

**CORRUPTION IN NIGERIA'S OIL AND GAS INDUSTRY: EXTENT AND
MACROECONOMIC IMPACT, 1981-2014**

BY

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**BEING A THESIS SUBMITTED TO THE DEPARTMENT OF ECONOMICS,
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DECLARATION

I hereby declare that this thesis titled, “**CORRUPTION IN NIGERIA’S OIL AND GAS INDUSTRY: EXTENT AND MACROECONOMIC IMPACT, 1981 – 2014**” submitted for the Doctor of Philosophy Degree in Economics of the Ahmadu Bello University, Zaria is the result of my research and has not been previously presented to any University for the award of a degree. All the sources and references used for this study are duly acknowledged. All errors and/ or omissions in this work are exclusively mine.

Yusuf Musbau

Date

CERTIFICATION

This is to certify that this thesis titled, “**CORRUPTION IN NIGERIA’S OIL AND GAS INDUSTRY: EXTENT AND MACROECONOMIC IMPACT, 1981-2014**” has been prepared in accordance with the regulations governing the preparation of thesis for the award of Doctor of Philosophy (Ph.D) degree in the Department of Economics, Ahmadu Bello University, Zaria and is hereby approved for its contribution to scientific knowledge and literary presentation.

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DEDICATION

This work is dedicated firstly, to the memory of my son, TESLIM YUSUF who came during the program but did not live to see the end of it, my entire family both nuclear and extended for their sacrifice and understanding during the program.

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ABSTRACT

Typically, the nexus between the oil and gas industry and the economy has evolved from the Dutch Disease literature to the resource curse literature. However, at the core of the relations is the issue of corruption. The various reports into corruption in the upstream and the downstream by the House of Representatives (2012) and the nonpayment of \$49 billion into the Federation Account suggest the likelihood of an endemic problem that is a pointer to the susceptibility of the industry to corruption which has undermined the development of the economy. This study investigated the problem of corruption in the oil and gas industry. The objective of the study was to determine the extent and macroeconomic impact of corruption in the oil and gas industry. To achieve the objectives, the study measured the extent of corruption in the industry, from the activities of the industry in both the upstream and the downstream. The summation of the losses from these activities was the measure of the extent of loss due to corruption in the industry. The study then measured the impact of the corruption using simulation analysis. The analysis was based on ten scenarios which showed how the macroeconomy was impacted by corruption in the oil and gas industry. Scenarios one to seven measured the individual sources of corruption in the upstream and the downstream, while eight to ten were the aggregate. The main findings of the results show that there was overproduction of crude oil from 1999- 2006 and under production from 2007 to 2014. The implication of over production was a distortion of the true state of nature, which gave exaggerated government revenue to the economy and other variables followed the pattern. From 2007 to 2014 there was under production, which reduced the government revenue as well as other variables. The Crude Oil Theft has significant impact on the economy as it did not only reduce the government revenue, government expenditure and reserve, but increased the public debt and importation of the finished product. The Refinery inefficiencies were also found to be very significant, as it reduced the government revenue, government expenditure and reserve. It also increased the public debt and importation of the finished product. Capacity under utilization was found to be responsible for a greater proportion of the importation of the finished product and as such reduced the government revenue, government expenditure and reserve, thereby increasing the public debt. On the aggregate level the results found that corruption in the upstream and the downstream have negative and significant impacts on all the macroeconomic variables. It shows that the opportunity cost of corruption is very high. The study concludes that there is significant corruption in the oil and gas industry, and its impact on the economy is also significant. Therefore, recommends the effective enforcement of legal provisions to minimize corruption in the upstream downstream of the oil and gas industry.

CHAPTER ONE INTRODUCTION

1.1 Background to the Study

Despite the complexities that surround the concept of corruption globally in terms of its multi dimensional nature with regards to cultural, sociological, psychological, definition, secrecy and measurability, corruption has continued to attract interests of scholars, advocates, governments and multilateral organizations. This is so given the challenges and problems that are associated with the menace globally.

Scholars differ on the perception and effects of corruption on the economy. Some of them such as Leff (1964), Huntington (1968), Lui (1985), Lien (1986) Acemoglou and Verdier (1998) and Aluko (2008), argued that corruption enhances efficiency and as such positively impacts on the economy. For example, Leff (1964) and Huntington (1968) suggest that under rigid regulation and inefficient bureaucracy, corruption might foster economic growth. In their model, they believed that agents use "speed money" to get around bad laws and institutions. Additionally, Lui (1985) shows that bribery can be efficient in a queuing model if agents with higher values of time can use bribes to obtain a better place in line. Acemoglou and Verdier (1998) on their part argue that some degree of corruption may be part of the optimal allocation of resources in the presence of incomplete contracts or due to market failure.

This opinion is partly justified on the ground that illegal payments are required to make things pass swifter and favorably through the state bureaucracy. By implication, corruption has the potency of making an economic agent more efficient and in the long run it promotes economic growth. The next logical question is what is the evidence? Is it

conclusive? If not conclusive, this provides opportunities for further studies. Also what are the limitations of the existing studies?

On the other hand, Mauro (1995) Tanzi and Davoodi(1997) among others maintained that corruption lowers investment and by extension impacts negatively on the economy. Tanzi and Davoodi (1997) not only supported this position by their findings but also extended it by showing the direction of causality. Bardhan, (1997) .Weder,(2003), Meon and Seklat (2005) followed the above pattern in their analysis of the effect of corruption on the economy.

The effects of corruption generally are so broad and complicated to the point of losing it devastating consequences on the economy in which it exist, and to address this problems without been carried away with it elusive features, the areas of concern where corruption affect the macro economy is hereby been focused. This is in line with the decision of the United Nation Convention against Corruption (UNCAC) in early 2002. Where it was agree that corruption should not be define at all because of it complicated nature, but rather address the problem areas. The emphasis (focus) of this work is on the corruption in the Nigeria's oil and gas industry. In the work of Garba et al, (2009) GIABA study on corruption and Money Laundering in West Africa, The case of Nigeria, Agriculture and oil and gas industries were identified as the most susceptible industries to corruption. This work picks one out of the two industries, which is the oil and gas industry. The susceptibility of the sector to corruption has undermined the development of the economy.

Oil is a major source of energy in Nigeria and the world in general. Oil being the mainstay of the Nigerian economy plays a vital role in shaping the economic and political destiny of the country. Although Nigeria's oil industry was founded at the beginning of the century, it was not until the end of the Nigeria civil war (1967 - 1970) that the oil industry

began to play a prominent role in the economic life of the country. Odularu (2008).The study therefore look back at the operation of the industry in the period under review.

In many economies that are not resource-dependent, to carry out government activities, the governments tax citizens, who demand efficient and responsive governance in return. This bargain establishes a political relationship between rulers and subjects. In countries whose economies are dominated by natural resources, however, rulers don't need to tax their citizens because they have a guaranteed source of income from natural resources. Because the country's citizens are not being taxed, there appeared to be less incentive to be watchful of how government spends its money. In addition, those benefiting from mineral resource wealth may perceive an effective and watchful member of the society as a threat to the benefits that they enjoy, and they may take steps to thwart them. As a result, citizens are in most cases impoverish by their rulers, and as such disempowered, and if the citizens complain, money from the natural resources enables governments to pay for armed forces to keep the citizens in check. Countries whose economies are dominated by resource extraction industries tend to be more repressive, corrupt and badly-managed. Asobi (2009)

Oil dominates the Nigerian economy and generates enormous revenue, indeed the bulk of government revenue, but this has not translated into an improved standard of living for the citizens due to corruption and mismanagement. This argument is woven around the concept of the 'rentier state'. The contention is that states, like Nigeria, which depend heavily on rent from their natural resources, rather than taxes from their citizens, corporate and individual, tend to be corrupt and poor. This is so for three main reasons. First, resource rent is much more easily appropriable than revenue from taxation because its source is concentrated (oil is a "point resource"), not dispersed. Second, it is easier for political leaders to ignore public

demand for accountability in a rentier state because, since they do not depend on taxes from citizens for the national income, they can acquire, retain and use state power without bothering about legitimacy. Third, rent seeking has a magnetic effect; it tends to suck all and sundry into its seductive loop, including entrepreneurs who could have invested in manufacturing and agriculture. Consequently, diversification of the economy is difficult to achieve in a rentier state. Asobi (2009).

The influence of the international players in the oil and gas industry owing to the importance of the product to them cannot be ruled out as they go out of their way in most cases to undermine the process so as to have their way always and protect their own interest. They mostly succeed in this venture because of the selfishness and ignorant of the officer in charge of the sector. This is evidence in the wikileaks report (Ann pickard) which the then president of the Federal Republic of Nigeria (Good luck Jonathan) referred to as the beer parlour gossip.

Apart from that, corruption has also been blamed on colonialism. According to this view, the nation's colonial history may have restricted any early influence in an ethical revolution. Throughout the colonial period, most Nigerians were stuck in ignorance and poverty. The trappings of flash cars, houses and success of the colonists may influence the poor to see the colonist as symbols of success and to emulate the colonists in different political ways.

Involvement in the agenda of colonial rule may also inhibit idealism in the early stage of the nascent nation's development. A view commonly held during the colonial days was that the colony's property (cars, houses, farms etc.) is not "our" property. Thus vandalism and looting of public property was not seen as a crime against society. This view is what has

degenerated into the more recent disregard for public property and lack of public trust and concern for public goods as a collective national property. (Wikipedia free encyclopedia; corruption in Nigeria).

The government has claimed to be tackling corruption and mismanagement in the country through institutional changes. The 1979 constitution 5th schedule provides the code of conduct for public officers. The code of conduct required the public officers to publicly declare their assets before assumption of office and immediately after leaving the office. In the year 2000 Independent Corrupt Practices and other related offenses Commission (ICPC) was established with the aim of prohibiting corruption and prescribing punishment for the violator of the provision. Among other measures, Economic and Financial Crime Commission (EFCC) was established in 2003 to investigate all financial crime.

In spite of all these measures, there seems to be notmuch effect on corruption and this has affected the country's rating on global index of perception of corruption. Nigeria performs very low on the Transparency International's Corruption Perception Index. Nigeria ranked 54 out of 54 in 1996, 152 out of 158 in 2004, 134 out of 178 in 2010 and 143 out of 183 in 2011.

1.2 **Statement of the Problem**

Nigeria is richly endowed with oil and natural gas reserves in addition to solid minerals and Agricultural resources that are capable of financing development that can meet the basic consumption and developmental needs of the nation. Yet, Nigeria ranks among the least developed countries in the World Bank league tables, with a per capital income of \$1490.1, a poverty level of about 70% and unemployment level of about 24% in 2011. Couple with this is a very low ranking of 127th out of 139 countries and a score of 3.45 (aggregate), in the global competitiveness index. With a score of 3.19(basic requirement), 80th with a

score of 3.88,(efficiency enhancers),111th with a score of 3.31(institutions),135th with a score of 2.21(infrastructures)121st with a score of 3.96 (macroeconomic environment). (Which fall within 3.10-3.50 of low ranking category),

The corruption in the oil and gas sector is believed to have adverse macroeconomic effects on the economy. In Nigeria, just like any other resource rich countries, corrupt practices tend to impair the performance of the sector and by extension undermine the development of other sectors of the economy. An Audit Report on the Nigerian National Petroleum Corporation (NNPC) between 1999 and 2002 alone revealed that there was overshooting of production targets every year. The excesses of NNPC crude oil production within this period added up to 375.45 million barrels. Based on the oil price of \$25 per barrel and the exchange rate of ₦111.6 to \$1 at that period, Nigeria lost \$9.4 billions or N1.05 Trillions. More recently, the oil subsidy scandal has revealed an extra-budgetary spending in excess of ₦2 trillion (House of Representatives, 2012). The opportunity cost of ₦1.05 trillions in 1999-2002 in terms of forgone investments in infrastructural development, forgone competitiveness, forgone investment in output and productivity growth and forgone employment, income and welfare are likely to be very significant.

Similarly, the opportunity cost of about ₦2.0 Trillions linked to the subsidy scandal of 2009-2011 is likely to be very high. The NNPC (2011) indicated that Nigeria earned \$200.34 billions (about ₦30 trillions) in oil revenue from the sale of 4.56billions barrel of crude between 1999 and 2009. From the above figures it is obvious that Nigerian economy from 1999 to 2009 witnessed an increase in the price of crude oil, which invariably increases the government revenue; the implication of this is that there should be an increase in the public assets, and reduction in government debt, which will have positive impact on macroeconomic

variables. But this was not so. Simply because, as the revenue and the price of crude oil are increasing, the qualities of infrastructures as well as the quality of public service are decreasing while the government debt is increasing.

This is an indication of the fact that something is fundamentally wrong; the admission of this fact is what led to the establishment of the various probe panels. The outcomes of the panels revealed high contract cost and lack of performance. This has adverse effect on Government Revenue in terms of the actual amount that is to be generated and Government Expenditure in terms of how well the revenue is been expended. This by extension impacted on the macroeconomic variables. Even though there may be other factors that are responsible for this situation, leakages in the oil and gas industry of the economy are likely to have significant impacts.

Garba et al (2008) observed that Nigeria's resource endowment particularly, the fact that oil and gas and, agriculture are the major sources of foreign exchange earnings makes Nigeria's fiscal system and international trade and financial flows highly susceptible to corruption and money laundering. Oil and Gas activities (exploration, production and transportation) like most extractive activities are highly capital intensive, rent generating and, foreign dominated. The rent generating attribute inherent in oil and gas business is an inherent incentive for government officials and foreign oil and gas corporations to engage in corruptive behaviours. In the Joint Ventures Partnerships (JVPs) that dominate the upstream of the oil and gas industry, the partner with the majority shares (the Federal Government) is passive. The passivity of the government gives room for corruptive behaviour in the exploration, production and transportation of oil also, in the flaring and utilization of gas. Therefore, in JVPs and even more so, in Production Sharing Agreements (PSAs), the nature of oil and gas

compounded by information asymmetries provide opportunities for the thriving of high-level corruption and, money laundering.

The stylized facts of the oil and gas industry and the Nigerian economy in the last two decades suggest that;

1. There is persistent and enlargement in the scope of corruption in the oil and gas industry in Nigeria;
2. The oil and gas industry is highly vulnerable to large scale corruption as revealed by all the probe panel and recent reports.
3. The opportunity cost of corruption is likely to be very high especially as oil revenue is not matching the increase in prices; and
4. The paradox of a rich nation of poor people is indicative of the potential adverse effects of corruption.

Rather than test the hypothesis however, it is important to:

- (a) quantify the extent of corruption in the oil and gas industry;
- (b) analyze its macroeconomic impact on the economy;

1.3 These give rise to the following key questions;

- (a) What is the extent of corruption in the Nigerian oil and gas industry?
- (b) What are the impacts of the corruption on the macro economic variables?

1.4 **Objectives of the Study**

Broadly, the objective of the study is to examine the corruption in the Nigeria's oil and gas industry. The specific objectives are;

- (a) To measure the extent of corruption in the Nigerian oil and gas industry.
- (b) To analyze and measure the impact of corruption on macroeconomics variables.

1.5 **Justification of the Study**

In the various analysis of corruption, much emphasis and focus has been on the expenditure side. However, there is need to focus also on the revenue side of corruption. This thesis provides another perspective, the revenue side. Given the size of the oil and gas industry and the opportunities for corruption in the industry because of its 'rentier' nature, minimizing corruption is an important national goal. More importantly, estimating corruption as well as the measurement of its impacts is critical. With factual information on corruption, a country is better equipped to target its specific responses to corruption problems and understand the extent of the problem in a country.

The use of simulation analysis to establish the impact of corruption in the industry makes it different from the previous studies on corruption in the industry, as the results show clearly the extent of the impact on the various blocks of the macroeconomy. These results are expected to help policy maker target different sources of corruption and to improve the management of the economy.

1.6 **The scope of the study**

The study covers the period from 1981 to 2014. The focus is on the Oil and Gas industry of the economy because of the susceptibility of the sector to corruption. The emphasis is more on the measurement of the extent and the impact of corruption in the oil and Gas industry on macroeconomic variables. In the areas where corruption becomes an issue, some are measurable while some are not. This study focused on the measurable ones.

1.7 **Organization of the work**

The work is organized into five chapters. The introduction is chapter one. Chapter two is the literature review. Chapter three presents the methodology of the study. Chapter four discusses the findings of the research and chapter five contains the summary, conclusion and recommendations of the work.

CHAPTER TWO

LITERATURE REVIEW

This chapter attempts a comprehensive review of existing conceptual, empirical and theoretical literature on the macroeconomic impact of corruption on the Nigeria's oil and gas industry.

2.1 Conceptual Review

There is no single, comprehensive, universally accepted definition of corruption. An attempt to develop such a definition will invariably encounter legal, criminological and in many countries political problems. The conceptualization of the term corruption has long been ideologically, morally, culturally, politically and intellectually elusive to the point of losing sight of its detrimental and parasitic symbiosis with many nations including Nigeria and their citizens all over the world.

The systematic study of corruption is hampered by the almost non-existence of an adequate definition. But still at that, virtually everyone who writes about it attempts to first define it and almost all recognize that it is difficult to do so given the broad range of activities that could be included in the rubric of corruption. The definition ranges from the generic (narrow definition) to specific such as economic, political, social, and ethical, (Jain,1998)

The narrow or generic definitions of corruption have ranged from defining it by a particular type of action peculiar to public office, such as using of public or official positions in ways that contradict the public interests; abnormal behaviours that encourage private gains at public expense; unacceptable behaviours that openly violate the norms and expectations that is legitimate and acceptable to the society. In some instance, it is conceptualized as behaviors that are not only rotten, spoiled, but unethically polluted and as such deviate from the formal

and expected role which the society expects from every member. Also, Encyclopedia Americana(2006) defines “corruption” as a general term for the misuse of a public position of trust for private gain. This is the definition that was followed by many authors, though it does not capture corruption in the private sector, but the word - misuse- also makes it to be appropriate for the private sectors as well. Any misuse of position any where amount to corruption in this sense. The encyclopedia Americana(2006)further admits that the definition of corruption in areas outside politics is not certain, not minding the fact that corruption in large, quasi-public enterprises and in private enterprises may be injurious to the society and to the economy.

According to Ogundiya (2009), corruption connotes the abuse of public roles or resources or the use of illegitimate forms of political power and influence, by public and private parties. Usman, (2011) sees corruption as the abuse of public office for private gain, dishonesty for personal gain, dishonest exploitation of power for personal gain depravity; and extreme immorality. This definition portay a situation whereby a public official accept money or money’s worth for doing something that he is under a duty to do or that he/she is under a duty not to do. Corruption involves the injection of additional but improper transactions aimed at changing the normal course of event and altering judgements and positions of trust(Ojukwu and Shopeju2011).

Leslie(1983) views corruption as the use of public office for private advantage. This definition is both simple and sufficiently broad to cover most of the corruption that exist, and it is also widely used in literature. Public office offers many opportunities for private gain. Bribes are one of the main tools of corruption. The income of a public official, who as an economic agent regards his office as a business, "does not depend on his usefulness for the

common good but upon the market situation and his talent for finding the point of maximal gain on the public's demand curve." Thus the "corruption is always an exploitation of the public, which can occur only because the civil servants occupy a constitutionally independent position vis-a-vis the public."

Alatas(1990), while elaborating on corruption, divided it into seven distinct types: autogenic, defensive, extortive, investive, nepotistic, supportive, and transactive. Autogenic corruption is self-generating and typically involves only the perpetrator. A good example would be what happens in cases of insider trading. A person learns of some vital information that may influence the price of goods in the market and either quickly buys or gets rid of large amounts of goods before the consequences arising from this information come to pass. This often happens among the major distributors of multi nationals. Defensive corruption involves situations where a person needing a critical service is compelled to bribe in order to prevent unpleasant consequences being inflicted on his interests. For instance, a person that is travelling and being stopped by the police in a deadly armed robbers' zone and is made to pay bribes or face being delayed for the trip. This personal corruption is in self-defense. Extortive corruption is the behavior of a person demanding personal compensation in exchange for services. Investive corruption entails the offer of goods or services without a direct link to any particular favor at the present, but in anticipation of future situations when the favor may be required. Nepotistic corruption refers to the preferential treatment of, or unjustified appointment of friends or relations to public office, in violation of the accepted guidelines.

The supportive type usually does not involve money or immediate gains, but involves actions taken to protect or strengthen the existing corruption. For example, a corrupt regime or official may try to prevent the election or appointment of an honest person or government

for fear that the individual or the regime might be probed by the successor(s). Finally, transactive corruption refers to situations where the two parties are mutual and willing participants in the corrupt practice to the advantage of both parties. For example, a corrupt businessperson may willingly bribe a corrupt government official in order to win a tender for a certain contract. The most prominent of all these in our circumstance is the defensive corruption, not only because it appears to be at the core of the corruption phenomenon, but also because the other forms appear to be the offshoot of this fundamental type. There would be no corruption if the people are protected against the uncertainty in the society.

Going through all the above definitions, it could be reasonably argued that none is without problems. It should be noted however, that these problems vary in the contexts and scope that each of them covers. But the problems notwithstanding, a critical look at the various definitions of the concept of corruption in the literature, reveals that corruption is doing the wrong things instead of the right things. It is also believed that wrong things cannot bring forth good things, hence the effect of corruption may be assumed to be negative in most discussion in the economic literature. The present state of many public goods such as schools, roads, railways, airports, hospitals and the likes, seem to support the claim that the effects of corruption is negative. This explains why the World Bank (2000) identified corruption as the single greatest obstacle to economic and social development, as it distorts the rule of law and weakens the institutional foundations upon which economic growth depends; that once a nation tackles and solves the problem of corruption, the entire problems facing such a nation is over.

To guide against conflicting conceptualization of corruption so as to be able to forge ahead in proffering solutions to it, in 2002 when negotiations of United Nations Convention

against Corruption began, one option under consideration was not to define corruption at all but to list specific types or acts of corruption that is of interest to the particular circumstances and situations.

For the purpose of this dissertation, following Garba (2009), corruption will be conceptualized in line with the Stanford Encyclopedia of Philosophy which holds that: (i) the scope of corrupt act is wide; (ii) the concept of corruption is intricate and connected in nature hence, it is not feasible to arrive at a watertight and comprehensive definition of corruption. It therefore suggests that the following simplified and general definition should suffice:

A particular act performed by certain agent is an act of institutional corruption if and only if:

The act has a specific effect of sabotaging or contributing to the sabotaging of some institutional process and/or purpose of some institution; by this the act also produced effect of contributing to the debasement of the moral character of some actors of the institution;

In view of the above definition, at least one of (a) or (b) below is true:

- (a) an official of an institution in performing an act of corruption envisaged or anticipated a particular result or should have predicted it; and
- (b) that the officer of an institution and the agent attempting to corrupt could have avoided the consequences of this act if they had chosen to do so.

The concept of corruption above revealed two scenarios; firstly, it holds two parties liable, the corrupter and the corrupted and secondly, the actions of the two parties obstruct some institutional process that was hitherto unhindered. In explaining corrupt behavior therefore, it is pertinent to recognize the moral recklessness and irresponsibility of the

corrupter and, the corrupted; the unwholesome behaviours/actions/choices and the resultant effects on institutions, processes and performances. The significance of this conceptual analysis is two-fold. First, it help to recorgnise that the offences at the base of corrupt actions are multifaceted hence; second, an equally divergent range of anticorruption measures are needed to tackle corruption in its multi dimensional forms.

2.2 The Causes of Corruption

The causal variables of corruption have been categorized into four main factor-groups namely: political and judicial factors; historical factors; social and cultural factors, and economic factors.

The political factors capture the democratic environment of a given country, the effectiveness of its judicial system and the origin of its legal system. The role of democracy has been highlighted in several studies of corruption. Treisman, (2000), and Paldam, (2003). It is widely believed that corruption is related to the deficiencies of the political system and that of democracy. Promoting of political competition and increasing transparency and accountability, can provide a check, albeit an imperfect one, on corruption. The judicial system is also expected to play a role in controlling corruption Becker (1968). The role of the legal system and the rule of law have featured prominently in many studies on the quality of governance and its consequences for development, as expressed by North (1990), and Easterly and Levine (1997).

Strong legal foundations and efficient legal systems with well-specified deterrents protect property rights and so provide a stable framework for economic activity. Failure of the legal system to provide for the enforcement of contracts undermines the operation of the free

market and, in turn, reduces the incentives for agents to participate in productive activities. But legal systems may differ in the degree to which property rights are protected and in the quality of government they provide. Empirical work suggests that the common law system, mostly found in the former colonies of Britain, appear to have better protection of property rights compared with the civil law system typically associated with the former colonies of continental Europe, La Porta, (1999). Political instability may also matter for corruption, the expectation being that more unstable countries will have higher levels of perceived corruption.

To a large extent, it is difficult to separate the historical factors from the political and judicial factors since the effectiveness of the judicial system is dependent on the colonial heritage of the country in question. La Porta, (1999) show that those countries that were former colonies of Britain and who adopted the common law system appear to have more effective judicial systems than those who adopted civil law systems associated with former colonies of continental European countries. Treisman (2000) also explores the direct influence of historical tradition on perceived corruption showing that former British colonies or dominions appear to reduce perceived corruption in excess of the role played by the common law system.

This group of factors captures the social and cultural characteristics of a country that may impact upon the pervasiveness of corruption. For example, religion shapes social attitudes towards social hierarchy and family values and thus may determine the acceptability, or otherwise, of corrupt practices. In more hierarchical systems (for example, Catholicism, Eastern Orthodoxy and Islam), challenges to the status quo are less frequent than in more equalitarian or individualistic religions. The role of the religious tradition and corruption has

been explored explicitly by Treisman (2000) who found that a Protestant tradition appears to have a negative (though small) effect on perceived corruption. Religion may also impact on the quality of the legal system, as explored by La Porta,(1999). They found that countries with a high proportion of Catholics or Muslims reduces the quality of government and, by extension, may reduce the deterrence of corruption. Religious fractionalization may also have an impact on corruption and other characteristics associated with the quality of government Alesina,(2003).

Ethnic and linguistic fractionalization of a society may also contribute to the pervasiveness of corruption in a given country. The evidence is, however, mixed. Treisman (2000) found no evidence that linguistic fractionalization had a direct impact on perceived corruption, while La Porta,(1999) found evidence that, in societies that were more ethno-linguistically diverse, governments exhibited inferior performance. There after, Alesina, (2003) presented evidence that ethnic and linguistic fractionalization has a statistically significant impact on corruption i.e. countries that are Ethno-linguistically diverse are associated with higher perceived levels of corruption.

The economic determinants of corruption across countries have focused typically on three factors: the degree of openness, a country's endowments of natural resources and the size of the public sector. Less open countries restrict trade and impose controls on capital flows. This creates rents and hence enhances the incentives to engage in corrupt activities. There are a number of papers that have investigated this issue: for example, Ales and Di Tella, (1999) submitted that increased competition reduces corruption and that more open economies are less corrupt. Treisman (2000) opined that higher imports lower corruption. Wei

and Wu, (2001) presented evidence that countries with capital controls have higher corruption and, in turn, receive less foreign investment and are more prone to financial crisis.

More so, Neeman, (2003) reported that the effect of corruption on economic growth depends on the openness of the economy. Natural resource endowments have also featured in cross-country studies of corruption, the justification here being that the concentration of exports on natural resources is a proxy for rent-seeking opportunities. Ades and Di Tella, (1999) suggest that corruption may offer greater gain to officials who exercise control over the distribution of the rights to exploit these natural resources. Treisman (2000) finds that a higher concentration of natural resource exports has a positive effect on perceived corruption.

Several studies on the causes of corruption have emphasized the size of the public sector. Tanzi, (1998), for instance, noted that the significant role of the public sector in the economy affords public officials some degree of discretion in the allocation of goods and services provided and hence increases the likelihood of corruption. This mechanism is reinforced if the wages public officials receive are relatively low. This issue is explored by Van Rijckeghem and Weder (2001) who find that low wages for civil servants have a statistically significant effect on (perceived) corruption. Treisman (2000) however, finds rather inconclusive evidence of the size of the public sector in influencing corruption across countries.

2.3 Review of Key Theories and Studies of the Impact of Corruption

2.3.1 The Resource Curse Theory

The resource curse (Paradox of Plenty) refers to the paradox that countries and regions with an abundance of natural resources, specifically point-source, non-renewable resources like minerals and fuels, tend to have less economic growth and worse development outcomes

than countries with fewer natural resources. This is hypothesized to happen for many different reasons, including a decline in the competitiveness of other economic sectors (caused by appreciation of the real exchange rate as resource revenues enter an economy), volatility of revenues from the natural resource sector due to exposure to global commodity market swings, government mismanagement of resources, or weak, ineffective, unstable or corrupt institutions (possibly due to the easily diverted actual or anticipated revenue stream from extractive activities).

The idea that natural resources might be more of an economic curse than a blessing began to emerge in the 1980s. In this light, the term resource curse thesis was first used by Richard (1993) to describe how countries rich in natural resources were unable to use that wealth to boost their economies and how counter-intuitively, these countries had lower economic growth than countries without an abundance of natural resources. Numerous studies, including one by Jeffrey and Warner (1995), have shown a link between natural resource abundance and poor economic growth. This disconnect between natural resource wealth and economic growth according to them, can be seen by looking at an example from the petroleum-producing countries

The ambitions of the people and the government conflict due to the large amount of resources and money a country's government amass for their own luxuries rather than for the people. Thus, natural resources serve as a curse for the people, who then have a lower standard of living. Apart from that, there is often international pressure on resource-rich countries of the Third World to avoid reinvesting resource revenues in social investment purposes, or even in developmental efforts towards economic diversification. It is alleged that this pressure comes from powerful states such as the United States and other leading western

countries as well as pro-liberalization institutions such as the World Trade Organization and the International Monetary Fund

In many economies that are not resource-dependent, governments tax citizens, who demand efficient and responsive government in return. This bargain establishes a political relationship between rulers and subjects. In countries whose economies are dominated by natural resources, however, rulers don't need to tax their citizens because they have a guaranteed source of income from natural resources. Because the country's citizens aren't being taxed, they have less incentive to be watchful with how government spends its money. In addition, those benefiting from mineral resource wealth may perceive an effective and watchful civil service and civil society as a threat to the benefits that they enjoy, and they may take steps to thwart them. As a result, citizens are often poorly served by their rulers, and if the citizens complain, money from the natural resources enables governments to pay for armed forces to keep the citizens in check. Countries whose economies are dominated by resource extraction industries tend to be more repressive, corrupt and badly-managed.(Asobi, 2009)

However, in the criticising the Resource Curse Theory, Cavalcanti and his group argues that previous assumptions that oil abundance is a curse were based on methodologies which failed to take into account cross-country differences and dependencies arising from global shocks, such as changes in technology and the price of oil. The researchers studied data from the World Bank over the period 1980 to 2006 for 53 countries, covering 85% of world GDP and 81% of world proven oil reserves. They found that oil abundance positively affected both short-term growth and long-term income levels. Cavalcanti (2011), in their paper, using data on 118 countries over the period 1970-2007, they showed that it is the volatility in

commodity prices, rather than abundance per se, that drives the resource curse paradox. This study rather sees the existence and prevalence of corruption as the curse and not the resources. This invariably leads to the study of another theory called the “Dutch Disease.”

2.3.2 The Dutch Disease

The Dutch Disease (DD) refers to the paradoxical consequence of natural resource booms on the countries where they occur. The concept was coined from the experience of Netherlands in the 1960s when, as a result of the exploitation of the newly discovered large deposits of natural gas in the North Sea, the non-oil tradable sector became less competitive and declined, with a ripple effect on the whole economy which also declined (Olusi and Olugunju, 2005).

Dutch disease is an economic phenomenon in which the revenues from natural resource exports damage a nation's productive economic sectors by causing an increase of the real exchange rate and wage increase. This makes tradable sectors, notably agriculture and manufacturing, less competitive in world markets. The increasing national revenue will often result in higher government spending (health, welfare, military) that increases the real exchange rate and raises wages. The decrease in the sectors exposed to international competition and consequently even greater dependence on natural resource revenue, leaves the economy vulnerable to price changes in the natural resource. Also, since productivity generally increases faster in the manufacturing sector, the economy will lose out on some of those productivity gains.

Dutch Disease first became apparent after the Dutch discovered a massive natural gas field in Groningen in 1959. The Netherlands sought to tap this resource in an attempt to export the gas for profit. However, when the gas began to flow out of the country so too did

its ability to compete against other countries' exports. With the Netherlands' focus primarily on the new gas exports, the Dutch currency grew at a very quick rate which harmed the country's ability to export other products. With the growing gas market and the shrinking export economy, the Netherlands began to experience a recession. This process has been witnessed in multiple countries around the world including but not limited to Venezuela (oil), Angola (diamonds, oil), the Democratic Republic of the Congo (diamonds), Nigeria (Oil) and various other nations. All of these resources are considered "resource-cursed".

2.3.3 Approaches used by Various Authors to Model Corruption

Different econometric methods such as Ordinary Least Squares (OLS), 2 Stage Least Squares, and Maximum Likelihood Estimator (MLE) among others have been used. Only few who used the economic growth approach were able to empirically support the negative relationship between corruption and growth. This may be due to the endogeneity bias, subjective surveys and sample size sensitivity. On the other hand, although utilizing the Game Theory yields some useful insights into the notion of corruption, this approach ignores government involvement; it models only the demand side of corruption, and involves one stage game while corruption occurs in continuing relationships. As for the MIMIC (Multiple Indicators Multiple Causes), the output is a time-series index that can be used to construct Ordinal and cardinal time series of corruption, this model lacks structural interdependence in addition to co-linearity between indicators. The MIMIC model explains the relationship between observable variables and an unobservable variable by minimizing the distance between the sample covariance matrix and the covariance matrix predicted by the model. The observable variables are divided into causes of the latent variable and its indicators. Formally,

the MIMIC model consists of two parts: the structural equation model and the measurement model. The structural equation model is given by:

$$\eta_t = \gamma' \mathbf{x}_t + \zeta_t \dots \dots \dots (2.1)$$

Where: $\mathbf{X}_t = (X_{1t}, X_{2t}, \dots, X_{qt})$ is a $(1 \times q)$ vector of time series variables as indicated by the subscript t . Each time series x_{it} , $i = 1, \dots, q$ is a potential cause of the latent variable η_t . $\gamma = (\gamma_1, \gamma_2, \dots, \gamma_q)$, a $(1 \times q)$ vector of coefficients in the structural model describing the “causal” relationships between the latent variable and its causes. Since the structural equation model only partially explains the latent variable η_t the error S_t represents the unexplained component. The MIMIC model assumes that the variables are measured as deviations from their means and that error term does not correlate to the causes, i.e. $\mathbf{E}(\eta_t) = \mathbf{E}(\mathbf{x}_t) = \mathbf{E}(\zeta_t) = 0$ and $\mathbf{E}(\mathbf{x}_t \zeta_t') = \mathbf{E}(\zeta_t \mathbf{x}_t') = 0$ the variance of ζ_t is abbreviated by ψ and Φ is the $(q \times q)$ covariance matrix of the causes \mathbf{X}_t .

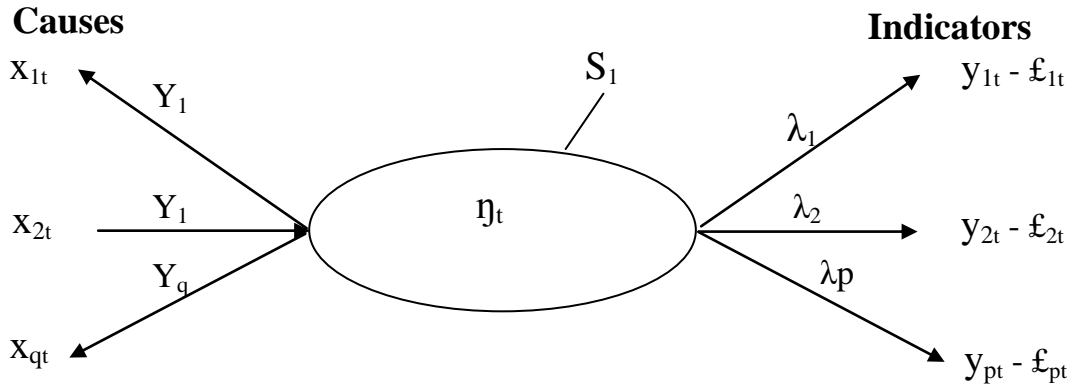
The measurement model represents the link between the latent variable and its indicators, i.e. the latent unobservable variable is expressed in terms of observable variables. It is specified by:

$$\mathbf{Y}_t = \lambda \eta_t + \varepsilon_t \dots \dots \dots (2.2)$$

Where: $\mathbf{y}_t = (y_{1t}, y_{2t}, \dots, y_{pt})$ is a $(1 \times p)$ vector of individual time series variables y_{jt} , $j = 1, \dots, p$. $\varepsilon_t = (\varepsilon_{1t}, \varepsilon_{2t}, \dots, \varepsilon_{pt})$ is a $(p \times 1)$ vector of disturbances where every ε_{jt} , $j = 1, \dots, p$ is white noise error term. Their $(p \times p)$ covariance matrix is given by $\Theta \varepsilon$. The single λ_j , $j = 1, \dots, p$ in the $(p \times 1)$ vector of regression coefficients λ , represents the magnitude of the expected change of the respective indicator for a unit change in the latent variable. Like the MIMIC model’s causes, the indicators are directly measurable and expressed as deviations from their means,

that is, $\mathbf{E}(y_t) = \mathbf{E}(\varepsilon_t) = 0$. Moreover, it is assumed that the error terms in the measurement model do not correlate either to the causes \mathbf{x}_t or to the latent variable η_t , hence, $\mathbf{E}(x\varepsilon') = \mathbf{E}(\varepsilon x') = 0$ and $\mathbf{E}(\eta\varepsilon') = 0$. A final assumption is that the ε_t do not correlate to S_t , i.e. $\mathbf{E}(\varepsilon_t S_t') = \mathbf{E}(S_t \varepsilon_t') = 0$.

Figure 2.1 shows the general structure of MIMIC model.



From equations (2.1) and (2.2), we can derive the MIMIC model's covariance matrix Σ . This describes the relationship between the observed variables in terms of their covariance. Decomposing the matrix derives the structure between the observed variables and the unobservable, latent variable, here, the shadow economy. The model's covariance matrix is given by:

$$\Sigma = \begin{bmatrix} \lambda(y' \Phi y + \psi) + \Theta E \lambda y' \Phi \\ \Phi y \lambda' \Phi \end{bmatrix} \dots \dots \dots (2.3)$$

Where the Σ is a function of the parameters λ , y and the covariance contained in Φ , Θ_E , and ψ . Since the latent variable is not observable, its size is unknown, and the parameters of the model must be estimated using the links between the observed variables' variances and covariance. Thus, the goal of the estimation procedure is to find values for the parameters and

covariance that produce an estimate for Σ that is as close as possible to the sample covariance matrix for the observed causes and indicators, i.e. the \mathbf{x}_t s and \mathbf{y}_t s. This model is extended to include the concepts of cointegration.

As for the MLE, the principle of maximum likelihood estimation (MLE), originally developed by Fisher(1920), states that the desired probability distribution is the one that makes the observed data “most likely,” which means that one must seek the value of the parameter vector that maximizes the likelihood function $L(w/y)$. The resulting parameter vector, which is sought by searching the multi-dimensional parameter space, is called the MLE estimate, and is denoted by:

$$wMLE = (w_{MLE}, \dots, w_{KMLE}) \dots \dots \dots (2.4)$$

Maximum likelihood estimation is a method to seek the probability distribution that makes the observed data most likely.

For computational convenience, the MLE estimate is obtained by maximizing the log-likelihood function, in $L(w/y)$ this is because the two functions, in $L(w/y)$ and $F(y/w)$ are monotonically related to each other so the same MLE estimate is obtained by maximizing either one. Assuming that the log-likelihood function, in $L(w/y)$ is differentiable, if $wMLE$ exists, it must satisfy the following partial differential equation known as the likelihood equation:

$$\theta L(w/y) = 0 \dots \dots \dots (2.5)$$

The studies by Mo (2001) and Anorou and Braha (2004) in which they identified the direct and indirect effects of corruption on economic growth in line with the specification of Barro’s model (1990) which is an outgrowth of Ram (1986) model, permits the inclusion of a wider range of policy variables including corruption. This model provides both the theoretical

foundation and analytical tool for analysis of impact of corruption on economic growth in Nigeria. The model assumes the economy is comprised of public sector (G) and Private sector (P). Since the investment by the public sector in infrastructure can make private sector more profitable, it is assumed that the output of (G) exerts some externalities on the output of the private sector. The model also assumes that government levies an income tax and runs a balanced budget. It uses a production function of the form:

$$Y = G^\beta K^\alpha L^{1-\alpha} \dots\dots\dots(2.6)$$

Where: Y = Total output of the economy

G = Public sector input

K = Private physical capital

L = Labor input

α = Contribution of capital to aggregate output

1- α = Share of output per worker

b = Contribution of public sector to aggregate output

G = tY (government is assumed to levy tax and run balanced budget)

$$tY = t G^\beta K^\alpha L^{1-\alpha}$$

The production function of the Public Sector (G) is given as:

$$G = g(Lg, Kg) \dots\dots\dots(2.7)$$

While that of the Private Sector is given as:

$$P = p(Lp, Kp, G) \dots\dots\dots(2.8)$$

The Total factor inputs

$$LT = Lg + Lp \dots\dots\dots (2.9)$$

$$KT = Kg + Kp \dots\dots\dots (2.10)$$

Subscripts g, p and T relate to the inputs of public sector, private sector and aggregate economy respectively. Since the total output of the economy is a function of output in both public and private sector.

$$Y = g(L_g + K_g) + p(L_p + K_p + G) \dots\dots\dots(2.11)$$

$$= L_g + L_p + K_g + K_p + G$$

The model is modified by them to include corruption, therefore we have

$$Y = K_T + L_T + G + C \dots\dots\dots (2.12)$$

$$Y = aK_T + (1-a)L_T + bG + IC \dots\dots\dots(2.13)$$

Finally, simulation models show the strength of the Cause-effect relationship between corruption and growth, but cannot detect unstable equilibrium, and the total convergence cannot be achieved in finite time. Table 2.1 summarizes the previous approaches used in modeling corruption with their strengths and weaknesses.

Table 2.1: Summary of the Previous Approaches used in modeling Corruption

Approach	Scholar	Models	Methods	Limitation	Findings
Economic growth It explores the relationship between corruption and economic growth	(Murphy, 1993) (Mandapaka, 1995) (Triole, 1996) (Mauro, 1997) (Bardhan, 1997) (Hellman, 2000)	Lucas type Rent seeking Keynesian Neoclassical	OLS 2 Stage LS	Subjective surveys Endogeneity bias Sample size sensitivity	Only few were able to empirically prove the negative relationship between corruption and growth
Game theory It identifies that conditions that are necessary for corruption and those that are conducive to it.	(Andvig, 1990) (Laffont, 1991) (Basu, 1992) (Mookherjee, 1995) (Dixit, 1997) (Elliot, 1997) (Acemoglu, 2000)	Principal agent Heterogenous bureaucrats (agents)	One stage game	Models the demand side Ignores that government Corruption occurs in continuing relationships	This approach yield some useful insights into the notion of corruption
Multiple indicators multiple causes It considers observable data on potential indicators to predict values for unobservable (corruption)	(Week, 1983) (Frey, 1984) (Balasa, 1985) (Salvatore, 1991) (Greenaway, 1994) (Loaysa, 1996) (Schneider, 1997) (Guiles, 1999)	LISREL MIMIC	MLE	Co-linearity between indicators Weak estimation techniques Lacks structural interdependence	The output of this model is a time series index that can be used to construct ordinal and cardinal time series of corruption
Simulation It tests the effectiveness of some proposed solution to combat corruption	(Turnovsky, 1995) (Jain, 1998) (Stapenhurst, 1999) (Hammond, 2000) (Luna, 2002) (Situngkir, 2003)	Agent -based	Swarm Stella	No way to detect unstable equilibrium Total convergence is not achieved in finite time	Many showed the strength of the cause effect relationship between corruption and growth
Simulation	Yusuf,(2014)	Macro	OLS	Only few variables did not tract well	Measured the impact of loss in the industry

Source: Moe Farida and FredounAhmadi-Esfahani in Obayelu (2007) Modified by the author,(2014)

2.4 Review of Empirical Studies

Even though, scholars differ on the perception and effects of corruption on the economy, some of them such as (Leff, 1964; Huntington, 1968; Lui,1985; Lien,1986;

Acemoglu and Verdier, 1998 and conditionally Aluko, 2008) argue that corruption enhances efficiency and as such positively impact on the economy. For example, Leff (1964) and Huntington (1968), suggest that under rigid regulation and inefficient bureaucracy, corruption might foster economic growth. In their model, they believe that agents use "speed money" to get around bad laws and institutions. Additionally, Lui (1985) shows that bribery can be efficient in a queuing model if agents with higher values of time can use bribes to obtain a better place in line. Acemoglu and Verdier (1998) on their part argue that some degree of corruption may be part of the optimal allocation of resources in the presence of incomplete contracts or due to market failure.

This opinion is partly justified on the ground that illegal payments are required to make things pass swifter and favorably through the state bureaucracy. By implication, corruption has the potency of making an economic agent more efficient and in the long run it promotes economic growth. The next logical question is what is the evidence? Is it conclusive? If not conclusive, it therefore provides opportunities for further studies. Also, what are the limitations of the existing studies?

On the other hand, Mauro (1995), Tanzi and Davoodi(1997) among others maintained that corruption lowers investment and by extension impacts negatively on the economy. Tanzi and Davoodi (1997) not only supported this position by their findings but also extended it by showing the direction of causality. Bardhan, (1997), Weder,(2003), Meon and Seklat(2005) followed the above pattern in their analysis of the effect of corruption on the economy.

The effects of corruption generally are so broad and complicated to the point of losing its devastating consequences on the economy in which it exists, and to address this problem without being carried away with its elusive features, the areas of concern where corruption

affects the macro economy is hereby being focused. This is in line with the decision of the United Nation Convention against Corruption (UNCAC) in 2002, where it was agreed that corruption should not be defined at all because of its complicated nature, but rather address the problem areas.

There have been a number of studies that have reported quantitative results on the effect of corruption on economic variables. These studies have used cross-section analysis of available corruption indices and relevant economic indicators. The pioneering effort in this area was the study by Mauro (1995) who found that corruption lowers investment and thereby economic growth. Later, the study by Tanzi and Davoodi, (1997) further extended and elaborated this line of causality by showing that corruption increases public investment while reducing its productivity. Productivity of public investment was measured through physical indicators such as the quality of roads, and other infrastructures such as health education and security. How well these infrastructures are will explain the productivity of investment.

A number of studies have shown that corruption affects economic growth through both domestic and foreign investments. Shleifer and Vishny, (1993) and Bardhan, (1997) suggest that corruption has some sort of distributional effects, as it promotes redistribution of resources. Businesses derive benefits from corrupt state machinery by forging patron-client relationships. Leff (1964) and Huntington, (1968) suggest that corruption increases economic growth for a number of reasons including helping entrepreneurs to avoid bureaucratic delay by bribing officials. Lui (1985) suggests corruption minimizes waiting costs thus reducing inefficiency in economic activity. Beck and Maher, (1986) and Lien, (1986) maintain that allocative efficiency can exist even where corrupt officials grant bids to the highest bidder.

The problem in cross country analyses of corruption also revealed that what is legal in some countries may well be illegal in others. This brings to mind the question as to whether the impact of corruption is necessarily adverse. The debate on corruption is not one-sided as noted earlier. There is a branch of literature which suggests that corruption may actually be beneficial to growth. This view has been propagated by Huntington (1968) and Leff (1964) who argue that in a society in which inefficient laws and regulations are present, corruption helps to reduce inefficiency. There is some support for this view theoretically as well. Lui (1985) used the Game Theoretic Model to show that in a queue, it may be optimal to allow bribes to jump the queue. It could also be argued that if firms were to bid competitively or bribe an official for a permit, the firm with the lowest cost of production (i.e. the most efficient firm) would be able to pay the highest bribe and would get the permit Lien (1986). This argument however, seems to take a limited view of the problem. While it assumes that inefficiencies exist, it does not question why they do. A plausible reason is that they exist to allow opportunities for rent extraction. Shleifer and Vishny (1992) claim that firms might create artificial shortages and then gather a large surplus by collecting bribes. Banerjee(1997) also argues that bureaucrats may artificially create red tape in order to screen potential bribers according to their willingness to bribe. Those with a high willingness to pay often do so and overcome the red tape, while those who are unwilling tend to get enmeshed in it, thereby ensuring an effective mechanism for screening the willing from the unwilling. Thus corruption might be a symptom or cause of inefficiency rather than something which circumvents it. As far as greasing the wheels goes, where is the guarantee that the work for which the bribe is paid gets done and that further bribes are not asked for?

Moreover, firms that bribe the highest amounts may not be the most efficient ones since they may pay large bribes and later simply reduce the quality of goods to recover the cost of the bribes. Most abandoned projects especially the road projects were seriously affected by this scenario. Some empirical studies such as that of Mauro (1995) and Kaufmann and Wei (1999) also refute the “Grease hypothesis”. However, as Meon and Sekkat, (2005) note, there is not enough evidence to systematically reject this hypothesis. The economic growth approach has the ability to test the relationship between economic growth and corruption, but its main limitation lies in using the correct index of corruption in the objective function. Most of indices of corruption that had been used Mauro (1995), Knack (1995), Murphy (1993), Bardhan (1997), and Mandapaka (1995) were based on surveys. These indices reflect either the general perception of the people on the level of corruption present in the country or the expertise perception, and they fail to reflect the actual level of corruption present in the country. The theoretical modelling here suggests that output and growth are influenced by the level of corruption. If one of the indicators of macroeconomic variable suffers a quality loss in the presence of corruption, then this will also affect growth Farida and Ahmadi-Esfahani (2007).

In general, experience-based indicators appear to offer the greatest potential for comparability, since they avoid some of the problems associated with perception-based indicators. Corruption is often modeled as a principal – agent problem. A principal delegate some decision power to an agent, where the principal’s rules of preference in exercising the power are known to the agent.

The principal’s problem is that the agent may serve his/her own interests rather than the principal’s. Bardhan, (1997). The influence of corruption on economic growth has been

modeled using economic growth models, Krueger (1974); Murphy (1993); Mandapaka (1995); Mauro (1995). In addition, corruption has been modeled using the game theoretic approach with three players: principal, agent, and hidden principal Andvig (1990); Laffont (1991); Basu (1992); Mookherjee (1995); Acemoglu (2000). In addition, SWARM (as programming language) has also been widely used method to simulate corruption models, and analyse the dynamic and evolutionary process of corruption on various parameters. Turnovsky (1995); Jain (1998); Stapenhurst (1999).

2.4.1 An Overview of the Nigeria's Oil and Gas Industry

Mineral exploration in Nigeria began in the early 1900s, when a German company, the Nigerian Bitumen Corporation, obtained a license to exploit bitumen deposits in the country's western region. This was followed by the grant of an exclusive concession right to Shell D'Arcy to explore and prospect for oil in 1937 (Ofoh, 1992). From 1955, exploration licenses were granted to other companies to search for oil primarily in areas surrendered by Shell in the former Northern and Western regions. The first oil field was eventually discovered in 1956 in the Niger Delta field of Oloibiri in the South-South geopolitical zone in the former Eastern Nigeria, where the first commercial oil and gas extraction took place in 1958.

Nigeria ranks among the top 10 nations in proved oil and natural gas reserves, worldwide. As of January 1, 2009, the estimated crude oil and natural gas reserves are, respectively, 36.2 billion barrels and 181.9 trillion cubic feet (tcf). Crude oil production has also expanded significantly, growing from its initial daily output of about 5,100 barrels in 1956 to as high as 2.5 million barrels per day in the late 1970s (OPEC Bulletin, 2008). The aggregate crude liquids petroleum production (oil, condensates and NGL) was about 1.98

million barrels per day in 2008. This represents about 10.7 percent decline from daily production of 2.2 million in 2007 due to persistent disturbances and crisis in the Niger Delta (CBN, 2008). Continual investments and economic and policy incentives have been instituted by the Federal government in an attempt to increase Nigeria's proved oil reserves to 40 billion barrels and expand its production capacity from 2.5 million barrel per day to between 3 and 4 million barrels per day by 2010 and beyond. Subsequent to the massive investment in deepwater by international companies, Nigeria has increased its oil reserves by 200 percent of its production since 1980. At the extraction levels, Nigeria's reserves would provide for about 30 years of oil production in comparison to a global average of 45 years (Iledare, 2008).

The number of international petroleum companies operating in Nigeria has increased from a single producer (Shell BP) in 1958 to more than 24 producers in 2007. The top four companies--Shell Petroleum Development Company (Shell), ExxonMobil, Chevron Nigeria Limited (CNL) and Total (formerly Elf Petroleum Nigeria Limited or EPNL)—accounted for nearly 83 percent of Nigeria's total petroleum production in 2008, an indication that the Nigeria petroleum industry is dominated by few international firms. The new players to emerge in recent years include the Korean National Oil Company, Addax Petroleum Development (Nigeria) Limited, China National Oil Company, Express Petroleum, Cavendish, AENR, Consolidated Oil Limited (Conoil), and AMNI International (AMNI) (Ariweokuma,2008).

In 1971, the Nigerian National Oil Company (NNOC), was incorporated “in direct response to Organization of Petroleum Countries” (OPEC) calls for member countries to establish national oil companies (NOCs), which would be vehicles for state participation in the oil industry” Omoregbe (2003). Since then, Nigeria has remained a key member of OPEC,

producing the organizations longest serving secretary general, Dr. Rilwanu Lukman, from 1995-2000. In the aftermath of the 1973 oil embargo and the sudden quadrupling of crude oil prices, Nigeria became a significant player in the international crude oil market as a net exporter of crude oil and the conduct of the oil and gas industry in Nigeria changed. That year, the Federal Government of Nigeria (FGN) invoked the first participation agreement and acquired a 35 percent equity interest in all the oil and gas companies operating in Nigeria in the form of joint venture agreements. The equity interest was increased to 55 percent in 1974 in the aftermath of OPEC resolutions mandating its member countries to acquire majority participating interests in petroleum ventures in all member countries. In 1977, NNOC was replaced with a new National Oil Company called the Nigeria National Petroleum Corporation (NNPC). NNPC was formally restructured to facilitate the effective management of the oil and gas industry in general and, more specifically, of the government's equity interest in the joint ventures with international oil companies.

Over the years, the Nigerian oil and gas sector has dominated merchandise exports. Oil revenue from exports grew from \$718 million to \$9.4 billion from 1970 to 1978 but declined dramatically from a high of \$25 billion in 1980 to \$4.7 billion in 1986 as a result of the crude oil price collapse. The vulnerability of the economy to oil price instability has also been costly in terms of revenue fluctuation, income distortions, and fiscal indiscipline. In 2008 total oil export receipts for Nigeria were about \$75 billion dollars, which represents about 98.8 percent of total exports for the year. Yet, the oil and gas sectors share of GDP in Nigeria declined from 47.7 percent in 2000 to just 25 percent in 2005 and 22 percent in 2006. A recent World Bank estimate shows that the contribution of the oil sector to GDP is still low at 28.4 percent (Okonjo-Iweala, 2009).

The petroleum sector has also dominated governmental fiscal revenues. Of Nigeria's 36 States, only nine are classified as oil and gas producers. The nine States are located in the three southern geopolitical zones—Southwest, South-South (Niger Delta), and the Southeast. The six producing States in the South-South geopolitical zone and their adjacent offshore-Delta, Bayelsa, Rivers, AkwaIbom, Cross River, and Edo States—accounted for 91.5 percent of the gross oil production but only 15 percent of the total population. Ondo State in the Southwest zone and Imo and Abia States in the Southeast zone are the other producing States and these three States accounted for about 8.5 percent of total oil production in 2008. Rivers State accounted for about 36.9 percent of total oil and gas production in Nigeria, followed by AkwaIbom State, which accounted for about 21.2 percent of production. In the late 1990s, the majority of oil and gas production was from onshore and shallow water fields.

2.4.2 Operators in the industry: Active and Passive

For the purpose of simplicity, the upstream sector can be divided into production and transportation while the downstream could be classified into processing (refining, petrochemical, liquefied natural gas etc.), transportation and marketing. Service operations can be considered as a third distinct activity group.

Table 2.2: Players in the Nigerian Petroleum Industry and their Relative Strategic Positions

Activity	Federal Government	Multinational Companies	Private Nigerians
Upstream			
Production	❖ Weak (Passive Joint Venture Operator)	- Dominant	- Weakest
❖ Transportation ❖ Pipelines ❖ Ships and barges	❖ Significant ❖ Weak	- Significant - Dominant	- Weak
Downstream			
❖ Processing: ❖ Crude ❖ Gas	❖ Absolute control ❖ Passive Joint Operator	- Dominant	- No role
❖ Storage and transportation ❖ Pipelines ❖ Haulage Trucks	❖ Absolute control ❖ Unclear	- Dominant	- Significant Equity participation
Marketing	❖ Diminished by privatization	- Dominant (strengthened by privatization)	- Significant Equity participation
Services	❖ Weak	- Dominant	- Weak

Source: Garba (2000)

Table 2.2 shows the players and their strategic positions in the petroleum industry in Nigeria. In the table, the dominant role of the multinational oil companies in the upstream sector comes across very clearly in production and in the transportation of products (crude) to foreign refineries. The major oil companies (Shell, Chevron, Mobil, Elf, Texaco and Agip) which together accounted for about 97% of total production in 1986-92 dominate the service operations. Of the six majors, Shell alone accounts for 50% of total production in the same period and its market power is traceable to what Igweonwu (1988) termed the hegemonic phase of the petroleum industry when oil concessionaires “had effective control over the range of oil activities” (Ikein, 1993). The hegemonic age in turn, had roots in Nigeria’s colonization and in particular, the Mineral Oil Act Laws of Nigeria, Chapter 130, 1914. The Act specified

that the “powers conferred upon the Governor General to grant licenses and leases for mineral oils shall be exercised subject to the following conditions:

No lease or license shall be granted except to a British subject or to a British company and having its principal base of business within Her Majesty’s dominions, the Chairman and the managing director (if any) and the majority of the other directors of which are British subjects.

As it can be seen from Table 2.2, the dominance of multinational companies has been sustained even after Nigeria acquired controlling equity participation in fulfillment of Resolution XVI Article 90 of June 1968 of OPEC which required all member countries to acquire controlling equity participation in oil companies. In a curious arrangement -the Joint Venture Participation-, the Federal government through the Nigerian National Petroleum Company (NNPC) opts to be a passive partner and in doing so, surrenders strategic advantage to multinational companies. For instance, the agreement provided that only the operator will prepare and propose programs of work and alternative expenditure requirements. Although, the agreement also provides that technical matters are discussed and policy decisions are taken at Operating Committees (OPCOMS), composed according to equity participation, it is unlikely that the NNPC lacking in requisite operational experience could utilize its majority equity shares to any advantage. Furthermore, because multinational companies are vertically integrated, the opportunities for extracting the most advantage are very high. The opportunity set is likely to expand as the oil companies concentrate further through mergers. In the downstream, the Federal government through the NNPC is potentially the dominant player.

First, it owns all the four refineries with a combined capacity of 445,000 barrels per day. Clearly, the Federal Government is a monopoly in the downstream. Second, the Federal government owns and controls all the depots and the pipeline networks. Both refining and distribution efficiency therefore, depends critically on the efficient operations of the refineries

and the pipelines and depots by the NNPC. The dependence of the refineries on the major oil companies and other multinationals for Turn-Around Maintenance (TAM) of the refineries increases (a) operating costs, (b) time loss in maintenance, (c) leakage of surplus and hence (d) adverse invisible and capital balances. The World Bank (1993) found that involvement of the multinationals was causal to the over-shooting of the cost of the TAM of Port Harcourt II by between about 520% and 640% in 1992. Interestingly, in 1998, the TAM of Kaduna Refinery, which has a lower capacity than Port Harcourt II was 34.7 fold the estimated international costs in 1992. Similarly, the contract cost for the TAM for Port Harcourt I and II which \$32 million awarded to Shell for consultancy services was 365% higher than contract cost in 1992.

Table 2.3 shows that the major oil companies dominate the marketing of petroleum products in Nigeria. Their dominance is also reflected in transportation from depots to filling stations.

Table 2.3: Major and Independent Marketers of Petroleum Products

Firm	Parent company	Private Nigerians	Government
a. Mobil	60		
b. Total	60		
c. Elf	60		
d. Unipetrol	-	60	40
e. African Petroleum		60	40
f. Texaco	60	40	
g. National – NOLCHEM	40 (Shell)	20	
h. Agip	60	40	
i. 1,200 Independents	-	100	

Source: Garba (2000)

In Table 2.4, three aspects of economic conduct are highlighted: entry/exit; pricing and marketing/transportation. The laws regulating entry in the upstream vests ownership of hydrocarbon resources in the state (Petroleum Decree 1969) but provide for leases to nongovernmental bodies. The Petroleum (Drilling and Production) Regulations 1969 for instance, provides for the granting of leases (oil prospecting lease and oil mining lease). Oil Pipelines Act Cap 145, 1958 (as amended) provides among other things for the granting of oil pipeline leases and their maintenance. Both laws also provide for the termination of lease by the leasee and the lessor.

The Petroleum Profit Tax law of 1969 (as amended) and the Memorandum of Understanding (MOU) of 1986 and 1991 provide the guidelines for pricing of Nigeria's Crude. The laws also provide incentives for oil companies. For instance, within the price band of \$12.50 - \$23 per barrel established by the MOU (1986), the risks and benefits of fluctuations in crude oil prices are substantially shifted from the oil company to the government" (Tom Mitro, Nigeria's Oil and Gas Monthly, Vol. No.5, 1998: 27). Its main consequence being that:

When world crude prices begin to decline, the external price risk factor would not negatively impact the attractiveness of exploration prospect in Nigeria. Prospect in every country would be negatively affected. . . . when crude prices are expected to move upward, the attractiveness of an exploration prospect in Nigeria is not enhanced since very little , if any, of the benefits will go to the oil company.

In the downstream sub-sector, the entry and exit laws limit entry to petroleum refining to the federal government (Petroleum Refining Regulations, 1974). The Uniform Pricing Decree of 1973 restricts entry of non-federal governmental bodies and organizations to the

import of petroleum products. Both laws thus, vest the Federal government with monopoly powers with respect to the supply of petroleum products. It is worth noting that the Uniform Pricing Decree also stripped States of powers to tax petroleum products.

The Uniform Pricing Decree of 1973 also vests in the Federal government the power to fix the price of petroleum products. The powers of the Federal government to set the price of petroleum products was most frequently exercised in the 1986-1998 period during which the price of gasoline rose from 20 kobo in 1985 to N25 (it later reduced to N20). Because the Federal government has monopoly powers, it is argued that it is a theoretical perversity to assume that increasing the price of petroleum products strengthens competitiveness or efficiency (Garba, 1997). On the contrary, it weakens efficiency by penalizing consumers of petroleum products and rewarding inefficiencies at all points on the production and distribution chain of petroleum products.

Table 2.4: Laws Regulating the Economic Conducts of Oil Companies in Nigeria

Type of Conduct	Upstream	Downstream
Economic Conduct		
Entry	Petroleum Decree 1969: Oil Pipelines Act Cap 145, 1958 (as amended): Petroleum (Drilling and Production) Regulations 1969	Petroleum refining Regulations 1974: Uniform Pricing Decree 1973
Pricing	Petroleum Profit Tax 1959, Cap 354, Laws of the Federation of Nigeria, 1990: MOU, 1991 (as amended)	Uniform pricing Decree 1973: Petroleum (Special) Trust Fund, 1994.
Marketing/Transportation	Oil Terminal Dues Act 1969: Crude oil (Transportation Shipment) Regulations 1984:	Uniform Pricing Decree of 1973, Petroleum (Refining) Regulations 1974: Petroleum Production and Distribution (Anti-Sabotage) Act 1975 Petroleum products (Identification of Tankers) Regulations 1985

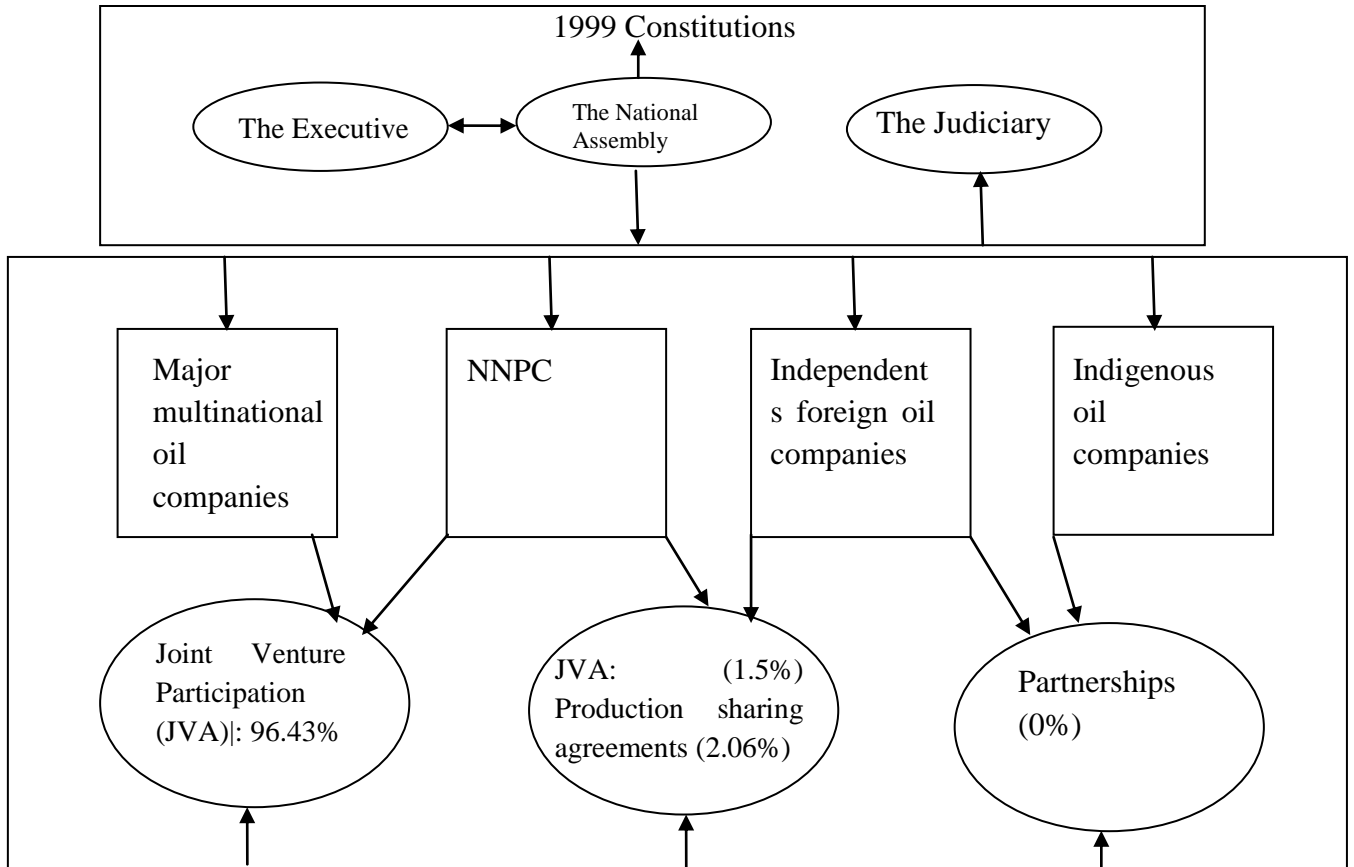
- **Source:** Garba (2000)

After the many price increases in 1994, the Petroleum (Special) Trust Fund, Decree of 1994 was enacted. The Decree provided for the allocation of the price of petroleum products after the increase of 1994 to the NNPC (refining and crude costs), PTF, marketers (marketers margin and transport costs) and to the Federal government (excise tax). The Decree does not promote efficiency either at any point on the production and distribution chain of petroleum products nor does it promote efficiency in the use of public resources. For instance, the Decree allocates an insignificant proportion of the price of petroleum products to refineries and pipelines and depots and even then, the allocation is not paid directly to refineries or pipelines and depots.

The Uniform Pricing Decree caused an unprecedented shortage of petroleum products in 1973-74 not only because of the fixing of prices below market levels but also, because distribution was centralized at the NNPC and organized through a collusive monopoly of the NNPC and major marketers. Yet another decree, the Petroleum Production and Distribution (Anti-Sabotage) Act 1975 addressed the persistence of shortage caused by un-competitive structures erected by decrees. The formation of task forces of various fancy names was its equivalent in 1986-99. However, none of the fancy named Task Forces could forcefully make regular or efficient supply of petroleum products a reality.

Existing State of Regulations in the Petroleum Industry

Fig 2.2: Overview of the Regulatory Framework of the Petroleum Industry



Source: Garba (2000)

Fig 2.2 illustrates the regulatory framework of the oil industry in a Nigerian State under an executive civil government and a civil National Assembly. The top panel illustrates the supremacy of the 1999 Constitution over the three arms of government and the separations of powers. The Executive for instance has roles that include:

- (a) Administration of government joint venture interests;
- (b) All policies relating to concession, marketing of petroleum and petroleum products; conservation, control and inspection of the industry;

- (c) Development of hydrocarbon industry (natural gas, processing, refineries and petrochemical);
- (d) Fixing of prices (crude oil, natural gas, petroleum products and their derivatives);
- (e) Licensing of all petroleum operations and activities;
- (f) Overall supervision of the industry; and
- (g) Relations with OPEC, NNPC, Petroleum Equalization Fund, Petroleum Technology Development Fund and the Petroleum Training Institute, Effurum.

The oil and gas laws are subject to changes in the National Assembly as the law making authority. For instance, the committees of the Senate or House of Representatives on Petroleum Resources could initiate and lobby through the National Assembly bills that change any of the oil and gas laws following procedures specified in the 1999 Constitution.

Although bills could originate outside the National Assembly, the National Assembly is the only entity that can legislate in Nigeria. However, unless the National Assembly in accordance with the provisions of the 1999 Constitution amends the laws, the oil and gas laws are binding on the industry and on all arms of government.

The courts would adjudicate on matters brought before it by any interested party (private or public) on any dispute. For instance, the Federal High Court ruled against Shell's request for protection against the National Assembly's decision to probe its activities. The operations of the 1999 constitution by the Executive and the Legislature, and the constitution itself, provide the legal framework for the petroleum industry through a set of oil and gas laws. In the bottom panel, the entry of players and the type of ownership structures forged are all determined by oil and gas laws in the Constitution. The legal environment of the oil and

gas industry comprises laws on ownership, pipelines, production, environmental protection, fiscal requirements and marketing.

2.4.3 An overview of the Main Activities along the Oil and Gas Value Chain

Crude oil has become one of the world's most strategic natural resources required as a crucial input in contemporary economic activities. Versatile, non-renewable natural resources, crude oil is a highly demanded commodity in both rich and poor countries, providing about 50% of the global energy requirements Anyanwu et al, (1997; Igbatayo, (2004).

Crude oil has also become the single most important commodity in the world because of its value-chain which can be summarized into seven different phases as shown in the Figure2.3; and expatiated more in Table 2.5

Figure 2.3: The Oil and Gas Value Chain

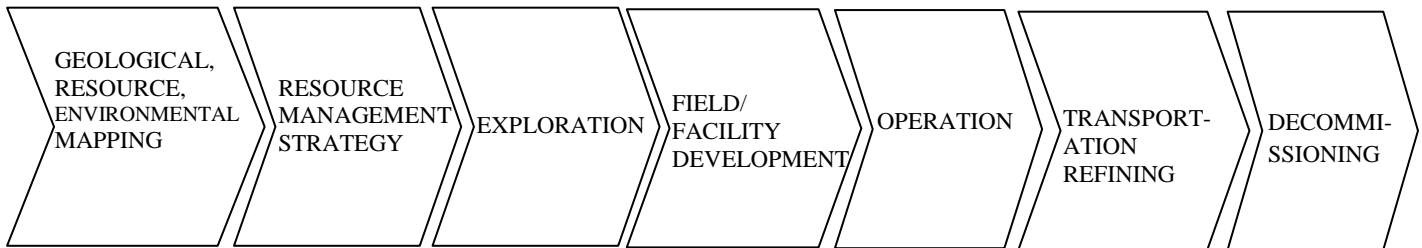


Table 2.5: Overview of Main Activities along the Oil and Gas Value Chain.

Value chain	Description of main activities	Potential Opportunities for Corruption
Geological, resource, environmental mapping	Geological mapping, including desk study and seismic surveys, identify areas with favourable geological conditions for oil and gas extraction. Seismic surveys offshore are conducted by sending sound waves into the seabed, using large, specially designed ships with air guns and cables with receivers. The air guns fire strong, compressed air-based sound pulses (sound waves) at regular intervals, typically each 25 metres the vessel moves. Seismic surveys onshore are conducted either by shot-hole method (using dynamite) or vibroseis (using a generator that hydraulically transmits vibrations into the earth). Mapping of resources and environment is performed to establish a knowledge base for environmental protection.	Distortion of facts.
Opening of new regions/fields	The government (1) opens new regions (areas) for exploration drilling, (2) issues production licenses in opened areas, and (3) approves field developments for discoveries in granted licenses.	Incompetency of the license holders.
Exploration	Exploratory drilling explores the presence or absence of a hydrocarbon reservoir while appraisal drilling may improve quantification of the reserves. Mobile rigs commonly used offshore include jack-ups and semi-submersibles, whilst in shallow protected waters barges may be used. For land-based operations a pad is constructed at the chosen site to accommodate drilling equipment and support services. A self-contained support camp is also constructed, which may include helipad for remote sites. The time to drill a bore hole is commonly in the order of one or two months. Where a hydrocarbon formation is found, initial well tests-possibly lasting another month, are carried out, often generating oil, gas and formation water that need to be disposed of, followed by the drilling of more wells to determine the size and extent of the field (appraisal wells).	Distortion of facts.
Field and facility development	Field and facility development involves drilling of production wells and constructing platforms/FPSO/subsea systems, production facilities, pipelines and infrastructure for transportation of oil and gas.	Over invoicing in the facility development.
Operation	Oil and gas are produced from the reservoir through formation pressure, artificial lift (water or gas), and possibly advanced recovery techniques, until economically feasible reserves are depleted. Injection wells are drilled in order to inject gas/water/steam to maintain reservoir pressures and increase recovery rates (other methods of recovery can also be used). Production facilities process the hydrocarbon fluids and separate oil, gas, and water. Produced water is treated and discharged or re-injected.	Abuse of quota
Transportation and Refining	Oil and gas is transported to refinery where crude oil is separated and converted into end products such as high-octane motor fuel (gasoline/petrol), diesel oil, liquefied petroleum gases (LPG), jet aircraft fuel, kerosene, heating fuel oils, lubricating oils, bitumen, and petroleum coke. Refined products are transported from refinery to end-users by pipelines, ship or road.	Absence of metering.
Decommissioning	Petroleum installations are either re-used or demolished for recycling or disposal. Clean up is also included as part of decommissioning. Decommissioning generally involves permanently plugging and abandoning all wells, and may include removal of buildings and equipment, transfer of buildings and roads to local communities or host government entities, implementation of measures to encourage site re-vegetation and site monitoring.	Diversion of funds for maintenance and training.

Source: Adapted from OGP, 2008 and E&P Forum/UNEP, 1997. Modified by the author.

Table 2.5 clearly shows that the Crude oil and gas have assumed a predominant role in the global economic framework, providing jobs as well as much of the energy that drives the economy in both industrialized and developing countries.

In view of the strategic nature of the petroleum industry as the predominant source of global energy, it has become a prime source of revenue generation to many countries including Nigeria. In line with this, the Organization of Petroleum Exporting Countries (OPEC) has played a leading role in the global oil industry, promoting market stability and ensuring a stable/steady flow of revenue accruing to member countries of the cartel. At the top of the petroleum industry in Nigeria is the federal government-owned parastatal; Nigeria National Petroleum Corporation (NNPC) that operates a joint venture (JV) agreement with other foreign multi-national oil companies in Nigeria to produce both the nation's crude oil and gas.

In the work of Garba et al, (2009) GIABA study *on corruption and Money Laundering in West Africa, The case of Nigeria*, Agriculture and oil and gas industries were identified as the most susceptible industries to corruption. Of the two, the oil and gas industry is the most susceptible to corruption. In additions, it has the most negative impacts on the development of the economy.

Oil is a major source of energy in Nigeria and the world in general. Oil being the mainstay of the Nigerian economy plays a vital role in shaping the economic and political destiny of the country. Although Nigeria's oil industry was founded at the beginning of the century, it was not until the end of the Nigeria civil war (1967 - 1970) that the oil industry began to play a prominent role in the economic life of the country. Odularu (2008).

In many economies that are not resource-dependent, to carry out government activities, the governments tax citizens who demand efficient and responsive governance in return. This bargain establishes a political relationship between rulers and subjects. In countries whose economies are dominated by natural resources, however, rulers don't need to tax their citizens because they have a guaranteed source of income from natural resources. Because the country's citizens are not being taxed, there appears to be less incentive to be watchful of how government spends its money. In addition, those benefiting from mineral resource wealth may perceive an effective and watchful member of the society as a threat to the benefits that they enjoy, and they may take steps to thwart them. As a result, citizens are in most cases impoverished by their rulers, and as such disempowered, and if the citizens complain, money from the natural resources enables governments to pay for armed forces to keep the citizens in check. Countries whose economies are dominated by resource extraction industries tend to be more repressive, corrupt and badly-managed, Asobi (2009)

Oil dominates the Nigerian economy and generates enormous revenue. Indeed the bulk of government revenue, but this has not translated into an improved standard of living for the citizens due to corruption and mismanagement. This argument is woven around the concept of the 'rentier state'. The contention is that states, like Nigeria, which depend heavily on rent from their natural resources, rather than taxes from its citizens, and corporate organizations tend to be corrupt and poor. This is so for three main reasons. First, resource rent is much more easily appropriable than revenue from taxation because its source is concentrated (oil is a "point resource"), not dispersed. Secondly, it is easier for political leaders to ignore public demand for accountability in a rentier state because, since they do not depend on taxes from citizens for the national income, they can acquire, retain and use state power without

bothering about legitimacy. Third, rent seeking has a magnetic effect; it tends to suck all and sundry into its seductive loop, including entrepreneurs who could have invested in manufacturing and agriculture. Consequently, diversification of the economy is difficult to achieve in a rentier state, Asobi (2009).

2.4.4 An Overview of the Corruption in the Oil and Gas Industry in Nigeria

The complex and largely vague operations of the oil and gas industry makes it difficult to establish exactly how, when and to what extent corruption takes place in the industry. This state of affair was revealed by findings from a jointly sponsored survey by the Nigeria Extractive Industries and Transparency Initiative (NEITI) and the British Department for International Development (DFID). The findings established, that Nigeria could neither account for the volume of her crude exports, nor ‘accurately’ affirm in any recognized standards of measure, the total volume of fuel imported into the country for her domestic consumption’. This support the claim that, “whenever a public official has discretionary power over distribution to the private sector of a benefit or cost, incentives for corrupt practices are created” (Rose-Ackerman,1997).

U4 Brief (2009) identified four channels through which public sector institutions governing the Nigerian oil and gas industry permit the existence of corruption: awards of oil blocks, export of crude and import of refined products awards of contracts and bunkering.

a. Award of Oil Blocks

The Nigeria Petroleum Act of 1969 gave the Minister of Petroleum the discretionary powers and full authority to allocate license for oil blocks for the exploration, prospecting, and mining of oil. (To do this requires bidding; this process is one of the critical avenues of

high profile corruption because of the archaic laws and autocratic military interventions in the running of oil and gas industry). This state of affairs has been subjected to series of abuse that have undermined the potential contribution of the industry. During the military era, most licenses were awarded on a discretionary basis by the Head of State.(Usman, 2011).

Consequently in a bid to address all the mess in the sector, on assumption of office in 1999, former President Obasanjo revoked eleven blocks given to Senior Military officers and their allies by the previous military government, and to end such sharp practices, his regime through 1999 to 2007 attempted to introduce competition and transparency into the Nigeria's oil block bidding processes. Specifically, the 2000, 2005, 2006 and 2007 oil bid were to some extent publicly advertised by the government, indicating the available blocks and selection criteria and as well, disclosed the various bids received. However, the whole processes according to the U4 2009a report, suffered serious shortcomings by given advantages to "certain preferred companies". In fact, Louis (2009) quoted Ofurhie as saying that "between 2001 and 2006, there was no open bidding for oil blocks, but only selective bidding authorized by the Presidency."(Usman,2011).

Louis (2009) declared that "oil blocks were almost given freely to individuals who are highly connected to those in power." These individuals then sell the blocks to International Oil Companies (IOCs) and earned substantial income. The IOCs on their part knowing full well that the process of the transaction is not transparent exploit the opportunity to reap excess profit and use the proceeds to undermine the entire system by corrupting whoever is in charge of the industry.

It is believed in some quarters that politically, Nigerian leaders perceived and used oil blocks as a form of reward and punishment to compel or elicit certain behaviour from targeted

individuals. A probe into the bid rounds under the Obasanjo Presidency (1999 – 2007) by the House of Representatives, uncovered these manipulations. This resulted in the suspension of the Director of the DPR who supervised the bid by proxy, and revocation of several blocks (U4, 2009b).

b. Crude Export and Importation of Refined Products

According to Usman (2011,) the crude oil distortion was perpetuated by the NNPC through five major fronts:

- (i) deliberate increase in the quota against figures allocated to Nigeria by the OPEC;
- (ii) enabling of ship-to-ship transfer to create untraceable paperwork;
- (iii) payment of subsidies money to phantom and non-existing importers,
- (iv) diversion of interest on income from illegal transferred money from the NNPC joint venture account; and
- (v) the diversion of money through a non-existent joint venture account cash call arrears.

The illegal smuggling of petroleum products is well organized to the extent of becoming normal. For instance in 2003, black oil which comprises of Long Residue Sulphur (LRS), LPFO and VGO that are used mainly to power heavy machineries in industry were sold at N4.25k per liters to retired and serving military personnel, top hierarchy of police force, serving ministers and corrupt party official. The corrupt aspect of it was that a ticket attracts N140,250 as payment to government for 33,000 liters tanker of LRS and the same ticket right in front of refinery gates attracted as much as N495,000 at N15 per liter in an instant second hand sale. For a ticket holder that does not have the capacity to load and market a tanker, he made a profit of N354, 750 for doing nothing. There are some that can take as many as 10 to 20 tickets in a day which they eventually transport to Lagos for onwards transport to

Switzerland and USA for as much as N37 per litre.(Usman,2011) The illegal smuggling is well organized.To buttress the fact further, the late President Umar Musa Yar'adua acknowledged that there was a powerful cartel in the Nigeria oil industry, which he described as “the greatest institutional corruption in this country” at his press briefing on May 12, 2009.

The documented evidences equally show an extensive and dynamic nature of corruption within the Nigerian National Petroleum Corporation (NNPC), it was titled: How Nigerian National Petroleum Corporation Officials feed fat from Fuel Imports, describing how certain mafia were feeding fat from the millions of liters of petroleum products imported daily into the country by its subsidiary, the Pipeline and Products Marketing Company (PPMC).

In his work, it was revealed how the mafia uses PPMC to receive a commission of \$500,000 (about N75 million) daily from international commodity traders, comprising Trafigura, Glencore, and Vitol, who lift crude on behalf of the corporation and also import petroleum products from PPMC. Key officials of the NNPC and PPMC share the commissions paid by the commodity traders. Trafigura, Glencore, and Vitol pay the commissions to sustain the importation contracts awarded by NNPC and/or PPMC. In addition, due to the inefficient marketing and distribution structure, the PPMC abandoned the usage of its own Atlas Cove (Lagos) and Mosimi (Sagamu) storage facilities, in preference for YinkaFolawiyo Oil and Capital Oil depots, both privately-owned storage facilities in Lagos at a great cost in a shady deal, despite the fact that, the storage facilities at Mosimi and Atlas Cove are more than those of Capital Oil and YinkaFolawiyo depots Combined, “PPMC pay these private depot owners N3 per liter for storage. Owners of these private storage facilities in return pay the NNPC mafia N1 on every liter of petroleum products stored. Usman (2011).

c. **Award of Contracts**

The oil sector's involvement in the award of numerous large-scale contracts is one of the means by which there is a large scale corruption. It was alleged in the Haliburton Scandal that most of the Nigerian leaders were involved in the award of contract in the industry. This however, did not come into limelight until when a US oil service company pleaded guilty to paying around US \$180 million in bribes to top government officials to secure four contracts, worth over US \$6 billion, (i.e. to build Liquefied Natural Gas (LNG) facilities in Nigeria). Usman (2011)

d. **Bunkering**

Bunkering is the theft of crude oil directly from pipelines, flow stations, and export facilities. Shell in 2003; had been complaining for many years that about 110,000 bpd of crude oil has been stolen by organized criminal gangs using barge and ocean-going vessels. The bunker cabals use their political leverages to make bunkering a legitimate trade by calling it maritime equivalent of vehicles pulling up at filling stations to fill up. They told the then President (Obasanjo) that Nigerian companies can actually benefit from getting involved in this trade. They affirmed it would create beneficial jobs for Nigerians judging from the size of the market which they put at \$40 billion and that Nigeria was losing a lot by not being involved. They convinced the then President that there was a distinction between illegal bunkering and commercial bunkering and that private sector should be empowered to have capacity to buy ships and operate them, and also be issued license to lift oil. This was granted and oil pirates now use their licenses as cover to steal crude oil. Geoge,(2003)

It is important to note that it was the lobby of this group of people that led to the inauguration of the Federal Government Committee to examine in the first quarter of 2003, way out for indigenous companies' participation in the crude oil lifting which was stopped in

early 2002, in a memo dated May 22, 2002 owing to abuses. It was however revisited and continued unabated.(since then until very recently, it has been big oil theft under the cover of commercial bunkering with its attendant ethnic and community unrest in the Niger Delta region).

Worthy of note also, is that the strength of the cartels comes from the country's military complex empowered to check it. The cartels are well connected and intertwined with the serving and retired generals and have become sacred cows to the security task force in the areas whose members will prefer to look the other way so as to keep their jobs. A Naval officer was reported to have said that the Navy gives escort to illegal oil bunkering vessels in the Delta.Inwarri, such escorted vessels are reportedly called 'OKURA', the local name for Navy. Whenever the patrol ship sight 'okura', they smile and wave at them as they close their eyes to illegal bunkering.

In 2003, apparently worried by the amount of revenue lost annually to oil bunkering, The government tasked the Nigerian Navy and other security agencies to put a check to the activities of these economic saboteurs. Without wasting time again, the Navy launched what it tagged "operation safety value", with the deployment of 3 out of the 10 antiquated warships and named after animals of the feline family in the three major languages; Hausa, Ibo and Yoruba.(Kalu 2003)

Commander Joe Aikhomu manned NNS Nwaoma, Navy captain Efeludu took care of NNS Kyanwa, while captain Alili commanded NNS Olongbo.While NNS olongbo was attached to the Western Naval Command, the other two were to guard the multibillion dollar shell SPDS, Escarvo. The brief was clear, 'Go catch the thieves'. Every watcher knows that the task before the operation was a dangerous one but with commitment and after a serious

battle and the dust settled, two Naval warships in Warri Delta state, arrested two mother ships and five suppliers ships and accessories worth a total of 142 millions barrels of crude oil valued at over \$250 million (N35 billion). They were charged for oil bunkering and pilferage. Investigation revealed that they belong to two members of the Aso Rock oil cabals and up till today nothing is heard of the arrest again. These cabal, according to General T.Y Danjuma had frustrated government effort to reposition the country since 1999. (Insider Weekly Nov, 24, 2003).

To show that it did not stop at that, the former Group Managing Director (GMD) of the NNPC Engr. Abubakar Yar'adua raised the alarm that "Nigeria loses at least 150,000 barrels of crude oil worth N2.2 billion naira daily as a result of illegal bunkering activities" (Daily Trust Newspaper, June 6, 2008. Pp.1-5). This quantity is more than the entire oil production of Cameroon (U4: 2009a). Government agencies, oil company representatives, militants, politicians, and traditional rulers across the length and breadth of Nigeria particularly those from the Niger Delta oil rich region are widely perceived as complicit in varying degrees in bunkering activities in Nigeria. "Groups of well-armed young men typically execute the pipeline sabotage, but their activities are overseen by powerful figures" (U4, 2009b). The effects of bunkering are enormous. It reduces the amount of Nigeria crude export capacities, thereby lowering the revenues which accrue to the state. Apart from the security risk, bunkering serves as the most veritable and steady source of funding for the militancy activities and other vices in the country by the corrupt syndicates.

Apart from the above there are several documentary evidences that lend credence to the problem of corruption in the oil and gas industry. An Audit Report on the Nigerian National Petroleum Corporation (NNPC) between 1999 and 2002 alone revealed that there was

overshooting of production targets every year. The excesses of NNPC crude oil production within this period added up to 375.45 million barrels. Based on the oil price of \$25 per barrel and the exchange rate of ₦111.6 to \$1 at that period, Nigeria lost \$9.4 billions or ₦1.05 trillions. Usman (2011).

AigImokhuede presidential committee to investigate the oil and gas industry strong recommended among other things, the recovery of ₦382b by the government from the indicted 21 companies. From the Senate, in December 2011, the Senate Joint Committees on Petroleum (Downstream) Appropriation and Finance that was mandated to investigate the subsidy regime revealed that over ₦ 1.4 trillion (over \$9billion) had been spent by the Federal government on the subsidy regime. This was also corroborated by the PPPRA which gave its own figure as ₦1.348trillion.

The summary of the Ribadu Taskforce's key findings on the various aspects of the oil and gas industry include the following areas; In the area of proceeds from Sale of Petroleum Products; From the task force's review, NNPC is owed ₦27 billion including current debt, total overdue, disputed debt and total debt outstanding, by the major marketers of petroleum products. They also found that amounts payable to suppliers of petroleum products, as at 31 December 2011 amounts to approximately US\$3.6 billion, of which US\$2.7 billion represented amount outstanding for over 365 days. The task force also observed that pipeline product loss had steadily increased over the years.

On the NNPC and its Subsidiaries; from the review of the latest available audited financial statements (2009) it was noted that NNPC has sixteen (16) subsidiaries. The financial performance of the Corporation and its subsidiaries in 2009 showed the Group had a deficit of approximately ₦298 billion for the period. Various reviews conducted by the task

force showed that the NNPC did not receive the required capital to grow its assets or meet operating costs. NNPC had therefore increasingly relied on the FGN for lines of credit, and deduction of oil revenue due to the Federation Account. In the review, the panel said, the legal basis for this practice was unclear.

On the signature Bonus; the task force found that discretionary decision-making in the award of oil blocks could result in revenue losses for Nigeria. Their review also showed that the management of past bid rounds had resulted in lower demand and fewer qualified bidders, uncompleted deals weakened government returns, and lower development of acreage.

The DPR provided the task force with information indicating that 67 licenses were awarded between 1 January 2005 and 31 December 2011; with an outstanding balance of \$566 million unpaid in signature bonuses. For the 7 discretionary allocations reviewed, the task force found \$183million outstanding and due to the nation's treasury. They were however informed that of the total \$749 million outstanding in signature bonuses, \$321 million was legally disputed.

In the area of Royalties (Crude Oil and Gas); The task force found that \$3.027billion was outstanding from the operators for crude oil royalties as at 31 December 2011 per the DPR's records. Of this amount, the DPR had stipulated that ADDAX is liable to pay \$1.5billion royalties under the 2003 fiscal regime and there is currently a dispute between Addax and NNPC on the one hand, and the DPR on the other. In the course of the review, the task force also encountered differences in records of payments made to the CBN vis-a-vis DPR records, and lack of independent gas production and sales data.

In the area of Gas Flare Penalties; The Task Force found that the DPR is currently unable to independently track and measure gas volumes produced and flared and depends largely on the information provided by the operators. They also observed that the periodic reconciliation meetings with the operators to address the gas flare volumes were delayed with only 6 completed of 36 at the time of their review.

The total revenue from gas flaring during the review period was \$175 million with the balance outstanding as unpaid was approximately \$58 million indicating that \$115 million had been received by the DPR. The taskforce however reviewed payments received by the CBN in respect of gas flare penalties. However a review of CBN records showed that \$137 million was received between 1 January 2005 and 31 December 2011. The DPR was not able to reconcile the \$115 million with the \$137 million. Lastly, operators have not complied with the Ministerial directive signed on 15 August 2011 increasing the gas penalty fee from ₦10.00 to \$3.50. The operators have continued to flare gas at the rate of ₦10 and records at the DPR reveal that none of the companies had paid any gas penalty fee in 2012.

The Bern Declaration, a Swiss Non-Governmental Organization documented in a report titled; Swiss traders' opaque Deals in Nigeria, describes the Nigerian oil scam as the greatest fraud Africa has ever known. The report narrates the specific roles played by seven major oil marketers and fuel importers through their shell companies in Switzerland and notorious offshore tax haven, Bermuda, to deny Nigeria billions of naira in tax earnings. The report details the various methods employed by Nigerian and foreign partners; such as creating off-shore subsidiaries referred to as "letterbox companies"; ship-to-ship transfer to create untraceable paper work; payment of subsidies money to phantom and non-existing

importers; and partnering with politically exposed fraudsters to defraud the country to the tune of over \$6.8billion from 2009-2011.

Apart from these various reports, the former governor of the Central Bank of Nigeria Mall. Sanusi alleged that some \$20billion of the state oil revenue were missing from the national energy company, this created an uproar that was met by a promise from the former President Goodluck Jonathan to audit the Nigeria National Petroleum Corporation (NNPC). The outcome of which we are still waiting for. While that is still on, comes the private theft; Royal Dutch Shell, the largest foreign oil operator in Nigeria reported that some \$1billion worth of oil and natural gas were stolen in 2013. In response to which the Nigerian Navy announced that it has shut down some 260 illegal refineries and burned 100,000 tons of stolen oil. The common denominator to all these probes reports is that there is a serious problem with the oil and gas industry in Nigeria. This manifested in both the upstream and the downstream sub sector of the industry.

It is important to also note that the allocation of crude oil to local refineries graduated from a figure of 60,000bpsd from 1965 to 1970 when only Port-Harcourt Refinery Company (PHRC) was in existence to 160,000bpsd between 1978 and 1979 when Warri Refineries and Petrol-Chemical (WRPC) came on board with 100,000bpsd capacity. From 1980 to 1985 the allocation of crude to local refineries increased to 260,000bpsd when Kaduna Refining and Petrol-Chemical (KRPC) came on with 100,000bpsd capacity and with additional 10,000bpsd in 1986, it increased the allocation of crude oil allocation to local refineries to 270,000bpsd. It increased to 295,000bpsd in 1987 to 1988, when WRPC added 25,000bpsd capacity. However, from 1989 till date, the allocation of crude to local refineries is steady at 445,000bpsd with PHRC additional 150,000bpsd capacity. (NNPC Website)

The summary of the annual crude oil allocated to local refineries for the period under analysis is hereby presented thus. The number of days is 365days for all the years.

Table: 2.6.Crude oil allocated to local refineries for the period under analysis

Refineries	Initial capacity	Additional capacity	Total current capacity
PHRC	60,000	150,000	210,000
WRPC	100,000	25,000	125,000
KRPC	100,000	10,000	110,000
Total			445,000

Source: computed by the Author (2014). From NNPC website

Furthermore, part of the aspect of the industry that aided corruption is the weaknesses of the Joint Venture Contract (JVC) and the Production Sharing Contract (PSC) in the industry. Joint Venture in a broad sense is used to denote all situations in which the host country and the foreign oil companies are into joint participation or cooperation in any phase of the oil industry. It can also be seen as a production team in which complementary roles are played by the players in the industry.

The NNPC has joint venture agreements with oil majors that involve mostly a 50-50 percent sharing agreement of crude produced from onshore or off-shore fields. The NNPC may decide to refine the whole 50 percent that belong to the Nigerian government which will be more than enough to meet the local need and sell the surplus to the international market. Or it may sell all of its 50 percent on the international market. Given its nature, the government mostly sells its share of crude daily on the international markets so as to have access to quick cash. The government loses significant value from doing this. The value lost

would have contributed significantly to the growth of the industry and the economy at large. The extent of the losses here constitutes an aspect of corruption in the upstream.

The Production Sharing Contract (PSC) is also, a contractual agreement between a contractor and a host government in which all the exploration costs, risk, production and development costs are borne by the contractor in return for a stated share of production resulting from this effort over the period of the contract. One or more foreign oil company are usually authorized by the host government to conduct petroleum operations within the area specifically described in the agreement in accordance with the terms of the contract (Omolade, 2010).

In a Production Sharing Contract, the contractors production cost are recoverable out of production each year but in any year this cost recovery has a maximum amount of oil production that can be used for it. This share is known as 'cost oil'. Profit oil is the balance of the oil and is divided net of royalty payments. The amount of cost oil will drop to cover operating expenses only and the profit oil will increase by a corresponding amount after the contractor has recovered its expenses (William and Meyers cited by Maxwell, 1999).

Under production sharing contracts, the foreign oil company has the mandate to provide technical and financial services in the host state for the exploration, exploitation and development of the petroleum deposits. Also, technically the oil resources remain with the state but it permits the multinational oil companies to control the management and operations of the development of the oil and gas field since the country lacks the technical expertise to efficiently develop the oil and gas for a share of the production.

The exposition of the lopsidedness in the allocation of oil blocks constitutes another situation where institutions and rules of procedures are being manipulated and distorted for personal gain and patronage. Allocation of crude oil blocks witnessed the worst shady deals where the country was fleeced of billions of dollars in the past. For instance, prior to year 2000, allocation of oil block was on discretionary basis, with the military top ranks allocating acreages to their associates and cronies, without laid down rules or due process. This discretionary allocation system under the military gave room for government officials to award oil blocks to their friends and loss of revenue for the government. In addition to that is the total number of gas flared over the year. The economic and financial losses as a result of gas flaring also constitute part of this corruption. Gas flaring and venting associated with petroleum exploration and production in Nigeria is dated back to 1956 after the discovery of oil and gas resources in commercial quantity. Flaring and venting of associated natural gas are widely used in the petroleum industry to dispose of associated natural gases for safety reasons during petroleum development operations and/or where no infrastructure exists to bring it to market. Associated natural gas, which is a by-product of petroleum production, is burned on reaching the surface with a process called flaring or by being released into the atmosphere without burning through venting. These activities of flaring and venting of petroleum associated gas has been tremendously curbed in the developed countries of the world. For example, Norway has adopted flaring reduction measures and introduced a carbon tax, which penalizes companies for flaring or venting gas.

However, Nigeria's penalty for gas flaring and venting seems too low to either influence the practice or curb emissions. The penalty is so low to the point of almost non-

existence, as most operators prefer flaring and venting as a means of disposing associated or waste gas to payment of penalty.

Since 1979, The Nigerian government has policy and regulations, regulating gas flaring in the petroleum sector and by the 1979 Associated Gas Re-injection Act; no oil company was permitted to flare gas after January 1984 without ministerial authorization. But, these flaring policy and regulations were not properly enforced, and Nigeria flares over 75 % of the associated gas it produces and this represents a pollution equivalent to 45million tons of Carbon dioxide(CO₂)per day. Currently, there are over 123 flaring sites in Nigeria. This has been regarded as one of the highest emitter of greenhouse gases in Africa. In the developed countries, several attention and corrective measures have been adopted to address the problems associated with these remarkable wastes with significant economic value and considerable environmental costs.

Nigeria, the highest producer of gas in Africa, has been ranked among some of the highest gas flaring countries across the world along with Russia and Iraq. Over the past fifty years, petroleum exploration and production companies have done little to stop gas flaring in the country, and there is slow pace of adoption of modern technology for utilization of petroleum-associated gas that could help curb flaring and venting in the country. Although, empirical studies on the impact of gas flaring on the physical, chemical, biological, atmospheric, soil and social environment have not been adequately documented, the total environmental costs are yet to be adequately quantified; the effects of flaring and venting of gas associated with petroleum exploration and production are multifaceted and complex in nature. The gas industry statistics publisher, Cedigaz, indicates that Nigeria accounted for

19.79% of global flaring in 2001, more than the second (Iran) and third (Indonesia) countries combined.

This shows that more gas is flared in Nigeria than anywhere else in the world. The extent of loss is hereby quantified in Table 2.8.

Table 2.7: Gas Produced, Utilized and Flared in Nigeria (1970-2012)

Year	Production (Mm ³)	Utilization (Mm ³)	Flared (Mm ³)	Price of Gas*	Loss to Flared(US\$)
1970	8068	111.0	7957.0	0.17	1352.69
1971	12996.0	206.0	12790.0	0.18	2302.2
1972	17122.0	274.0	16848.0	0.19	3201.12
1973	21882.0	395.0	21487.0	0.22	4727.14
1974	27170.0	394.0	26776.0	0.30	8032.8
1975	18656.0	323.0	18333.0	0.44	8066.52
1976	21274.0	657.0	20617.0	0.58	11957.86
1977	21815.0	863.0	20952.0	0.79	16552.08
1978	20486.0	1046.0	19440.0	0.91	17690.4
1979	27619.0	1546.0	26073.0	1.18	30766.14
1980	24551.0	2337.0	22214.0	1.59	35320.26
1981	17113.0	3643.0	13470.0	1.98	26670.6
1982	15382.0	3442.0	11940.0	2.46	29372.4
1983	15192.0	3244.0	11498.0	2.59	29779.82
1984	16251.0	3438.0	12813.0	2.66	34093.22
1985	18569.0	4647.0	13922.0	2.51	34944.22
1986	18738.0	4821.0	13917.0	1.94	26998.98
1987	17170.0	4976.0	12194.0	1.67	20363.98
1988	20250.0	5510.0	14740.0	1.69	24910.6
1989	25129.0	6303.0	18784.0	1.69	31744.9
1990	28430.0	6020.0	22410.0	1.71	38321.2
1991	31460.0	6800.0	24660.0	1.64	40442.4
1992	32084.0	7508.0	24575.0	1.74	42760.5
1993	33680.0	7910.0	25770.0	2.04	52570.8
1994	33680.0	6770.0	26910.0	1.85	49783.5
1995	35100.0	8114.0	26986.0	1.55	41828.3
1996	36970.0	10150.1	26820.0	2.17	58199.4
1997	37150.0	10383.0	24234.0	2.32	56222.88
1998	37039.0	13407.0	23632.0	1.96	46318.72
1999	43636.0	21274.0	22362.0	2.19	48972.78
2000	42732.0	18477.0	24255.0	3.68	89258.4
2001	52453.0	25702.0	26759.0	4.00	107036
2002	48192.5	23356.9	24835.6	2.95	73265.0
2003	51766.0	27823.0	23943.0	4.88	116841.8
2004	58963.6	33881.68	25090.9	5.46	136996.3
2005	59285.0	36282.3	23002.7	7.33	168609.8
2006	82063.9	53479.5	28584.4	6.39	182654.3
2007	84707.3	57400.2	27307.1	6.25	170669.4
2008	80603.6	58792.6	21811.0	7.97	173833.7
2009	41534.0	38076.5	13457.2	3.67	49387.924
2010	58006.0	44506.6	13499.3	4.48	60476.864
2011	55099.1	38898.2	16200.5	3.95	63991.975
2012	56552.6	41702.4	14849.9	4.22	62234.420

*: Time series of LNG price is at wellhead price and in US\$ per CCF

Source: Nigerian National Petroleum Corporation (NNPC), Department of Petroleum Resources (DPR) and Central Bank of Nigeria (CBN) Estimates

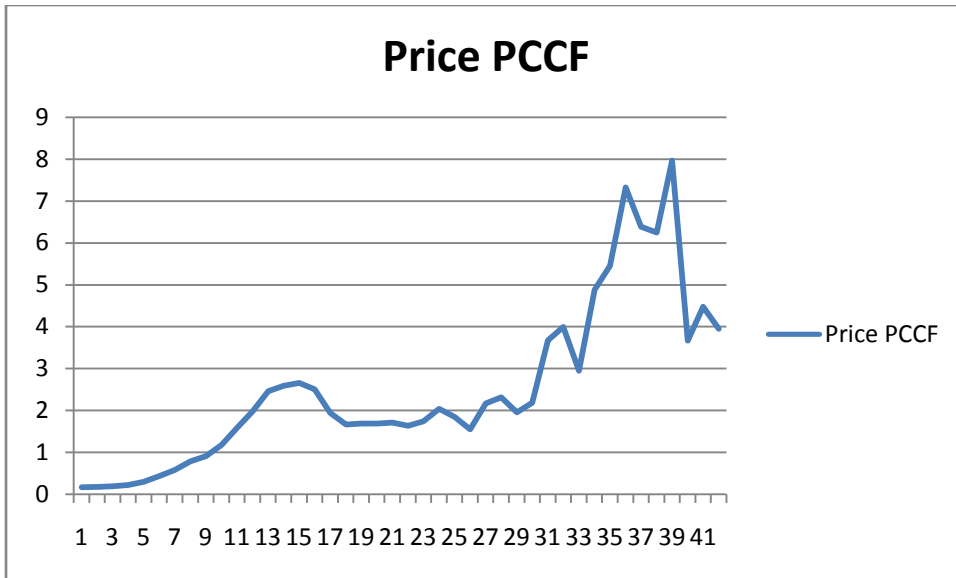


Fig 2.4 Price of Gas in Cubic Feet.

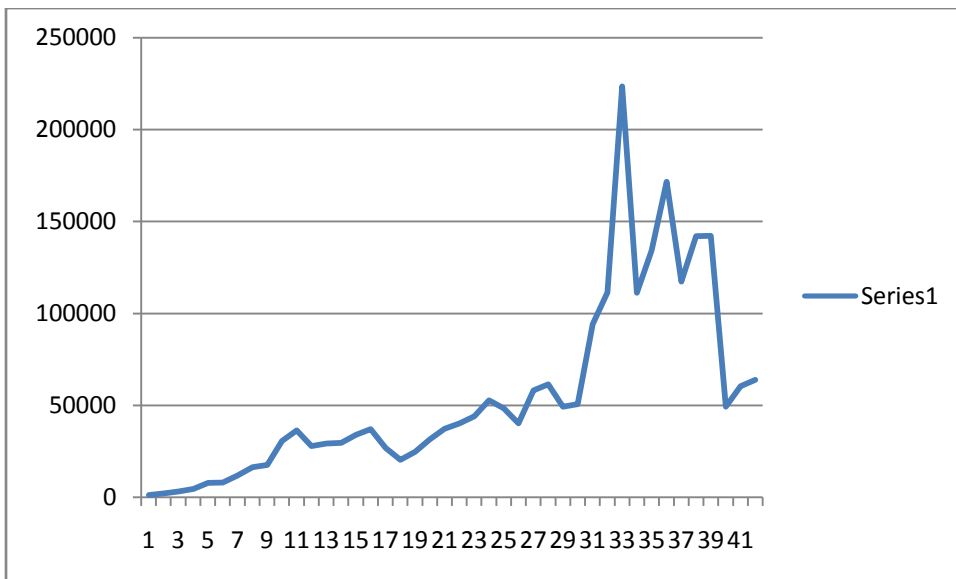


Fig. 2.5 Revenue Lost to gas flaring
 Source: Plotted by the author (2014)

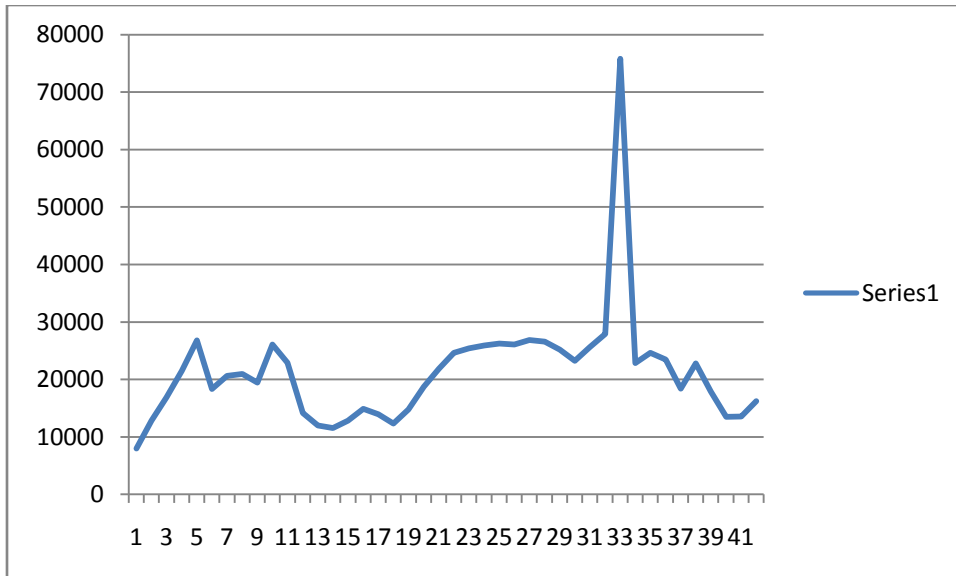


Fig. 2.6 The quantity of gas flared
 Source: Plotted by the author (2014)

The quantity of gas production in million cubic meters has increased tremendously in Nigeria from 1970 to 2012. Gas production increased from 8029.0 (Mm³) in 1970, to 24551.0 (Mm³) in 1980, 28163 (Mm³) in 1990, 47537 (Mm³) in 2000 and 55099.1 (Mm³) in 2011. This shows clearly that in the period under analysis, the quantity of gas produced had increased. The price of gas over the period increased from US\$ 0.17 in 1970 to US\$1.59 in 1980, US\$ 1.70 in 1990, US\$ 3.68 in 2000 and US\$3.95 in 2011. The same way these figures increased, the quantity of gas flared over this period was also increased. The gas flared increased from 7957.0 (Mm³) in 1970 to 22904 (Mm³) in 1980, 21820 (Mm³) in 1990, 25592 (Mm³) in 2000 and drop to 16200 (Mm³) in 2011 and 14849 (Mm³) in 2012. This therefore prevented the country from reaping the benefits that would have come from the increase in the quantity produced and in the increase in price over time. The inability of the country to stop the flaring as it's been done in other area where such resources are found lead to colossal loss of revenue to government.

The extent of loss of revenue from this flaring activities ranged from US\$1352.7 in 1970 to US\$36417.4 in 1980, US\$37312.2 in 1990, US\$94178.6 in 2000 and US\$62234.0 in 2012. This financial loss to the economy could have been avoided if the officials in charge of the industry did what was expected of them. (That means if they did not do things differently from how it should have been done for reasons other than efficiency). Putting this revenue to the economy would have solved most of the economic problems confronting the nation. It would have helped in terms of electricity generation, employment generation which would have increased the government revenue from the various taxes in the economy.

2.4.5 Measurement of Corruption in the Literature

Corruption is a classic example of an observable phenomenon that is not easy to quantify, because its very nature is concealed. In an attempt to measure corruption, four approaches have been identified. These include:

Corruption Perception - Based Approach

A perception-based corruption index draws upon opinion surveys and expert estimates of how corrupt various countries are. This index is widely associated with the Transparency International. The Corruption Perception Index (CPI) is a league table of international corruption with the least corrupt countries at the top and the most corrupt at the bottom. It has been published annually by the Non-Governmental Organization (NGO), Transparency International since 1995.

The league table measures perceived level of corruption among public officials and politicians rather than corruption as such. Countries are assigned scores of between 10-0 (with 10 being low) which are derived from polls and surveys of corruption in each country and, in effect, the CPI is a 'poll of polls'. The CPI has consistently shown that developed countries are

generally perceived as less corrupt than developing and transition countries. This is understandable, because of the dominance of private sector as opposed to heavy presence of government that is the characteristic of developing countries.

The CPI has received wide publicity and fulfils Transparency International's aim of raising public and political awareness of corruption. Its assumptions and methodological limitations indicate that the results of the CPI should be regarded with caution. While the database has expanded and the statistical methods have become more sophisticated, critics claim the CPI still has important weaknesses, part of which is that constructing a league table on the basis of perception assumes that the perceptions of survey respondents are both accurate and representative. The perceptions of international businessmen differ from those of rural labourers. The entire CPI rests on the measurement of perceptions of corruption but perceptions may not reflect the actual incidence of corruption but its openness and the extent to which it is publicized. The use of different surveys for different countries raises the issue of whether like is being compared to like.

Another major shortcoming of this approach is that the Transparency International assumes that corruption is a one-dimensional phenomenon varying along a single continuum. But this is not always the case as it has so many facets, including embezzlement, bribery, and extortion and the CPI does not distinguish among these types of behaviour. Also there is wide variation in the way corruption is organized, how the income from corruption is spent, and so on. These variations are likely to produce different economic outcomes. The CPI does not show clearly the difference between grand and petty corruption knowing fully well that their effects are more devastating than the other. What the index shows is how systemic corruption is perceived by the chosen informants.

In all, because it is based on perceptions, which may not necessarily be correct, the CPI does not necessarily reflect the true extent of corruption in a country. It is important to also note that CPI may be biased against poorer regions of the world, and this portends a serious danger to such regions as people's perceptions about corruption may be an important determinant of what actually happens in such regions. For instance, the belief that government officials are crooked and fraudulent may affect business confidence and in turn investment behavior (GoldSmith, 1999).

Owing to all these, some critics of the CPI have pointed out that the CPI has failed to take into account the supply side of bribery, which often originates from the developed world. In the Nigerian context, the person that steals is not as guilty as the accomplices. The inability of the organization to look at the other side of the coin in their rating has not been taken lightly by the critics of recent, as most of the countries that were rated as less corrupt serve as an avenue where looted funds are being kept.

The equation for calculating the corruption perception index is given as:

$$CPI^j = \frac{1}{N^j} \sum_{i=1}^{N^j} S_j^i \dots\dots\dots(2.14)$$

Where: N^j is the number of different corruption ratings sources of country j (CPI 2011)

The Bribe Payer Index Approach

Partly in response to the CPI criticism, Transparency International created the Bribe Payers Index, (BPI) in 1998. BPI, on its own is a league table of bribery in international trade which ranks countries in terms of their perceived willingness to offer bribes. The BPI rankings are limited to bribes between leading exporting countries and senior public officials in a specified group of key emerging economies. It measures the supply side of bribery by

identifying the country of origin of bribe givers whereas the Corruption Perception Index (CPI) focuses on bribe recipients. Transparency International produces both indices, and the BPI was first published in 1999.

The BPI is a useful way of showing how leading export countries help create and aggravate the incidence of corruption in developing countries. As such, it helps share the 'blame' for corruption between the developed and developing worlds.

Although presented in a similar 10 - 0 numerical scales, the BPI differs from the CPI: on the following ground; it is highly selective and biased, and it is based on only one source of data.

Because it is based on the perceptions of business people, accountants, bankers and lawyers, it is vulnerable to objections based on accuracy, representativeness and reliability. In identifying countries rather than companies, it may give the potentially misleading impression that countries promote bribe giving, but Transparency International claims there are too many multinational companies to rank. On the final note, the BPI is a useful complement to the CPI but it has serious methodological limitations.

The bribe payer index is calculated as $CRR(\text{country } x) = 0.5 (PR + FR + ER) \dots 2.15$

Where: CRR = Corporate Risk Rating

PR = Political Risk Rating

FR = Financial Risk Rating

ER = Economic Risk Rating .

Schlessinger and Meir Approach

Another approach to measuring corruption was that of Schlessinger and Meir (2002). They made comparisons based upon arrest and conviction data for corruption offences. This would have been better or rather superior to that of perception, but it is not without its shortcomings. The approach relied heavily on information about the corruption found in the court cases. In a country with honest judiciary, the most reliable information about corruption is found in court cases. Courts are spending huge resources on establishing which transactions have in fact taken place, and to judge whether they have actually been corrupt. The problem with court cases is that they were so few, compared to the underlying number of corrupt acts, that they cannot be used neither as indicator of social occurrences nor of general frequency. For the same reason, court data are difficult to use for cross-country comparisons. Apart from this, the judiciary must be honest in all sense of the word, but this was assumed in the analysis of Schlessinger and Meir, which in most cases is not true globally.

The Opacity Index Approach

Furthermore, Price Waterhouse Coopers (2001), in a bid to simplify the measurement problem provides a hybrid approach known as the “Opacity Index” which incorporates multi-component indices perceptual ratings of nations with transparency problems.

Opacity is the lack of clear, accurate, formal, easily discernible, and widely accepted practices in the broad arena where business, finance, and governments meet. As the globalization of economic life advances, all participants recognize that the relative opacity or transparency of a country capital markets varies enormously. There emerged a view that greater opacity raises greater obstacles to the economic progress of countries and their citizens. Similarly, there is the belief that greater transparency across many dimensions of

capital markets encourages investor confidence and keeps the costs of doing business under control.

The Opacity Index, first introduced in January 2001, identifies the causes and measures the costs and effects of large-scale risks and small-scale risks that are associated with the lack of transparency in countries' legal, economic, regulatory and governance structures that can confound global investment and commerce.

Opacity index uses the O-factor in the computation of corruption.

$$O_i = 1/5 * [C_i + L_i + E_i + A_i + R_i] \dots\dots\dots(2.16)$$

Where: O refers to the composite factors

C refers to the impact of corrupt practice

L refers to the effect of legal and judicial opacity (including shareholder rights)

E refers to economic/policy opacity

A refers to accounting/corporate governance opacity

R refers to the impact of regulatory opacity and uncertainty/arbitrariness.

It is however important to point out that the opacity is not without it adverse effects.

Opacity can adversely impact the cost and availability of capital in several different ways.

Domestic capital markets may suffer from relative underdevelopment if proper disclosure of information is not made to investors who are deciding where to place their funds.

International investors may be reluctant to fund projects if they are uncertain that funds will be allocated to their purported uses. In addition, the lack of clear, consistent, and reliable practices in the realms of legal disputes, regulation, and national economic policy may negatively impact the quantity of funds available for investment in countries. Similarly,

awareness of unofficial (and often illegal) payments required by bureaucrats may dissuade investors from purchasing securities or investing in physical plants in the countries.

While these perceptual scales have helped in understanding the cause and effects of corruption, as well as put pressure on governments and society to address the corruption problem, they are obviously imperfect owing to their subjective nature. Perception data are just estimates of how corrupt a society is thought to be, and are thus open to influence and distortion from full range of factors affecting any human judgments. The more obvious limitation of these approaches is that it treats whole societies as units of analysis, and thus it becomes far removed from analyses that have specific country or provinces as focus.

There are no obvious answers to these problems, yet finding useful ways to compare level of corruption over time remains a necessity for an empirical focused study. Going by all the approaches, the most suitable one that will be adopted for this study is that of opacity index. The industry under consideration is shrouded in secrecy as not much is known about the activities of the industry which invariably eroded transparency and accountability in the industry.

In line with this, a corruption equation can be set out as follows, following Klitgaard (1998):

$$C = R + D - A \dots\dots\dots(2.17)$$

In the above equation, C stands for corruption, R for economic rent, D for discretionary powers, and A for accountability. Put differently, it can therefore be established that corruption is an increasing function of rent, and it is also an increasing function of discretion.

$$C = f(R), \frac{\delta R}{\delta C} > 0, \frac{\delta^2 R}{\delta C^2} > 1 \dots\dots\dots(2.18)$$

$$C = f(D), \frac{\delta D}{\delta C} > 0, \frac{\delta^2 D}{\delta C^2} > 1 \dots\dots\dots(2.19)$$

The equations state that the more opportunities for economic rent (R) that exist in a country, the larger will be the corruption. Similarly, the greater the discretionary powers (D) granted to administrators, the greater will be the corruption. However, the more administrators are held accountable (A) for their actions, the less will be the corruption, and hence a minus sign in front of A. (Mathematically speaking, we can say C varies directly with R and D, and inversely with A). Asia-Pacific Development Journal,(2000).

CHAPTER THREE

METHODOLOGY

The research methodology begins with a conceptual framework that clarifies the concept of corruption and the context of a corruption analysis in the Nigerian oil and gas industry. Therefore we present the empirical framework which (i) explains how corruption is measured and (ii) how its macroeconomic impact is measured.

3.1 Conceptual Framework

Following the Stanford Encyclopedia of Philosophy, the following conceptual analysis of corruption is adopted: a particular act performed by any agent is an act of institutional corruption if and only if:

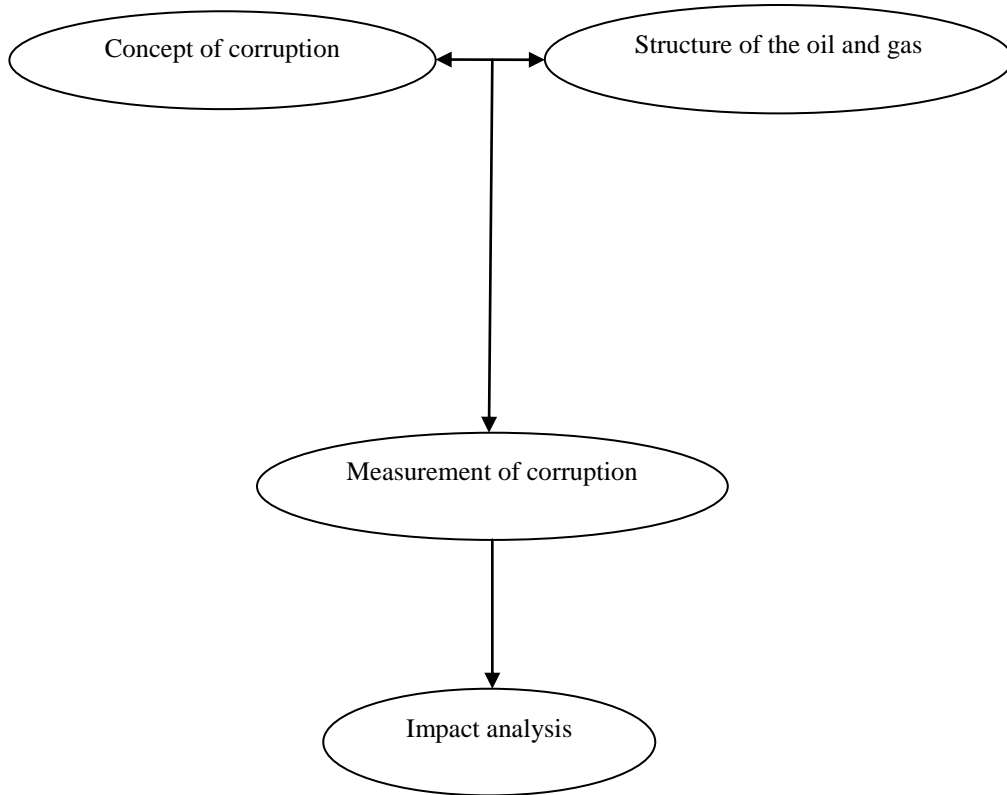
- (a) the act has a specific effect of sabotaging or contributing to the sabotaging of some institutional processes and /or purpose of some institutions and
- (b) the act contributes to the debasement of the moral character of some actors of the institution. Garba (2009)

The study considers acts that sabotage or contribute to sabotaging economic processes and economic targets of the oil and gas industry as corruption. Such acts include acts that weaken institutions, compromise strategies and policies, and lead to inefficient management of oil and gas resources and delays in remittances of oil and gas revenue to the federation account.

The objectives of the study require the measurement of corruption in the oil and gas industry and the analysis of its impact on the economy. The Figure 3.1 shows how the study conceptualized the problem. The concept of corruption and the structure of the oil and gas industry guide the measurement of corruption. The measurement of corruption enables the

analysis of its impact on the economy. Section 3.2.1 explains the measurement of corruption while section 3.2.2 articulates the methods for the impact analysis.

Figure 3.1 Thesis conceptualization of the problem



Source: Drawn by the author (2014)

3.2 Measurement of Corruption

The oil and gas industry is classified into upstream and downstream. The study thus identified potential points of corruption in the upstream and in the downstream and identified those that could be quantified. Various reports have been produced about corruption in the oil and gas industry. Table 3.1 shows a summary of some of the reports.

Table 3.1 Summary of the findings of the various Committees/Probe Panels set up to investigate corruption cases in the oil and gas industry in Nigeria

S/N	Reporting Committee/Probe Panel	Nature of Findings/Remarks	The Extent of Loss
i.	The Audit Report on NNPC (1999-2000)	Overshooting of production target amounting to 375.45 million barrels	\$9.4 billion or ₦1.05 trillion
ii.	Senate Joint Committee on Downstream (2011) backed by PPRA figure	Shoddy subsidy regime	\$9 billion ₦1.4 trillion back by PPRA ₦1.348 trillion
iii.	SanusiLamidoSanusi Allegation	Non—remittance of Oil Revenue	\$20 billion
iv.	Bern declaration	Denial of tax earning.	\$6.8 billion
v.	AigImokhuede Presidential Committee Report	From the indicted 21 companies	₦382 billion
vi.	Ribadu Taskforce	Collection/remittance problem - sales of domestic crude oil in 2011 (revenue due to government) - proceed from gas sales from Bonga oil field - poor business plan resulting in loss making of 16 subsidiaries (2009) - signature bonus losses	₦843 billion ₦137.572 billion (\$946.878) million ₦298 billion ₦566 million

Source:Ajagunna(2012), unraveling the fuel subsidy scandal.

The reports in Table 3.1 suggest key points of corruption in the upstream. These include overshooting of production (OP), non-remittance of oil revenue by NNPC(NR), non-payment of taxes and royalties by oil companies(URT), oil theft(CT) and the non- accounting of crude allocated for domestic consumption(NADC). These suggest that the corruption in the upstream (CORU) can be computed as:

$$CORU = OP + NR + NADC + CT + OT \quad (3.1)$$

Over-production is measured as:

$$OP = Q_N - Q^*_N ; OP \geq 0 \quad (3.2)$$

When $OP > 0$, then it implies that there is over production, and where it is equal to zero there is no over production.

Non-remittance by NNPC is measured in equation 3.3 as the difference between expected revenue from the sales of crude allocated to NNPC (ER) and the actual remittance (AR);

That is:

$$NR = ER - AR \quad (3.3)$$

Under-payment of royalties and taxes (URT) is given by expected royalties and taxes (ERT) less actual royalties and taxes paid (ART):

$$URT = ERT - ART \quad (3.4)$$

Crude oil theft (COT) is measured by expected daily losses (EDL) to the crude thieves announced by the government

$$COT = EDL \quad (3.5)$$

The non-accounting of crude allocated to domestic refineries could be measured as:

$$NADC = DCAL * CP \quad (3.6)$$

Where, DCAL = domestic crude allocation losses

CP = crude price

Equation 3.1 could be re-written as:

$$CORU = OP + NR + NADC + CT \quad (3.7)$$

This assumes that the losses due to corruption is additive. It is possible that the various sources may not be independent. This would cause CORU to either under or overshoot the true extent of corruption. For the purpose of this study, the components are assumed to be independent.

Table 3.1, also highlighted some of the key points of corruption in the downstream, among which are: the losses from refining inefficiencies (RI), revenue losses from excess product import (EPM) and losses to subsidy (LS). It is clear from the reports that the loss

from the subsidy deals is significant. The indictment of some marketers and prominent members of the society gives credence to the position of the reports. From the reports the measure of corruption in the downstream (CORD) could be estimated as:

$$\text{CORD} = \text{RI} + \text{EPM} + \text{LS}. \quad (3.8)$$

In calculating the losses from refining inefficiencies, the study compared the Nigerian design yield to the California design yield that reflects an international standard. As presented in the Table 3.2.

Table 3.2: The Global Standard for Refining Petroleum Products

Product	Percent of Total (California) %	Percent of Total (Nigeria) Actual yield	Percent of Total (Nigeria) Design yield
PMS	51.4	30.81	32.28
Distillate Fuel Oil	15.3%	22.41	23.72
Jet Fuel /DPK	12.3%	15.98	14.28
Still Gas	5.4%		
Marketable Coke	5.0%		
Residual Fuel Oil	3.3%	16.84	17.5
Liquefied Refinery Gas	2.8%	0.98	2.27
Asphalt and Road Oil	1.7%		
Other Refined Products	1.5%	2.17	3.5
Lubricants	0.9%		

Source: California Energy Commission, Fuels Office, PIIRA database.(2014)

*Calculate output as –yield X 158 X 445,000 (E.g. 0.514 X 158 X 445,000 = 36.1)
 {For Nigeria RI, (0.318 X 158 X 445000 = 22.4) and 36.1-22.4 =13.7}

From the Table 3.2, it was observed that both the design and actual yield fall short of the global standard for the PMS and higher than the global standard for other products. The performance gap for each barrel of crude in terms of the PMS is 32.5322 liters [(0.514-

30.81)x 158] for each barrel. This implies that for 445,000 barrels allocated for domestic consumption, about 14.48 million liters (32.5322×445000) are lost to poor design and production wastages and in efficiencies. Had Nigeria the global standard design, it would be producing 36.14 million liters of PMS daily. This would have considerably reduced if not eliminated the import demand for petroleum products which is taking up to about 15% of annual forex allocation.(Garba, 2015).

While, Nigeria's allies in OPEC (Saudi Arabia, Kuwait, Libya, Algeria, and Venezuela) continue to expand their National Oil Companies to develop their economies and meet their national product needs, Nigeria keeps on importing the products that she can domestically refine. The refining inefficiencies give rise to excess imports which in turn fuels the corrupt subsidy regimes that several investigative reports have shown to be highly inflated and wasteful.

The aggregate corruption in the industry (CORT) is the sum of (CORU) and (CORD). Thus the aggregate effects are the sum of upstream (CORU) and downstream (CORD) effects. The measurement of the sizes of corruption will be guided by equations 3.1- 3.8.

3.3 Model Specification

The macro-econometric models of the Nigerian economy specified for the analysis of the impact of corruption in the oil and gas industry on the macro economy are presented in equations 3.9 – 3.29. The models consist of five types of accounts; the Public Sector Accounts (equations 3.9- 3.14), National Account (equations 3.15- 3.20), the Private Sector Accounts (equation 3.21), Money Survey (equations 3.22 - 3.27) and External Sector Accounts (equation 3.28-3.29). The logic of the specification follows from Figure 3.2 which shows that corruption in oil and gas industry works through the Public Sector Accounts to the other

accounts of the macro-economy. The nexus between the other accounts and the Public Sector Accounts is thus very important in the transmission chain.

Public Sector Accounts

In the Public Sector Accounts, Government Expenditure (GE) presented as equation (3.9) and Government Revenue (GR) in equation (3.10) The GR comprises of Oil Revenue (ORR) and Non-oil Revenue (NOR) in equations (3.11) and (3.12). Therefore, equations (3.9) and (3.10) are linked to the Balance Budget (BB) in equation (3.13) which is also linked to the Public Debt (PDEBT) in equations (3.14). The claim is that corruption affects GR, GE, BB and PDEBT through its impact on ORR. The stochastic equations are 3.9, 3.11, 3.12 and 3.14, while equations 3.10 and 3.13 are identities. The effect of corruption on Public Sector Accounts works through oil revenue (equation 3.11), government revenue, government expenditure, balance budget and public debt. The stochastic equations reflect standard specifications for the dependent variables as follows:

$$GE = f(ORR, NOR, CPI) \quad (3.9)$$

$$GR = ORR + NOR \quad (3.10)$$

$$ORR = f(OXP, NER, COP) \quad (3.11)$$

$$NOR = f(Y, IMP+OXP) \quad (3.12)$$

$$BB = GR - GE \quad (3.13)$$

$$PDEBT = f(ORR, CG, BB, NER, CPS) \quad (3.14)$$

National Account

The National Account (Y) in equations 3.15 to 3.20 comprises of one identity (equation 3.15) and five stochastic equations 3.16-3.20. The national income identity in

equation 3.15 is the standard aggregate demand identity while equations 3.16- 3.20 are stochastic equations of its components. These are Private Consumption (PC); Private Investment (Ip); Government Expenditure (GE), Oil Export (OXP) and Import (IMP), (3.20). The determinants of the stochastic equations follow standard specifications with PC determined by Nominal Exchange Rate (NER), Nominal Interest Rate (NIR), Income (Y) and the Inflation Rate (CPI). Investment is specified as determined by CPI, NIR, PC and CG and it is proposed to be crowded-out by credit to government (Cg), Government expenditure is specified as in equation 3.9. Oil export is determined by world price of oil (COP), NIR and NER.

$$Y = C + I + G + X - M \quad (3.15)$$

$$PC = f(\text{NER}, \text{NIR}, Y, \text{CPI}) \quad (3.16)$$

$$I_p = f(\text{CPI}, \text{NIR}, PC, CG) \quad (3.17)$$

$$GE = f(\text{ORR}, \text{NOR}, \text{CPI}) \quad (3.18)$$

$$\text{OXP} = f(\text{COP}, \text{NER}, \text{NIR}) \quad (3.19)$$

$$\text{IMP} = f(\text{GE}, \text{NER}, \text{RESV}, Y) \quad (3.20)$$

The corruption in the oil and gas industry is expected to affect private consumption expenditure, gross investment expenditure, government spending and net export.

Private Sector

The Private Sector Account is represented by equation 3.21 which is a budget constraint that private sector income (Yp) is either invested (Ip) or consumed (Cp) the two components of Yp have been modeled as part of the national account. Consequently, it is not necessary to re-specify them here.

$$Y_p = I_p + C_p \quad (3.21)$$

Money Survey

In the Money Survey, there are two identities equations 3.23-3.24. Equation 3.23 shows that the NDC is disaggregated into credit to government (CG) and credit to the private sector (CPS) while equation 3.24 shows that net foreign asset is net export. The three stochastic equations are Money supply (3.22), credit to government (3.25) and credit to the private sector (3.26). The Money supply is a function of National income, Nominal interest rate. The credit to government is a function of net domestic credit, government expenditure, nominal interest rate and money supply. While the credit to the private sector tests the crowding-out thesis and the effect of exchange rates (NER), income and money supply.

$$M_1 = NDC + NFA + OAN \quad (3.22)$$

$$NDC = CG + CPS \quad (3.23)$$

$$NFA = X - M \quad (3.24)$$

$$CG = f(BB, NDC, M_1) \quad (3.25)$$

$$CPS = f(CG, NER, Y, M_i) \quad (3.26)$$

External Account

The External Account specified in equations 3.27- 3.29 below contains two identities. The overall balance is the sum of NFA (net exports) and capital account balance (KAB). The NFA is as defined in equation 3.24, while KAB is stochastic and determined by net foreign asset, public debt, nominal interest rate, nominal exchange rate of the naira and the lagged KAB.

External Account

$$NBAL = NFA + KAB \quad (3.27)$$

$$NFA = X - M \quad (3.28)$$

$$KAB = f(NFA, PDEBT, NIR, NER, KAB_{t-1}) \quad (3.29)$$

Table 3.3 shows a summary of the model. In all, there are 21 equations: 12 stochastic and 9 identities.

Table 3.3: The summary of the Macro-econometric model

		STOCHASTIC	IDENTITIES	TOTAL
1	Public Sector Accounts	4	2	6
2	National Accounts	5	1	6
3	Private Sector Accounts	-	1	1
4	Money survey	3	2	5
5	External Sector Accounts	1	2	3
	Total	12	9	21

Source: Extract from the equations 3.9 - 3.29.

Impact Analysis

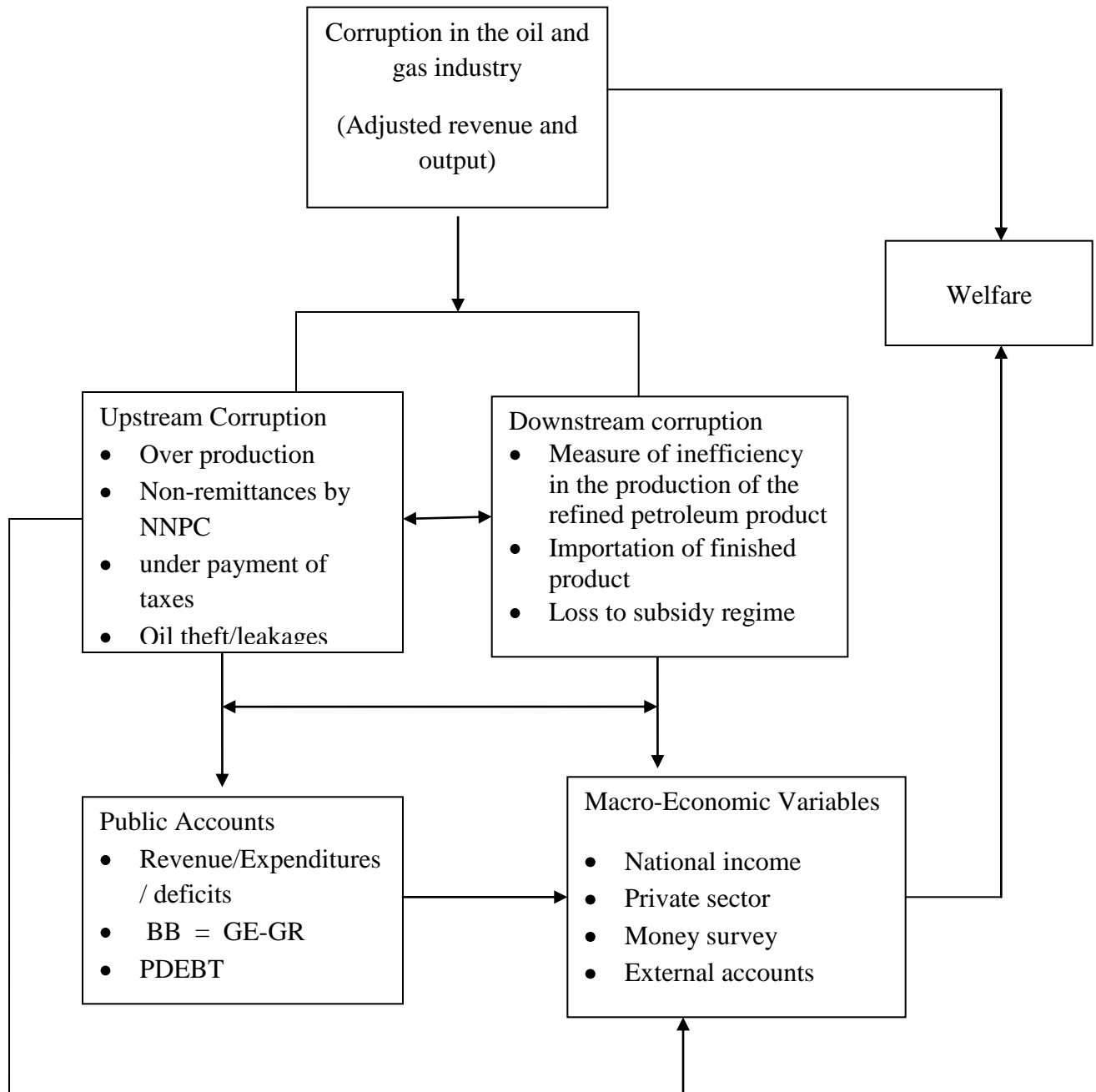
The analysis of the impact of corruption on the macro economy of Nigeria requires the specification of an appropriate macroeconomic model to facilitate the application of simulation analysis. The conceptualization of the nexus between corruption in the oil and gas and the macro-economy is shown in Figure 3.2. In this section, we present macro econometric model. The primary assumption of the model is that corruption in the oil and gas industry can affect the economy and policy variables in a number of channels. Figure 3.2 shows the links between the oil industry and the economy. The figure shows that the extent or prevalence of corruption in the oil and gas industry from both the upstream and the downstream sub sectors will affect the public sector accounts. The impact on public accounts particularly revenue, expenditure, deficit and borrowing, will have impact on the national account, private sector,

money survey and external accounts. The corruption in oil and gas industry affects economic welfare directly and indirectly.

One of the most important functions of the economic system is to ensure an efficient allocation of resources. Corruption in the oil and gas industry may crowd-out resources from the government sector and households. The framework indicated in Figure 3.2 requires the specification of a macroeconomic model. For the purpose of simulating the effect of corruption, the model is specified in econometric form.

From the simple macroeconomic framework in Figure.3.2, the corruption in the oil and gas industry (adjusted revenue and output) came about from the activities of both the upstream and the downstream sub-sector of the industry. The points where corruption was an issue in the industry were identified in the sub- section 3.2.1. The impact of corruption is transmitted primarily through the public accounts and then the macro economy. In the public accounts, we have the Government Expenditure (GE), Government Revenue (GR), Balanced Budget (BB) and Public Debt (PDEBT). The GR is disaggregated to Oil Revenue (ORR) and Non- oil Revenue (NOR). The corruption effects are transmitted through Oil revenue to the budget balance (BB) and public debt (PDEBT). The model specified in Figure 3.2, thus begins with the public account and then national account, private account, money survey and the external account.

Figure 3.2 Model of Macroeconomic Impact and extent of Corruption in the Nigeria's Oil and Gas Industry



Source: Drawn by the author (2014)

Data Requirement and Sources

The data required for the study includes that of the Public Sector Accounts, National Income Account, Private Sector Account, Money Survey and External Sector Accounts. The

data was sourced from the Statistical Bulletin of the Central Bank of Nigeria (2013, 2014). Also, the data used to estimate the corruption in the upstream and downstream was sourced from Annual Statistical Bulletin of the Nigerian National Petroleum Corporation, Organization of Petroleum Exporting Countries (OPEC) website, International Financial Statistics (IFS), publications of the International Monetary Fund (IMF), the World Bank as well as the reports of the various probe panels. The variables used, their measurement and sources are presented in the appendix 21.

3.3.1 Estimation Techniques

The study used the Ordinary Least Squares (OLS) technique to estimate the equations of the macro model. In estimating the recursive macroeconomic model, Econometric Views (E-views 9) software was used for all the econometric analyses.

3.2.4 Simulation Analysis

The impact analysis requires counter-factual analysis of the scenarios in which corruption in oil and gas did not exist. Given that corruption in oil and gas originates from two sources (upstream and downstream), ten (10) scenarios are therefore estimated and analyzed. The first seven scenarios comprises of the various sources of corruption in both the upstream and the downstream. Two in the upstream comprises of the over production impact and crude theft impact and five in the downstream comprises of design inefficiency from the actual yield impact, design inefficiency from the design yield impact, excess import impact, capacity underutilization impact, refinery inefficiency impact. The last three are the aggregate impact. That is, the corruption in the upstream impact, the corruption in the downstream impact and the corruption total impact.

To conduct the simulation experiments, we began with the baseline simulation to validate the model in order to ensure its suitability for the simulation analysis. The baseline simulation was solved using the Gauss Seiddel solution algorithm. Given that the baseline solution includes the impact of corruption on the macro economy, the impacts of corruption in the ten scenarios were measured as the difference between the baseline simulation values and the simulated values that is:

$$M_{ij} = B_i - S_{ij} \quad (3.30)$$

Where:

M_{ij} is the impact of corruption on variable i for scenario j .

B_i is the baseline value of variable i

S_{ij} is the simulated value of variable i in scenario j .

For the simulation experiment, the ten scenarios that was considered and simulated in the study, includes the components of the upstream (CORU), and the components of the downstream (CORD). The second stage is the measurement of the impact of the aggregate of the various components. In all the scenarios, corruption is viewed as a loss to the government revenue. This implies that, if there is no corruption the government revenue will be higher than what it was in the period of the study, as such the revenue would have been increased by the sum of the amount of the corruption in the upstream and the corruption in the downstream. The government revenue that is used in the scenarios is presented thus:

Scenario1 (Over production impact): $GR1 = GR + \text{Over Production} \quad (3.31)$

Scenario 2(Crude theft impact): $GR2 = GR + \text{Crude Theft} \quad (3.32)$

Scenario 3 (Design inefficiency A/Y) $GR3 = GR + \text{Design inefficiency } .A/Y \quad (3.33)$

Scenario 4 (Design inefficiency D/Y) $GR4 = GR + \text{Design inefficiency } .D/Y \quad (3.34)$

Scenario 5 (Excess import impact) $GR5 = GR + \text{Excess import}$ (3.35)

Scenario 6 (Cap. Underutilization) $GR6 = GR + \text{Cap. Underutilization}$ (3.36)

Scenario 7 (Refinery inefficiency impact) $GR7 = GR + R.I$ (3.37)

Scenario 8(CORU Impact) $GR8 = GR + \text{CORU}$ (3.38)

Scenario 9 (CORD Impact) $GR9 = GR + \text{CORD}$ (3.39)

Scenario 10 (CORT Impact) $GR10 = GR + \text{CORT}$ (3.40)

This same procedure is followed for other macroeconomic variables.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF RESULTS

This section presents and analyzes the result of the study. It is pertinent to recall that the thesis sets out to; (i) measure the extent of corruption in the Nigeria oil and gas industry, and (ii) analyze its impact on the macro economy. Section 4.1 presents the results of the measurement of corruption while section 4.2 presents and analyzes the results of the impact analysis which comprise four sets of results: stochastic properties of the variables, estimation results, baseline simulation and simulation experiments.

4.1 Estimates of Corruption in the Nigerian Oil and Gas Industry

The areas where corruption were issues in the oil and gas industry were the upstream and the downstream sub sectors of the industry. From the documentary evidences presented in Table 3.1, the key points of corruption in the upstream and the downstream were identified. In the upstream, the key sources were over shooting of the crude oil production (OP) beyond the OPEC approved quotas and crude oil theft. Therefore, $CORU = OP + CT$. While in the downstream the key sources were refining inefficiencies and excess import. The estimates of corruption in the downstream and upstream are presented in Tables 4.1 and 4.2 respectively. The aggregate estimates of corruption in the oil and gas industry are presented in Table 4.3. The results in Tables 4.1 and 4.2 are summaries of the detailed estimates presented in Appendix 13 and 14 (Table 4.1) and Appendix 18 and 19 (Table 4.2).

4.1.1 Estimates of Corruption in the Upstream

Table 4.1 shows the estimates for the two sources of corruption in the upstream: Over-production and crude oil theft. It shows the sum of the corruption in the upstream of the oil and gas industry (CORU).

The estimate for over-production shows that there was positive over-production in 1999-2006 and negative over-production in 2007-2014. For ease of analysis therefore, we computed period averages for the two periods and period totals. On the average, the positive over-production increased the revenue by ₦348.4 billion and the negative over-production reduced the revenue by an average of ₦1.5 trillion. The cumulative total was ₦3.2 trillion,(Positive over-production) and ₦12 trillion.(Negative overproduction)

The problem with the positive over-production was that it encourages unsustainable levels of expenditure such that when the negative underproduction offset the increased revenue of 1999-2006, government deficit and debt rose very fast.

The annual average losses to crude oil theft from 1999 to 2014 was ₦221 billion while the cumulative total was ₦3.5 trillion. The estimate of the extent of revenue losses due to corruption in the upstream in the Table 4.1 was ₦ 161.2 billion average annual losses. The cumulative total was ₦ 2.6 trillion.

Table 4.1: Measurement of Corruption in the Upstream (Billion Naira)

Year	Over Production(Billion N)	Crude Theft(Billion N)	CORU (Billion N)
1999	183.4	77.2	260.6
2000	150.0	133.8	283.8
2001	529.0	119.1	648.1
2002	277.3	131.7	409
2003	353.9	160.4	514.3
2004	769.3	217.3	986.6
2005	694.9	274.9	969.8
2006	229.5	304.5	534
2007	-649.5	315.3	-334.2
2008	-1689.7	409.3	-1280.4
2009	-1162.5	305.1	-857.4
2010	-2622.9	409.2	-2213.7
2011	-880.8	603.9	-276.9
2012	-1149.6	629.5	-520.1
2013	-1980.9	607.9	-1373
2014	-1845.7	557.2	-1288.5
Total	-8794.3	5256.3	-3538
Average	-549.6	328.5	-221.1
Total	(1999 -2006) 3187.3		
Average	(1999 -2006) 398.4		
Total	(2007-2014) -11981.6		
Average	(2007-2014) -1497.7		

Source: Extract from Appendices 13 and 14.

4.1.2 Estimates of Corruption in the Downstream

The measure of corruption in the downstream (CORD) is the summation of refining inefficiency (RI) and excess product import (EPM). Refining inefficiency arises from two sources; design inefficiency and capacity underutilization. In calculating refining inefficiency and capacity underutilization, the following assumptions were made:

- a. The standard yield is 51.4%
- b. The design yield is 32.28%; while the actual yield is 30.81%
- c. Daily crude allocation is 445,000 barrels
- d. 1 barrel is equal to 158 litres
- e. 1 gallon is equal to 3.785 Litres

- f. Design in efficiency = Standard yield –Design yield
- g. Yearly allocation of crude 445,000 x 365 (barrels)
- h. Yearly loss = Design inefficiency x yearly allocation

Following the above assumption, the detail of the design inefficiency, capacity under utilization and excess product import were computed and presented in the appendices 15 to 19. The summary of the estimates for design inefficiency and capacity underutilization and excess import is presented in Table 4.2.

In Table 4.2, the loss to refinery inefficiency from 1999 to 2014 was an annual average of ₦576 billion, while the average annual loss to excess import was ₦536.3 billion. As a result, the total annual average loss to corruption in the downstream was ₦1.1 trillion.

Table 4.2 Measures of Corruption in the Downstream

YEAR	Refinery Inefficiency(Billion N)	Excess Import(Billion N)	CORD(Billion N)
1999	201.7	132.9	334.6

2000	252.7	246.0	498.7
2001	204.3	156.2	360.5
2002	244.1	177.2	421.3
2003	443.5	311.5	755.0
2004	459.5	398.6	858.1
2005	395.5	353.3	748.8
2006	447.5	500.3	947.8
2007	495.5	646.3	1141.8
2008	455.5	612.1	1067.6
2009	805.1	657.2	1462.3
2010	753.1	702.3	1455.4
2011	740.1	861.8	1601.9
2012	1133.6	945	2078.6
2013	1123.9	912.3	2036.2
2014	1060.2	967.2	2027.4
Total	9215.8	8580.2	17795.9
Average	576.0	536.3	1112.3

Source: Extract from Apendices 18 and 19

4.1.3 Estimates of Aggregate Corruption in the oil and gas industry

Table 4.3 shows the estimates of the aggregate corruption in the oil and gas industry as well as upstream and the downstream estimates. The aggregate corruption was an annual average of ₦892.1

billion. The cumulative total of aggregate corruption for the period 1999-2014 was 14.3 trillion. Given that the budget for 2014 was 4.6 trillion, it follows that the total estimate of loss was more than three times the 2014 budget.

Table 4.3 Measures of Aggregate Corruption

YEAR	CORU(Billion N)	CORD(Billion N)	CORT(Billion N)
1999	260.6	334.6	595.2
2000	283.8	498.7	782.5
2001	648.1	360.5	1008.6
2002	409	421.3	830.3
2003	514.3	755.0	1269.3
2004	986.6	858.1	1844.7
2005	969.8	748.8	1718.6
2006	534	947.8	1481.8
2007	-334.2	1141.8	807.6
2008	-1280.4	1067.6	-212.8
2009	-857.4	1462.3	604.9
2010	-2213.7	1455.4	-758.3
2011	-276.9	1601.9	1325
2012	-520.1	2078.6	1558.5
2013	-1373	2036.2	663.2
2014	-1288.5	2027.4	738.9
Total	-3538	17795.9	14257.9
Average	-221.1	1112.3	891.2

Source: Extract from Tables 4.1 and 4.2

4.2 Stochastic Properties of the Series: Test of Stationarity

The results of the test for the stationarity for nineteen key variables were presented in Appendix 20. The results shows that one of the series been I (0), five were I (1) and thirteen I (2). Among the series that were I (2) were Government Expenditure (GE), Non oil revenue (

NOR),Public Debt(PDEBT), Private Consumption(PC), Oil export(OXP),Money supply(M1),Credit to Government(CG),Credit to the private Sector(CPS),Net foreign Asset (NFA),Net Domestic Credit(NDC),Capital account Balance (KAB),Corruption in the downstream(CORD) and Corruption in the upstream (CORU). The five series that were I (1) include Balanced Budget (BB), Government Revenue (GR), Oil Revenue (ORR), Import (IMP), and Nominal interest rate (NIR).

4.3 Estimation Results and Analysis

The results for the twelve stochastic equations of the macro-economic model are presented in Tables 4.4-4.7. The Public Sector Account block is in Table 4.4, the National Account block is in Table 4.5, the Money Survey block in Table 4.6 and the external sector block in Table 4.7. The t-values of the estimated parameters are shown in parenthesis in addition to the R-Square (R^2) and the Durbin-Watson statistic (DW).

Table 4.4 shows the regression results for four equations of the public sector account. The results indicates very good fit for the four equations given that the R^2 ranges from 0.92 and 0.99 implying that between 92% and 99% of the movements in dependent variables were explained by the determinants in the models.

Table 4.4.The Regression Results for the Public Sector Account

$\text{LOG GE} = 1.34 + 0.21\text{LOG}(\text{ORR}) + 0.36\text{LOGNOR} + 0.48\text{LOGCPI}$ <p style="text-align: center;">(2.1) (3.8) (4.1)</p>	(4.1)
$R^2 = 0.99$ D.W = 1.7	
$\text{LOGORR} = -1.022 + 0.58\text{LOG}(\text{OXP}) + 0.49\text{LOG}(\text{NER}) + 0.45\text{LOG}(\text{COP})$ <p style="text-align: center;">(11.5) (7.2) (7.0)</p>	(4.2)

$R^2 = 0.99 \quad D.W = 1.4$	
$\text{LOGNOR} = -2.63 + 0.67\text{LOG}(Y) + 0.32\text{LOG}(\text{IMP} + \text{EXP}) \quad (4.3)$	$(3.8) \quad (2.3)$
$R^2 = 0.99 \quad D.W = 1.3$	
$\text{PDEBT} = 149.7 - 2.18\text{ORR} - 0.04\text{CG} + 2.18\text{BB} + 44.9\text{NER} + 0.33\text{CPS} \quad (4.4)$	$(-2.3) \quad (-0.04) \quad (2.4) \quad (7.8) \quad (1.7)$
$R^2 = 0.92 \quad D.W = 1.2$	

From the result in the Public Sector Account of the model specifications, in equation 4.1, Non-oil revenue (NOR), Consumer price Index (CPI) and Oil revenue (ORR) were all significant determinants of Government Expenditure (GE). And all of them have positive signs in conformity to expectations. In equation 4.2, the export of oil (EXP), Nominal Exchange rate (NER) and crude oil price (COP) were statistically significant determinants of oil revenue (ORR) and they have positive signs in line with a priori expectations. The coefficients indicate approximately a unit elasticity, indicating that a 1% increase in oil exports is likely to raise oil export by 1%. Also, the nominal exchange rate (NER) has a positive sign and is equally significant. The results suggest that the key determinants of oil revenue are oil exports, crude oil price and nominal exchange rate.

. In equation 4.4, Budget Balance (BB), Credit to the private sector (CPS) and Nominal exchange rate (NER) were all significant determinants of Public Debt (PDEBT), while the Credit to the Government (CG) and Oil Revenue (ORR) were not significant determinants. The CG and the ORR had negative signs.

Table 4.5 showed the regression results for equations for the four stochastic equations of the National Account block. The four equations in the national account are very good fit of the data with R² ranging from 0.90 to 0.98.

Equation 4.5 clearly shows that only Government Expenditure (GE) was statistically significant determinant of Private Consumption (PC) with a positive sign: National income (Y) and the Nominal Exchange Rate (NER) have positive signs as expected but were insignificant. Out of the four determinant variables of Private Investment (IP) in equation 4.6, it was only PC and CPI that were statistically significant while NIR and CG were statistically insignificant. The two variables have negative signs in addition to their insignificant status.

In equation 4.7, Crude Oil Price (COP) and Nominal Exchange Rate (NER) were significant determinants of Oil Export (OXP) with positive signs, while Nominal Interest Rate (NIR) even though it was having a positive sign, it was statistically insignificant. Among the variables in equation 4.8, Government Expenditure (GE), National Income (Y) were significant determinants of imports of oil (IMP) and had positive signs, Reserves (RESV) was also significant but with a negative sign. The Nominal Exchange Rate (NER) was insignificant.

Table 4.5: The Regression Result for the National Account

$PC = 862.6 + 11.5*NER + 0.2*Y + 3.5*GE + 0.8*AR(1) \quad (4.5)$				
	(0.72)	(0.59)	(3)	(4.0)
$R^2 = 0.98 \quad D.W = 1.9$				
$IP = 8420.4 + 7741*CPI - 5158.9*NIR + 55*PC - 33.1*CG \quad (4.6)$				
	(2.5)	(-0.7)	(3.4)	(-0.4)

$R^2 = 0.95$ D.W = 1.1	
$\text{OXP} = -4738.5 + 87.5 \cdot \text{COP} + 47.9 \cdot \text{NER} + 54 \cdot \text{NIR}$	(4.7)
$\begin{matrix} & (6.6) & (9.2) & (0.8) \end{matrix}$	
$R^2 = 0.90$ D.W = 0.5	
$\text{IMP} = -0.16 + 0.30 \cdot \text{GE} - 1.29 \cdot \text{NER} - 0.32 \cdot \text{RESV} + 0.04 \cdot \text{Y}$	(4.8)
$\begin{matrix} & (2.9) & (-1.0) & (-3.0) & (4.0) \end{matrix}$	
$R^2 = 0.96$ D.W = 2.1	

Table 4.6 shows the regression results for the Money Survey. The results indicated a very good fit for all the variables, with R^2 ranging from 0.97 to 0.99. In the result in equation 4.9, National income (Y) had a positive sign in line with expectations, and it was statistically significant determinant of the money supply (M1). Nominal interest rate (NIR) with a positive sign was not statistically significant.

In equation 4.10, Government Expenditure (GE) and Money Supply (M1) had positive signs and were significant determinants of Credit to the Government (CG). While the Net Domestic Credit (NDC) and Nominal interest rate (NIR) were insignificant.

In equation 4.11, the National Income (Y), Nominal Exchange Rate (NER) and Money Supply (M1) were significant determinant of Credit to the Private Sector (CPS), while Credit to Government was not significant in determining the CPS. The results in Table 4.15 show that NIR and NER were statistically insignificant while NFA and PDEBT were significant in the determination of the Capital Account Balance (KAB).

Table 4.6: The Regression Result for the Money Survey

$$\begin{aligned}
 M1 = & -7.02 + 0.08*Y + 6.1*NIR \quad (4.9) \\
 & \quad (4.5) \quad (0.3) \\
 & R^2 = 0.96 \quad D.W = 1.0 \\
 CG = & 34.6 + 0.02*NDC + 0.31*GE + 0.44*M1 - 7.9*NIR \quad (4.10) \\
 & \quad (0.98) \quad (2.3) \quad (4.6) \quad (0.98) \\
 & R^2 = 0.99 \quad D.W = 2.2 \\
 CPS = & 31.7 - 1.64*CG - 13.04*NER + 0.12*Y + 2.2*M1 \quad (4.11) \\
 & \quad (-1.8) \quad (-3.6) \quad (6.6) \quad (3.7) \\
 & R^2 = 0.98 \quad D.W = 1.7
 \end{aligned}$$

Table 4.7: The Regression Result for the External Sector Account

$$\begin{aligned}
 KAB = & 1875.98 - 0.31*NFA + 0.29*PDEBT - 47.1*NIR - 9.1*NER \quad (4.12) \\
 KAB = & 1875.98 - 0.31*NFA + 0.29*PDEBT - 47.1*NIR - 9.1*NER \quad (4.12) \\
 & \quad (-3.0) \quad (-2.2) \quad (1.2) \quad (1.1) \\
 R^2 = & 0.01 \quad D.W = 1.95
 \end{aligned}$$

Table 4.8 shows the variables that were significant in each equation and those that were not significant.

Table 4.8: Significant Levels of the Variables in the Macro Econometric Model

Variables	Significant	Insignificant
EQ.4.1 LOG GE	ORR,NOR,CPI	
EQ.4.2 LOG ORR	OSP,NER,COP	

EQ.4.3 LOG NOR	Y,(IMP+OXP)	
EQ.4.4 PDEBT	BB,NER,CPS	ORR,CG
EQ.4.5 PC	GE	NER,Y
EQ.4.6 IP	CPI,PC	NIR, CG
EQ.4.7 OXP	COP,NER	NIR
EQ.4.8 IMP	GE,Y	NER,RESV
EQ.4.9 M1	Y	NIR
EQ.4.10 CG	GE,M1	NDC,NIR
EQ.4.11 CPS	Y, M1	CG,NER
EQ.4.12 KAB		NFA,PDEBT,NIR,NER

Source: Extract from Tables 4.4 to 4.7

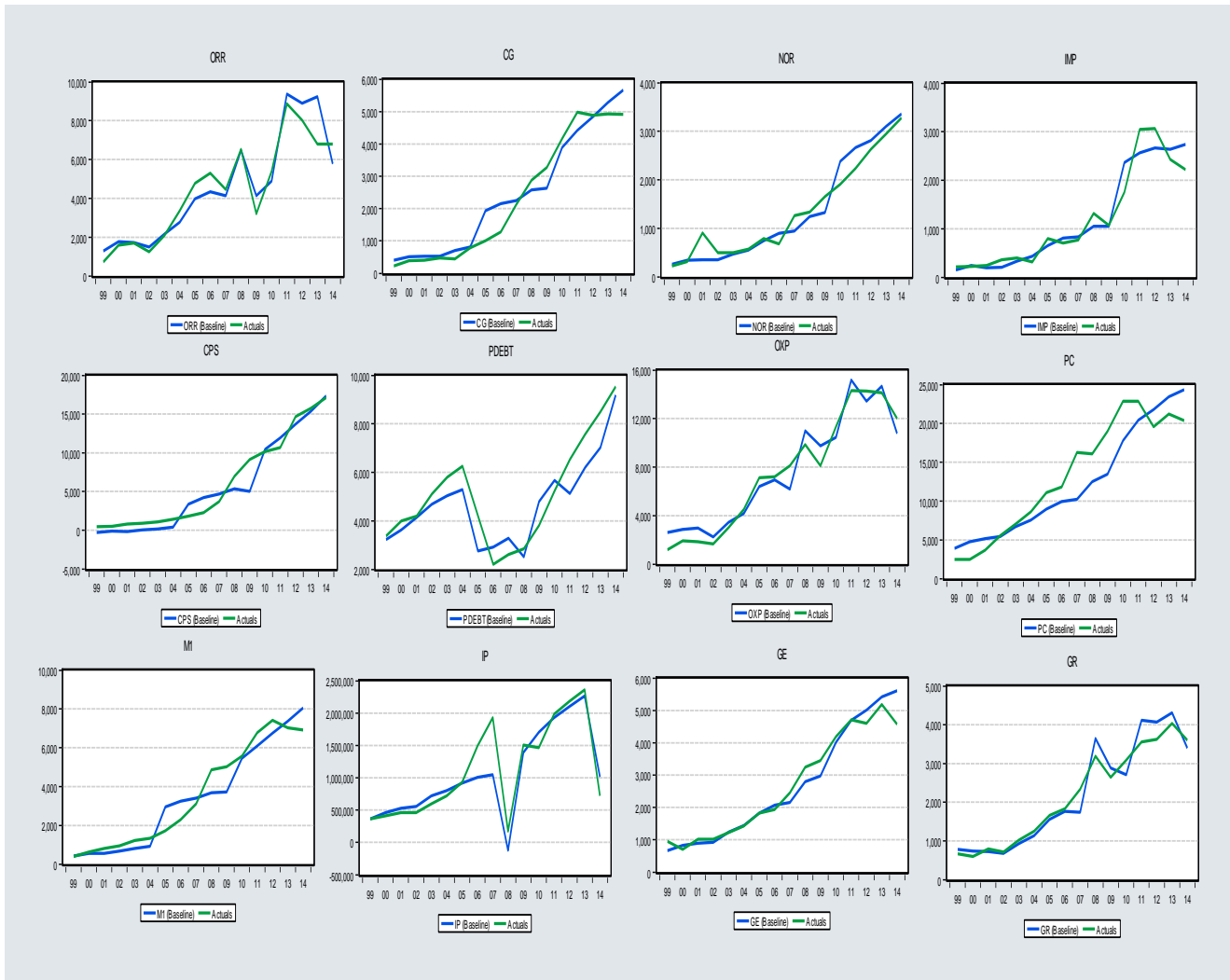
*The significant test in the study uses the rule of thumb: $t \geq 2$

4.4 Baseline Simulation

The model for the simulation analysis comprised equations 4.1- 4.12 with the associated identities was solved for baseline solution using Gauss-Sidel Algorithm in E-views

To validate the estimated model, the graphical approach was used to examine how well the model tracked stochastic variables. It could be observed from Figure 4.1 that the model tracked very well for the majority of the variables.

Figure 4.1 Tracking power of the Baseline Simulation.



Source: Output from E-views, Version 9.0

4.5 Macroeconomic Impacts of Corruption in the Oil and Gas Industry in Nigeria

Ten simulation experiments were conducted to measure the impact of corruption in oil and gas on macroeconomic aggregates. The ten scenarios were: Overproduction, Crude Oil Theft, Design Inefficiency from the actual yield, Design Inefficiency from the Design yield, Excess Import, Capacity Underutilization, Import due to refinery inefficiency, the upstream, downstream and the aggregate impact. The detailed results are shown in Appendices 22 to 31.

The summary of the results are shown in Table 4.9, 4.10 and 4.11. The workings of the various accounts in the model are interconnected, from the public account to the national account, money survey and external account. In the Public Account, there are two components, revenue and expenditure, then the balanced budget. If there is surplus the government invests, and if there is deficit in the budget the government borrowed leading to public debt. Either way, it will affect the national account, money survey, private account as well as the external account.

4.5.1 Impact of the Upstream Corruption

In Table 4.9, the impact of upstream corruption was captured in the scenarios 1 and 2. In the scenarios 1, overproduction on the average affected the public account by 5.1% national accounts by 5.5% money survey by 12.2% and external account by 6.1%. Of all the accounts, money survey has the highest impact; the implication of this is that corruption in the upstream through the overproduction had reduced all the accounts by the percentages expressed. In the scenario 2, crude oil theft on the average affected the public account by 4.3%, national accounts by 0.08% money survey by 0.11% and external account by 4.2%. The impact crude oil theft which was negative was more on the public account than all other accounts. The crude oil theft reduced the public account by 4.3% and reduced the external account by 4.2%. The impact of crude oil theft on national account and money survey were mild, with 0.08% and 0.11% respectively.

Table 4.9 Upstream Corruption

ENDOGENOUS VARIABLES	SCENARIO 1	SCENARIO 2
Public Account	AVERAGE (%)	AVERAGE (%)
Government Retained Revenue	1.14	0.12
Government Expenditure	0.74	1.72
Public Debt	7.4	-0.07
Oil Revenue	11.1	0.05
AVERAGE	5.1	4.3

National Account		
National Income	0.7	0.01
Private Consumption	0.3	0.02
Private Investment	-0.1	0.00
Imports	21.0	0.29
AVERAGE	5.5	0.08
Money Survey		
Money Supply	8.4	0.10
Net Domestic Credit	7.5	0.07
Credit to Government	20	0.17
Credit to Private Sector	13	0.09
AVERAGE	12.2	0.11
External Sector		
Reserves	8.8	0.19
Net Foreign Assets	3.33	0.06
AVERAGE	6.1	4.2

Source: Author's computation from the E-views version 9 (2016)

4.5.2 Impact of the Downstream Corruption

In Table 4.10, the impact of corruption in the downstream was captured by scenarios 3 to 7. Scenarios 3 which measured the impact of design inefficiency from the actual yield, on the average affected the public account by 9.43%, national accounts by 9.39% money survey by 12.56% and external account by 14.41%. The impact design inefficiency from the actual yield which was negative was more on external account than all other accounts. It reduced the public account by 9.4% and external account by 14.4%.

Scenario 4 which measured the impact of design inefficiency from the design yield, on the average affected the public account by 10.08%, national accounts by 8.73% money survey by 11.67% and external account by 13.39%. The impact design inefficiency from the design yield which was negative was more on external account than all other accounts. It reduced the external account by 13.4%, and money survey by 11.7%.

Scenario 5 which measured the impact of excess import of petroleum product on the average affected the public account by 16.3%, national accounts by 17% money survey by

20% and external account by 26%. The impact of excess import of petroleum product which was negative was more on external account than all other accounts. It reduced the external account by 26%, money survey by 20%, national account by 17% and public account by 16%.

Scenario 6 which measured the impact of capacity underutilization on the average affected the public account by 11.3%, national accounts by 10% money survey by 13% and external account by 15%. The impact of capacity underutilization which was negative was more on external account than all other accounts. It reduced the external account by 15%, money survey by 13%, national account by 10% and public account by 11%.

Scenario 7 which measured the impact of import of petroleum product due to refinery inefficiency on the average affected the public account by 33.3%, national accounts by 9.4% money survey by 12.6% and external account by 4.9%. The impact of import of petroleum product due to refinery inefficiency which was negative was more on public account than all other accounts. It reduced the public account by 33%, money survey by 12%, national account by 9% and external account by 5%.

Table 4.10 Downstream Corruption

ENDOGENOUS VARIABLES	SCENARIO 3 (%AVERAGES)	SCENARIO 4 (%AVERAGES)	SCENARIO 5 (%AVERAGES)	SCENARIO 6 (%AVERAGES)	SCENARIO 7 (%AVERAGES)
Public Account					
Government Retained Revenue	14.0	13.03	24.58	14.8	14.06
Government Expenditure	11.4	10.6	21.19	12.06	11.42
Public Debt	-5.56	-5.2	-11.48	-6.18	-5.57
Oil Revenue	7.29	6.8	12.99	16.91	7.30
AVERAGE	9.43	10.08	16.32	11.26	33.27
National Account					
National Income	1.30	1.20	2.33	1.33	1.30
Private Consumption	2.45	2.28	4.45	2.57	2.46

Private Investment	0.03	0.03	0.07	0.04	0.03
Imports	33.79	31.40	61.21	35.23	33.83
AVERAGE	9.39	8.73	17.02	9.79	9.41
Money Survey					
Money Supply	11.38	10.57	10.57	11.58	11.39
Net Domestic Credit	8.46	7.86	15.16	8.61	8.47
Credit to Government	20.22	18.79	34.58	20.32	20.24
Credit to Private Sector	10.18	9.46	17.54	10.16	10.19
AVERAGE	12.56	11.67	19.46	12.67	12.57
External Sector					
Reserves	21.55	20.02	39.63	22.41	21.58
Net Foreign Assets	7.27	6.75	12.56	7.45	7.28
AVERAGE	14.41	13.39	26.10	14.94	4.93

Source: Author's computation from the E-views version 9 (2016)

4.5.3 Impact of the Aggregate Corruption in Oil and Gas Industry

In Table 4.11, the impact of the aggregate corruption in the oil and gas industry was the summation of scenarios 8 and 9. Scenario 10 which measured the aggregate corruption impact on the macroeconomy, on the average affected the public account by 24%, national accounts by 52% money survey by 72% and external account by 13%. The impact of the aggregate corruption on the macroeconomy that was negative was more on money survey than all other accounts. It reduced the money survey by 72%, national account by 52%, public account by 24% and external account by 13%.

Table 4.11 Aggregate Corruption

ENDOGENOUS VARIABLES	SCENARIO 8	SCENARIO 9	SCENARIO 10
Public Account	% AVERAGES	% AVERAGES	% AVERAGES
Government Retained Revenue	16.7	54.4	71.2
Government Expenditure	-43.0	32.61	-10.4
Public Debt	18.0	-17.06	0.98
Oil Revenue	6.9	27.93	34.79
AVERAGE	-0.35	24.5	24.2
National Account			
National Income	2.1	4.96	7.04
Private Consumption	3.0	9.47	12.50

Private Investment	-0.02	0.14	0.12
Imports	57.5	130.2	187.8
AVERAGE	15.66	36.19	51.87
Money Survey			
Money Supply	20.5	42.9	63.44
Net Domestic Credit	16.6	32.2	48.81
Credit to Government	40.98	75.1	116.10
Credit to Private Sector	23.57	37.9	61.45
AVERAGE	12.57	25.41	47.03
External Sector			
Reserves	-72.78	61.19	-11.58
Net Foreign Assets	10.96	27.3	38.25
AVERAGE	-30.91	44.25	13.34

Source: Author's computation from the E-views version 9 (2016)

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

The study estimated the extent of corruption in the Nigeria's oil and gas industry in the period 1981 – 2014 and evaluated the impact on key macroeconomic aggregates. The objectives were achieved using two methodologies. The first was the measurement of the extent of corruption in the industry, focusing on the activities of the industry in both the upstream and downstream. Using some assumptions and available data, the estimate of each source of corruption in the upstream and the downstream were estimated. The second methodology was the measurement of the impact using simulation analysis. The analysis was based on ten scenarios which estimated the macroeconomy impacts of the corruption in the oil and gas industry. Scenarios one to seven measured the individual sources of corruption in the upstream and the downstream, while eight to ten were the aggregate.

The main findings of the results shows that there was overproduction of crude oil from 1999 - 2006 and under production from 2007 to 2014. The implication of over production was a distortion of the true state of government finances, which gave exaggerated government revenue to the economy and other variables followed the pattern. From 2007 to 2014 there was under production, which reduced the government revenue as well as other variables.

The Crude Oil Theft has significant impact on the economy as it reduced the government revenue, government expenditure and reserves as well as increased the public debt and importation of the finished product.

The Refinery inefficiencies which were broken down into design yield inefficiency and capacity under-utilization was also found to be very significant, as it reduced the government revenue, government expenditure and reserve. It also increased the public debt and importation of the finished product. Capacity under utilization was found to be responsible for a greater proportion of the

importation of the finished product and as such reduced the government revenue, government expenditure and reserve, there by increasing the public debt. On the aggregate level the results found that corruption in the upstream and the downstream had a negative and significant impact on key macroeconomic variables. It showed that the opportunity cost of corruption was very high.

5.2 Conclusion

From the finding in the research, the study concludes that there was significant corruption in the upstream and downstreams of the Nigeria's oil and gas industry. Second, the corruption had significantly negative impact on the public finance, national accounts, money survey and external accounts.

5.3 Recommendations

The findings and conclusions of the study led to four main recommendations:

First, the government should strickly adhere to the production quotas by OPEC.

This requires the no overproductions and effort to resolve the Niger Delta crisis.

Second, government should eliminate crude oil theft. This is also part of what led to the Niger Delta crisis.

Third, it is important to imrove the production technology for domestic refineries and to ensure optimal capacity utilization. Finally, improving domestic refining should gradually reduce imports and consumption subsidy on refined products.

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APPENDIX 1

Dependent Variable: LOG(GE)
 Method: Least Squares
 Date: 01/20/16 Time: 15:50
 Sample: 1981 2014
 Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.337962	0.131202	10.19769	0.0000
LOG(ORR)	0.209772	0.101038	2.076183	0.0468
LOG(NOR)	0.362577	0.095843	3.783039	0.0007
LOG(CPI)	0.483583	0.117804	4.104992	0.0003
SER02	0.067067	0.127424	0.526330	0.6027
R-squared	0.994234	Mean dependent var		5.725484
Adjusted R-squared	0.993439	S.D. dependent var		2.176284
S.E. of regression	0.176277	Akaike info criterion		-0.498464
Sum squared resid	0.901136	Schwarz criterion		-0.274000
Log likelihood	13.47389	F-statistic		1250.205
Durbin-Watson stat	1.648919	Prob(F-statistic)		0.000000

APPENDIX 2

Dependent Variable: LOG(ORR)
 Method: Least Squares
 Date: 01/20/16 Time: 15:50
 Sample: 1981 2014
 Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.022214	0.204740	-4.992752	0.0000
LOG(OMP)	0.578337	0.050455	11.46253	0.0000
LOG(NER)	0.486456	0.067196	7.239338	0.0000
LOG(COP)	0.459569	0.065723	6.992509	0.0000
SER02	-0.247544	0.100513	-2.462800	0.0200
R-squared	0.996743	Mean dependent var		5.907042
Adjusted R-squared	0.996294	S.D. dependent var		2.498600
S.E. of regression	0.152104	Akaike info criterion		-0.793446
Sum squared resid	0.670937	Schwarz criterion		-0.568981
Log likelihood	18.48858	F-statistic		2218.949
Durbin-Watson stat	1.440724	Prob(F-statistic)		0.000000

APPENDIX 3

Dependent Variable: LOG(NOR)

Method: Least Squares

Date: 01/20/16 Time: 16:01

Sample: 1981 2014

Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.631847	0.496715	-5.298501	0.0000
LOG(Y)	0.669693	0.174510	3.837562	0.0006
LOG(IMP+OXP)	0.318650	0.141701	2.248753	0.0320
SER02	0.088450	0.214495	0.412362	0.6830
R-squared	0.985542	Mean dependent var		4.759657
Adjusted R-squared	0.984096	S.D. dependent var		2.379521
S.E. of regression	0.300082	Akaike info criterion		0.540610
Sum squared resid	2.701478	Schwarz criterion		0.720181
Log likelihood	-5.190363	F-statistic		681.6581
Durbin-Watson stat	1.249437	Prob(F-statistic)		0.000000

APPENDIX 4

Dependent Variable: PDEBT

Method: Least Squares

Date: 01/20/16 Time: 12:44

Sample: 1981 2014

Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	149.7404	215.6374	0.694408	0.4931
ORR	-2.181778	0.931744	-2.341606	0.0265
CG	-0.035135	0.872908	-0.040250	0.9682
BB	2.179653	0.921067	2.366443	0.0251
NER	44.86761	5.750661	7.802166	0.0000
CPS	0.330996	0.199743	1.657108	0.1087
R-squared	0.924247	Mean dependent var		2666.086
Adjusted R-squared	0.910720	S.D. dependent var		2767.000
S.E. of regression	826.7747	Akaike info criterion		16.43173
Sum squared resid	19139582	Schwarz criterion		16.70108
Log likelihood	-273.3394	F-statistic		68.32438
Durbin-Watson stat	1.151162	Prob(F-statistic)		0.000000

APPENDIX 5

Dependent Variable: PC
 Method: Least Squares
 Date: 02/01/16 Time: 14:06
 Sample(adjusted): 1982 2014
 Included observations: 33 after adjusting endpoints
 Convergence achieved after 85 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	862.5624	1742.952	0.494886	0.6245
NER	11.45720	15.97452	0.717217	0.4792
Y	0.023515	0.039890	0.589490	0.5603
GE	3.482698	1.174765	2.964592	0.0061
AR(1)	0.791452	0.195719	4.043818	0.0004
R-squared	0.980742	Mean dependent var		6703.158
Adjusted R-squared	0.977990	S.D. dependent var		8196.483
S.E. of regression	1215.998	Akaike info criterion		17.18325
Sum squared resid	41402261	Schwarz criterion		17.40999
Log likelihood	-278.5236	F-statistic		356.4787
Durbin-Watson stat	1.939135	Prob(F-statistic)		0.000000
Inverted AR Roots	.79			

APPENDIX 6

Dependent Variable: IP
 Method: Least Squares
 Date: 02/01/16 Time: 14:24
 Sample: 1981 2014
 Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8420.413	113944.4	0.073899	0.9416
CPI	7740.975	3065.688	2.525037	0.0175
NIR	-5158.899	7120.607	-0.724503	0.4748
PC	55.00222	17.44883	3.152201	0.0038
CG	-33.07192	75.04460	-0.440697	0.6628
DUMMYGFC	-1363650.	155799.8	-8.752579	0.0000
R-squared	0.944509	Mean dependent var		537794.2
Adjusted R-squared	0.934600	S.D. dependent var		736295.1
S.E. of regression	188295.7	Akaike info criterion		27.28820
Sum squared resid	9.93E+11	Schwarz criterion		27.55756
Log likelihood	-457.8994	F-statistic		95.31757
Durbin-Watson stat	1.098970	Prob(F-statistic)		0.000000

APPENDIX 7

Dependent Variable: OXP
 Method: Least Squares
 Date: 01/20/16 Time: 12:51
 Sample: 1981 2014
 Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4738.486	1331.596	-3.558503	0.0013
COP	87.51043	13.18200	6.638633	0.0000
NER	47.85057	5.220475	9.165941	0.0000
NIR	54.13346	66.89857	0.809187	0.4248
R-squared	0.899169	Mean dependent var	3695.403	
Adjusted R-squared	0.889086	S.D. dependent var	4899.424	
S.E. of regression	1631.692	Akaike info criterion	17.74275	
Sum squared resid	79872607	Schwarz criterion	17.92233	
Log likelihood	-297.6268	F-statistic	89.17589	
Durbin-Watson stat	0.465933	Prob(F-statistic)	0.000000	

APPENDIX 8

Dependent Variable: IMP
 Method: Least Squares
 Date: 02/01/16 Time: 13:39
 Sample: 1981 2014
 Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.155109	50.58828	-0.003066	0.9976
GE	0.300814	0.100751	2.985711	0.0057
NER	-1.293911	1.252902	-1.032731	0.3103
RESV	-0.323163	0.108874	-2.968220	0.0060
Y	0.035686	0.009027	3.953129	0.0005
R-squared	0.957557	Mean dependent var	579.6853	
Adjusted R-squared	0.951702	S.D. dependent var	894.1177	
S.E. of regression	196.4977	Akaike info criterion	13.53423	
Sum squared resid	1119729.	Schwarz criterion	13.75870	
Log likelihood	-225.0819	F-statistic	163.5660	
Durbin-Watson stat	2.095038	Prob(F-statistic)	0.000000	

APPENDIX 9

Dependent Variable: M1
 Method: Least Squares
 Date: 02/01/16 Time: 14:21
 Sample: 1981 2014
 Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-7.023134	303.8213	-0.023116	0.9817
Y	0.074615	0.016430	4.541327	0.0001
NIR	6.106972	20.30436	0.300771	0.7657
DUMMY	1355.109	1169.186	1.159019	0.2559
DUMMYCON	453.0163	908.3914	0.498702	0.6218
R-squared	0.958448	Mean dependent var		1696.118
Adjusted R-squared	0.952716	S.D. dependent var		2485.510
S.E. of regression	540.4703	Akaike info criterion		15.55781
Sum squared resid	8471135.	Schwarz criterion		15.78227
Log likelihood	-259.4828	F-statistic		167.2283
Durbin-Watson stat	1.038901	Prob(F-statistic)		0.000000

APPENDIX 10

Dependent Variable: CG
 Method: Least Squares
 Date: 02/01/16 Time: 14:07
 Sample(adjusted): 1982 2014
 Included observations: 33 after adjusting endpoints
 Convergence achieved after 11 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	34.58225	157.2107	0.219974	0.8275
NDC	0.017800	0.018210	0.977466	0.3370
GE	0.308300	0.135799	2.270273	0.0314
M1	0.442722	0.095792	4.621718	0.0001
NIR	-7.943238	8.072952	-0.983932	0.3339
AR(1)	0.624325	0.161662	3.861907	0.0006
R-squared	0.992830	Mean dependent var		1176.052
Adjusted R-squared	0.991502	S.D. dependent var		1738.299
S.E. of regression	160.2425	Akaike info criterion		13.15422
Sum squared resid	693296.6	Schwarz criterion		13.42631
Log likelihood	-211.0446	F-statistic		747.7361
Durbin-Watson stat	2.205373	Prob(F-statistic)		0.000000
Inverted AR Roots	.62			

APPENDIX 11

Dependent Variable: CPS
 Method: Least Squares
 Date: 02/01/16 Time: 13:48
 Sample: 1981 2014
 Included observations: 34

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	31.66022	179.5723	0.176309	0.8613
CG	-1.636688	0.906822	-1.804862	0.0815
NER	-13.03673	3.608517	-3.612765	0.0011
M1	2.183553	0.597982	3.651535	0.0010
Y	0.124040	0.018758	6.612787	0.0000
R-squared	0.984011	Mean dependent var		2913.562
Adjusted R-squared	0.981806	S.D. dependent var		5056.750
S.E. of regression	682.0822	Akaike info criterion		16.02323
Sum squared resid	13491846	Schwarz criterion		16.24770
Log likelihood	-267.3949	F-statistic		446.1939
Durbin-Watson stat	1.678798	Prob(F-statistic)		0.000000

APPENDIX 12

Dependent Variable: KAB
 Method: Least Squares
 Date: 01/20/16 Time: 13:00
 Sample(adjusted): 1982 2014
 Included observations: 33 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1875.983	19899.56	0.094273	0.9256
NFA	-0.312157	3.121840	-0.099991	0.9211
PDEBT	0.288944	4.655546	0.062064	0.9510
NIR	-47.13332	1240.913	-0.037983	0.9700
NER	-9.082132	260.9694	-0.034802	0.9725
KAB(-1)	0.088147	0.204217	0.431634	0.6694
R-squared	0.008700	Mean dependent var		732.8879
Adjusted R-squared	-0.174874	S.D. dependent var		27612.69
S.E. of regression	29929.84	Akaike info criterion		23.61407
Sum squared resid	2.42E+10	Schwarz criterion		23.88616
Log likelihood	-383.6321	F-statistic		0.047391
Durbin-Watson stat	1.945700	Prob(F-statistic)		0.998497

APPENDIX 13

Overproduction Value (Naira)

YEAR	OPEC QUOTAS (000B/D)	OPEC QUOTAS (000B/A)	NIGERIA CRUDE OIL PRODUCTION (000B/A)	OVER PRODUCTION (000B/A)	CRUDE OIL PRICE (\$)	EXCHANGE RATE (N)	OVER PRODUCTION (BILLION\$)	OVER PRODUCTION (BILLION N)
1999	1885	688025	774703	86678.00	22.3	94.9	1.93	183.4
2000	2157	787305	828198	40893.00	35.76	102.48	1.46	150.0
2001	1911	697515	859627	162112	29.23	111.6	4.74	529.0
2002	1778	648970	725860	76890.00	28.5	126.56	2.20	277.3
2003	2092	763580	844100	80520.00	33.86	129.79	2.73	353.9
2004	2142	781830	911045	129215.0	44.81	132.86	5.79	769.3
2005	2265	8265	918973	92248.00	57.57	130.84	5.31	694.9
2006	2306	841690	869197	27507.00	65.03	128.28	1.79	229.5
2007	2406	878190	803001	-75189.00	69.51	124.28	-5.23	-649.5
2008	2519	919435	768746	-150689	95.25	117.72	-1435	-1689.7
2009	2519	919435	780348	-139087	55.96	149.36	-7.78	-1162.5
2010	2519	919435	896043	-23392	73.44	152.67	-17.18	-2622.9
2011	2519	919435	866245	-53190	107.5	153.9	-57.18	-880.8
2012	2519	919435	852777	-66658	109.5	157.5	-73.00	-1149.6
2013	2519	919435	800488	-118947	105.87	157.3	-1259	-1980.9
2014	2519	919435	798542	-120893	96.29	158.55	-1164	-1845.7

Source: Annual Statistical Bulletin OPEC 1999, 2014; 2015; and NNPC 1999, 2014.

APPENDIX 14

Crude Theft

YEAR	Crude Theft(MILLION BARRELS)	CRUDE OIL PRICE(\$/BARREL)	LOSSES TO CRUDE THEFT(MILLION \$)	EXCHANGE RATE(N)	LOSSES TO CRUDE THEFT(BILLION N)
1999	36.5	22.3	813.95	94.9	77.2
2000	36.5	35.76	1305.24	102.48	133.8
2001	36.5	29.23	1066.895	111.6	119.1
2002	36.5	28.5	1040.25	126.56	131.7
2003	36.5	33.86	1235.89	129.79	160.4
2004	36.5	44.81	1635.565	132.86	217.3
2005	36.5	57.57	2101.305	130.84	274.9
2006	36.5	65.03	2373.595	128.28	304.45
2007	36.5	69.51	2537.115	124.28	315.3
2008	36.5	95.25	3476.625	117.72	409.3
2009	36.5	55.96	2042.54	149.36	305.1
2010	36.5	73.44	2680.56	152.67	409.2
2011	36.5	107.5	3923.75	153.9	603.9
2012	36.5	109.5	3996.75	157.5	629.5
2013	36.5	105.87	3864.255	157.3	607.9
2014	36.5	96.29	3514.585	158.55	557.2

Source: Annual Statistical Bulletin OPEC 1999, 2014; NNPC 1999, 2014; CBN 1999, 2014 and Leadership Newspaper (Mar 4 2015 naval chief comment).

APPENDIX 15

Design Inefficiency (From the Actual Yield)

Year	Annual Capacity(Million/barrels)	Standard yield(million/barrels)	Actual yield	Design Inefficiency (million/br)	Design Inefficiency (billion'ltrs)	NNPC Price /litres(n)	Value of design ineff(billion'n)
1999	162.4	84.1	50	34.1	5.4	20	107.7
2000	162.4	84.1	50	34.1	5.4	22	118.5
2001	162.4	84.1	50	34.1	5.4	22	118.5
2002	162.4	84.1	50	34.1	5.4	26	140.1
2003	162.4	84.1	50	34.1	5.4	40	215.5
2004	162.4	84.1	50	34.1	5.4	40	215.5
2005	162.4	84.1	50	34.1	5.4	40	215.5
2006	162.4	84.1	50	34.1	5.4	40	215.5
2007	162.4	84.1	50	34.1	5.4	40	215.5
2008	162.4	84.1	50	34.1	5.4	40	215.5
2009	162.4	84.1	50	34.1	5.4	65	350.1
2010	162.4	84.1	50	34.1	5.4	65	350.1
2011	162.4	84.1	50	34.1	5.4	65	350.1
2012	162.4	84.1	50	34.1	5.4	97	522.5
2013	162.4	84.1	50	34.1	5.4	97	522.5
2014	162.4	84.1	50	34.1	5.4	87	468.6

Note. Annual Capacity (AC) is obtained by multiplying the daily crude allocation by the numbers of the day in a year. The standard yield is calculated by multiplying the annual capacity with the global standard for PMS (0.514). The design yield (from the actual yield) is obtained by multiplying the annual capacity with the actual capacity of the refineries (0.3081). The design inefficiency is therefore obtained by subtracting the design yield from the standard yield. To get the design inefficiency in litres, the design inefficiency in barrels is multiplied by 158 which is the number of litres in a barrel. Finally, the value of design in efficiency in Naira is obtained by multiplying the design inefficiency by the depot price of the product.

Source: Annual Statistical Bulletin OPEC (1999, 2014) and (NNPC 1999, 2014).

APPENDIX 16

Design Inefficiency (From the Design Yield)

YEAR	ANNUAL CAPACITY(MILLION BARRELS)	STANDARD YIELD(MILLION BARRELS)	DESIGN YIELD(MILLION BARRELS)	DESIGN INEFICIENCY(MILLION BARRELS)	DESIGN INEFFICIENCY(MILLION LTRS)	PRICE/LTR	VALUE OF DESIGN INEFFICIENCY(BILLION N)
1999	162.4	84.1	52.5	31.6	50.0	20	100.1
2000	162.4	84.1	52.5	31.6	50.0	22	110.1
2001	162.4	84.1	52.5	31.6	50.0	22	110.1
2002	162.4	84.1	52.5	31.6	50.0	26	130.1
2003	162.4	84.1	52.5	31.6	50.0	40	200.2
2004	162.4	84.1	52.5	31.6	50.0	40	200.2
2005	162.4	84.1	52.5	31.6	50.0	40	200.2
2006	162.4	84.1	52.5	31.6	50.0	40	200.2
2007	162.4	84.1	52.5	31.6	50.0	40	200.2
2008	162.4	84.1	52.5	31.6	50.0	40	200.2
2009	162.4	84.1	52.5	31.6	50.0	65	325.3
2010	162.4	84.1	52.5	31.6	50.0	65	325.3
2011	162.4	84.1	52.5	31.6	50.0	65	325.3
2012	162.4	84.1	52.5	31.6	50.0	97	485.4
2013	162.4	84.1	52.5	31.6	50.0	97	485.4
2014	162.4	84.1	52.5	31.6	50.0	87	435.4

Source: Annual Statistical Bulletin OPEC 1999, 2014; NNPC 1999, 2014

APPENDIX 17

Capacity Underutilization

YEAR	ANNUAL CAPACITY (MILLION BARRELS)	PROCESSED CRUDE (MILLION BARRELS)	CAPACITY UNDERUTILIZED (MILLION BARRELS)	CAPACITY UNDERUTILIZED (%)	PMS LOSSES (MILLION BARRELS)	PMS LOSSES (BILLION LITRES)	PRICE/ LTR	PMS LOSS VALUE (BILLION N)
1999	162.4	66.4	96.0	59	29.6	4.7	20	94
2000	162.4	36.2	126.1	78	38.9	6.1	22	134.2
2001	162.4	81.5	80.91	50	25.0	3.9	22	85.8
2002	162.4	79.5	82.98	51	25.5	4.0	26	104
2003	162.4	44.8	117.6	72	36.2	5.7	40	228
2004	162.4	38.0	124.3	77	38.3	6.1	40	244
2005	162.4	70.6	91.78	56	28.3	4.5	40	180
2006	162.4	43.5	119.9	73	36.7	5.8	40	232
2007	162.4	19.1	143.4	88	44.2	7.0	40	280
2008	162.4	39.3	123.1	76	38.0	6.0	40	240
2009	162.4	17.8	144.7	89	44.6	7.0	65	455
2010	162.4	34.9	127.6	78	39.3	6.2	65	403
2011	162.4	39.4	123.0	75	37.9	6.0	65	390
2012	162.4	33.6	128.8	79	39.7	6.3	97	611.1
2013	162.4	35.2	127.2	78	39.2	6.2	97	601.4
2014	162.4	23.34	139.1	86	42.9	6.8	87	591.6

NOTE. Annual capacity (AC) is obtained by multiplying the daily crude allocation by the numbers of days in a year. The crude processed by the refineries in the year is subtracted from the annual capacity to arrive at the capacity underutilization in barrels. The percentages of capacity underutilization are computed by dividing the capacity underutilization with the annual capacity and multiply the result by 100. To get the value for the PMS losses in barrels, the capacity underutilized (barrels) is multiplied by 0.3081 and to get the losses of PMS in litres the value in barrels is multiplied by 158 in line with the earlier assumptions. The PMS losses in Naira value is obtained by multiplying the PMS losses in litres with the depot price of PMS per litres.

Source: Annual Statistical Bulletin OPEC 1999, 2014; NNPC 1999, 2014.

APPENDIX 18

Refining Inefficiency (Design Inefficiency + Capacity Underutilization)

YEAR	DESIGN INEFFICIENCY(BILLIONS N)	CAPACITY UNDERUTILIZATION (BILLION N)	REFINING INEFFICIENCY (BILLION N)
1999	107.7	94	201.7
2000	118.5	134.2	252.7
2001	118.5	85.8	204.3
2002	140.1	104	244.1
2003	215.5	228	443.5
2004	215.5	244	459.5
2005	215.5	180	395.5
2006	215.5	232	447.5
2007	215.5	280	495.5
2008	215.5	240	455.5
2009	350.1	455	805.1
2010	350.1	403	753.1
2011	350.1	390	740.1
2012	522.5	611.1	1133.6
2013	522.5	601.4	1123.9
2014	468.6	591.6	1060.2

Source: Extract from Tables 4.4 and 4.6

APPENDIX 19

Measures of Excess Import

YEAR	PMS LOSSES(B'LTRS)	RETAIL PRICE OF PMS(GALON/\$)	RETAIL PRICE OF PMS (LTS/\$)	LOSSES TO EXCESS IMPORT(B'\$)	ERN	LOSSES TO EXCESS IMPORT(B'N)
1999	4.7	1.14	0.30	1.4	94.9	132.86
2000	6.1	1.48	0.40	2.4	102.48	245.952
2001	3.9	1.42	0.38	1.4	111.6	156.24
2002	4.0	1.35	0.36	1.4	126.56	177.184
2003	5.7	1.56	0.41	2.4	129.79	311.496
2004	6.1	1.85	0.49	3.0	132.86	398.58
2005	4.5	2.27	0.60	2.7	130.84	353.268
2006	5.8	2.57	0.68	3.9	128.28	500.292
2007	7.0	2.8	0.74	5.2	124.28	646.256
2008	6.0	3.25	0.86	5.2	117.72	612.144
2009	7.0	2.35	0.62	4.4	149.36	657.184
2010	6.2	2.78	0.73	4.6	152.67	702.282
2011	6.0	3.52	0.93	5.6	153.9	861.84
2012	6.3	3.62	0.96	6.0	157.5	945
2013	6.2	3.51	0.93	5.8	157.3	912.34
2014	6.8	3.36	0.89	6.1	158.55	967.155

Source: Annual Statistical Bulletin OPEC (1999, 2014) and (NNPC 1999, 2014).

APPENDIX 20

Augmented Dickey – Fuller (ADF) Unit Root Test

Variables	Order of integration	ADF Statistics	Critical Value
			5%
BB	I(1)	-5.0	-3.1
GE	I(2)	-5.2	-3.1
GR	I(1)	-4.8	-3.1
ORR	I(1)	-4.5	-3.1
NOR	I(2)	-4.9	-3.1
PDEBT	I(2)	-3.7	-3.1
CP	I(2)	-4.9	-3.1
OXP	I(2)	-3.7	-3.1
IMP	I(2)	-5.2	-3.1
M1	I(2)	-4.5	-3.1
CG	I(2)	-3.7	-3.1
CPS	I(2)	-4.9	-3.1
NFA	I(2)	-4.4	-3.1
NDC	I(2)	-4.6	-3.1
KAB	I(2)	-3.4	-3.1
CORD	I(2)	-7.7	-3.1
CORU	I(2)	-3.0	-3.1
NER	I(0)	-6.1	-3.1
NIR	I(1)	-4.7	-3.1

Source: Test Results.

APPENDIX 21
Data Requirements and Sources

S/N	VARIABLES	MEASUREMENT	SOURCES
1	GE		CBN Statistical bulletin (2014)
2	GR		CBN Statistical bulletin (2014)
3	BB		CBN Statistical bulletin (2014)
4	ORR		CBN Statistical bulletin (2014)
5	NOR		CBN Statistical bulletin (2014)
6	CPI		CBN Statistical bulletin (2014)
7	OXP		CBN Statistical bulletin (2014)
8	NER		CBN Statistical bulletin (2014)
9	COP		CBN Statistical bulletin (2014)
10	Y		CBN Statistical bulletin (2014)
11	CG		CBN Statistical bulletin (2014)
12	CPS		CBN Statistical bulletin (2014)
13	NIR		CBN Statistical bulletin (2014)
14	RESV		CBN Statistical bulletin (2014)
15	PC		CBN Statistical bulletin (2014)
16	NDC		CBN Statistical bulletin (2014)
17	NFA		CBN Statistical bulletin (2014)
18	OAN		CBN Statistical bulletin (2014)
19	MI		CBN Statistical bulletin (2014)
20	KAB		CBN Statistical bulletin (2014)
21	CT	Naval Chief Estimate	Leadership Newspaper March 4, 2015.
22	O.P	Differences between OPEC and NNPC Production Quotas	OPEC and NNPC ASB (2014)
23	RI	Comparism with California	OPEC and NNPC ASB (2014)
24	EPM	Out come of RI	OPEC and NNPC ASB (2014)
25	CORU	OP + CT	Computed by the Author
26	CORD	RI +EPM	Computed by the Author
27	CORT	CORU +CORT	Computed by the Author
28	INF		CBN Statistical bulletin (2014)
29	KST		CBN Statistical bulletin (2014)

Source: Author's (2016).

Appendix22

SCENARIOS 1: MEASUREMENT OF THE IMPACT OF OVERPRODUCTION

ENDOGENOUS VARIABLES	% DEVIATION FROM THE BASELINE/YEARS																
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	AVERAGES
PUBLIC ACCOUNT																	
Government Retained Revenue	27.7	25.1	66.4	38.7	34.6	61.4	41.9	12.5	-27.9	-52.9	-44	-8.5	-24.8	-31.7	-49.1	-51.2	1.14
Government Expenditure	19.4	21.4	52	27.2	28.9	53.9	38.1	11.8	-26.5	-52.2	-33.7	-6.3	-18.7	-25	-38.2	-40.3	0.74
Public Debt	-5.4	-3.8	-12.6	-5.4	-6.1	-12.3	-16.5	-10.4	24.9	59.4	30.5	5	13.5	15.2	23.3	19.4	7.4
Oil Revenue	25.3	9.42	30.98	22.52	17.02	22.93	14.59	4.3	-14.5	-25.9	-36.4	-4.9	-9.9	-14.3	-29.1	-27.2	11.1
NATIONAL ACCOUNT																	
National Income	3.9	2.2	7.7	3.6	3.6	6.7	4.8	1.2	-3.1	-7.0	-4.7	-0.5	-1.4	-1.6	-2.5	-2.1	0.7
Private Consumption	7.5	6.1	14.3	5.0	5.0	8.9	6.3	1.9	-4.0	-10.5	-6.1	-1.1	-3.9	-5.9	-9.4	-9.1	0.3
Private Investment	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.0	-0.0	-1.0	-0.1	-0.0	-0.0	-0.1	-0.1	-0.3	-0.1
Imports	86.6	67.9	223.1	76.6	88.5	241.8	87.1	32.3	-84.4	-	-	-14.9	-28.9	-37.5	-81.5	-83.3	21.0
MONEY SURVEY																	
Money Supply	46.7	23.5	64.8	29.3	28.8	57.8	40.3	10.1	-20.8	-34.8	-23.2	-4.7	-13.0	-15.5	-28.2	-26.7	8.4
Net Domestic Credit	29.0	31.8	62.3	20.9	19.6	38.1	30.0	3.2	-24.1	-34.1	-14.8	-3.1	-6.7	-9.1	-13.6	-9.8	7.5
Credit to Government	79.3	38.1	131.2	58.0	78.4	97.9	69.3	17.9	-30.4	-58.8	-35.5	-6.3	-17.7	-23.6	-40.2	-37.6	20
Credit to Private Sector	42.53	28.3	69.2	29.8	32.2	54.1	37.8	10.0	-17.6	-24.3	-12.7	-2.6	-8.3	-7.9	-12.6	-10.8	13
EXTERNAL SECTOR																	
Reserves	64.7	42.3	96.9	46.8	51.4	105	91.1	23.5	-54.4	-109	-70.3	-14.2	-31.6	-31	-38.9	-30.9	8.8
Net Foreign Assets	27.53	11.76	39.25	21.61	25.42	29.08	16.95	3.64	-8.93	-19.8	-15.3	-4.04	-12.3	-12.7	-22.9	-26.0	3.33

Source: Author's computation from the E-views version 9 (2016)

Appendix 23

SCENARIOS 2: MEASUREMENT OF THE IMPACT OF CRUDE THEFT

ENDOGENOUS VARIABLES	% DEVIATION FROM THE BASELINE/YEARS																
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	AVERAGE
PUBLIC ACCOUNTS																	
GR	0.12	0.22	0.14	0.14	0.12	0.13	0.13	0.13	0.11	0.11	0.1	0.1	0.11	0.11	0.10	0.10	0.12
GE	0.09	0.19	0.11	0.1	0.1	0.11	0.12	0.12	0.1	0.11	0.06	0.06	0.08	0.09	13.0	13.0	1.72
PDEBT	-0.02	-0.03	-0.03	-0.02	-0.02	-0.02	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.03	-0.07
ORR	0.11	0.0	0.06	0.08	0.06	0.05	0.04	0.05	0.06	0.05	0.06	0.05	0.04	0.05	0.06	0.05	0.05
NATIONAL ACCOUNT																	
Y	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.00	0.01
PC	0.03	0.05	0.03	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.02	0.02
IP	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.00	0.00	0.00	0.00
IMP	0.39	0.59	0.46	0.28	0.30	0.50	0.26	0.34	0.33	0.26	0.19	0.15	0.13	0.13	0.16	0.16	0.29
MONEY SURVEY																	
M1	0.21	0.20	0.13	0.11	0.10	0.12	0.12	0.11	0.08	0.07	0.04	0.05	0.06	0.05	0.06	0.05	0.10
NDC	0.13	0.28	0.12	0.07	0.06	0.07	0.09	0.03	0.09	0.07	0.02	0.03	0.02	0.031	0.03	0.02	0.07
CG	0.35	0.33	0.27	0.21	0.27	0.20	0.21	0.19	0.12	0.12	0.06	0.06	0.08	0.08	0.08	0.07	0.17
CPS	0.19	0.25	0.14	0.11	0.11	0.11	0.11	0.10	0.07	0.05	0.02	0.03	0.04	0.03	0.02	0.02	0.09
EXTERNAL SECTOR																	
RESV	0.29	0.37	0.2	0.17	0.17	0.22	0.28	0.25	0.21	0.23	0.12	0.15	0.14	0.11	0.08	0.06	0.19
NFA	0.12	0.10	0.08	0.08	0.09	0.06	0.05	0.04	0.03	0.04	0.03	0.04	0.05	0.04	0.05	0.05	0.06

Source: Author's computation from the E-views version 9 (2016)

Appendix 24

SCENARIO 3 MEASUREMENT OF THE IMPACT OF DESIGN INEFFICIENCY (ACTUAL YIELD)

ENDOGENOUS VARIABLE	% DEVIATION FROM THE BASELINE/YEARS																
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	AVERAGE
PUBLIC ACCOUNTS																	
GR	16.3	19.9	14.9	19.6	21.1	17.2	13	11.7	9.2	6.8	13.3	11.3	9.9	14.4	13	13	14.0
GE	11.4	16.9	11.6	13.8	17.6	15.1	11.8	11.1	8.8	6.7	10.1	8.4	7.4	11.4	10.1	10.2	11.4
PDEBT	-3.2	-3	-2.8	-2.8	-3.7	-3.4	-5.1	-9.8	-8.3	-7.6	-9.2	-6.7	-5.4	-6.9	-6.2	-4.9	-5.56
ORR	14.87	7.44	6.94	11.39	10.39	6.42	4.53	4.08	4.83	3.30	10.97	6.49	3.94	6.51	7.67	6.90	7.29
NATIONAL ACCOUNT																	
Y	2.30	1.77	1.72	1.80	2.17	1.89	1.47	1.16	1.04	0.89	1.41	0.64	0.56	0.73	0.65	0.53	1.30
PC	4.39	4.78	3.21	2.53	3.06	2.49	1.95	1.82	1.32	1.33	1.84	1.53	1.53	2.67	2.47	2.30	2.45
IP	0.03	0.03	0.03	0.03	0.04	0.03	0.02	0.01	0.01	0.12	0.02	0.02	0.02	0.02	0.02	0.07	0.03
IMP	50.87	53.67	49.98	38.73	54.02	67.75	27.03	30.32	28.05	16.38	32.76	19.93	11.50	17.05	21.51	21.16	33.79
MONEY SURVEY																	
MI	27.40	18.58	14.51	14.81	17.59	16.19	12.49	9.45	6.92	4.44	6.98	6.28	5.17	7.04	7.43	6.78	11.38
NDC	17.04	25.11	13.96	10.54	11.95	10.67	9.32	3.02	8.02	4.35	4.45	4.12	2.67	4.11	3.59	2.48	8.46
CG	46.57	30.11	29.40	29.29	47.83	27.42	21.48	16.79	10.11	7.51	10.71	8.42	7.03	10.70	10.60	9.55	20.22
CPS	24.98	22.34	15.49	15.05	19.65	15.164	11.72	9.41	5.87	3.11	3.83	3.45	3.28	3.57	3.32	2.74	10.18
EXTERNAL SECTOR																	
RESV	38	33.4	21.7	23.7	31.3	29.4	28.3	22.1	18	13.9	21.2	19	12.6	14.1	10.2	7.9	21.55
NFA	16.16	9.29	8.79	10.93	15.52	8.15	5.26	3.41	2.97	2.52	4.61	5.38	4.90	5.78	6.03	6.60	7.27

Source: Author's computation from the E-views version 9 (2016)

Appendix 25

SCENARIO 4 MEASUREMENT OF THE IMPACT OF DESIGN INEFFICIENCY (DESIGN YIELD)

ENDO GENO US VARI ABLES	% DEVIATION FROM THE BASELINE/YEARS																AVERA GE
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
PUBLIC ACCOUNTS																	
GR	15.1	18.4	13.8	18.2	19.6	16	12.1	10.9	8.6	6.3	12.3	10.5	9.2	13.4	12.1	12.1	13.03
GE	10.6	15.7	10.8	12.8	16.3	14	11	10.3	8.2	6.2	9.4	7.8	6.9	10.5	9.4	9.5	10.6
PDEBT	-3	-2.8	-2.6	-2.6	-3.5	-3.2	-4.7	-9.1	-7.7	-7	-8.5	-6.2	-5	-6.4	-5.7	-4.6	-5.2
ORR	13.82	6.92	6.45	10.57	9.65	5.97	4.20	3.79	4.49	3.07	10.19	6.03	3.66	6.05	7.13	6.41	6.8
NATIONAL ACCOUNT																	
Y	2.4	1.64	1.60	1.67	2.02	1.74	1.37	1.08	0.97	0.82	1.31	0.60	0.52	0.68	0.61	0.49	1.20
PC	4.08	4.44	2.99	2.35	2.84	2.32	1.81	1.69	1.23	1.24	1.71	1.42	1.42	2.48	2.29	2.14	2.28
IP	0.03	0.03	0.02	0.03	0.03	0.03	0.02	0.01	0.01	0.12	0.02	0.02	0.02	0.02	0.02	0.06	0.03
IMP	47.28	49.86	46.44	35.97	50.19	62.94	25.11	28.17	26.06	15.22	30.44	18.51	10.69	15.84	19.98	19.66	31.40
MONEY SURVEY																	
M1	25.46	17.27	13.48	13.75	16.34	15.04	11.60	8.78	6.42	4.12	6.48	5.84	4.80	6.54	6.90	6.29	10.57
NDC	15.84	23.33	12.97	9.79	11.10	9.91	8.65	2.80	7.45	4.04	4.14	3.83	2.47	3.82	3.34	2.31	7.86
CG	43.28	27.98	27.31	27.20	44.44	25.48	19.96	15.60	9.39	6.97	9.95	7.83	6.53	9.94	9.84	8.87	18.79
CPS	2322	20.76	14.39	13.98	18.26	14.08	10.89	8.74	5.44	2.88	3.56	3.20	3.05	3.31	3.08	2.54	9.46
EXTERNAL SECTOR																	
RESV	35.3	31	20.2	22	29.1	27.3	26.3	20.5	16.8	12.9	19.7	17.6	11.7	13.1	9.5	7.3	20.02
NFA	15.02	8.64	8.17	10.15	14.42	7.57	4.89	3.17	2.76	2.34	4.28	5.00	4.56	5.37	5.61	6.13	6.75

Source: Author's computation from the E-views version 9 (2016)

Appendix 26

SCENARIOS 5: MEASUREMENT OF THE IMPACT OF EXCESS IMPORT

ENDO GENO US VARIA BLES	% DEVIATION FROM THE BASELINE/YEARS																
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	AVERAGE
PUBLIC ACCOUNTS																	
GR	20.1	41.2	19.6	24.7	30.4	31.8	21.3	27.2	27.7	19.2	24.9	22.7	24.3	26	22.6	26.9	24.58
GE	14	35.1	15.4	17.4	25.4	28	19.4	25.8	26.4	18.9	19	16.7	18.3	20.5	17.6	21.1	21.19
PDEBT	-4	-6.2	-3.7	-3.5	-5.4	-6.4	-8.4	-22.7	-24.8	-21.5	-17.2	-13.4	-13.2	-12.5	-10.7	-10.1	-11.48
ORR	18.3	15.5	9.2	14.4	15.0	11.9	7.4	9.5	14.5	9.4	20.6	13.0	9.7	11.8	13.4	14.2	12.99
NATIONAL ACCOUNT																	
Y	2.84	3.67	2.27	2.27	3.14	3.49	2.42	2.69	3.13	2.52	2.65	1.29	1.37	1.32	1.14	1.09	2.33
PC	5.41	9.92	4.24	3.20	4.42	4.61	3.19	4.23	3.98	3.80	3.46	3.07	3.78	4.84	4.31	4.75	4.45
IP	0.04	0.06	0.03	0.04	0.05	0.06	0.04	0.03	0.03	0.35	0.04	0.05	0.04	0.04	0.04	0.13	0.07
IMP	62.76	111.4	65.90	48.99	78.09	125.	44.3	70.39	84.13	46.53	61.49	39.97	28.32	30.84	37.55	43.66	61.21
MONEY SURVEY																	
M1	25.46	17.27	13.48	13.75	16.34	15.0	11.6	8.78	6.42	4.12	6.48	5.84	4.80	6.54	6.90	6.29	10.57
NDC	21.02	52.11	18.40	13.33	17.27	19.7	15.3	7.01	24.04	12.36	8.36	8.26	6.56	7.44	6.28	5.12	15.16
CG	57.44	62.49	38.75	37.04	69.14	50.7	35.2	38.98	30.31	21.31	20.1	16.89	17.30	19.4	18.5	19.8	34.58
CPS	30.81	46.38	20.43	19.04	28.41	28.0	19.2	21.84	17.56	8.82	7.18	6.91	8.08	6.46	5.80	5.65	17.54
EXTERNAL SECTOR																	
RESV	46.9	69.3	28.6	30	45.2	54.4	46.3	51.3	54.1	39.5	39.7	38.1	31	25.5	17.9	16.2	39.63
NFA	19.94	19.29	11.59	13.82	22.44	15.1	8.62	7.93	8.89	7.16	8.65	10.80	12.07	10.45	10.54	13.63	12.56

Source: Author's computation from the E-views version 9 (2016)

Appendix 27

SCENARIO 6 MEASUREMENT OF THE IMPACT OF CAPACITY UNDERUTILIZATION

ENDOGENOUS VARIABLES	% DEVIATION FROM THE BASELINE/YEARS																AVERAGE
	1999	2000	2001	2001	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
PUBLIC ACCOUNTS																	
GR	14.2	22.5	10.8	14.5	22.3	19.5	10.8	12.6	12	7.5	17.2	13	11	16.8	14.9	16.4	14.8
GE	9.9	19.1	8.4	10.2	18.6	17.1	9.9	12	11.4	7.4	13.2	9.6	8.3	13.3	11.6	12.9	12.06
PDEBT	-2.8	-3.4	-2	-2	-3.9	-3.9	-4.3	-10.5	-10.7	-8.4	-11.9	-7.7	-6	-8.1	-7.1	-6.2	-6.18
ORR	13.0	8.4	5.0	8.5	11.0	7.3	3.8	4.4	6.3	3.4	14.3	7.47	4.39	7.61	8.83	8.71	16.91
NATIONAL ACCOUNT																	
Y	2.01	2.00	1.24	1.33	2.30	2.14	1.23	1.25	1.36	0.99	1.84	0.74	0.62	0.85	0.75	0.66	1.33
PC	3.83	5.41	2.33	1.88	3.24	2.83	1.63	1.96	1.72	1.49	2.39	1.76	1.71	3.13	2.84	2.91	2.57
IP	0.03	0.03	0.02	0.02	0.04	0.03	0.02	0.02	0.01	0.14	0.03	0.03	0.02	0.03	0.023	0.08	0.04
IMP	44.40	60.78	36.19	28.75	57.16	76.71	22.58	32.64	36.45	18.24	42.58	22.94	12.81	19.94	24.76	26.71	35.23
MONEY SURVEY																	
M1	23.91	21.04	10.51	10.99	18.61	18.34	10.43	10.17	8.99	4.94	9.07	7.23	5.76	8.23	8.55	8.55	11.58
NDC	14.87	28.43	10.11	7.82	12.64	12.08	7.78	3.25	10.42	4.85	5.79	4.74	2.97	4.81	4.14	3.13	8.61
CG	40.64	34.10	21.29	21.74	50.61	31.05	17.94	18.08	13.13	8.36	13.91	9.69	7.83	12.52	12.20	12.06	20.32
CPS	21.80	25.30	11.22	11.18	20.79	17.16	9.79	10.13	7.61	3.46	4.97	3.97	3.66	4.17	3.82	3.45	10.16
EXTERNAL SECTOR																	
RESV	33.2	37.8	15.7	17.6	33.1	33.3	23.6	23.8	23.4	15.5	27.5	21.8	14	16.5	11.8	9.9	22.41
NFA	14.11	10.53	6.37	8.11	16.42	9.23	4.39	3.68	3.85	2.81	5.99	6.19	5.4	6.76	6.95	8.33	7.45

Source: Author's computation from the E-views version 9 (2016)

Appendix28

SCENARIOS 7: MEASUREMENT OF THE IMPACT OF IMPORT DUE TO REFINING INEFFICIENCY

ENDOGENOUS VARIABLES	% DEVIATION FROM THE BASELINE/YEARS																AVERAGE
	1999	2000	2001	2001	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
PUBLIC ACCOUNTS																	
GR	16.3	19.9	14.9	19.6	21.1	17.2	13	11.8	9.3	6.8	13.3	11.4	9.9	14.4	13	13.0	14.06
GE	11.4	16.9	11.7	13.8	17.6	15.1	11.8	11.1	8.8	6.7	10.2	8.4	7.4	11.4	10.1	10.3	11.42
PDEBT	-3.2	-3	-2.8	-2.8	-3.7	-3.5	-5.1	-9.8	-8.3	-7.6	-9.2	-6.7	-5.4	-6.9	-6.2	-4.9	-5.57
ORR	14.88	7.45	6.94	11.39	10.40	6.43	4.53	4.08	4.83	3.30	10.98	6.50	3.95	6.52	7.68	6.91	7.30
NATIONAL ACCOUNT																	
Y	2.30	1.77	1.72	1.80	2.18	1.89	1.48	1.16	1.04	0.89	1.41	0.64	0.56	0.73	0.65	0.53	1.30
PC	4.39	4.79	3.22	2.53	3.06	2.50	1.95	1.82	1.33	1.34	1.85	1.53	1.53	2.68	2.47	2.30	2.46
IP	0.03	0.03	0.03	0.03	0.04	0.03	0.02	0.01	0.01	0.12	0.02	0.02	0.02	0.02	0.02	0.07	0.03
IMP	50.92	53.73	50.02	38.76	54.08	67.82	27.05	30.35	28.08	16.39	32.80	19.94	11.52	17.07	21.53	21.18	33.83
MONEY SURVEY																	
MI	27.42	18.60	14.52	14.82	17.60	16.21	12.50	9.46	6.92	4.44	6.99	6.29	5.18	7.05	7.44	6.78	11.39
NDC	17.05	25.13	13.97	10.55	11.96	10.68	9.32	3.02	8.03	4.36	4.46	4.12	2.66	4.12	3.59	2.48	8.47
CG	46.61	30.14	29.41	29.31	47.89	27.45	21.50	16.81	10.12	7.51	10.72	8.43	7.04	10.71	10.60	9.56	20.24
CPS	25.00	22.37	15.50	15.07	19.67	15.18	11.73	9.42	5.86	3.11	3.83	3.45	3.29	3.57	3.32	2.74	10.19
EXTERNAL SECTOR																	
RESV	38	33.5	21.7	23.7	31.3	29.5	28.3	22.1	18.1	13.9	21.2	19	12.6	14.1	10.3	7.9	21.58
NFA	16.18	9.30	8.79	10.93	15.54	8.16	5.26	3.42	2.97	2.52	4.62	5.39	4.91	5.78	6.04	6.61	7.28

Source: Author's computation from the E-views version 9 (2016)

Appendix 29

SCENARIOS 8 MEASUREMENT OF THE IMPACT OF CORU

ENDOGENOUS VARIABLES	% DEVIATION FROM THE BASELINE/YEARS																AVERAGE
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
PUBLIC ACCOUNTS																	
GR	39.3	47.5	81.3	57.1	50.2	78.8	58.4	29.1	-14.3	-40.1	-32.4	4.8	-7.8	-14.3	-34	-35.8	16.7
GE	19.4	21.6	-649.7	27.3	29	54	38.3	11.9	-26.4	-52	-33.6	-6.2	-18.6	-24.9	-38.1	-40.3	-43.0
PDEBT	-5.5	-3.8	157.7	-5.5	-6.1	-12.3	-16.5	-10.5	24.8	59.3	30.4	5	13.4	15.2	23.3	19.3	18.0
ORR	35.97	17.83	37.95	33.22	24.75	29.41	20.36	10.1	-7.47	-19.6	26.85	2.72	-3.11	-6.48	20.15	18.96	6.9
NATIONAL ACCOUNT																	
Y	5.57	4.23	9.39	5.25	5.18	8.65	6.64	2.88	-1.61	-5.27	-3.46	0.27	-0.44	-0.73	-1.71	-1.45	2.1
PC	10.62	11.45	17.57	7.38	7.29	11.42	8.76	4.51	-2.05	-7.96	-4.51	0.64	-1.21	-2.66	-6.47	-6.33	3.0
IP	0.07	0.07	0.14	0.09	0.09	0.14	0.1	0.04	-0.02	-0.74	-0.06	0	-0.01	-0.02	-0.06	-0.18	-0.02
IMP	123.09	128.53	273.34	113.1	128.7	310.2	121.6	75.1	-43.4	-97.3	-80.2	8.34	-9.08	-17	-56.5	-58.2	57.5
MONEY SURVEY																	
M1	66.29	44.5	79.36	43.21	41.89	74.14	56.2	23.42	-10.7	-26.4	-17.1	2.63	-4.08	-7	-19.5	-18.6	20.5
NDC	41.23	60.12	76.34	30.76	28.46	48.83	41.92	7.48	-12.4	-25.9	-10.9	1.72	-2.14	-4.09	-9.44	-6.82	16.6
CG	112.7	72.11	160.8	85.5	114	125.6	96.7	41.6	-15.6	-44.6	-26.2	3.5	-5.6	-10.7	-27.8	-26.3	40.98
CPS	60.44	53.5	84.72	43.94	46.82	69.39	52.75	23.35	-9.06	-18.4	-9.37	1.4	-2.59	-3.55	-8.71	-7.52	23.57
EXTERNAL SECTOR																	
RESV	65	42.7	-1211.6	47	51.6	105.2	91.4	23.7	-54.2	-109	-70.2	-14	-31.5	-30.9	-38.8	-30.9	-72.78
NFA	39.11	22.26	48.09	31.89	36.98	37.3	23.66	8.47	-4.59	-15	-11.3	2.25	-3.87	-5.75	-15.9	-18.2	10.96

Source: Author's computation from the E-views version 9 (2016)

Appendix 30

SCENARIOS 9 MEASUREMENT OF THE IMPACT OF CORD

ENDOGENOUS VARIABLES	% DEVIATION FROM THE BASELINE/YEARS																AVERAGE
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
PUBLIC ACCOUNTS																	
GR	50.5	83.5	45.2	58.8	73.8	68.5	45.1	51.6	48.9	33.4	55.3	47.1	45.1	57.3	50.5	56.3	54.4
GE	25.4	52	27	31.2	43	43.1	31.2	37	35.2	25.6	29.2	25.1	25.7	31.9	27.7	31.4	32.61
PDEBT	-7.1	-9.1	-6.6	-6.2	-9.1	-9.8	-14	-33	-33	-29	-26	-20	-19	-19	-17	-15	-17.06
ORR	46.2	31.3	21.1	34.2	36.4	25.6	15.7	17.9	25.6	16.4	45.8	27.0	18.0	25.9	29.9	29.8	27.93
NATIONAL ACCOUNT																	
Y	7.15	7.43	5.23	5.40	7.62	7.52	5.12	5.11	5.53	4.39	5.90	2.66	2.54	2.90	2.54	2.28	4.96
PC	13.6	20.1	9.78	7.60	10.7	9.93	6.76	8.01	7.03	6.64	7.70	6.37	7.01	10.6	9.61	9.96	9.47
IP	0.09	0.12	0.08	0.09	0.13	0.12	0.08	0.06	0.06	0.61	0.10	0.10	0.08	0.10	0.09	0.28	0.14
IMP	158	226	152	117	189	270	93.9	133	149	81.2	137	82.8	52.6	67.8	83.8	91.5	130.2
MONEY SURVEY																	
M1	85.1	78.2	44.2	44.5	61.6	64.5	43.4	41.6	36.6	21.9	29.2	26.1	23.7	28.0	28.9	29.3	42.9
NDC	52.9	106	42.5	31.7	41.9	42.5	32.4	13.3	42.5	21.6	18.6	17.1	12.2	16.4	14.0	10.7	32.2
CG	145	127	89.4	88.1	168	109	74.7	73.9	53.6	37.2	44.7	35.0	32.2	42.6	41.3	41.3	75.1
CPS	77.6	94.0	47.1	45.2	68.9	60.4	40.7	41.8	31.0	15.4	15.9	14.3	15.0	14.2	12.9	11.8	37.9
EXTERNAL SECTOR																	
RESV	84.9	103	50.3	53.7	76.6	83.9	74.6	73.5	72.1	53.4	60.9	57	43.5	39.6	28.2	24	61.19
NFA	50.2	39.1	26.8	32.9	54.4	32.5	18.3	15.2	15.7	12.5	19.3	22.3	22.4	22.9	23.5	28.6	27.3

Source: Author's computation from the E-views version 9 (2016)

Appendix 31

SCENARIOS 10: (MEASUREMENT OF THE IMPACT OF CORT)

ENDOGENOUS VARIABLES	% DEVIATION FROM THE BASELINE/YEARS																AVERAGE
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
PUBLIC ACCOUNTS																	
GR	89.8	131	126.6	115.8	124	147.3	103.5	80.7	34.6	-6.7	22.9	51.9	37.3	42.9	16.5	20.5	71.2
GE	44.8	73.6	-622.7	58.5	72	97.1	69.5	48.9	8.8	-26.5	-4.4	18.9	7.1	7	-10.4	-8.9	-10.4
PDEBT	-12.6	-12.9	151.1	-11.7	-15.2	-22.1	-30	-43	-8.2	30.2	4	-15.1	-5.2	-4.3	6.4	4.3	0.98
ORR	82.16	49.16	59.07	67.45	61.15	54.99	36.08	28.03	18.11	-3.25	18.9	29.7	14.9	19.4	9.75	10.88	34.79
NATIONAL ACCOUNT																	
Y	12.72	11.65	14.63	10.65	12.79	16.17	11.76	7.98	3.91	-0.87	2.44	2.93	2.10	2.17	0.83	0.83	7.04
PC	24.25	31.57	27.35	14.98	18.00	21.36	15.52	12.52	4.98	-1.32	3.19	7.01	5.80	7.98	3.13	3.63	12.50
IP	0.16	0.19	0.22	0.18	0.21	0.26	0.18	0.10	0.04	-0.12	0.04	0.11	0.07	0.07	0.03	0.10	0.12
IMP	281.1	354.4	425.4	229.5	317.9	579.9	215.5	208.50	105.2	-16.1	56.7	91.2	43.6	50.9	27.3	33.36	187.8
MONEY SURVEY																	
M1	51.4	122.7	123.50	7.73	03.5	138.6	9.60	64.98	5.94	4.37	12.1	28.8	19.6	20.9	9.44	0.68	63.44
NDC	94.17	165.8	118.80	62.44	70.31	91.31	74.28	20.73	30.07	-4.29	7.69	18.4	10.1	12.3	4.57	3.92	48.81
CG	257.3	198.8	250.22	173.6	281.6	234.8	171.3	115.46	37.92	-7.39	18.5	38.6	6.6	31.9	13.5	15.06	116.10
CPS	138.3	147.5	131.85	89.22	115.7	129.8	93.48	64.69	21.97	-3.06	6.62	15.8	12.4	10.6	4.21	4.31	61.45
EXTERNAL SECTOR																	
RESV	149.9	145.4	-1161.2	100.7	128.1	189.1	166	97.2	17.9	-55.4	-9.3	43	12.1	8.7	-10.6	-6.8	-11.58
NFA	89.32	61.37	74.85	64.75	1.37	69.75	41.93	23.49	11.12	-2.48	7.97	24.6	18.5	17.2	7.67	10.41	38.25

Source: Author's computation from the E-views version 9 (2016)

Appendix 32

The Summary of the Macroeconomic Impact of Scenarios on the Various Accounts in the Model (%)

THE ACCOUNTS	Scenario1 (Overproduction)	Scenario2 (Crude Theft)	Scenario3 Design inefficiency(A.Y)	Scenario4 Design inefficiency(D.Y)	Scenario5 Excess import	Scenario6 Capacity underutilization.	Scenario7 Import due to refinery inefficiency	Scenario8 CORU	Scenario9 CORD	Scenario 10 CORT
Public Account	5.1	4.3	9.43	10.08	16.32	11.26	33.27	1.47	28.31	3.59
National Account	5.5	0.08	9.39	8.73	17.02	9.79	9.41	15.66	36.19	51.87
Money Survey	12.2	0.11	12.56	11.67	19.46	12.67	12.57	25.41	47.03	71.45
External Account	6.1	4.2	14.41	13.39	26.10	14.94	4.93	30.91	44.25	13.34

Source: Author's computation extract from Tables 4.9 - 4.18