AN ECONOMETRIC STUDY OF TANKER SHIPPING SERVICES IN NIGERIA

BY

OKEKE OKECHUKWU KENNETH (B.TECH)

(20114772568)

A THESIS SUBMITTED TO

THE POSTGRADUATE SCHOOL,

FEDERAL UNIVERSITY OF TECHNOLOGY, OWERRI.

IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF MASTER OF SCIENCE IN MARITIME MANAGEMENT TECHNOLOGY.

OCTOBER, 2014

CERTIFICATION

We hereby certify that this work was carried out by OKEKE OKECHUKWU KENNETH of the Department of Maritime Management Technology of Federal University of Technology, Owerri.

BY

…… ……. DATE……..
PROF. K. U. NNADI
SUPERVISOR

. …… DATE… ……
PROF. K. U. NNADI
HOD

……..
PROF.S.M.NZOTTA DATE…….
DEAN SMAT

…….
ENGR.PROF.K.B.OYOH DATE…… ……
DEANPOSTGRADUATE SCHOOL

……...
PROF.U.J.F.EWURUM DATE……...
EXTERNAL EXAMINER

DEDICATION

This work is dedicated to God Almighty through my Lord Jesus Christ and to my beloved brother, Okeke Chika Charles.

ACKNOWLEDGEMENT

1 wish to share my profound gratitude with first and foremost, my God, the father of my Lord Jesus Christ, who has made this dream come true. This was something that was conceived of some years ago, but could only come true now. To Him glory and praise forever more. Permit me to say a big 'thank you' to Prof. K.U. Nnadi (HOD and my able supervisor) may God bless you. Topping the list here is my colleagues-Engr. (Dr). A.I Nwokoro, Dr. Obed Ndikom, Dr. G.C Emeghara, Dr. C. Onyemaechi, Mr. Donatus Onwuegbchulam and Mr. I.C. Nze, for your encouragements. To you my class mate (M.Sc. Programme) I salute you all. I will not forget my Dean (School of Management Technology) in the person of Prof. S.M. Nzotta, for your fatherly advice and assistance throughout this period. My appreciation also goes to Dean Postgraduate School, Engr. (Prof.) K.B Oyoh, for her assistance and the computer operator who helped me to arrange this work. Finally, to the library people and to everyone who help in one way or the other to make vision a reality.

TABLE OF CONTENTS

CHAPTER ONE

CHAPTER TWO

CHAPTER THREE

CHAPTER FOUR

CHAPTER FIVE

LIST OF TABLES

LIST OF GRAPHS

ABSTRACT

This research work titled ''An Econometric Study of tanker Shipping services in Nigeria'' aimed at examining the demand for tanker shipping services with the resultant crude oil to be exported from Nigeria to other parts of the world using a time series regression approach and correlations. The objective is to ascertain whether the demand for tanker vessels (tonnage) corresponds with the resultant volume of the crude oil available at oil terminal to be exported. Our findings using time series regression (Ordinary least square) approach with the trend equations(Y_t = -31483.776 + 16.10t,Y_t = -15071.381 + 7.91t,and Y = 497.1 + 0.232X_1 + 1.259E-006X_2 + e) and correlation shows that there is a correlation between the volumes of crude oil export and the capacity(tonnage) of crude oil tankers,change in the number of crude oil vessels that lift oil from Nigeria and the volume of crude oil production over the years in view, and there will be more number of crude oil vessels required to export crude oil if productioncontinues to increase. Finally, recommendations were made which includes: encouragement of local participations, check of ugly trends (such as the activities of the restiveness of Niger-Delta Youths, sabotage from the government juggernauts), liberalization in the oil sector, more investment in the oil industry and re-orientation of both the government and individuals. Based on the findings, we conclude that if increase in crude oil production persists; demand for tanker shipping services will increase because its demand depends on crude oil availability (derived demand).

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Shipping firms provide global shipping services transporting cargoes to meet the demand for sea transport services (Kendall and Buckley, 2001). Generally speaking, carriage of goods does not take place unless there is need for cargoes to be delivered from production to consumption areas. Demand for tanker shipping services is derived from the trade between buyers and sellers in the energy trade market. As demand for tanker shipping service is a derived demand, seaborne trade is a crucial variable in tanker shipping market.

Damu and Bacon (2004) state that "oil rules Nigeria". This assertion is true because over 90% of Nigeria's annually generated revenue (AGR) comes from crude oil and its products. Moreover, oil tanker is designed for the bulk transport of oil. Basic types of tankers include: crude tanker and product tanker. In addition, tankers are generally categorized by size, e.g., Panama, Aframax, Suezmax, VLCC, and ULCC.

In the course of this research, crude oil tanker is our focus. Crude tanker transports unrefined crude oil from extraction locations (Nigeria) to refineries (Abroad), while product tanker ships refined products to points close to consuming markets.

In his words, the secretary of International Maritime Organization (IMO), tanker is the second largest fleet of the world: numbering 11,356 as at January 1, 2005. More so, tanker shipping is the determinant factor of crude oil lifting all over the world with Nigeria inclusive. Nigeria is the 6th most oil producing country (OPEC Annual Report, 2009). Based on this, there is need for Nigerians to invest more in oil industry especially venturing into tanker shipping. One of the main objectives of this research centers on exposing those benefits that accrue to tanker shipping which Nigerians have neglected over the years.

The technology of oil transportation has evolved alongside the oil industry. Although anthropogenic use of oil reaches to prehistory, the first modern commercial exploitation dates back to James Young's manufacture of paraffin in 1850. In these early days, oil from upper Burma was moved in earthenware vessels to the river bank where it was then poured into boat holds.

In the 1850s, the Pennsylvania oil fields became a major supplier of oil, and a center of innovation after Edwin Drake had struck oil near Titusville, Pennsylvania. The first oil well in the United States was dug in 1859, initially yielding around ten (10) barrels per day. By 1871, the Pennsylvania oil fields were making limited use of oil tank barges and cylindrical railroad tank-car similar to those in use today. In 1876, Ludvig and Robert Nobel founded Bra-noble (short for brothers Noble) in the Russian Empire, active mostly in the oil rich region around

Baku (now Azerbaijan). During the late 19th century, Bra-noble was one of the largest oil companies in the world. Ludvig was a pioneer in the development of early oil tankers. The world's first successful oil tanker was Noble's Zoroaster. Zoroaster carried its 242 long tons of Kerosene cargo in two iron tanks joined by pipes.

In 1903, the Nobel brothers built two oil tankers which ran on internal combustion engines as opposed to the older steam engines. The Vandal, the first diesel-electric ship, was capable of carrying 750 long tons of refined oil and was powered by three 120 horse power (89kw) diesel motors. In addition, tankers have grown significantly in size since world war 11.The world's largest supertanker was built in 1979 at the Oppama shipyard by Sumitomo Heavy Industries Limited as the Sea wise Giant. This ship was built with a capacity of 564,763 DTW, a length overall of 458.45 meters (1,504.1Ft) and a draft of 24.611 meters (80.74Ft).As of 2011, the world's two largest working supertankers are the T1 class supertankers: T1 Europe and T1 Oceania. With the exception of the pipeline, the tanker is the most cost-effective way to move oil today. Worldwide, tankers carry some two (2) billion barrels ($3.2x10^{11}$) annually and the cost of transportation by tankers amounts to only US $00.2 per gallon at the pump.

1.2 Problem Statement

Tanker shipping services provided by shipping firms aim to meet the demand for sea transport services. Tanker shipping services derived demand from the seaborne energy trade. Therefore, crude oil export from Nigeria to other part of the world (Abroad) required a corresponding number of crude oil tankers. Although some scholars have done a great work on related topics but there is still a gap between the demands for tanker ships needed to export crude oil so as to meet up with the quota given to Nigeria by the Organization of petroleum exporting countries (OPEC). Therefore, there is the need for Nigerians to partake in the ventures that go-on on their own doorsteps.

Our target is to assess whether the demand commensurate with the resultant crude oil to be exported. Over the years, under-supply of crude oil to the outside world as expected by Nigeria (OPEC quota) has been a recurring decimal. The carriage of oil on the sea has been a problem due to tanker accidents/mishaps resulting to a great loose both to individuals and government.

It is on this background, therefore, that there is the need for Nigerians to invest in the business of tanker shipping services. This research aimed at comparing the volume of crude oil export of Nigeria to the other parts of the world and the corresponding number of tanker ships lifting oil from Nigeria using time series

analysis and regression. By so doing, Nigerian potential investors may now develop interest in the sector. It is a well known fact that the shipping market is highly influenced by certain factors. The restiveness in the Niger-Delta region from which the bulk of this oil comes, is one of such influences. The effect of such influences and its attendant consequences on tanker shipping in Nigeria is pertinent enough here to study. With seasonality in demand, the highest demand for both Nigerian crude oil and tanker shipping are made and inferences drawn.

1.3 Objectives of the Study

The main aim of this thesis is to carry out an analysis of demand for tanker shipping services in Nigeria using a time series regression approach. Therefore, the following objectives will be a guide to this research work:

a. To compare the volumes of crude oil export to the capacities (tonnage) of tanker ships that lift oil from Nigeria.
b. To calculate the trend of vessels availability.
c. To determine the trend of crude oil exports from Nigeria
d. To forecast crude oil tanker requirement for crude oil export to other parts of the world.

1.4 Research Hypothesis

This research work seeks to test these four hypotheses:

a. There is a correlation between the volumes of crude oil export and the capacity of crude oil tankers that lift oil from Nigeria.
b. There is a positive change in the number of crude oil vessels that lift oil from Nigeria (1997-2011)
c. There is a positive change in the volumes of crude oil exported from Nigeria (1997-2011).
d. There will be more number of crude oil vessels required for crude oil export in future.

1.5 Significance of the Study

The importance of this research cannot be over emphasized. Its significance includes: exposing hidden treasures in tanker shipping which many Nigerians are ignorant of and changing people's attitude toward sea transport (tanker shipping).

This work will also encourage the government to put up good measures so as to meet up with the quota allotted to Nigeria by OPEC. This will be useful to scholars who may have interest in carry-out research on related topics and also to the investors in maritime environment. In addition, it will expose much in terms of demand for tanker shipping services in Nigeria and beyond.

1.6 Scope of the Study

This work will be limited to crude oil tanker shipping in Nigeria (export) as earlier stated. This crude oil comes from Niger-Delta region such as Escravos, Bonny, Okpokiti, Obe, etc. The analysis will be based on fifteen(15) years (1997-2011) time series.

1.7 Limitations of the Study

The most problem encountered is gathering the data needed for this research. Moreso, the government agency (Pipeline and Petroleum Marketing Company-PPMC) responsible for such data could not make provision up to 2012 demanded. Another limitation here is the disruptions in crude oil production in Nigeria as a result of the insurgency in the Niger-Delta youths.

CHAPTER TWO
REVIEW OF RELATED LITERATURE

2.1Introduction

Tanker shipping can be seen as a capital intensive industries as huge investment in ships are required (Chen and Wang, 2004). Oil tanker is designed for the bulk transport of oil. The need for sea transport is derived from seaborne trade and shipping firms are not able to control the change of demand for shipping services (Mc-Convill, 1999). To tackle with an increase in sea cargo volume, tanker operators tend to enlarge the capacity of sea transport.

Hence, seaborne trade influences the key decision in shipping industry with regard to adjustment of shipping capacity. Moreover, our review of literature will concentrate mainly on related works on tanker shipping, crude oil and sea transport in general.

2.2 Conceptual Framework

The topic of tanker shipping is important to explore from the perspectives of both academics research(Glen and Martin, 2002; Lyridis et.al, 2004; Alizadeh and Nomikos, 2006; Gouielmos and Psifia, 2007) and industrial practitioners (Ocean Shipping Consultants ltd, 2004; UNCTAD, 2009; Clarkson Research Studies, 2010). Tanker shipping provides an economical and convenient way to transport

liquid bulk for international seaborne trade (Lun et.al, 2013).Many Maritime economists believe that the supply of tanker shipping operates under perfect competition is characterized by several conditions. The first feature is number of shipping service providers. There are a number of ship owners that own tankers that provide identical shipping services. The second characteristic is the availability of information. In tanker market, information on freight rate can be searched via such means as the Baltic Index.

Hence, shipping service providers are unable to manipulate the price. Obstacles to entry to and exit from the industry exist but these challenges can be managed. Entry barriers such as government regulations, economic factors, and marketing conditions, are not present in the tanker shipping industry. On the one hand, huge capital investment is needed to acquire ships (new ships from the new building market or second-hand ships from the sales and purchase market) to enter the industry. On the other hand, shipping firms may withdraw from the market by selling their assets (ship) in the second-hand vessel sale and purchase market. In 2010, the tanker trade volume reached to 2,767 million tons due to growth in demand for energy commodities. The increase cargo volume in the tanker market leads shipping firms to adjust their supply by building new ships in the new building market, and acquiring second-hand vessels in the sales and purchase market.

In tanker shipping, price level (freight rate) is influenced by the market (demand for shipping service and supply of shipping service). In the context of research in tanker shipping, demand for shipping is seaborne trade in energy products because demand for tanker shipping occurs as a result of demand for seaborne tanker shipping services (derived demand). More so, the supply of shipping service is fleet size in the tanker shipping market. From the perspective of the industrial organization paradigm, the interaction between the demand for and the supply of tanker shipping service affects the market structure which in turn plays a significant role in determining the investment and operation decision in the market place (Tirole, 2003).

2.3 Theoretical Framework

Shipping firms provide global shipping services transporting cargoes to meet the demand for sea transport services (Kendall and Buckley, 2001). Demand for tanker shipping services is derived from the trade between buyers and sellers in the energy trade market. As demand for tanker shipping service is a derived demand, seaborne trade is a crucial variable in tanker shipping market. Previous studies (e.g., Metaxas,1971; Lun and Quaddus,2009;Stopford,2009) have suggested the positive association between seaborne trade and freight rate. Change in freight rate is influenced by seaborne trade volume (Lun et.al,2010).

In the tanker shipping market, freight rate is an important indicator for shipping firm to conduct their business. When the volume of seaborne trade goes up, demand for sea transport service will rise. The excessive demand for shipping services will lead to the upward trend of freight rate. Freight rate also affects the decision of tanker shipping firms to adjust their fleet size and hence increase their supply in the tanker market. High freight rate stimulates growth in world fleet.

Tanker shipping can be seen as a capital intensive industry as huge investment in ships is required (Chen and Wang, 2004). The return on investment in ships relies on seaborne trade volume (Stopford, 2009). Cargoes cannot be delivered to destination without adequate investment in shipping capacity (Lun et.al, 2013). If ships are invested but demand for shipping services is sufficient, lay up of ship is costly. The need for sea transport is derived from seaborne trade and shipping firms are not able to control the change of demand for shipping service (Mc-Conille, 1999). To tackle with an increase in sea cargo volume, tanker operators tend to enlarge the capacity of sea transport. Hence, seaborne trade influences the key decision in shipping industry with regard to adjustment of shipping capacity.

2.3.1 Freight Rate

This is a shipping market structure where buyers and sellers are brought together to trade sea transport services. The demand for and supply of tanker shipping services

interact with each other to determine freight rate. Due to the nature of derived demand, demand for tanker shipping services depends on the seaborne trade volume (Lun and Quaddus, 2009). On the other hand, supply of shipping services is inelastic in the short run. Excessive supply of shipping capacity not only causes reduction in freight rate but also extra operational cost to lay up ships.

Conversely, shortage in ship supply leads to an increase in freight rate to motivate shipping firms for adjusting their shipping capacity. Although trade volume grows in the past decade, shipping firms may make their investment decision only when they expect that future freight rate will increase. However, it may take delivery of new ships if they decide to increase their shipping capacity.

2.3.2 New Building Vessel

The new building market is where shipping firms order new ships to expand their fleet size during freight boom. In the tanker shipping industry, demand for new vessels reflects the need for shipping capacity. The order of new ships from tanker shipping firms indicates that they have positive expectation of the growth of seaborne trade and increase in future freight rate.

From the perspective of business operations, prices of new building ships have a stabilizing effect in the tanker shipping (Dikos,2004). When the demand for shipping services increase, shipping firms make the decision to increase their

shipping capacity by ordering new ships. At the same time, freight rate increases due to the high demand for shipping services. High freight rate indicates that shipping firms can earn higher than normal profit. When the demand for seaborne trade rises, high freight rate and profit level affect shipping firms to place orders for new ships (Lun et.al,2013). With the increase in demand for new ships, prices in the building market also increase. Hence, capital cost of shipping firms increases. Such rise in the prices of new ships could be seen as a “stabilizer” to set a “barrier” for shipping firms for excessive profit.

2.3.3 Second-Hand Vessel

The second-hand market is where fairly used ships are traded between the owner and the buyer. In shipping market, the freight market is the main source of cash for the tanker shipping operation (Lun et.al,2013). The revenue earned in the freight market provides financial support to tanker shipping firms for acquiring new ships and second-hand vessels to serve the demand for shipping services.

Beenstock (2010), states that the new building and second-hand vessels are substitutes to each other as they are same kind of assets. New building ships and used ships are positively associated as both of them can be deployed to carry cargoes. While the deployment of new building ships may require waiting for a few years after placing the new order, the lead time to deploy second-hand ships to

freight market are much shorter. At the time of freight booms, the second-hand vessel market is a good option for shipping firms to adjust their shipping capacity to satisfy the demand for tanker shipping services (Goulielmos,2009).

Strandenes (2002) states that the second-hand vessel market can be categorized as an auxiliary market and the buying and selling of used ships are unlikely to alter the existing number of ships and the carrying capacity in the tanker shipping market. The sales and purchase facilitates the entry of shipping firms to the shipping market as shipping firms may acquire ship in the sales and purchase market with lower capital requirement. With the sales and purchase of used ships, the ship owners are able to exit the market or restructure their existing fleets in response to the changing demand (Strandenes, 2002).

At the time of high freight rate, demand for second-hand ships are high as shipping firms can deploy these ships to earn higher than normal profit. Hence, the price of second-hand ships increases during the time of freight boom and decreases during the time of freight depression (Lun and Quaddus,2009). On the other hand, low vessel prices usually correspond with low freight rates.

2.3.4 Scrapping Vessel

Ships are bought and sold in different tanker markets. The new building market deals with new ships while old or obsolete ships are scrapped in demolition

market. Strandenes (2002), activities of these two markets (new building and demolition markets) determine tanker shipping capacity to serve the seaborne trade. With the exception of old ships that are unable to meet the safety requirement and regulations, the scrapping decision made by ship owners depends on expected financial return from scrapping the ship and the future freight rate. Knapp et al.(2008) suggests that an increase in scrap price leads to a higher chance of vessels being scrapped. In the last decade, 2006, the worldwide consumption of steel grew significantly. The increase in demand for steel induces higher price of steel and subsequently boost scrapping price of demolition vessels (Knapp et al.2008).

At the time for freight boom, ship owners may keep the used ships to carry cargoes or sell these ships to other ship owner. On the contrary, ship owners are willing to send their ships to demolition market when they expect the profitability for vessels are negative in the foreseeable future and the demand for second-hand ships in the sales and purchase market is weak.

2.4Empirical Review

Ndukwe (2004) conducted research on the analysis of trend of tanker shipping in Nigeria. In his work, he points out restiveness in Niger-Delta as one the predominant factors that result in short supply of crude oil for export. They

interrupt the production of crude oil from time to time leading to under-production and a resultant reduction to the daily quota allotted to Nigeria by OPEC. Tankers carry bulk liquid cargo like crude oil, petroleum products, etc . Moreover, a bulk carrier is a large single deck ship that carries unpacked cargo (Alderton, 1987). The cargo is simply poured, tipped or pumped into the holds or tanks of the ship. Of this class of ships, the most important is the tanker and although there are specialist tanker which carries bulk Guinness, wine and chemicals, by far the most important is the oil tanker.

Ewart (2008) states that to avoid any confusion in the mind of the reader unfamiliar with the language of international shipping, bulk carriers are identified as vessel intended for the carriage of unpacked dry cargoes. He went on to say, "Although tankers do, of course, carry oil in bulk, they are referred to simply as tankers and the same applied to petroleum product". Efthimios (2005) made the clear distinction when he gave a statistics of the current world sea fleet- January 2005. Tankers were quite separated from bulk carriers as tankers are the second largest, bulkers are third in largest. He went on to say, "if takers provide the fuel that powers the modern economy, bulk carriers are responsible for moving the raw materials that are its life blood".

2.4.1 The Crude Oil Tanker

The main commodities transported by tanker vessels are crude oil and petroleum products, which accounts for one third of all world seaborne trade by volume (Hoffman et al.2011). There are two categories of tankers, clean and dirty (Arnesen and Johansen, 2012). The clean tankers carry clean oil products such as gasoline, diesel fuel and jet fuel while the dirty tankers carry crude oil and black products.

Meanwhile, an oil tanker otherwise known as a petroleum tanker is a merchant ship designed for the bulk transport of oil. Ndukwe (2000), crude oil tanker is provided with two or three longitudinal bulkheads and many transverse bulkheads dividing the hull into numerous tanks. Each tank has a watertight hatch and ventilator, and each tank is connected by pipeline to pumping rooms. Machinery and crew accommodations are aft; together with the navigation bridge. Extensive shore equipment is providing involving pumping apparatus. The crude oil tanker is thus a very specialized vessel (Allen, 1978). It is designed to deal with bulk liquid cargoes, permitting quick loading and discharge thereby ensuring the fast turn-round so essential to good utilization. As a basic rule of thumb, the pumping speed should be about 10% of the deadweight so that a 100,000 ton tanker should be able to pump the cargo at about 10,000 tons per hour.

Some oils would be very difficult to pump if they got too cold.So, steam heating coils in the tanks may be necessary. The cargo holds (tanks) have “manholes” with “oil tight” covers on the deck for inspection purposes. In addition to the central and wing tanks, for each tank, the tanker (oil) is provided with an expansion tank. This allows the oil to expand (cubical expansivity) in hot weather. Tankers generally do not have derricks but can have a smaller one for needed operations- lowering and lifting the hose on board etc. They are also low speed vehicles, some 16-18 knots. They carry reduced number of crews on board.

2.4.2 Liquefied Gas Carriers (LGCs)

This type of tanker shipping is an added economy to gas shipment (to long distances) as it reduces the volume by some 600 times (Ndukwe, 2004). A typical Liquefied National Gas (LNG) carrier has crew accommodation and machinery aft. Cargo is contained in prismatic internally insulted aluminum tanks. These tanks are contained in the holds (three-hold ship may contain 3-tanks in one hold). To keep the gas in liquid form, the temperature is reduced to some- 160°C or -258°F. the plywood lining keeps the gas from escaping if a tank leakage should occur.

The tanks are constructed of aluminum or nickel steel. Some vessels are equipped with self-supporting rectangular or spherical shaped independent tanks. Others incorporate a semi-membrane type fleet tank; the tanks jute out above the deck so

that about 40% of the cargoes are carried above the level. In these carriers, the gas "boiling off" can be used to fuel the ship's boilers.

2.4.3 Crude Oil Tanker Classification

Arnesen and Johansen (2012) crude oil tankers are classified thus- Handysize (MR), Panama (LR), Aframax, Suezmax and VLCC- ULCC. They went further to tabulate it showing the ship size (deadweight) and approximate speed (knots) as shown below.

Table 2.1: Shows Ships Type, Size and Approximate Speed

Vessel Type	Ship size (dwt)	Approximate Speed (knots)
Handysize (MR)	20,000-45,000	14-16
Panamax (LR)	50,000-70,000	14-16
Aframax	70,000-120,000	13-15
Suezmax	130,000-160,000	12-14
VLCC-ULCC	160,000-500,000	12-14

Source: Arnesen and Johansen (2012).

Moreover, very large crude carriers (VLCC) are such oil carrying vessels which exceed 200,000deadweight. Also, ultra large crude (ULCCs) are such oil carrying vessel in excess of 350,000 deadweight. Such tanker tonnages have presented numerous problems over many fields comprising safety/structural (Branch, 2005).

Nevertheless, these have been largely overcome and the trade has benefited economically from such tonnages. Many such vessels are equipped with bow and

stern thrusters to improve maneuverability. It is worthy to note that tanker vessel size varies from a few thousand tons to half a million tons in the case of crude oil (Arnesen and Johansen, 2012). In 2011, there were 611 new tankers of various types to be delivered over the next three years, totaling 105 million dwt and representing 27.5 per cent of the existing fleet (Hoffman et al. 2011).

2.4.4 Tanker Shipping Seasonality and Cyclicality

It is a known fact that the shipping market is highly influenced by seasonality in traded commodities (Arnesen and Johansen, 2012). Stopford (2009), seasonality in shipping is often divided into short-term and long-term. Short-term seasonality in the tanker shipping market is affected by seasonal energy consumption in the main energy markets which often implies that the tanker freight rates perform best during the first and last three months of a year, better known as "the cold seasons" (Alizadeh and Nomikos, 2009).

Consequently, there are to some extent predictable price fluctuations in the tanker shipping market. Long-term seasonality trends are best investigated by studying the economic characteristics of the industries which produce and consume the traded commodities (Stopford, 2009). Furthermore, long-term seasonality can also be studied by looking at some macroeconomic factors for major economies, which have been proven to be highly seasonal (Alizadeh and Nomikos, 2009). Research

has found it tends to be four to seven years cycles in the shipping market (Stopford, 2009; Alizadeh and Nomikos, 2009).

Frankly speaking, short term developments in oil supply are under constant scrutiny by the market observers (Jazayer and Yahyai, 2004). Analysts' perceptions of the immediate supply prospects have far reaching implication on energy prices as well as on prospective crude oil transport prices, thereby affecting the financial and capital markets. Taking an average price of $24.36 per barrel and an average world crude oil production of 75.22 million barrels per day in the year 2008, the oil supply is worth nearly $1.8 billion per day or approximately $669 billion per year. According to industrial sources, nearly 57% of the world oil, approximately 2000 million (2 billion) tons was transported by sea in 2007. It is therefore important to forecast oil supply as accurately as possible.

Moreover, the seasonality in tanker shipping corresponds to the four seasons of the world- mainly in the northern poles or the west, who are the major consumers of the crude oil, as they are heavily industrialized- winter, spring, summer, and autumn. It is pertinent to note that the world's crude oil supply is influenced by two major blocs- OPEC and non-OPEC countries.

2.4.5 Trade Volume and World Fleet Size

Shipping is a service, a primary logistics service, which is critical to international trade and national commercial activities and economic development (Ndikom, 2008). Tanker shipping service provided by shipping firms aims to meet the demand for sea transport services (Lun et al.2013). Carriage of goods takes place only when there is a demand for transport. Tanker shipping services derived demand from the seaborne trade. In their word, Lun et al (2013) "seaborne trade is a crucial variable in tanker shipping market". When there is an increase in the demand for tanker shipping service, freight rate will go up. High freight rate attracts ship owners to provide more shipping capacity to increase the supply of shipping services.

Tanker Shipping Review (2008), there was 492 VLCCs, 360 Suezmaxes, 783 Afromaxes, 329 Panamax tankers and 981 MR type product tankers in service. In 2010, the tanker trade volume reached to 2,767 million tons due to growth in demand for energy commodities according to Lun et al. (2013). Tankers made up the second largest category of ships (Ndukwe, 2004). As at 1st January 2005, the world trading fleet was made up of 46,222 ships, with a combined tonnage 597,709,000 gross tonnages. The vast bulk of the fleet was made up of:

Table 2.2: Shows World Fleet Size and their Numbers(2002-2008)

S/N	Ship Category	Number of Ships
1	General Cargo	18,150
2	Tankers	11,356
3	Bulk Carriers	6,139
4	Passenger Ships	5,679
5	Container Ships	3,165
6	Other Ships	1,733

Source: Tanker Shipping Review (2008)

Moreover, oil tankers made up of 36.9% of the world's fleet in terms of deadweight tonnage in 2005. The world's total oil tankers deadweight tonnage has increase from 326.1 million DWT in 1970 to 960.0 million DWT in 2005. The combined deadweight tonnage of oil tankers and bulk carriers represents 72.9% of the world's fleet (internet, 2013). Base on this assertion above; let us dwell on that which necessitates tanker shipping: crude oil (mainly for this research).

2.4.6 Crude Oil

Crude oil or petroleum is simply unprocessed oil found deep beneath the earth's surface. Nwoko (2005) said that crude oil otherwise known as petroleum is derived from two Latin words "petrus" meaning rock and "oleum" meaning oil. Therefore, it can range in color from clear to black and can be found as a liquid or solid. Overall properties of crude oil are dependent upon their chemical composition and structure. Crude oil is pumped and stored in barrels for future refinement. The refinement process may involve filtering, addition of additives, and specialized

separation techniques to create specific crudeoil and crude oil products. Generally, all crude oil are made up of hydrocarbon compounds. The main hydrocarbons found in crude oil are: Aliphatics, Alicyclics, and polycyclic Aromatic Hydrocarbon (PAH).

The Need Project (2012)submits that petroleum or crude oil is a fossil fuel. It is called a fossil fuel because it was formed from the remains of tiny sea plants and animals that died millions of year ago. When the plants and animals that died, they sank to the bottom of the oceans. Here, they were buried by thousands of feet of sand and sediment which turned into sedimentary rock. As the layers increased, they pressed harder and harder on the decayed remains at the bottom. The heat and pressure changed the remains and eventually petroleum was formed. Petroleum is called a non-renewable energy source because it takes millions of years to form.

2.4.7 History of Crude oil

People have used petroleum since ancient times. The ancient Chinese and Egyptians burned oil to light their homes. Before the 1850s, Americans used Whale oil to light their homes. When the Whale oil became scarce, people skimmed the oil that seeped to the surface of ponds and streams. The demand for oil grew, and in 1859, Edwin Drake drilled the first oil well near Titusville, Pennsylvania.

At first, the crude oil was refined or made into kerosene for lighting. Gasoline and other products made during refining were thrown away because people had no use

for them. This all changed when Henry Ford began mass producing automobiles in 1913. Everyone wanted an automobile and they all ran on gasoline. Gasoline was the fuel of choice because it provided the greatest amount of energy in relation to cost and ease of use.

Today, people all over the world use more petroleum than any other energy source mostly for transportation. Petroleum provides 35 per cent of the energy we use. Robinson (1977), states that petroleum can be obtained from shallow wells or from drilling as deep as 6000 meters. Once the drill has broken into petroleum layer, the pressure of the gas associated with the liquid can immediately force it with tremendous power to the surface.

2.4.8 Producing Crude Oil

Geologists look at the types of rocks and the way they are arranged deep within the Earth to determine whether oil is likely to be found at a specific location (Need Project, 2012). Even with new technology, oil exploration is expensive and often unsuccessful. Only 61 per cent of exploratory wells produced oil in 2010. When scientist think there may be oil in a certain place, a petroleum company brings in a drilling rig and raises an oil derrick that houses the tools and pipes oil w they need to drill a well. The typical oil well is about one mile deep. If oil is found, a pump moves the oil through a pipe to the surface.

2.4.9 Refining Crude Oil

What is refinery? A refinery is a factory that processes oil. The refinery cleans and separates the crude oil into many fuels and products. The most important one is gasoline. Other petroleum products are diesel fuel, heating oil, and jet oil. Industry uses petroleum to make plastics and many other products.

Energy Kids (2012) one barrel (bbl) of petroleum produces 42 gallons of petroleum products. It was also noted that the world's top five crude oil producing countries are: Saudi Arabia, Russia, United States, Iran, and China. However, the use of petroleum products made from crude oil has been growing, making it necessary for export and import of oil business lucrative.

2.4.10 Shipping Petroleum

After the refinery, most petroleum products are shipped out through pipelines. Pipeline remains the safest and cheapest way to move big shipments of petroleum. Moreover, special companies called jobbers buy petroleum products from oil companies and sell them to gasoline stations and to other big users as industries, power companies and farmers (Energy Kids, 2012).

Ndikom (2008), states that shipping as a mode of transport, continues to represent the cheapest and most efficient means of moving very large volumes of import and export. Base on this view, tanker shipping is the second in rank after pipeline in transporting crude oil products from place of production to the place of consumption. Apart from the facility as a means of trade, enhancement of

commercial activities and economic development, shipping services may be relied on as a means of creating significant valued-added services to other economic activities, through the various profits and job opportunities which they provide and stimulate by their very business nature (Ndikom, 2008).

2.4.11 Crude Oil and the Environment

Though products of crude oil help us do many things such as fuel our airplanes, cars, heat our homes etc, using them can harm the environment through air and water pollution. Drilling for and transporting oil can endanger wildlife and the environment if it spills into rivers or oceans. Leaking underground storage tank can pollute groundwater and create noxious fumes. Energy Kids (2012) petroleum products give off the following emissions when they are burned as fuel:

a. Carbon dioxide (CO_2)
b. Carbon monoxide (CO)
c. Sulfur Dioxide (SO_2)
d. Nitrogen oxides (NO_X) and volatile organic compound (VOC)
e. Particulate matter (PM)
f. Lead and various air toxics such as benzene, formaldehyde, acetaldehyde, and 1,3-butadiene may be emitted when some types of petroleum are burned.

Nearly all of these byproducts have negative impacts on the environment and human health:

1. Carbon dioxide is a greenhouse gas and a source of global warming.
2. SO_2 causes acid rain, which is harmful to plants and to animals that live in water and it worsens or causes respiratory illness and heart diseases, particularly in children and the elderly.
3. NO_X and VOC contribute to ground level ozone, which irritates and changes the lungs.
4. PM results in hazy conditions in cities and scenic areas, and along with ozone, contributes to asthma and chronic bronchitis especially in children and the elderly. Very small or" fine PM" is also thought to cause emphysema and lung cancer.
5. Lead can have severe health impacts especially for children and air toxics are known or probable carcinogens.

Moreover, the petroleum industry works hard to protect the environment. Gasoline and diesel have been changed to burn cleaner. And oil companies' work to make sure that they drill and transport oil as safely as possible.

2.4.12 Posted Price and Official Price of Nigeria Crude Oil

Tafida (2006), different kinds of contract exist in buying Nigerian Crude oil abroad. As it is in normal market forces where there is buyers and sellers (demand and supply), so do we have in crude oil market. The exporting country (supplier

e.g. Nigeria) offers for sale the available quantity and then states the price she wants to sell (per barrel), the importing country (demander e.g. U.S.A) will now haggle and offer the price she wants to buy; but there exist some difference here as price are mainly determine by OPEC.

Therefore, posted price is the price at which the crude oil is posted abroad, while official price is the price at which it is bought (per barrel) as determined by OPEC. In addition, there could be variations sometimes (ie, for "posted" and "official" price) due to market forces of demand and supply (Isa, 2006). This is exactly what is happening in the crude oil market. Crude oils are sold well above the posted price most often these days (Ndukwe, 2008).

2.4.13 OPEC Crude Oil Production 2004-2009

In 2009, OPEC crude oil production averaged 28.7mb/d, according to secondary source (OPEC Annual Report, 2009). This was lower by 2.5mb/d than the average of 2008. In the first quarter of 2009, OPEC crude oil production declined by 2mb/d from the fourth quarter of 2008, after which production experienced a gradual increase as the year progressed. Table 2.3, shows OPEC crude oil production from the period of 2004-2009.

Table 2.3

OPEC Crude Oil Production According to Selected Secondary Sources, 2004-2009 (1000b/d)

Year / Country	2004	2005	2006	2007	2008	2009
Algeria	1,236	1,347	1,364	1,358	1,381	1,272
Angola	1,019	1,241	1,385	1,660	1,871	1,786
Ecuador	527	532	536	507	503	476
Iran	3,920	3,924	3,845	3,855	3,892	3,726
Iraq	2,015	1,830	1,932	2,089	2,341	2,425
Kuwait	2,344	2,504	2,520	2,464	2,554	2,263
Sp Libyan	1,537	1,642	1,702	1,710	1,718	1,557
Nigeria	2,322	2,412	2,235	2,125	1,947	1,811
Qatar	771	792	821	807	840	776
Saudi Arabia	8,957	9,390	9,112	8,654	9,113	8,055
UAE	2,360	2,447	2,540	2,504	2,557	2,256
Venezuela	2,582	2,633	2,539	2,438	2,487	2,311
Total	29,591	30,693	30,532	30,171	31,205	28,714

Source: OPEC Annual Report 2009

2.5Summary of the Review of Related Literature

Literature review comprises of information from both local and foreign scenes. The literature review principally dealt with conceptual framework, theoretical studies, and empirical studies. The conceptual framework entails the importance of tanker vessel as it relates to seaborne trade, and world economy. Demand-Supply theory and theory of market structures of tanker ships were reviewed under the theoretical framework. Authors whose previous research work is related to the

study were reviewed as empirical review of the study (such as Ndukwe, Stopford, Arnesen and Johansen, Alizadeh and Nomikos, etc). Ndukwe (2004) points out restiveness in Niger-Delta as one of the predominant factors that result in short supply of crude oil for export. The scope of his work covers the period of 1997-2002 but fail to extend it up to 2011. Stopford (2009) conducted a research on the seasonality of the tanker shipping via short-term and long-term. Arnesen and Johansen (2012) classified crude oil tankers into Handysize, Panama, Aframax, Suezmax, and VLCC-ULCC. Finally, Alizadeh and Nomikos (2009) studied also seasonality of tanker shipping based on what he calls 'the cold seasons' which implies that the tanker freight rates perform best during the first and last three months of the year.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1Introduction

This chapter deals exclusively on the procedure adopted for data collection and analysis. Data collected is not useful until it is given adequate statistical treatment and analysis.

3.2Research Design

This work is designed to examine the demand for tanker shipping services with the resultant crude oil to be exported from Nigeria to other parts of the world using a time series regression approach and correlations. Data collected were used to assess the level of change in the demand for tanker vessel of a period of time (1997-2011). All data used were collected from a secondary source.

3.3 Population of the Study

This work covers a period of fifteen (15) years (1997- 2011) of the activities of crude oil tanker shipping from Nigeria to other parts of the world.

3.4 Research Instrument

The data used for this work was secondary data. The secondary data obtained for this work was through Annual Reports of the establishments mentioned below; others include- OPEC Annual Report, Journals, Library, and Internet etc.

a. Pipeline and Petroleum marketing company (PPMC) Lagos
b. Nigerian National Petroleum Corporation (NNPC) Lagos
c. Nigerian Port Authority (NPA) Lagos
d. Nigerian Shippers Council (NSC) Lagos

3.5 Method of Data Analysis

The statistical tools used in the analysis of the data collected for the purpose of this research work are:

a. Correlation Analysis
b. Time Series Analysis and
c. Regression Analysis.

3.6 Time Series Analysis Approach

A time series is a collection of nominal observations recorded at regular intervals of time such as daily, monthly, quarterly, or yearly (Ugwu, 2003).A time series is a set of observations obtained by measuring a single variable regularly over a period

of time. In a series of inventory data, for example, the observations might represent daily inventory levels for several months. A series showing the market share of a product might consist of weekly market share taken over a few years. A series of total sales figures might consist of one observation per month for many years. What each of these examples has in common is that some variable was observed at regular, known intervals over a certain length of time. Thus, the form of the data for a typical time series is a single sequence or list of observations representing measurements taken at regular intervals.

This also (not surprisingly) concerns the analysis of data collected over time ...weekly values, monthly values, quarterly values, yearly values, etc. Usually, the intent is to discern whether there is some pattern in the values collected to date, with the intention of short term forecasting (to use as the basis of business decisions). We will write

y_t = response of interest at time t

(we usually think of these as equally spaced in clock time).

One of the most important reasons for doing time series analysis is to try to forecast future values of the series. A model of the series that explained the past values may also predict whether and how much the next few values will increase

or decrease. The ability to make such predictions successfully is obviously important to any business or scientific field.

Examples include daily sales of a supermarket, quarterly production and export of crude oil, monthly consumption of electricity, and yearly export cocoa, crude oil etc. For the purpose of this work, the number of tanker vessels that call at the various Nigerian ports for crude oil lifting (export) at any given time period- daily, monthly, quarterly or yearly have to be included. The values assumed by a time series fluctuate from time to time according to the effects of several factors commonly referred to as “the components of a time series”. Information/knowledge gathered from the analysis of past data can be used to forecast or control the future values of the time series. Time series is denoted by Y_t, the value of a time series at time “t”.

Standard analysesof business time series involve:

1) Smoothing/trend assessment

2)Assessment of/accounting for seasonality

3)Assessment of/exploiting "serial correlation"

These are usually/most effectively done on a scale where the "local" variation in y_t is approximately constant.

3.7Component of a Time Series

A typical time series is made up of four components – trend (T_t), seasonal movement (S_t), cyclical movement (C_t), and irregular or random variation (I_t).

3.7.1 Trend (T_t)

The trend is smooth line, which indicates the average level attained by the time series and the general direction of the change of values at various times, t. It represent the regression line of Y_t in time‘t’(Ugwu, 2003). As our work is based on this, we are therefore going to analyze the smooth line (trend) which indicates the average level attained by Tanker Shipping in Nigeria. We have to analyze this also through the crude oil exports overseas in any given period of time – quarterly or yearly.

3.7.2 Seasonal Movements (S_t)

This is any recurrent change (increase or decrease) in the general level of a time series Y_t which recurs at regular interval of time usually not more than one year. The time lag between recurrent features (successive peaks or troughs) is called the period or periodicity. A quarterly series has periodicity of 4.

3.7.3 Cyclical Movements (C_t)

This is a long run shift in the general level of a time series lasting for several years and following a less rigid pattern than a seasonal movement, eg, the alteration of economic boom and slump (with the case study of oil boom and or doom or slump). Because of the nature, cyclical movements are most often ignored in time series analysis.

3.7.4 Irregular Variation (I_t)

These are random fluctuations in the level of the time series, which are usually of short duration, and small magnitudes expected to zero in the long run. They represent the part of the observed values Y_t not fully accounted for by T_t, S_t, and C_t. they are often caused by unusual or unexpected events such as trade disputes,strikes,wars,floods,fire out-break, earthquakes, etc. in the case of Nigeria, this can be attributed to the restiveness of the Niger-Delta youths .

3.8Time Series Models

The Time Series Modeler procedure estimates exponential smoothing, univariate Autoregressive Integrated Moving Average (ARIMA), and multivariate ARIMA (or transfer function models) models for time series, and produces forecasts. The procedure includes an Expert Modeler that automatically identifies and estimates

the best-fitting ARIMA or exponential smoothing model for one or more dependent variable series, thus eliminating the need to identify an appropriate model through trial and error. Alternatively, a custom ARIMA or exponential smoothing model can be specified.

The Time Series Modeler allows establishment of custom non-seasonal or seasonal ARIMA (Autoregressive Integrated Moving Average) models--also known as Box-Jenkins models--with or without a fixed set of predictor variables. Transfer functions for any or all of the predictor variables can be defined, and specify automatic detection of outliers, or specify an explicit set of outliers.

All independent (predictor) variables specified on the Variables tab are explicitly included in the model. This is in contrast to using the Expert Modeler where independent variables are only included if they have a statistically significant relationship with the dependent variable.

A time series model is an equation showing the relationship between time series Y_t and its components, ie, a mathematical equation expressing Y_t in terms of T_t, S_t, C_t, and L_t. There two types of this models which include:

a. **The Additive Model**: This shows the time series data to its component in summation form. That is,

$Y_t = T_t + S_t + C_t + L_t$

Taking C_t and $L_t = 0$, we have:

$Y_t = T_t + S_t$

b. **The Multiplicative Model**: This shows the multiplication form:

$Y_t = T_t \times S_t \times C_t \times L_t$

Taking C_t and $L_t = 1$, we have:

$Y_t = T_t \times S_t$.

3.9Decomposition of a Time Series

This means breaking up or separating each observed value of a time series, say $Y_t = Y_1, Y_2 \ldots\ldots Y_n$ into its constituent parts – trend, seasonal movement, cyclical movement and irregular variation. The steps involves in examining a time series data include:

1. Graphical display of the data in what is referred to as the scatter diagram or a time plot.
2. Estimation and elimination of cyclical effects where they exist.
3. Estimation of the trend component, T_t.

4. Estimation of the seasonal compound, S_t.
5. Examining the extent of irregular variation and
6. Forecasting.

3.9.1 Estimation of Trend (T_t)

There are so many methods of estimating the trend values which include – freehand, semi-average, moving average, ordinary least squares, etc.

3.9.1.1 The Ordinary Least Squares Method (OLS)

This is representing in linear format as follows:

$Y_t = a + bt$

Where,

Y_t = the estimated trend value for a given time period

a = the trend line value when t = 0 and this is intercept on the y-axis

b =the slope of the trend line, ie, the change in Y_t per unit of time and

t = the time unit.

The method of least square requires that the sum of the squared deviations of the observed values, from the estimated trend values, Y_t, be a minimum, ie.

$\sum(Y-Y_t)^2 = \sum(Y-a-bt)^2 = \text{minimum}$

The parameters 'a' and 'b' in the trend equation above are obtained as follows:

$a = \sum(Y/n) = \bar{y}$

$b = \sum Y_t / \sum t^2$

For odd number of years

$$\sum t^2 = \frac{n(n^2 - 1)}{12}$$

Moreover, this is the method of estimating the parameters ('a' and 'b') of a linear regression by finding a line that minimizes the sum of the square distance from each sample regression line. The basic steps for the regression analysis include:

1. We specify the set of values X_1, X_2…….X_n of the controlled variable X. This ranges from X = 1 to X =15 (data of fifteen years), ie, the number of crude oil tankers that called at the Nigerian ports from 1997 to 2011. Also Y ranges from 1 to 15 (the amount of crude oil exported by Nigeria from 1997 to 2011) will be matched with values of X.
2. We identify and postulate a model of the relationship between the paired observations (X_i, Y_i) where i =1, 2…..n (1-15 years).
3. We fit the postulated model to the observed data, ie, we estimate the parameter ('a' and 'b') of the postulated model.

4. We make predictions and other inferences that follow, eg, test of significance, etc.

3.9.1.2 Exponential Trend

This is defined as the exponential function format:

$Y_t = ab^t$

This is transformed into logarithm form as:

$\text{Log } Y_t = \log a + t \log b$

By the method of least squares, and numbering the ts, so that $\sum t = 0$, we can determine the parameters a and b as follows:

$$\log a = \frac{\sum \log y}{n}$$

and

$$\log b = \frac{\sum t \log y}{\sum t^2}$$

3.10Forecasting

One of the major advantages of time series analysis is its use in forecasting (peering) into the future. We use both models – additive and multiplicative to achieve this.

3.10.1 Forecasting using the Additive Model

Under the additive model based on our assumptions ($Y_t = T_t + S_t$**),** forecasts of the future values of a time series (Y_t) are made by projecting the least square trend ($T_t = a + bt$) into the future and adding the seasonal variation (S_t) corresponding to the particular forecast season – quarter or month. Thus, the forecast equation is:

$Y_t = T_t + S_t = (a + bt) \times S_t$

3.10.2 Forecasting using the Multiplication Model

From our assumption ($Y_t = T_t \times S_t$), forecasts are made by projecting the trend (T_t) into the future and multiplying by the seasonal index corresponding to the forecast season. Hence, the forecast equation is:

$Y_t = T_t \times S_t = (a + bt) \times S_t$

3.11Regression Analysis

This is a statistical investigation of the relationship between a dependent variable Y and one or more independent variable (s) X or Xs, and the use of the modeled relationship to predict, control or optimize the value of the dependent variable Y (Ugwu, 2003). The relationship is formulated in an equation to express the value of Yin terms of the corresponding values of X or the Xs and to enable future values of Y to be predicted in terms of the observed values of X to be controlled or

optimized by manipulating the values of X or the Xs. The independent variables Xs are called explanatory variables or controlled variables while the dependent variables Y is also called response variable. Though, we have so many types of regression analysis; simple linear regression analysis will be suitable for this work.

3.11.1 Simple Linear Regression Analysis

This shows the relationship between two variables; dependent variables (Y) and a single independent variable (X) which is expressed mathematical as:

$$Y = a + bX$$

This can be written in this form:

$$Y = a + bX + e$$

Where

Y = the total variation

a + bX = the explanatory variation

e = the unexplained variation

Moreover, in case of our work, Y (dependent variable) is the volume crude oil exported within the given period (1997- 2011); also X (independent variable) is the number of crude oil tankers that lift crude oil from Nigeria to other parts of the

world within the same period. Then, the unexplained variation (e) will be the effect of things like Niger-Delta insurgent which have contributed to much fluctuation in the amount of crude oil exported by Nigeria and thereby affect the number of crude oil tankers calling at Nigerian crude oil terminals. However, the parameter‘a’ and ‘b’ explain the total variation in the number of crude oil tankers during the period in view.

CHAPTER 4

DATA PRESENTATION AND ANALYSIS

4.1 Introduction

This chapter deals with the discursion and findings of the data collected in the previous chapter. Thus, we employ time series analysis to enable us assess the demand for tanker shipping services in Nigeria so as measure the level fluctuations in crude oil export to other parts of the world. We also use it for interpretation of our results based on the trend not only to the crude oil tanker shipping services in Nigeria, but also on that of crude oil export (which is the sole determinant factor of tanker shipping in Nigeria). Furthermore, regression analysis also helps us to analyze the dependence of the number of crude oil tankers on the volume of crude oil to be exported from Nigeria to other parts of the world within the period under review (for this work, 1997- 2011).

4.2Crude Oil Exportation from Nigeria to other parts of the world.

The crude oil export from Nigeria to other parts of the world is summarized in tables: 4.1, 4.2, 4.3 and 4.4.

Table 4.1

Crude Oil Export by Region from 2002-2011 (barrels)

Year	North America	South America	Central America	Europe	Asia & Far East	Ocenia/ Pacific	Africa	Total
2002	240,642,680	47,536,142	-	152,664,311	170,508,955	-	51,974,406	663,326,495
2003	329,233,145	64,030,369	-	175,518,968	153,187,639	-	68,046,139	791,016,260
2004	408,856,070	102,778,610	-	114,977451	179,284,313	-	68,390.150	871,286,594
2005	427,662,710	50,575,726	-	148,046,980	147,967,459	-	69,280,456	843,533,331
2006	401,040,785	68,081,235	-	162,917,829	116,166,923	-	69,181,185	817,387,957
2007	432,051,483	73,848,033	-	120,741,036	99,067,734	-	68,061.569	793,769,855
2008	342,566,123	61,582,276	2,190,566	172,126,638	77,096,968	-	68,917,225	724,479,796
2009	276,990,009	78,963,074	300,828	163,627,724	111,371,037	-	137,942,533	769,195,205
2010	352,265,421	77,012,515	-	172,875,067	147,376,118	9,453,755	105,719,225	864,702,101
2011	271,462,697	79,579,804	-	246,626,085	136,032,999	18,092,657	70,287,982	822,082,224
Total	**4,394,250,731**	**847,087,029**	**2,491,394**	**2,165,269,683**	**1,764,571,475**	**27,546,412**	**933,124,436**	**10,133,341,160**

Source: NNPC Annual Report 2002- 2011.

Table 4.2

Crude Oil Export in Nigeria from 2002-2011 (barrel)

Year / Month	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Jan	57,284,626	63,927,693	75,326,188	67,456,297	71,062,565	70,552,458	56,793,954	57,920,658	67,145,981	74,668,111
Feb	51,015,787	64,213,985	73,082,052	62,778,435	66,829,351	58,955,150	63,301,288	57,280,104	67,468,691	64,340,771
Mar	53,833,912	62,890,237	75,697,415	70,156,144	66,289,600	63,803,365	59,582,300	63,302,135	70,788,401	67,931,652
April	50,552,697	62,068,333	72,073,593	63,695,905	63,576,883	63,456,666	54,376,043	53,621,759	67,260,046	66,794,717
May	52,706,783	67,533,578	73,105,924	75,223,196	65,258,457	63,129,755	62,968,369	68,367,535	67,550,277	68,363,645
Jun	52,177,133	63,036,788	72,205,187	67,719,039	68,187,970	61,246,627	54,265,316	62,116,894	74,591,290	70,527,957
Jul	53,453,914	64,221,785	75,792,843	75,770,411	72,460,015	70,740,161	57,417,639	61,994,406	75,843,753	70,650,154
Aug	56,530,296	70,581,872	76,725,509	70,382,521	67,340,856	63,249,478	60,596,105	66,450,920	69,009,003	73,173,567
Sep	57,308,222	67,776,052	74,100,218	69,157,525	64,917,141	70,353,429	64,361,582	63,242,730	77,962,880	62,053,661
Oct	58,414,515	68,273,106	71,407,315	68,979,056	70,966,162	68,214,009	68,072,988	71,442,502	76,732,148	70,586,656
Nov	57,415,035	68,883,971	68,135,235	74,118,223	70,727,123	65,930,520	61,136,734	64,972,801	71,161,171	62,976,593
Dec	62,700,455	72,577,078	70,425,870	78,714,746	70,379,949	72,194,901	61,607,478	78,482,761	79,208,460	70,014,740
Total	**663,393,375**	**795,984,478**	**878,077,349**	**844,151,498**	**817,996,072**	**791,826,519**	**724,479,796**	**769,195,205**	**864,702,101**	**822,084,235**

Source: NNPC Annual Report 2002-2011.

Table 4.3

Crude oil tankers that lifted Crude oil from Nigeria and their Tonnage(GRT) (1997-2011)

S/N	YEAR	No of Tankers	Tonnage (GRT)
1	1997	693	66,178,786
2	1998	706	67,865,473
3	1999	639	61,830,750
4	2000	754	78,605,539
5	2001	719	73,907,241
6	2002	634	64,302,640
7	2003	657	73,216,175
8	2004	924	99,521,333
9	2005	902	94,984,566
10	2006	754	78,605,539
11	2007	719	73,907,241
12	2008	947	99,561,343
13	2009	706	67,865,473
14	2010	934	98,623,231
15	2011	914	71,765,567

Source: NPA Annual Reports (1997- 2011)

Table 4.4

Volumes of Crude Oil Export from Nigeria(1997-2011)

S/N	Year	Export (X 000,000 Barrels)
1	1997	769
2	1998	706
3	1999	678
4	2000	714
5	2001	780
6	2002	663
7	2003	796
8	2004	878
9	2005	844
10	2006	818
11	2007	792
12	2008	724
13	2009	769
14	2010	865
15	2011	822

Source: NNPC Annual Report 1997-2011

Table 4.4 shows the total export of Nigeria Crude Oil from 1997-2011.Then, the volume of crude oil export from Nigeria to other parts of the world was plotted against the corresponding year as shown in the graph below.

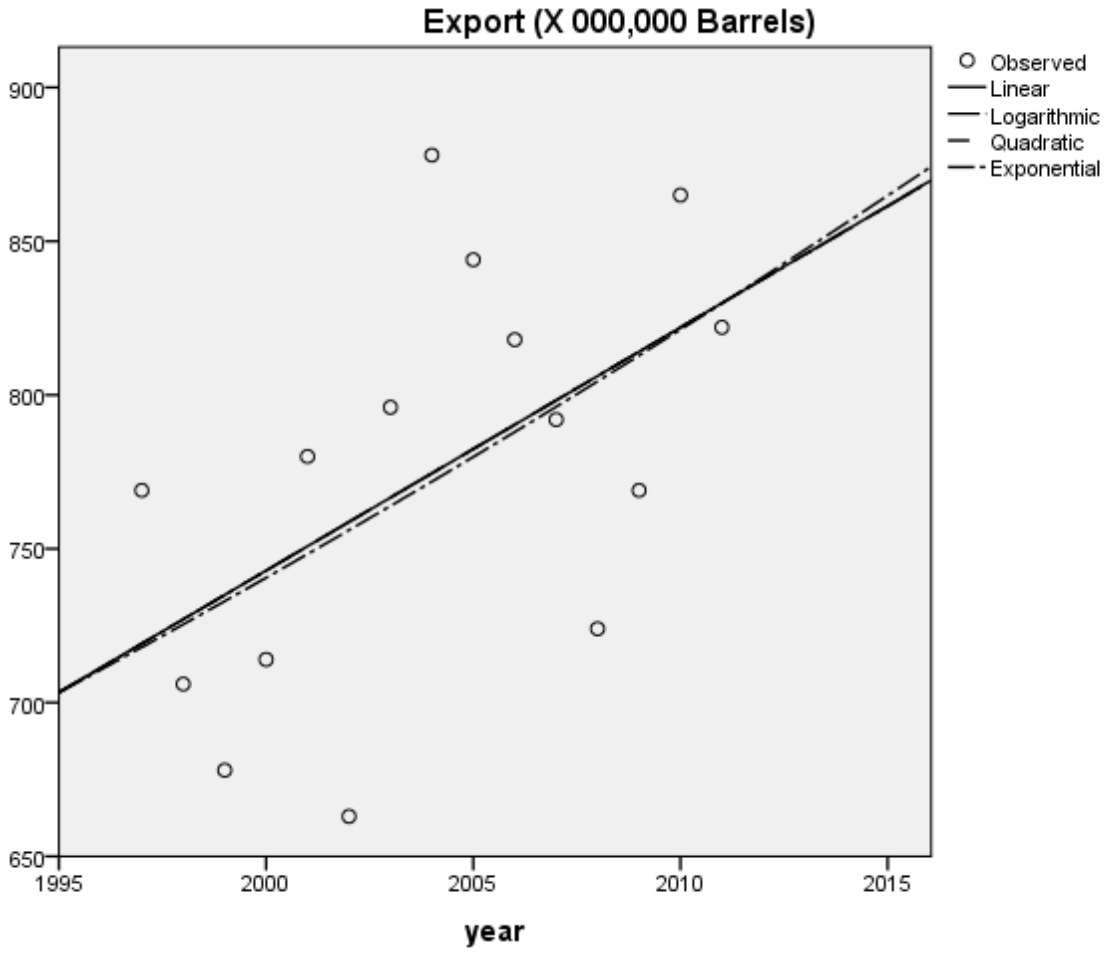

Figure 4.1: Graph Showing the Trend of Crude Oil Export from Nigeria 1997-2011.

Figure 4.1, shows the movement of Crude Oil Export from Nigeria to other part of the World from 19997-2011. It also indicates that the volume of the Crude Oil Export from Nigeria has been increasing and decreasing over the years in consideration.

Table 4.5

4.3 Results Interpretation on Trend of Crude Oil Export in Nigeria

Model Summary and Parameter Estimates

Dependent Variable: Export (X 000,000 Barrels)

Equation	Model Summary					Parameter Estimates		
	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	.285	5.186	1	13	.040	-15071.381	7.907	
Logarithmic	.285	5.189	1	13	.040	-119719.672	15848.457	
Quadratic	.285	5.186	1	13	.040	-15071.381	7.907	.000
Exponential	.286	5.206	1	13	.040	7.738E-007	.010	

The independent variable is year.

From the table 4.5, the value of R-Squared (R^2) and f-ratio for each of the four estimation models used includes:

Parameters / Models	R Square(R^2)	F-Ratio
Linear	0.285	5.186
Logarithmic	0.285	5.189
Quadratic	0.285	5.186
Exponential	0.286	5.206

Source: Field work as calculated by Researcher

Following the values of R-square (R^2) and F-ratio in the above table, we work with the model that has the highest values. In this case, exponential model is considered which has the values of 0.286 (28.6%) and 5.206 respectively. This shows a

positive value which means that the trend of the volume of crude oil exported from Nigeria to other parts of the World increased gradually as the year pass-by. Meanwhile, R-Squared (R^2) is one of the tests used to measure the goodness of the parameter estimates, which in this case shows a positive value.

4.4 Crude Oil Export Forecast from Nigeria to other parts of the World from 2012-2030.

From the regression (OLS) table above, the trend equation for each of the models used are as follows:

For Linear, $Y_t = -15071.381 + 7.91t$

For Logarithmic, $Y_t = -119719.672 + 15848.46t$

For Quadratic, $Y_t = -15071.381 + 7.91t$

For Exponential, $Y_t = 7.738E\text{-}007 + 0.01t$

Where Y_t= the estimated trend value for a given time period.

t= annually.

For example, if we want to forecast the volume of crude oil to be exported say 2050, which is 39 years ahead. Using exponential model, we have:

$Y_t = 7.738E\text{-}007 + 0.01t$

$Y_t = 7.738E\text{-}007 + 0.01(39)$

$Y_t = 7.738E\text{-}007 + 0.39=0.3970$(million barrels)

$=0.3970 \times 10^9$ barrels.

Table 4.6

Crude oil Tankers that lifted Crude oil from Nigeria(1997-2011)

S/N	Year	No of Tankers
1	1997	693
2	1998	706
3	1999	639
4	2000	754
5	2001	719
6	2002	634
7	2003	657
8	2004	924
9	2005	902
10	2006	754
11	2007	719
12	2008	947
13	2009	706
14	2010	934
15	2011	654

Source: NPA Annual Report 1997-2011

Table 4.6, shows the total number of tanker vessels that lift oil from Nigeria to other parts of the world. Then, the number of tanker vessels that lift oil from Nigeria was plotted against the corresponding year as shown in figure 4.2.

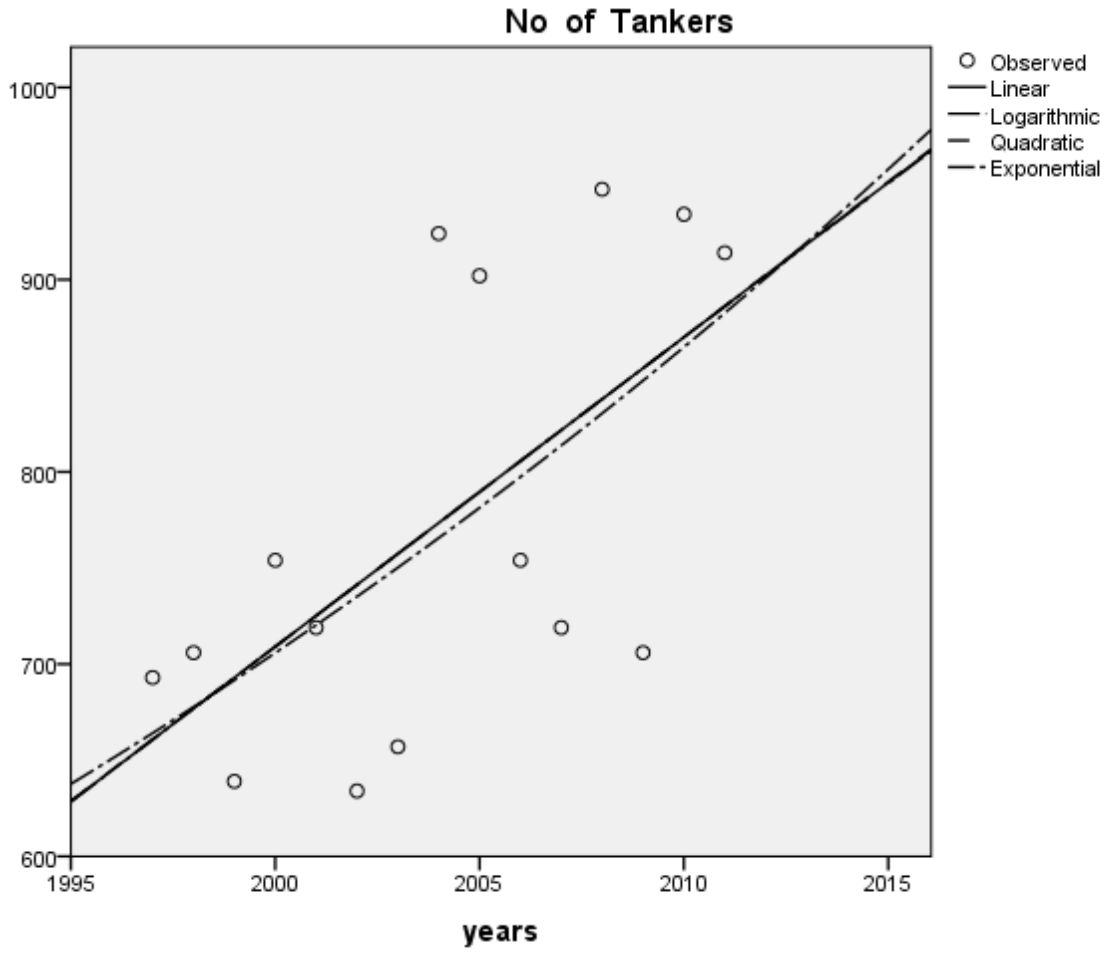

Figure 4.2: Graph Showing the Trend of Tanker Vessels that lift Crude Oil from Nigeria 1997-2011.

Figure 4.2, shows the movement of the number of tanker vessels that lift Crude Oil from Nigeria to other part of the World from 19997-2011. It also indicates that the number of tanker vessels that lift Crude Oil from Nigeria has been increasing and decreasing over the years in consideration showing irregular movement.

Table 4.7

4.5 Results Interpretation on the Trends of number of Tanker Vessels Availability.

Model Summary and Parameter Estimates

Dependent Variable: No of Tankers

Equation	Model Summary					Parameter Estimates		
	R Square	F	df1	df2	Sig.	Constant	b1	b2
Linear	.386	8.156	1	13	.014	-31483.776	16.096	
Logarithmic	.385	8.153	1	13	.014	-244445.547	32253.360	
Quadratic	.386	8.159	1	13	.013	-15357.096	.000	.004
Exponential	.384	8.092	1	13	.014	1.570E-015	.020	

The independent variable is years.

From table 4.7, the value of R-Squared (R^2) and f-ratio for each of the four estimation models used includes:

Parameters / Models	R Square(R^2)	F-Ratio
Linear	0.386	8.156
Logarithmic	0.385	8.153
Quadratic	0.386	8.159
Exponential	0.384	8.092

Source: Field work as calculated by Researcher

Following the values of R-square (R^2) and F-ratio in table 4.7,we work with the model that has the highest values. In this case, linear model is considered which has the values of 0.386 (38.6%) and 8.156 respectively. This shows a positive value which means that the trend of the number of tanker vessels that lift crude oil

from Nigeria to other parts of the World increased gradually as the year pass-by. Meanwhile, R-Squared (R^2) is one of the tests used to measure the goodness of the parameter estimates, which in this case shows a positive value.

4.6 Forecast on Number of Tanker Vessels that will lift Crude Oil from Nigeria to other parts of the World from 2012-2020.

From the regression (OLS) table above, the trend equation for each of the models used are as follows:

For Linear, $Y_t = -31483.776 + 16.10t$

For Logarithmic, $Y_t = -244445.547 + 32253.36t$

For Quadratic, $Y_t = -15357.096$

For Exponential, $Y_t = 1.570E\text{-}015 + 0.02t$

Where Y_t= the estimated trend value for a given time period.

t= annually.

For example, if we want to forecast the volume of crude oil to be exported say 2050, which is 39 years ahead. Using linear model, we have:

$Y_t = -31483.776 + 16.10t$

$Y_t = -31483.776 + 16.10(39)$

$Y_t = -31483.776 + 627.9 = -30855.88$ tankers

Table 4.8

LINEAR REGRESSION ANALYSIS FOR CRUDE OIL EXPORT (Y) AND NUMBER OF TANKERS (X): SCATTER DIAGRAM

S/N	Year	Crude oil Export(X 000,000 barrels) (Y)	No of Tankers (X_1)	Tonnage (GRT) (X_2)
1	1997	768	693	66,178,786
2	1998	706	706	67,865,473
3	1999	678	639	61,830,750
4	2000	714	754	78,605,539
5	2001	780	719	73,907,241
6	2002	663	634	64,302,640
7	2003	796	657	73,216,175
8	2004	878	924	99,521,333
9	2005	844	902	94,984,566
10	2006	818	754	78,605,539
11	2007	792	719	73,907,241
12	2008	724	947	99,561,343
13	2009	769	706	67,865,473
14	2010	865	934	98,623,231
15	2011	822	654	71,765,567

Source: As computed by Researcher.

Table 4.9

4.7 Analytical Interpretation of the Results of the Regression Model

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	497.099	98.959		5.023	.000
	no of tanker	.232	.256	.406	.904	.384
	tonnage	1.259E-006	.000	.256	.569	.580

Coefficients[a]

Model		95.0% Confidence Interval for B		Collinearity Statistics	
		Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	281.486	712.713		
	no of tanker	-.327	.790	.244	4.101
	tonnage	.000	.000	.244	4.101

a. Dependent Variable: Export (X 000,000 Barrels)

The equation of the simple regression model is:

Y = a+ bX+ e

Where, Y = the total variation

a + bX = the explanatory variation

e = the unexplained variation

From table 4.9, this can be represented as follows:

$Y = 497.1 + 0.232X_1 + 1.259E\text{-}006X_2 + e$

Moreover, the number of tanker vessels (dependent variable) calling on Nigerian oil ports depends on the volume of crude oil available to be exported (independent variable). Then, the unexplained variation (e) will be the effects of other things like

Niger-Delta insurgent which have contributed to much fluctuation in the amount of crude oil exported by Nigeria and thereby affecting the number of crude oil tankers calling at Nigerian crude oil terminals. However, the parameter ‘a’ and ‘b’ explain the total variation in the number of crude oil tankers during the period in view.

Table 4.9.1

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		
					R Square Change	F Change	df1
1	.640[a]	.410	.312	54.928	.410	4.173	2

Model Summary

Model	Change Statistics	
	df2	Sig. F Change
1	12	.042

a. Predictors: (Constant), tonnage, no of tanker

From the table above, R^2 is given as **0.410** which is also expressed as **41.0% (ie,0.410 x 100).** It suggests that the amount of variation that is explained by X (independent variable) is **41.0%.** This means that it has a low explanatory value; while unexplained (e) is very high **(ie, 59.0%).** In other words, the amount of crude oil that is lifted (exported) from Nigeria to other parts of the world cannot necessarily be explained by the number of tanker vessels that call at the crude oil terminals (depot). This is because the tankers that call do not have uniform tonnages (capacities).Different tankers have different tonnages and therefore sizes.

Table 4.10

4.8 Analytical Interpretation of the Results of the Correlations Model

Descriptive Statistics

	Mean	Std. Deviation	N
Tonnage (GRT)	78049393.13	13448378.463	15
Export (X 000,000 Barrels)	774.53	66.218	15

Correlations

		Tonnage (GRT)	Export (X 000,000 Barrels)
Tonnage (GRT)	Pearson Correlation	1	.608*
	Sig. (2-tailed)		.016
	N	15	15
Export (X 000,000 Barrels)	Pearson Correlation	.608*	1
	Sig. (2-tailed)	.016	
	N	15	15

*. Correlation is significant at the 0.05 level (2-tailed).

Correlations

			Tonnage (GRT)	Export (X 000,000 Barrels)
Spearman's rho	Tonnage (GRT)	Correlation Coefficient	1.000	.621*
		Sig. (2-tailed)	.	.013
		N	15	15
	Export (X 000,000 Barrels)	Correlation Coefficient	.621*	1.000
		Sig. (2-tailed)	.013	.
		N	15	15

*. Correlation is significant at the 0.05 level (2-tailed).

The above Correlation shows to the ratio at which tonnage (GRT) affects the volume of crude oil export from Nigeria. It reveals that for every 1-unit of tonnage change, there is a corresponding 0.608 volumes of Crude oil to be exported for Pearson correlation at 0.05 levels of significance, vice verse. Also, for every 1-unit of tonnage change, there is a corresponding 0.621 volumes of crude oil to be exported for Spearman's rho correlation at 0.05 levels of significance, vice verse.

4.9Testing of Hypothesis

Here, we tend to test our hypothesis as it was stated in chapter one of this research work which include:

(H_A :1). There is a correlation between the volumes of crude oil export and the capacity of crude oil tankers that lift oil from Nigeria.

Based on correlation model used, it shows that for every 1-unit of tonnage change, there is a corresponding **0.608** volumes of Crude oil to be exported for Pearson correlation at **0.05** levels of significance, vice verse. Also, for every 1-unit of tonnage change, there is a corresponding **0.621** volumes of crude oil to be exported for Spearman's rho correlation at **0.05** levels of significance, vice verse. This means that we accept our hypothesis since there is correlation between the volumes of crude oil export and the capacity of crude oil tankers that lift oil from Nigeria.

(H_A :2). There is a positive change in the number of crude oil vessels that lift oil from Nigeria (1997-2011)

Based on our time series analysis(OLS) using linear model on number of tanker vessels that lift crude oil from Nigeria which shows that **R^2 = 0.386(38.6%),** which means that the number of tanker vessels that lift crude oil from Nigeria to other parts of the world increase gradually over the years in view. Because R^2 shows a positive value, the hypothesis is accepted.

(H_A:3) There is a positive change in the volumes of crude oil exported from Nigeria (1997-2011).

Based on our time series analysis(OLS) using exponential model on crude oil export which shows **R^2 = 0.286(28.6%)**,which means that the volume of Crude Oil Export from Nigeria to other parts of World suggests a gradual rise or increase in the total number of barrels. More so, we can observe that the trend is positive showing an effective tanker shipping services since tanker vessel depends on the volume of crude oil to be exported. That is, tanker vessel was born as a result of a demand of transporting crude oil to other parts of the world. In this view, we accept the hypothesis.

(H_A:4). **There will be more number of crude oil vessels required for crude oil export in future.**

From our regression analysis $\mathbf{R^2}$ **=0.410** which represents**41.0%.** It suggests that the amount of variation that is explained by X (independent variable) is **41.0%.** This means that it has a low explanatory value; while unexplained (e) is very high **(ie, 59.0%).**Although, there is variation but it is very small. For the facts that there is variation, we accept (up hold) our hypothesis.

In general, we up hold that there will be more number of crude oil vessels required for crude oil export in future.

4.10 Discussion of Results

Here a detailed discussion of the results found using correlation, time series regression analysis will be carried out base on our research objectives. Firstly, our result found using correlation model shows that for every 1-unit of tonnage change, there is a corresponding **0.608** volumes of Crude oil to be exported for Pearson correlation at **0.05** levels of significance, vice verse. Also, for every 1-unit of tonnage change, there is a corresponding **0.621** volumes of crude oil to be exported for Spearman's rho correlation at **0.05** levels of significance, vice verse. Secondly, the result found using linear model (OLS) shows that there is **38.6%** gradual increase in the number of crude oil vessels that lift oil from Nigeria within the

period in view. Thirdly, the result found using exponential model (OLS) shows that there is **28.6%** gradual increase in volume of crude oil export from Nigeria to other parts of the world over the years in view.

Finally, the result found using regression analysis shows that there is **41.0%** explained value of independent variable 'X' as against **59.0%** unexplained value. This means that there will be more number of crude oil vessels required for crude oil export in future since there is variation at all, though it is small.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This work 'An Econometric Study of Tanker Shipping Services in Nigeria' shows that there is positive change in the number of crude oil tankers that lift crude oil from Nigeria to other parts of the world. It has made also a serious revelation, which initially, has been hidden in the sense that more investment was made on tanker shipping industry. The statistical tools – time series regression analysis and correlations have played great roles here. Using the various methods to estimate the trend for both crude oil export (which is the determinant factor of Tanker Shipping) and Tanker Shipping in general, we could detect positive trend in each case. This marks a good revelation! Our test of $\mathbf{R^2}$**(41.0%)** in regression analysis made a great revelation. This gives a low explanatory value, suggesting that the amount of variation that is explained by crude oil exported from Nigeria cannot necessarily be explained by the number of Tanker (vehicles) vessels (crude) that call in Nigeria to lift oil. The understanding ranges from the fact that different tankers have different tonnages. What matters, therefore, is the gross registered tonnage (GRT) of the tanker vessels that call, not necessarily the number.

5.2 Conclusion

From the ongoing, we are neither dreadful nor in a dilemma to infer, judging from the various methods used, that Tanker Shipping in Nigeria has a positive trend. Our local investors should therefore not entertain any fears in investing in this lucrative area of commercial endeavor.

Finally, the number of tanker vessels (crude oil) that call in Nigeria to lift crude (oil) does not necessarily determine the volume (tonnage) of crude oil lifted or exported from Nigeria. This is because, vessels (tankers inclusive) are determined in size terms by their gross registered tonnage(GRT) not their number.

5.3 Recommendations

Following our concluded positive trend of Tanker Shipping in Nigeria; we make the following recommendations:

1. Encouragement of Local Participation: The government (of

Nigeria) should do everything within her bound to make for the encouragement of local participation in Tanker Shipping in Nigeria through Cabbotage act. This has not been the case for a number of years now. We know that this is a highly technological intensive area that is why it calls for government support. The federal government should enact laws to make this possible: the earlier, the better.

2. Check of Ugly Trends: The government (federal) should do everything within her reach to check the ugly trends that go on in the oil industry. These include:

i. **The Activities of the Restive Niger-Delta Youths:** This has caused a lot of harm in terms of oil production and export in Nigeria-thereby affecting tanker shipping. Nigeria has recorded losses of up to 200,000barrels of crude oil a day. This is a whooping percentage to the daily output. Because of this inferno, Nigeria has not been able to meet up with her daily OPEC quota of some 2.5 million barrels of oil per day. This means a whooping cut in Nigeria's daily income and thereby the gross domestic income (GDI). Had it been it's not the current high price of oil in the international market, Nigeria would have cried hue.

ii. Sabotage from the Government Juggernauts: People close to the oil industry have reported cases of unaccounted for crude oil lifting abroad some high-ranking government officials are responsible for this. This means much more revenue to individual government officials and impoverishments of the entire country. No wonder so many Nigerians are richer than some countries in Africa.

3. Liberalization in the Oil Sector: The government should liberalize the oil sector - as this is the current spate of business events in the world today. The oil sector should not be an exception. Deregulation is the order of the day – though this should be done with care here.

4. More Investments in the Oil Industry: There should be more investments in the oil industry. This is so as the world economy is growing and the emerging economy – China – is consuming oil like mad. Nigerians should, therefore be

encouraged to invest in this area. This will lead to more growth in Tanker Shipping in Nigeria thereby diversifying the economy as more job opportunities will be created.

5. Reorientation of both the Government and Individuals: Professionals in this area - Tanker shipping and Transport in general- should be organizing seminars and lectures for both the government and those who 'can-afford-it' in Nigeria (the wealthy ones) to re-awaken their initiatives in this area of laudable venture. With this they will understand how to differentiate between 'what is' and 'what ought to be'. Let them understand that what makes for progress and growth of any economy is doing the right thing in the right sector.

5.4 Contribution to Knowledge

This work is an extension of trend analysis on tanker vessels that lift crude oil from Nigeria to other parts of the world (done by Ndukwe, 2004) from 2002 to 2011 so as to ascertain if the trend is still progressive or not using more statistical tools. Areas for further studies are: crude tanker vessel accident, effects of oil spillage from tanker vessels on the affected region, etc.

REFERENCES

Allen K, (1978) Energy in African, Internet.

Alderton R,(1987) Sea Transport. Internet

Alizadeh A.H, Nomikos N.K,(2006) Trading strategies in the market for tanker. Marit policy management 33(20):119-140.

Arnesen S., Johansen M,(2012) Historical Distribution, Volatility and value at risk in the Tanker Shipping Market. Economics and Resource Management Department, Norwegian University of Life Sciences.

Beenstock M,(1985). A theory of Ship Prices. Marit Policy Management 12(3):215-225.

Branch, A (2005) Element of Shipping. Red Lion Selters, London.

Chen Y,Wang S (2004) The Empirical Evidence of the Leverage Effect on Volatility in International Bulk Shipping Market. Marit Policy Management 31(2):109-124.

Clarkson Research Studies (2010) Oil and Tanker Trades Outlook. Clarkson Research Studies, London.

Dikos G, (2004) New Building Prices: Demand Inelastic or Perfectly Competitive? Marit Econ Logist 6(4):312-321.

Damu A, Bacan S (2004) World Crude Oil Consumption. International Energy Outlook (EIA) Publication, United States.

Effimious P (2005) Rolling Sample Volatility Estimators. Journal of Business & Economic Statistics,20,363-376.

Energy Kids (2012) World Oil Market Report. International Energy Agency (IEA) Publication, U.S.A.

Ewart W, (2008) Bulk Carriers. Fair-play Publications, London.

Glen D, Martin B (2002) The tanker Market: Current Structure and Economic Analysis. The handbook of Maritime Economies and Business, LLP, London.

Goulielmos A, Psifia M (2007) A Study of Trip and Time Charter Freight Rate Indices:1968-2003. Marit Policy Manag 34(1):55-67.

Goulielmos A,(2009) Risk Analysis of the Aframax Freight Market and of its New Building and Second hand Prices,1976-2008 and 1984-2008. Int. J Shipping Transp Logist 1(1):74-97.

Hoffman J, Rubiato M, Miroux A (2011) Review of Maritime Transport, United Nations. New York and Geneva: United Nations.

Isa,Y. (2006) Posted Price and Official price of Nigerian Crude Oil: Hybrid Publishers Ltd, Kano-Nigeria.

Jazayer S, Yahyai J (2004) The Crude Facts about the Price of Oil Internet.

Kendall L, Buckley J (2001) The Business of Shipping. Cornell Maritime Press, Centreville.

Knapp S, Kumar S, Remijin A, (2008) Econometric Analysis of the ship Demolition Market. Mar Policy 32(6):1023-1026.

Lun Y, Quaddus M (2009) An Empirical Model for the Bulk Shipping Market. Int .J Shipping Transp Logist 1(1):37-54.

Lun Y,et al.(2013) Oil Transport Management, Shipping and Transport Logistics. Springer-Verlag London 2013.

Lyridis D, Zacharioudakis P, Mitrou P, Mylonas A (2004) Forecasting Tanker Market Using Artificial Neutral Networks. Marit Econ Logist 6(1):93-108.

Mc-Conville J,(1999) Economics of Maritime Transport: theory and practice. Witherby, London.

Metaxas B,(1971) The Economics of Tramp Shipping. The Athlone press of the University of London, London.

Ndukwe P (2004) Analysis of Trend of Tanker Shipping in Nigeria. Msc Thesis, FUTO-Nigeria.

Ndikom B (2008) Maritime Transport Management and Administration in Nigeria. Bunmico Publishers, Nigeria.

Need Project (2012) Energy Information Services (EIS), Nigeria's Oil and Gas Industry.

Nwoko I.C (2005) An Analysis of Crude Oil and Refined Petroleum Product. B. Tech Project, FUTO-Nigeria.

Ocean Shipping Consultants Ltd (2004) Shipping Profitability to 2015. The outlook for Vessel costs and Revenue. Ocean Shipping Consultants Ltd, Chertsey.

OPEC (2009) The OPEC Annual Report (2009). Internet.

Robinson R (1977) School Certificate Chemistry. African Universities Press, Lagos-Nigeria.

Stopford M (2009) Maritime Economics. Routledge, New York.

Strandenes S.P. (2002) Economics of the Markets for Ships. The Handbook of Maritime Economics and Business. LLP, London.

Tafida J (2006) Petroleum Distribution. Internet.

Tirole J (2003) The Theory of Industrial Organization. The MIT press, Cambridge.

UNCTAD (2009) Review of Maritime Transport. United Nations Conference on Trade and Development, Geneva.