reduced rank approach allows for the estimation of multiple co-integration vectors when tests involve more than two variables. The maximum likelihood procedure recommended by Johansen (1988 and 1991) is mainly preferable when the number of variables in the study is more than two due to the possibility of the existence of multiple co-integrating vectors. Therefore, this present analysis makes use of the Johansen methodology.

#### Limitations.

The exclusion of dynamics can create significant bias in finite samples and this sternly weakens the performance of the estimator Hendry et al (1986). In addition, endogeneity bias can involve small sample estimates. Any errors introduced in the first step are passed on to the second step (Enders 2004). Park and Philips (1988) argued that the ordinary least square estimator in the first step has non-normal distributions. Hence, the t-statistics information on the long-run parameters may be ambiguous.

#### 3.5 Model Specification.

Theoretically, the model for this research can be viewed from endogenous growth theory (AK Model) in terms of how resource wealth can influence economic growth. Lucas (1988) and Romer (1986). Assuming aggregate output is produced based on the constant return to scale production function where A > 0 below:

$$Y_t = AK_t$$
 Such that:  $Y_{t+1} = AK_{t+1}$  therefore,  $A = \frac{Y_{t+1}}{K_{t+1}}$ 

Respectively *K* and *t* are the capital stock and time. *A* measures the level of total factor productivity. At steady states, economic growth rate is a combination of the marginal productivity of capital, proportion of total savings for investment and the savings ratio. In distinctive form, this can be shown as:

$$Y = lnA + lnB lnS$$

The idea here is that the equation above represents a combination of three major instruments through which agriculture and oil may induce endogenous economic growth:

The relationship between natural resource wealth and economic growth in Nigeria can then be examined by broaden the AK model stated above. This is carried out by adding the natural resource wealth (Activities from the agricultural sector and oil) to the growth equation:

$$Y_t = \alpha_0 + \alpha_1 \left(\frac{\kappa_t}{Y_t}\right) + \alpha_2 H_t + \alpha_3 AGRICVA_t + \alpha_4 OILRENT_t + U_t$$

The argument in the equation above is that the agricultural savings and investment as well as crude oil savings and investment activities in the agricultural and oil markets/ sectors induces economic growth endogenously. The main idea of this study is to test the hypothesis that weather resource wealth in Nigeria is linked with real economic growth.

For the purpose of this research, the model is specified thus:

$$GDPC = f(GCF, AMSO).$$

In a more Explicit and log linear Form, the model is thus given as:

$$lnGDPC_t = \beta_0 + \beta_1 lnGCF_t + \beta_2 lnAMSO_t + U_t$$

The log linear form helps to remove the variance inherent in the variables. Incorporating the output of each sector independently gives:

$$\begin{split} lnGDPC_t &= & \beta_0 \ + \ \beta_1 lnGCF_t + \ \beta_2 lnAGRICVA_t + \beta_3 lnMFGVA_t + \ \beta_4 lnSEVVA_t \\ &+ \ \beta_5 lnOILRENT_t + \ U_t \end{split}$$

#### 3.6 Definition of Variables, Data Sources and Time Span.

Table 3.6.1 Definition of Variables.

Symbol	Variable	What it Proxies	Expected Signs.
GDPC	Gross Domestic Product per capital(in constant 2005 U.S.D)	Economic Growth	NA
GCF	Gross Capital Formation.	Outlays on additions to the fixed assets of the economy plus net changes in the level of inventories	+
AGRICVA	Agriculture, value added (% of GDP)	Includes forestry, hunting, and fishing, as well as cultivation of crops and livestock production.	+
MFGVA	Manufacturing, value added (% of GDP)	Industries defined as the physical or chemical transformation of materials of components into new products.	+
SEVVA	Services, value added (% of GDP)	Correspond value added in wholesale and retail trade (including hotels and restaurants), transport, and government, financial, professional, and personal services.	+
OILRENT	Oil rents (% of GDP)	The difference between the value of crude oil production at world prices and total costs of production	+

Source: world bank (2013).

#### **Data Sources and Time Span:**

To control the occurrence of unreliable data source, the data set used for this analysis was obtained from the 2013 World Development Indicators. The nature of the data is a secondary annual data, Metadata Indicators for a single country Nigeria covering a period of 33 years (1980-2013). The period 1980 to 2013 selected for this study exhibits the period the economy experienced series of reforms with a target of guaranteeing a more market economy. Since 1980, the liberalization policy including (SAP) structural adjustment programme suggested by the international monetary fund (IMF) have been executed by consecutive governments of Nigeria to promote economic growth. Thus allowing for credibility and maintaining a reasonably good degree of freedom in the model. However, the number of observations did not allow for some statistically significant since the study is limited to the time frame where data is available.

### Chapter 4

## Analysis of Results and Discussions.

### 4.1 Introduction

As earlier stated that the main objective of this research work is to empirically investigate the paradox of economic growth in Nigeria with perspective from natural resource wealth. This chapter therefore concentrates on the presentation of annual time series data used, followed by the descriptive analysis, correlation analysis, interpretation of the unit root tests, Johansen cointegration analysis, error correction mechanism, and granger causality test.

## 4.2 Descriptive Results and Discussion.

Table 4.2, Descriptive Statistics.

	GDPC	GCF	AGRICVA	MFGVA	SEVVA	OILRENT
Unit	In constant					
	USD	USD	USD	USD	USD	USD
Mean	682.3858	12.39726	33.42725	5.895045	29.33944	32.79728
Median	590.0519	11.35743	32.85022	5.495197	26.56374	32.63151
Maximum	1055.837	34.02084	48.56594	10.43726	57.01118	62.21516
Minimum	494.2390	5.467015	20.99640	2.410130	19.73632	13.43094
Std. Dev.	177.8669	6.258992	6.226284	2.483062	10.25580	10.19198
Skewness	0.928826	1.913995	-0.047684	0.285581	1.750636	0.438939
Kurtosis	2.347024	6.862294	3.029246	1.986000	4.949158	3.701482
Jarque-Bera	5.331215	40.65989	0.013682	1.862332	22.07992	1.736279
Probability	0.069557	0.000000	0.993183	0.394094	0.000016	0.419732
Observations	33					

Source: computed from World Development Indicators, (WDI) 2013.

Table 4.2 presents the descriptive statistics of the data used in the empirical analysis.

Kurtosis measures the peakedness or flatness of the distribution of the series. The statistics show AGRICVA as only variable that is normally distributed. i..e equal to 3. However, GCF, SEVVA and OILRENT are sharper than a normal distribution, with values concentrated around the mean and thicker tails i.e. greater than 3. This means high probability for extreme values. While GDPC, MFGVA are flat relative to the normal distribution with a wider peak i.e. less than 3.

Skewness is a measure of asymmetry of the distribution of the series around the mean. The statistic for skewness shows that all the variables except for AGRICVA is positively skewed, implying that these distributions have long right tails. The Jarque-Bera which measures whether the series is normally distributed or not also rejects the null hypotheses of normal distribution for GCF and SEVVA.

## 4.3 Correlation Analysis Results and Discussion.

Table 4.3 Correlation Matrix Analysis.

	GDPC	GCF	AGRICVA	MFGVA	SEVVA	OILRENT
GDPC	1.000					
GCF	0.172	1.000				
AGRICVA	-0.568	-0.272	1.000			
MFGVA	-0.074	0.725	-0.111	1.000		
SEVVA	0.725	0.404	-0.572	0.493	1.000	
OILRENT	-0.572	-0.202	0.251	-0.125	-0.626	1.000

Source: Computed from World Development Indicators, (WDI) 2013.

The table above is a correlation matrix variable analysis. The correlation matrix helps in detecting the presence of multicolinearity and eliminating any variable found to have a high correlation coefficient from the model. Some researchers propose that a high pair-wise correlation coefficient value of 0.8 or above shows the presence of serious multi-co-linearity. However Gujarati (2004) disputed that a high pair-wise correlation coefficient is an ample condition for the presence of co-linearity, but not an indispensable criterion for its existence in a model.

Therefore, the strategy for understanding the correlation coefficient to resolve the possibility of the presence of multicolinearity and acceptability of the variables for inclusion in the models is given thus: Between 0 and 0.5 (0 and -0.5), a weak positive (negative) linear correlation. The presence of a very weak multicolinearity. Between 0.5 and 0.7 (-0.5 and -0.7), a moderate positive (negative) linear correlation. The presence of a moderate multicolinearity. Between 0.7 and 1.0 (-0.7 and -1.0), a strong positive (negative) linear correlation. The

presence of a very strong multicolinearity. Showing a poor acceptance of the variables to be integrated in the model. The range of 0.4 for this study allows for the presence of very weak multi-co-linearity as this is within the verge of 0.5 highlighted by Gujarati (2004) thus retaining an acceptable level of multicolinearity.

From the table 4.3 above, it can be observed that, all the variables are correlated with growth (GDPC). Oilrent shows a negative correlation with other estimated variables in the model except for the Agricultural sector indicating a weak positive correlation. The implication of this is that the proceed from oil rent has no significant effect on overall growth of the economy. What might be causing the growth of the Nigerian Economy is largely due to the service sector indicating a positive correlation with the exception of the agricultural sector and oilrent. The implication of this is that the service sector provides information useful in gearing overall growth.

# 4.4 Time Series Properties of the Variables.

To avoid the problem of spurious regression, it is necessary to examine the time series properties of the variables. In literature, most economic time series are non-stationary and including non-stationary variables in the model can lead to spurious regression coefficient estimate (Granger and Newbold, 1974).

### 4.4.1 Unit Root Test – Results and Discussion.

The hypothesis of stationarity in the data employed is vital in the study of time series data. The stationarity of data is significant because conditions of variance, constant covariance, and mean need to be satisfied to certify the correctness of the parameters and model. Thus, it is imperative to check if the data are stationary or not while estimating the relationship between the determinants of economic growth. Phillips and Perron(1986) assert that conducting regressions which uses non-stationary variables may lead to misleading results, showing actually significant relationships, even where the variables are generated separately. (Patterson 2000) affirms that

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spurious regression frequently takes place while dealing with time series data. A unit root test can be practical to determine if the variables of interest are stationary or not.

## Lag length selection of the Augmented Dikey-Fuller (ADF) Unit Root Test

Table 4.4.1. Lag Selection Test Based on Akaike info Criterion (AIC).

Var	Lags	AIC	Var	Lags	AIC	Var	Lags	AIC
lnGDPC	1	-2.423361	lnAGRICVA	1	-0.748282	lnSEVVA	1	-0.630233
lnGDPC	2	-2.368845	lnAGRICVA	2	-0.699185	lnSEVVA	2	-0.488520
lnGDPC	3	-2.290338	lnAGRICVA	3	-0.640387	lnSEVVA	3	-0.171679
lnGCF	1	-0.124982	lnMFGVA	1	-0.003191	lnOILRENT	1	0.120638
lnGCF	2	-0.066008	lnMFGVA	2	0.083193	lnOILRENT	2	0.156788
lnGCF	3	-0.035299	lnMFGVA	3	0.264827	lnOILRENT	3	0.124797

Source: Authors Computation from Eviews Statistical Package.

From Table 4.4.1 above, the maximum number of lag length required to minimise the AIC is 1. As the lag length increases, AIC increases. Thus, to minimise the akinke info cri and to account for serial correlation, the maximum number of lag required is 1. In addition, the lag selection period was selected by default in e-views statistical package. Included in test equation is the intercept by default from e-views statistical package. From levels of the series, It appears that series has a non-zero mean. No time/linear trend included in test equation.

A summary of the Augmented Dikey-Fuller (ADF) unit root tests results obtained can be found in the table 4.4.1 below. The ADF tests the null hypothesis that the natural logarithm of the variable of interest has a unit root. The tests were performed with the use of econometric software Eviews. All the variables were lagged by one year period.

The hypothesis tested in the unit root test is given thus:

H<sub>0</sub>: the series have a unit root (Non Stationary)

H<sub>1</sub>: the series are stationary (No unit root)

The criterion measure is that, where the value of the ADF test statistic is greater than the critical value at the 5% levels of statistical significance, the null hypothesis H<sub>0</sub> cannot be rejected. i.e. non stationary. On the other hand, where the ADF test statistic value is less than the critical value at 5% levels, the null hypothesis is rejected, indicating nonexistence of a unit root i.e. stationary.

Table 4.4.2 ADF unit root test result at level.

Variables	ADF unit root test	5% Critical	Order of Integration	Meaning
	I(O)	Value*		
lnGDPC	-0.030223	-2.9591	I(0)	Non Stationary
lnGCF	-2.119474	-2.9591	I(0)	Non Stationary
lnAGRICVA	-2.256944	-2.9591	I(0)	Non Stationary
lnMFGVA	-1.597492	-2.9591	I(0)	Non Stationary
InSEVVA	-0.605970	-2.9591	I(0)	Non Stationary
lnOILRENT	-1.477438	-2.9591	I(0)	Non Stationary

Source. Authors computation from Eviews Statistical Package.

As it can be observed from table 4.4.2, the ADF test statistics for all the variables were greater than the critical values at 5% levels of significance and integrated at levels (I(0)). Thus, the null hypothesis cannot be rejected and the variables are non stationary. This result was expected, since most time series are non-stationary, due to the nature of their data generation process. Hence, it was therefore essential to perform the tests using the first and if need be, a second difference with the aim that the data would be stationary. The results from the first and second difference of the Augmented Dickey-Fuller (ADF) tests are presented in the table 4.4.3 below.

Table 4.4.3 ADF unit root test result at First difference.

Variables	ADF unit root test	5% Critical	Order of Integration	Meaning
	I(1)	Value*		
lnGDPC	-3.445507	-2.9627	I(1)	Stationary
lnGCF	-5.527109	-2.9627	I(1)	Stationary
lnAGRICVA	-5.835571	-2.9627	I(1)	Stationary
lnMFGVA	-3.608142	-2.9627	I(1)	Stationary
lnSEVVA	-4.512286	-2.9627	I(1)	Stationary
InOILRENT	-5.806797	-2.9627	I(1)	Stationary

Source: Authors Computation From Eviews Statistical Package.

From the results of the ADF tests in table 4.4.3, the null hypothesis of a unit root for each series at first and second difference was rejected. Hence, all of the variables were found to be stationary at their first differences i.e I(1) at 5% level of significance. Overall, the tests indicate that the variables are stationary.

To further confirm the stationarity of the data, the error term u was generated which is equated to the residuals. The error term (u) of the regression estimates were tested for unit root at first difference. The result showed that the data are stationary at first difference at 5% critical values.

Table 4.4.4 ADF unit root test result of the Error Term (u) at First difference.

variables	ADF Test	5% Critical	Order of	Meaning
	Statistic	Value	Integration	
U=Residuals	-5.684388	-2.9627	I(1)	Stationary
		4 11 14		

Source: Authors Computation from Eviews Statistical Package.

Based on the order of integration of the variable being stationary, it is feasible to apply the Johansen co-integration methodology.

### 4.5 Johansen Co-integration Result and Discussion

It is necessary to conduct Co-integration test for the model to determine if there are long run association among the variables observing that the unit root tests of the variables are stationary at their First and Second difference. Using the Johansen (1992) frameworks, the trace statistic (likelihood ratio) is compared with the critical value at 5% level of significance in order to determine the number of co-integrating vector(s) in the model. If this test establishes at least

one co-integrating vector among the variables under investigation, then a long run equilibrium relationship exist in the model. All the variables were lagged by one year period.

### **Result of Johansen Co-Integration Test**

Table 4.5.1 Unrestricted Co-integration Rank Test (Trace)

Johansen Co-integration Result (Trace Statistic)							
SERIES: lnGDPC lnGCF lnAGRICVA lnMFGVA lnSEVVA lnOILRENT logGDPC logGCF							
logAGRICVA logMFGVA logSEVVA logOILRENT							
Hypothesized Eigenvalue Trace Statistic 0.05 Critical Value Prob.**							
No. of CE(s)							
None *	0.741846	117.9294	95.75366	0.0007			
At most 1 *	0.680393	75.94923	69.81889	0.0149			
At most 2	0.495495	40.58869	47.85613	0.2021			
At most 3	0.325589	19.37920	29.79707	0.4659			
At most 4	0.196846	7.167826	15.49471	0.5582			
At most 5 0.011940 0.372370 3.841466 0.5417							
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level							

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

Source: Authors Computation from Eviews Statistical Package.

Table 4.5.2 Unrestricted Co-integration Rank Test (Maximum Eigenvalue)

Johansen Co-integration Result (Maximum Eigenvalue).								
SERIES: lnGDPC lnGCF lnAGRICVA lnMFGVA lnSEVVA lnOILRENT logGDPC logGCF								
logAGRICVA logMFGVA logSEVVA logOILRENT								
Hypothesized No. of	Hypothesized No. of Eigenvalue Max-Eigen 0.05 Critical Prob.**							
CE(s)	CE(s) Statistic Value							
None *	0.741846	41.98016	40.07757	0.0302				
At most 1 *	0.680393	35.36054	33.87687	0.0330				
At most 2	0.495495	21.20949	27.58434	0.2637				
At most 3	At most 3 0.325589 12.21137 21.13162 0.5269							
At most 4	At most 4 0.196846 6.795456 14.26460 0.5136							
At most 5	0.011940	0.372370	3.841466	0.5417				

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

Source: Authors Computation from Eviews Statistical Package.

The result of the co-integration tests as shown in both tables above indicates the presence of cointegration vectors. Meaning that there are long-run relationships involving the indicators of economic growth and the other variables in the study. Thus, an indication that increased in natural resource wealth activities could impact on other sectors of the economy. The trace statistic and maximum eigenvalue results from the co-integration estimations shown above

<sup>\*\*</sup>MacKinnon-Haug-Michelis (1999) p-values

indicate that not enough evidence exist to accept the null hypothesis of no co-integration at the 5% level of significance. The trace statistics indicate 1 co-integrating vector equations in the model at the 5% level of significance. The Maximum eigenvalues, also indicate 1 co-integrating vector equations at the 5% level of significance. In consistent with (Oyinbo et al.,2013), their result showed that there exist one cointegrating equation in their studies meaning there is a long term relationship between economic growth and agriculture. The maximum eigenvalues results were chosen as they are perceived to be more reliable and robust.

Since there is long run relationship / associations among the variables, i.e. a confirmation that the variables move at the same speed, it is therefore necessary to use the Error Correction Mechanism. Engle and Granger (1987) confirms that, if evidence of co-integration is found in any model, an error correction representation relating to that model may be also found, hence indicating that all variations within the dependent variables in the model are as a result of the co-integrating vectors attempting to return to equilibrium and the error correction term that captures these variations. In conjunction with this, error correction models are estimated in the next section to obtain the short-run dynamics.

### 4.6 Error Correction Mechanism.

The model was first used by Sargan (1962) and later by Engle and Granger (1987) to correct for disequilibrium in a co-integrating relationship. The error correction terms within the ECM model contain significant important information about the equilibrium of the system equation model. It captures the short-run dynamics and provides a measure to resolve the behaviour of an economic variable in the short run with its performance in the long run. The ECM equation is specified below.

 $d(lnGDPC) = \beta_1 + \beta_2 * d(lnGCF) + \beta_3 * d(lnAGRICVA) + \beta_4 * d(lnMFGVA) + \beta_5 * d(lnSEVVA) + \beta_6 * d(lnOILRENT) + \beta_7 * U_{t-l} + V$ 

The model above was estimated at first difference since its variables and residual were stationary at first difference.  $\beta_1$  is the intercept,  $\beta_2$ to  $\beta_6$  are the short run coefficient,  $\beta_7$ is the coefficient of the error correction term,  $U_{t-1}$  (Error correction term) is the one period lag residual of the model. Also known as equilibrium error term of one period lag. It is used in explaining the long run relationship or speed of adjustment towards long run equilibrium. It coefficient is expected to be significant with a negative sign. This is the term that also for corrects disequilibrium in the model and V is white noise error term. The ECM estimated values of the coefficients for Error Correction Equations is specified below. The equation below is explained both in long run and shot run analysis.

 $d(\ln GDPC) = 0.006435465679 + 0.04786384219*d(\ln GCF) - 0.1091570999*d(\ln AGRICVA) - 0.1567925154*d(\ln MFGVA) + 0.2945582236*d(\ln SEVVA) + 0.02329165091*d(\ln OILRENT) - 0.3029744644*U_{t-1} + V$ 

Table 4.6.1 Estimates of Error Correction Model.

Error Correction Mechanism Result.							
Dependent Variable: GDP PER CAPITA d(lnGDPC).							
Variable	Coefficient	(Std. Error)	[t – Statistic]	Prob			
С	0.006435	0.012498	0.514911	0.6111			
d(lnGCF)	0.047864	0.055800	0.857768	0.3992			
d(lnAGRICVA)	-0.109157	0.075051	-1.454439	0.1583			
d(lnMFGVA)	-0.156793	0.114807	-1.365706	0.1842			
d(lnSEVVA)	0.294558	0.161147	1.827884	0.0795			
d(lnOILRENT)	0.023292	0.053975	0.431523	0.6698			
ECM(-1)	-0.302974*	0.172497	-1.756405	0.0913			
Observations				33			

The Result of the ECM model is accepted given that the R<sup>2</sup> statistic of 0.25 is less than the DW statistic of 1.62

Source: Authors Computation from Eviews Statistical Package.

The above table shows the Error Correction Mechanism (ECM). The Short run coefficients of the model were not significant as their probability values are greater than 5%. This further implies that the short run coefficients are not significant variable to explain economic growth in the short run. The error correction estimates presented above reveal that the

<sup>\*</sup>Significant at 10%

error correction term [ECM(-1)] or speed of adjustment towards long run equilibrium is correctly signed with the expected negative Error Correction Term. This means that there is a tendency by the model to correct and move towards the equilibrium path following disequilibrium in each period. Hence, meaningful error correction is taking place annually. Therefore in each short-term period, economic growth is adjusted by taking into account the previous time periods difference between the independent variables and per capita real GDP growth. The ECM term, however accounts for the correction of about 30.29% of the error generated in the last period. i.e. the speed of adjustment is 30.29% annually. The speed of the adjustment implies that by computation, it will take between 6 to 7 years for the economy to close the gap between its current state (short run period) and the long run equilibrium. In consistent with (Oyinbo et al., 2014), their result indicated the expected negative sign of the error correction term, implying that about 68% of disequilibria from the previous year's shock converge back to the long run equilibrium in the current year in their study. The result of the ECM also keeps the validity that there exist a long run equilibrium relationship between GDPC and other variable of interest. However, the ECM term is not statistically significant at 5% level of significance but Significant at 10% level of significance. Thus in the short run, agriculture is not significant to explain economic growth. This is in line with (Oyinbo et al., 2013) as their heir Error Correction Estimates of Economic Growth in Nigeria indicated that in the short run, the lagged value of agriculture is negative and insignificant in influencing economic growth. They attributed this to poor budgetary allocation to agriculture relative to other sectors of the economy (Oyinbo et al., 2013). Thus, the integral role of agricultural financing is lacking, thereby hindering growth of the agricultural sector. Based on current supervision and assessment reports of 2007 and 2008 (Ujah and Okoro, 2009) shows that agricultural budget was far below 25% and 10% recommendation from the Food and Agricultural Organization and African Union respectively. The insignificance of the agricultural sector in influencing the Nigerian economic growth in the short

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run period is also essentially attributed to a number of problems and challenges faced by the sector over the past decades. "International market opportunities for some exportable commodities have been low on account of the sector's inability to be competitive" (UNDP report 2012). (Oni, T.O 2013) identified numerous challenges such as: "marketing problem, storage and processing problems, infrastructural inadequacies, unstable input and output Prices, seasonal labour shortages due migration of able-bodied youths from the rural to urban areas, technical constraint, inadequacies in past policies and programmes as well as impute supply problems". In addition, resources from the agricultural sector are under utilized for the growth of the Nigerian economy. Thus, there is little or no effort to add value to the sector from the returns of economic growth. This is consistent with literature and empirically true for the Nigerian economy that highlights the lack of attention, total neglect and investment in the agriculture sector in spite of its proven potentials Awokuse (2008). Another reason why this sector has performed poorly on economic growth stems from the land tenure system and its associated problems in Nigeria. In Nigeria, Land is communally owned. Land is been shared out to families and individuals, while the community or clan maintained absolute ownership. Although land has been heavily regulated by the Nigerian government through the establishment of the Land Tenure Law of Northern Nigeria of 1962 and Land Use Act No. 6 of 1978, "the implementation of the Act in the past decades has increasingly become an obstruction in the wheel of economic growth and development as the Act is anti-people and oppressive" (Namnso et al., 2014). The Land Use Act has resulted to multiple forms of tenure system leading to unwarranted bureaucracy in getting consent and approval for land transactions and certificate and insecurity of right of occupancy granted under the Act. In terms of ease of registration of property, Nigeria is ranked among the lowest, World Bank (2014). According to the provision of Section 1 of the Act, individuals cannot own freehold interest in land in Nigeria. This implies that all land in the territory of each state, government holds the absolute interest in land.

In connection with the above, the oil sector which has the bulk of the Nigerian federally collected revenue has no significant impact in influencing the growth of the Nigerian economy. (Akinlo, 2012) argued that the oil sector has very little linkage with other sectors of the economy since the sector does not offer much opportunity for employment. Nigeria is a country whose relationship with oil over the decades has been volatile, plagued by corruption and mismanagement. Volatility in oil price makes the exchange rate volatile thereby encouraging excessive short term capital flow (Akinlo, 2012). Thus the efficiency of macroeconomic policy is being constrained. The oil rich Niger Delta region has become the site of an intense and controversial struggle between the state and the indigenous population (Omeje 2006). Local indigenous people have become incensed by foreign oil corporation reaping the rewards of this resource, when they themselves have seen little if any improvement in their standard of living (Ome je 2006). The effects of oil extraction for the environment and the Niger Delta communities have been devastating. According to Nigerian federal government figures, there were more than 7,000 oil spills between 1970 and 2000 (Omeji 2006). This has led to serious ecological damage in the fragile region. In the last decade, a militant group called the Movement for the Emancipation of the Niger Delta (MEND) emerged. This group have launched many attacks on oil workers and pipelines, attempting to shut down production in the region (Omeje 2006). In consistent with other empirical literature that oilrent is not influential to economic growth. Lane and Tornell (1998) note that oil-rich Venezuela's terms of trade rose 13.7% per year during 1970-1990, while per capita output declined at a rate of 1.4% per year. They also point out that Saudi Arabia's real per capita GDP actually declined between 1970 and 1999. Gylfason (2001, p. 848) claims that per capita GNP in OPEC countries fell 1.3% per year during 1965-1998.

In general, the bulk of the reasons why agriculture and oil has not been significant to the growth of the Nigerian economy is chiefly due to gravity of corruption and mismanagement entirely different from the rest of the world. Going by Transparency International report, Nigeria

was ranked among the 38 most corrupt countries in the world out of 175 countries examined (Transparency International 2014). In addition, Global Corruption Barometer reports that the population's perception of corruption has increased significantly between 2011 and 2013. From the time Nigeria gained her in dependence, public funds amounting to about US\$400 billion has been vanished due to corruption. New and evident report indicates that about US\$6.8 billion was missing due to corruption in the subsidy program (Berne Declaration 2013). A search also discovered between 2001 and 2008, an astounding 300,000 barrels of oil were stolen per day and a total of 15 fuel importers collected more than US\$300 million in fuel subsidy funds without importing any fuel (Nwaroh 2012).

The R<sup>2</sup> of the model is 0.246386. Although this value is low but it is warranted based on the nature of the variables in the model. There are so many other variables that the growth of the Nigerian economy depends on which are deliberately not included in the model. There exclusion was aimed at concentrating on natural resource impact on the growth of the Nigerian Economy. The Result of the ECM model is accepted given that the R2 statistic of 0.25 is less than the DW statistic of 1.62. In confirmation to this is a test of statistical error below.

Overall, the findings in this chapter have important policy implications for the Nigerian Economy and other developing countries with similar economic structures. The evidence indicates that the agricultural and oil sectors plays important role in terms of the Nigerian Economy. Thus, the development of these sectors would be beneficial and rewarding to the Nigerian economic growth.

## 4.7 Test of Statistical Error and Discussion

 $H_{0:} \rho_i = 0$  (No serial auto correlation of any order up to  $\rho$ ).

 $H_1: \rho_i \neq 0$  (There is serial auto correlation).

Table 4.7.1 Serial Correlation Test.

# Breusch-Godfrey Serial Correlation LM Test:

F-statistic Obs*R-squared		Prob. F(2,23) Prob. Chi-Square(2)	0.3833 0.2780
Obs R-squared	2.300120	1100. CIII-5quarc(2)	0.2760

Source: Authors Computation from Eviews Statistical Package.

From the above table, the Pvalue of the Chi-Square result is more than 5% level of significance, hence we cannot reject the null hypothesis.

### Chapter 5

### **Summary and Conclusion**

### 5.1 Introduction.

This chapter provides a summary and conclusion to the study and its main findings. Also, it highlights the main contribution of the thesis, presents some policy implications and proffers some recommendations on ways to improve the contributions of natural resource wealth to economic growth. It then finishes by presenting the limitations of the study and proffers some suggestions on areas for further research.

### 5.2 Summary and Conclusion

This thesis investigated the link between the natural resource wealth and economic growth in Nigeria, using time series data form world development indicators. It applied the error correction model (ECM) to evaluate the natural resource wealth and economic growth relationship. In this research, two questions were addressed: does a resource based growth strategy leads to sustained economic growth? What is the relationship between the natural resource wealth and economic growth in Nigeria? And if there is a relationship what is the direction of the relationship between natural resource wealth and economic growth in Nigeria? Does natural resource wealth cause economic growth or does economic growth cause the development of natural resources? Does Natural resource wealth cause inconsistency in the growth of the Nigerian Economy?

The study utilised two measures of natural resource wealth, Agriculture and Oilrent. The study established the existence of co-integration for all measures. Thus, the results obtained for all measures of natural resource wealth used in this research point to the existence of long run relationship between resource wealth and economic growth.

### 5.3 Main Contributions of the Study.

This thesis makes a contribution by providing time series evidence for a developing country on natural resource wealth and economic growth relationship. To improve robustness and avoid simultaneous bias as highlighted by Gujarati (2004), the study included the manufacturing sector and the service sector since these sectors exhibits some sort of relationship with resource wealth and growth.

In addition, the study re-examined the endogenous growth model to identify the importance of capital formation and technical progress to economic growth. As it can be clearly observed in the study that results obtained for any particular country cannot be generalised readily for another country. Issues relating to the relationship are country specific. Thus, this study makes a contribution by providing insight into the natural resource wealth and growth relationship for a specific country (Nigeria). The findings from this study can thus be readily utilised as a reference for policy formulation for the Nigerian economy.

# 5.4 Policy Implications and Recommendations.

The empirical findings from this study highlight a policy implication issue relating to the role of natural resource wealth in economic growth in Nigeria. A major policy implication from the results is that natural resource based growth strategy will not lead to sustained economic growth. Thus Nigeria should aim at pursuing industrial growth strategy with a vibrant real sector that would result in the diversification of the economy. Also it is critically imperative for Nigerians and it government to tackle the issue of wide spread corruption and mismanagement of public funds in all respective areas and sectors of its economy.

### 5.5 Limitations of the Study and Suggestions for Further Research

The study's result may be improved by removing some of the restrictions to it. This study's restrictions include the unavailability of sufficiently long time-series data for variables that are included in the theoretical models. In some instances, data was available for an earlier

period of time than others. The researcher could collect annual data for only 33 years, which was sufficient in statistical terms but less than was originally intended. In addition, natural resource wealth indicators which the researcher used in the empirical analysis is limited to only two indicators agriculture and oil; however, there are other sources of natural resource wealth and other factors not considered having impact on the Nigerian economic growth. This study uses annual time-series data to examine growth paradox in Nigerian. Since the study is a single-country study, with the applications of the study limited to the country studied (Nigeria). A further extension of this research could be to conduct a similar study for other countries, particularly other developing countries.

In addition, this research utilizes GDPC as a proxy for economic growth. However, there are other variables which could be used as a proxy for economic growth including gross national product, HDI indicators (health, education and living standards), household income, technological advancement, savings, investments and many others. Also, this analysis was conducted using annual time-series data but the analysis could be conducted using higher frequency data, possibly quarterly and monthly, to confirm that the findings of this study are not as a result of aggregations and could prove to be quite informative.

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# Appendix.

## ADF Test for lnGDPC at I(0)

ADF Test Statistic	-0.030223	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGGDPC)

Method: Least Squares Date: 04/11/16 Time: 19:30 Sample(adjusted): 1983 2013

Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGDPC(-1)	-0.001751	0.057939	-0.030223	0.9761
D(LOGGDPC(-1))	0.253696	0.194607	1.303634	0.2030
C	0.022261	0.374727	0.059406	0.9531
R-squared	0.064352	Mean deper	ndent var	0.013956
Adjusted R-squared	-0.002480	S.D. depend	dent var	0.068718
S.E. of regression	0.068803	Akaike info	criterion	-2.423361
Sum squared resid	0.132549	Schwarz crit	Schwarz criterion	
Log likelihood	40.56210	F-statistic		0.962899
Durbin-Watson stat	2.002329_	Prob(F-statis	stic)	0.394069

# ADF Test for lnGDPC at I(1)

ADF Test Statistic	-3.445507	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGGDPC,2)

Method: Least Squares Date: 04/11/16 Time: 19:32 Sample(adjusted): 1984 2013

Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGGDPC(-1))	-0.786791	0.228353	-3.445507	0.0019
D(LOGGDPC(-1),2)	0.013868	0.186093	0.074523	0.9411
C	0.014072	0.012810	1.098537	0.2817
R-squared	0.403923	Mean dependent var		0.003394
Adjusted R-squared	0.359769	S.D. dependent var		0.085368
S.E. of regression	0.068307	Akaike info criterion		-2.434978
Sum squared resid	0.125977	Schwarz criterion		-2.294858
Log likelihood	39.52466	F-statistic		9.148079
Durbin-Watson stat	2.037621	Prob(F-statis	stic)	0.000926

## ADF Test for lnGCF at I(0)

ADF Test Statistic	-2.119474	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LOGGCF)

Method: Least Squares Date: 04/11/16 Time: 19:38 Sample(adjusted): 1983 2013

Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGGCF(-1)	-0.326311	0.104605	-3.119474	0.0042
D(LOGGCF(-1))	0.160720	0.162340	0.990019	0.3306
C	0.757605	0.252308	3.002702	0.0056
R-squared	0.266154	Mean dependent var		-0.022686
Adjusted R-squared	0.213737	S.D. dependent var		0.244857
S.E. of regression	0.217118	Akaike info criterion		-0.124982
Sum squared resid	1.319931	Schwarz criterion		0.013791
Log likelihood	4.937228	F-statistic		5.077581
Durbin-Watson stat	1.874893_	Prob(F-statis	stic)	0.013136

# ADF Test for lnGCF at I(1)

ADF Test Statistic	-5.527109	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGGCF,2)

Method: Least Squares
Date: 04/11/16 Time: 19:40
Sample(adjusted): 1984 2013

Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGGCF(-1))	-1.268223	0.229455	-5.527109	0.0000
D(LOGGCF(-1),2)	0.398669	0.171379	2.326246	0.0278
C	-0.020052	0.042184	-0.475344	0.6384
R-squared	0.556688	Mean dependent var		0.009815
Adjusted R-squared	0.523850	S.D. dependent var		0.332001
S.E. of regression	0.229093	Akaike info criterion		-0.014739
Sum squared resid	1.417055	Schwarz criterion		0.125380
Log likelihood	3.221091	F-statistic		16.95261
Durbin-Watson stat	_ 1.674309_	Prob(F-stati	stic)	0.000017

### ADF Test for lnAGRICVA at I(0)

ADF Test Statistic -2.256944 1% Critical Value\* -3.6576

5%	Critical Value	-2.9591
10%	Critical Value	-2.6181

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGAGRICVA)

Method: Least Squares Date: 04/12/16 Time: 18:32 Sample(adjusted): 1983 2013

Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGAGRICVA(-1)	-0.430341	0.190674	-2.256944	0.0320
D(LOGAGRICVA(-1))	0.224591	0.205250	1.094230	0.2832
C	1.498573	0.670904	2.233663	0.0337
R-squared	0.154619	Mean dependent var		-0.014008
Adjusted R-squared	0.094234	S.D. dependent var		0.167048
S.E. of regression	0.158982	Akaike info criterion		-0.748282
Sum squared resid	0.707711	Schwarz criterion '		-0.609509
Log likelihood	14.59836	F-statistic		2.560576
Durbin-Watson stat	1.861775	Prob(F-statis	stic)	0.095222

# ADF Test for lnAGRICVA at I(1)

<b>ADF Test Statistic</b>	-5.835571	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGAGRICVA,2)

Method: Least Squares Date: 04/12/16 Time: 18:34 Sample(adjusted): 1984 2013

Included observations: 30 after adjusting endpoints

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Variable	Coefficient	Std. Error	t-Statistic	Prob.		
D(LOGAGRICVA(-1))	-1.455388	0.249399	-5.835571	0.0000		
D(LOGAGRICVÀ(-´	0.397161	0.172871	2.297440	0.0296		
1),2)						
C	-0.021488	0.029297	-0.733451	0.4696		
R-squared	0.603762	Mean dependent var		-0.004641		
Adjusted R-squared	0.574411	S.D. dependent var		0.244934		
S.E. of regression	0.159788	Akaike info criterion		-0.735297		
Sum squared resid	0.689370	Schwarz cri	terion	-0.595177		
Log likelihood	14.02945	F-statistic		20.57040		
Durbin-Watson stat	2.087341	Prob(F-stati	stic)	_0.000004		

## ADF Test for lnMFGVA at I(0)

ADF Test Statistic	-1.597492	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	2.6181

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGMFGVA)

Method: Least Squares Date: 04/12/16 Time: 18:38 Sample(adjusted): 1983 2013

Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGMFGVA(-1)	-0.154749	0.096870	-1.597492	0.1214
D(LOGMFGVA(-1))	0.040187	0.186606	0.215356	0.8311
C	0.250358	0.164771	1.519425	0.1399
R-squared	0.084106	Mean dependent var		-0.004199
Adjusted R-squared	0.018685	S.D. dependent var		0.232937
S.E. of regression	0.230751	Akaike info criterion		-0.003191
Sum squared resid	1.490886	Schwarz criterion		0.135582
Log likelihood	3.049464	F-statistic		1.285611
Durbin-Watson stat	1.990568	Prob(F-statis	stic)	0.292303

# ADF Test for lnMFGVA at I(1)

ADF Test Statistic	-3.608142	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGMFGVA,2)

Method: Least Squares Date: 04/12/16 Time: 18:39 Sample(adjusted): 1984 2013

Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGMFGVA(-1))	-1.006773	0.279028	-3.608142	0.0012
D(LOGMFGVA(-1),2)	-0.018482	0.194203	-0.095168	0.9249
C	-0.004862	0.044887	-0.108308	0.9146
R-squared	0.509485	Mean deper	ndent var	0.004430
Adjusted R-squared	0.473150	S.D. depend	dent var	0.338072
S.E. of regression	0.245388	Akaike info	criterion	0.122686
Sum squared resid	1.625811	Schwarz crit	terion	0.262806
Log likelihood	1.159706	F-statistic		14.02208
Durbin-Watson stat	1.951553	Prob(F-stati	stic)	0.000067

## ADF Test for lnSEVVA at I(0)

ADF Test Statistic	-0.605970	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGSEVVA)

Method: Least Squares Date: 04/12/16 Time: 18:40 Sample(adjusted): 1983 2013

Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGSEVVA(-1)	-0.079317	0.130893	-0.605970	0.5494
D(LOGSEVVA(-1))	0.032157	0.214139	0.150167	0.8817
C	0.280166	0.432023	0.648498	0.5219
R-squared	0.013844	Mean deper	ndent var	0.018495
Adjusted R-squared	-0.056595	S.D. depend	dent var	0.164070
S.E. of regression	0.168649	Akaike info	criterion	-0.630233
Sum squared resid	0.796386	Schwarz crit	terion	-0.491460
Log likelihood	12.76861	F-statistic		0.196543
Durbin-Watson stat	_ 1.981830_	Prob(F-stati	stic)	0.822690

## ADF Test for lnSEVVA at I(1)

ADF Test Statistic	-4.512286	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGSEVVA,2)

Method: Least Squares
Date: 04/12/16 Time: 18:41
Sample(adjusted): 1984 2013

Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGSEVVA(-1))	-1.224524	0.271376	-4.512286	0.0001
D(LOGSEVVA(-1),2)	0.188493	0.189031	0.997153	0.3275
C	0.021452	0.031336	0.684571	0.4994
R-squared	0.532307	Mean deper	ndent var	9.69E-05
Adjusted R-squared	0.497663	S.D. depend	dent var	0.239410
S.E. of regression	0.169684	Akaike info	criterion	-0.615120
Sum squared resid	0.777401	Schwarz crif	terion	-0.475000
Log likelihood	12.22680	F-statistic		15.36508
Durbin-Watson stat	1.941615_	Prob(F-stati	stic)	0.000035

## ADF Test for InOILRENT at I(0)

ADF Test Statistic	-1.477438	1% Critical Value*	-3.6576
		5% Critical Value	-2.9591
		10% Critical Value	-2.6181

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGOILRENT)

Method: Least Squares

Date: 04/12/16 Time: 18:42 Sample(adjusted): 1983 2013

Included observations: 31 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LOGOILRENT(-1)	-0.256990	0.173943	-1.477438	0.1507
D(LOGOILRENT(-1))	0.109393	0.212676	0.514364	0.6110
С	0.871407	0.607224	1.435065	0.1623
R-squared	0.074584	Mean deper	ndent var	-0.022385
Adjusted R-squared	0.008483	S.D. depend	dent var	0.251034
S.E. of regression	0.249967	Akaike info	criterion	0.156788
Sum squared resid	1.749535	Schwarz crit	terion	0.295561
Log likelihood	0.569779	F-statistic		1.128336
Durbin-Watson stat	1.838852	Prob(F-stati	stic)	0.337844

# ADF Test for InOILRENT at I(1)

ADF Test Statistic	-5.806797	1% Critical Value*	-3.6661
		5% Critical Value	-2.9627
		10% Critical Value	-2.6200

<sup>\*</sup>MacKinnon critical values for rejection of hypothesis of a unit root.

Augmented Dickey-Fuller Test Equation Dependent Variable: D(LOGOILRENT,2)

Method: Least Squares Date: 04/12/16 Time: 18:43 Sample(adjusted): 1984 2013

Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOGOILRENT(-1))	-1.481786	0.255181	-5.806797	0.0000
D(LOGOILRENT(-	0.410580	0.175376	2.341136	0.0269
1),2)				
C	-0.036698	0.043511	-0.843416	0.4064
R-squared	0.605734	Mean deper	ndent var	-0.013729
Adjusted R-squared	0.576529	S.D. depend	dent var	0.364834
S.E. of regression	0.237415	Akaike info	criterion	0.056622
Sum squared resid	1.521873	Schwarz crit	terion	0.196742
Log likelihood	2.150673	F-statistic		20.74080
Durbin-Watson stat	1.985671_	Prob(F-stati	stic)	0.000003

# Cointegration Test and Result.

# **Unrestricted Co-integration Rank Test (Trace)**

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.741846	117.9294	95.75366	0.0007
At most 1 *	0.680393	75.94923	69.81889	0.0149
At most 2	0.495495	40.58869	47.85613	0.2021
At most 3	0.325589	19.37920	29.79707	0.4659

At most 4	0.196846	7.167826	15.49471	0.5582
At most 5	0.011940	0.372370	3.841466	0.5417

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

# **Unrestricted Co-integration Rank Test (Maximum Eigenvalue)**

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None * At most 1 * At most 2 At most 3 At most 4 At most 5	0.741846	41.98016	40.07757	0.0302
	0.680393	35.36054	33.87687	0.0330
	0.495495	21.20949	27.58434	0.2637
	0.325589	12.21137	21.13162	0.5269
	0.196846	6.795456	14.26460	0.5136
	0.011940	0.372370	3.841466	0.5417

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

## Test of Error Correction Mechanism.

Dependent Variable: D(LOGGDPC)

Method: Least Squares Date: 08/06/15 Time: 20:56 Sample(adjusted): 1982 2013

Included observations: 32 after adjusting endpoints

Variable	Coefficien	Std. Error	t-Statistic	Prob.
	t			
С	0.006435	0.012498	0.514911	0.6111
D(LOGGCF)	0.047864	0.055800	0.857768	0.3992
D(LOGAGRICVA)	-0.109157	0.075051	-1.454439	0.1583
D(LOGMFGVA)	-0.156793	0.114807	-1.365706	0.1842
D(LOGSEVVA)	0.294558	0.161147	1.827884	0.0795
D(LOGOILRENT)	0.023292	0.053975	0.431523	0.6698
U(-1)	-0.302974	0.172497	-1.756405	0.0913
R-squared	0.246386	Mean dependent var		0.012374
Adjusted R-squared	0.065519	S.D. dependent var		0.068190
S.E. of regression	0.065919	Akaike info criterion		_
_				2.410151
Sum squared resid	0.108632 Schwarz criterion		-	
				2.089521
Log likelihood	45.56241	F-statistic		1.362246
Durbin-Watson stat	1.616067	Prob(F-sta	tistic)	0.268065

<sup>\*</sup> denotes rejection of the hypothesis at the 0.05 level

<sup>\*\*</sup>MacKinnon-Haug-Michelis (1999) p-values

<sup>\*</sup> denotes rejection of the hypothesis at the 0.05 level

<sup>\*\*</sup>MacKinnon-Haug-Michelis (1999) p-values